Indiana Diet Manual

A project of the

INDIANA DIET MANUAL COMMITTEE

Approved by the

INDIANA DIETETIC ASSOCIATION

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Third Edition 1986
Fourth Edition 1991
Fifth Edition 1996
Sixth Edition 2001
Seventh Edition 2006
Eighth Edition 2011
Institutional Approval

This diet manual has been approved for use in:

Institution

Address

<table>
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<th>REGISTERED DIETITIAN</th>
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Preface

The Indiana Dietetic Association has designed and prepared the 2011 Diet Manual to accommodate a variety of institutional care providers. The goal of this manual is to provide basic concepts in nutrition and dietetics for food service providers in these institutions, as well as resources for further information. Food service professionals and other staff members will be able to use this manual as a guide in meal planning for diverse populations. Physicians may use this to aid in determining appropriate modified diets. In addition, nurses and other staff members may use the manual to interpret and carry out physician orders or dietitian recommendations.

The Indiana Dietetic Association reviews and revises the Diet Manual as needed every five years. With each new edition, we aim to incorporate the most up to date information available. The manual is divided into five sections:

1. Nutrition Assessment
2. Principles of Nutrition
3. Medical Nutrition Therapy
4. Diet Therapy
5. Appendix

The first section covers nutrition assessment of adults and children, including methods of determining nutrition requirements. The second section uses the US Dietary Guidelines and Pyramid Food Guide to describe the basic principles of nutrition care. Upon the release of the 2010 Guidelines, a revised supplemental section will be sent to buyers. The third section includes guidelines for nutritional management of specific diseases. The fourth section is intended provide a guide for food services to fill prescriptions for diet modifications. The appendices include pediatric growth charts and information on infant formulas.

As in the Seventh Edition, this manual utilizes the American Dietetic Association’s Nutrition Care Process (NCP) Model (Lacey & Pritchett, 2003, p.1063) in order to address nutrition care for a variety of diseases and conditions. The NCP has the following 4 steps:

1. Nutrition Assessment
2. Nutrition Diagnosis
3. Nutrition Intervention
4. Nutrition Monitoring and Evaluation

Special thanks to Christine Carver, RD, CD for her work as Diet Manual Chair for the 2006 Manual, which implemented this current format.

Valerie Amend, MS, RD, CD
Diet Manual Chairperson
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- Fish Allergy Diet
- Latex Allergy Diet
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**Adult Nutrition Assessment**

The first step in the nutrition care process is nutrition assessment. Dietetics professionals use nutrition assessment in several ways:
- to determine a person's current nutrition status and needs
- to develop a plan for improvement
- to monitor the outcomes of interventions
- to decide when to change the care plan

Some facilities develop a nutrition screening process to identify who needs a full nutrition assessment. They choose risk factors for their specific population. A variety of healthcare staff can complete simple, brief screening. This frees the dietitians to focus on those with greater needs. It is important to note that nutrition screening and assessment must be completed in a preset time frame. Accrediting or regulatory agencies often specify the time allowed (Charney & Malone, 2009, p. 16).

Nutrition assessment must include multiple factors. No factor has adequate specificity and sensitivity to be used alone. The key components of nutrition assessment covered in this section are:
- medical diagnosis
- patient history
- anthropometric data
- biochemical data
- nutrition-focused physical exam

**Glossary**

*Medical diagnosis* is the identification of a disease or pathology of specific organs or body systems that can be treated or prevented. It does not change as long as the disease or condition is present.

*Nutrition diagnosis* is the identification and labeling of a specific nutrition problem that a dietitian can treat independently. It changes as the person's response changes.

**Medical Diagnosis**

In the past, the medical diagnosis has provided the organizational framework for nutrition assessment and care planning. The medical nutrition therapy section of this manual provides guidelines for steps in the nutrition care process based on the medical diagnosis.

The American Dietetic Association has developed standardized language for making nutrition diagnoses. Medical and nutrition diagnoses are not the same. Dietitians use medical and health history data to evaluate the nutrition-related causes or consequences of disease. Beyond this, they cluster, synthesize and analyze assessment information of all types to identify and label nutrition problems (Nutrition Diagnosis and Intervention: Standardized Language for the Nutrition Care Process. Chicago, American Dietetic Association, 2007, p. 3-5)
Section 1A: Adult Nutrition Assessment

Patient History

Use several sources for the patient history. Review the medical records. Interview the person, the family, or other caregivers. For a thorough assessment, include the following factors from the ADA's nutrition care process.

**Medical and Health History**
- Present and past illness or disease
- Family medical history
- Mental health history

**Social History**
- Socioeconomic status
- Cultural and religious beliefs
- Daily routines and activity patterns
- Education level
- Cognitive abilities

**Diet History**
- Food and beverage intake
- Eating patterns
- Current diet modifications
- Food preferences, intolerances, or allergies

**Nutrition Knowledge**
- Knowledge and beliefs about nutrition
- Self-monitoring and health management experiences
- Previous nutrition counseling experiences

**Meal Management**
- Meal planning
- Food availability
- Food purchasing
- Food preparation methods
- Food safety practices

**Anthropometric Data**

Height and weight are the most commonly used anthropometric data in adults. Other measures include data on body composition from skin fold thickness and muscle circumference. Monitoring changes in anthropometric data is used in evaluating the effectiveness of the current nutrition interventions.

**Height**
To determine height, use either of the following methods.
Section 1A: Adult Nutrition Assessment

**Standing.** Measure the person:
standing, flat-footed, without shoes
with legs, head, and back straight
with arms at the side

**Arm Span.** Use this method if the person cannot stand:
extend the dominant arm at a 90° angle
measure the distance from the sternal notch to the tip of the middle finger
on the dominant hand
double this measurement (Charney & Malone, 2009, p. 156)

**Weight**
To find weight, use a standing, chair, or bed scale.

**Evaluation of Weight Change**
Investigate unplanned weight changes. Rule out errors due to changes in clothing, bedding, or equipment, or errors in the scales. Confirm subjective reports of weight change with objective weight data and/or by physical exam.

Find the percentage weight change by using the following equation:
\[
\%	ext{ of weight change} = \frac{\text{UBW} - \text{CBW}}{\text{UBW}} \times 100
\]

\(\text{UBW} = \text{usual body weight}; \text{CBW} = \text{current body weight}\)

Example: a person's weight decreased from 129 to 101 pounds in 6 months.
\[
\frac{129 - 101}{129} \times 100 = 28 \text{ divided by } 129 \times 100 = 0.22 \times 100 \text{ or } 22\% \text{ weight loss in 6 months}
\]

(Charney & Malone, 2009, p 159-160)

Evaluate reasons for reported weight loss such as inadequate calorie intake, inadequate hydration, use of diuretics, or loss of tissue from immobility or amputation. Table 1A-1 provides interpretation of weight loss due to inadequate calorie intake.

Weight gain also may be a serious nutrition problem. Reasons for weight gain include extra calorie intake, medication changes, or fluid retention.

**Table 1A-1: Assessment of Weight Change**

<table>
<thead>
<tr>
<th>Time</th>
<th>Significant Weight Loss (%)</th>
<th>Severe Weight Loss (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 week</td>
<td>1 to 2</td>
<td>greater than 2</td>
</tr>
<tr>
<td>1 month</td>
<td>5</td>
<td>greater than 55</td>
</tr>
<tr>
<td>3 month</td>
<td>7.5</td>
<td>greater than 7.5</td>
</tr>
<tr>
<td>6 month</td>
<td>10</td>
<td>greater than 10</td>
</tr>
</tbody>
</table>


**Desirable or Healthy Body Weight**

*The Hamwi Method*
Section 1A: Adult Nutrition Assessment

This method provides a rough estimate of desirable body weight based on height. It does not accurately account for age, race, or frame size differences (Charney & Malone, 2009, p. 154). Use the following calculation.

\[
\text{Men} = 106 \text{ lb for 5 ft} + 6 \text{ lb/in over 5 ft} \\
\text{Women} = 100 \text{ lb for 5 ft} + 5 \text{ lb/in over 5 ft}
\]

Add 10% for large-framed people; subtract 10% for small-framed ones. For people who have had amputations, adjust the desirable weight using the percentages in Table 1A-2.

**Table 1A-2: Percentage of body weight contributed by specific body parts**

<table>
<thead>
<tr>
<th>Body Part</th>
<th>Body Weight (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hand</td>
<td>.07</td>
</tr>
<tr>
<td>Arm, below the elbow</td>
<td>2.3</td>
</tr>
<tr>
<td>Entire arm</td>
<td>5.0</td>
</tr>
<tr>
<td>Foot</td>
<td>1.5</td>
</tr>
<tr>
<td>Leg, below the knee</td>
<td>5.9</td>
</tr>
<tr>
<td>Leg, at the knee</td>
<td>9</td>
</tr>
<tr>
<td>Leg, above the knee</td>
<td>15</td>
</tr>
</tbody>
</table>


The Body Mass Index (BMI)

Another way to evaluate body weight is to look at body mass (National Heart, Lung, and Blood Institute [NHLBI], 2000, p. 1). However, BMI cannot be used to evaluate people with amputation, edema, or large muscle mass. To determine BMI, use the following calculation.

\[
\text{BMI} = \frac{\text{weight (in kg)}}{\text{height}^2} \quad \text{(in M)} \\
\text{BMI} = \frac{\text{weight (in lb)}}{\text{height}^2 \times 703.1} \quad \text{(in in)}
\]

To interpret BMI use the following guidelines:

- Normal: 19-27
- Underweight: less than 19
- Overweight: 28-30
- Obese: greater than 30

Waist Circumference

Waist circumference is an especially useful measure to determine disease risk in people who have a BMI classified as normal or overweight. Monitoring waist circumference is helpful in estimating abdominal fat changes over time, especially if BMI does not change. It has the same predictive value as waist-to-hip ratio but it is simpler to perform. Measuring at the top of the iliac crest (the highest and widest part of the pelvis) will give you the most accurate reading.
Section 1A: Adult Nutrition Assessment

Use the following guidelines to identify people with a greater risk for development of diabetes, high lipid levels, high blood pressure and cardiovascular disease (NHLBI, 2000, p. 1).

Men: greater than or equal to 40 in
Women: greater than or equal to 35 in

Biochemical Data

<table>
<thead>
<tr>
<th>Albumin Level (grams per deciliter)</th>
<th>Decrease</th>
<th>Increase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal 3.5 to 5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depletion:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mild 3.0 to 3.4</td>
<td>October response</td>
<td>Intravascular volume depletion</td>
</tr>
<tr>
<td>Moderate 2.4 to 2.9</td>
<td>Severe liver failure</td>
<td>Intravenous albumin or plasminate, blood transfusions(temporary rise)</td>
</tr>
<tr>
<td>Severe less than 2.4</td>
<td>Redistribution: Intravascular volume overload, third-spacing, pregnancy, lying recumbent</td>
<td>Anabolic steroids, possibly glucocorticoids</td>
</tr>
<tr>
<td></td>
<td>Increased losses: nephrotic syndrome, burns, exudates, protein-losing enteropathy, severe zinc deficiency</td>
<td></td>
</tr>
</tbody>
</table>

Acute phase response (APR) refers to the hormonal response that occurs with inflammation associated with conditions such as infection, injury, surgery, and cancer.

Prealbumin

Prealbumin (also called transthyretin) is another serum protein produced by the liver. It has a half-life of only 2-3 days, so it is not useful as an indicator of long-term nutritional intake. However, prealbumin has been used as an indicator of acute nutrition status and to evaluate the effectiveness of nutrition interventions (Charney & Malone, 2009, p. 69). Alterations in prealbumin occur as a result of the same conditions that make albumin a poor nutrition indicator (Fuhrman, Charney, & Mueller, 2004, p. 1258). See Table 1A-4.
C-Reactive Protein (CRP)

C-reactive protein is not a nutrition marker. It is, however, a good indicator of the acute phase response. To determine if the APR influences the...
levels of other serum proteins, draw CRP levels at the same time (Charney & Malone, 2009, p. 65). Serial CRP levels have also been used to help identify when inflammatory processes are ebbing and aggressive nutrition support may begin.

**Electrolytes**

Serum electrolyte values indicate hydration status and acid-base balance. See Table 1A-5 for factors that will affect electrolyte levels.

**Hemoglobin and Hematocrit**

Hemoglobin is the carrier of oxygen in red blood cells. Hematocrit refers to the volume of packed red blood cells. They are used as biochemical measures of iron status, but they are not specific for iron deficiency. Both are decreased in the third stage of iron deficiency. Both vary with age and gender (hemoglobin also varies by race). Both are increased in dehydration, but decreased in overhydration, blood loss, malnutrition, and chronic infection.

**Nutrition-Focused Physical Examination**

A review of physical status is part of a comprehensive nutrition assessment. Nutrition assessment information can come either from a direct examination or from the findings of another health care provider (Charney & Malone, 2009, p. 40). The following factors should be included (pp. 41-43)

**General Survey**
- Body positioning
- Level of awareness and ability to communicate
- Functional ability with activities of daily living (ADLs) such as ability to shop for groceries, prepare meals, or self-feed

**Physical Appearance**
- Amputations
- Musculature and fat stores, signs of wasting, or altered body composition
- Changes in nails or hair

**Oral Health**
- Condition of teeth and gums; ability to chew
- Condition of lips and tongue; ability to swallow

**Skin**
- Presence of bruises, wounds, or pressure ulcers
- Presence of rashes or dermatitis
- Moisture and texture, or presence of edema
- Condition of mucous membranes
Calculated Adult Nutrition Needs

Calorie Needs

This section describes methods for calculating energy needs.

Glossary

*Basal energy expenditure (BEE)* refers to the calories used to maintain heartbeat, breathing, body temperature, and normal cell functions.

*Indirect calorimetry* is the calculation of calories used by measuring oxygen consumption and carbon dioxide production.

*Respiratory quotient (RQ)* is an indicator of the source of calories being used by the body. It is derived by dividing the amount of carbon dioxide released by the amount of oxygen used.

*Resting energy expenditure (REE)* is the calculation of calories used at rest by using indirect calorimetry.

*Total energy expenditure (TEE)* represents all the calories used in a 24-hour period.

Using predictive equations

The ADA’s *Nutrition Care Manual, October 2009 Ed.* cites several formulas for estimating basal energy needs. Evidence analysis has been used to establish recommendations for the predictive equation(s) to use depending upon the health status of the individual being assessed.

**Acutely Ill Patients**

*Mifflin-St. Jeor Equations for Resting Metabolic Rate (RMR)*

These two formulas express RMR in calories per day.

Men:  
\[
\text{RMR} = 10W \text{ (wt in kg)} + 6.25 H \text{ (ht in cm)} - 5 A \text{ (age in yrs)} + 5
\]

Women:  
\[
\text{RMR} = 10W \text{ (wt in kg)} + 6.25 H \text{ (ht in cm)} - 5 A \text{ (age in yrs)} - 161
\]

To estimate total energy expenditure (TEE), use the following equation, which accounts for additional activity and stress factors. Choose factors that estimate caloric needs for activity from Table 1B-1 and for stress from Table 1B-2 (Width & Reinhard, 2009, p. 14).

\[
\text{TEE} = \text{BEE} \times \text{activity factor} \times \text{stress factor}
\]

**Table 1B-1: Activity factors**

<table>
<thead>
<tr>
<th>Activity Level</th>
<th>Activity Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Confined to bed</td>
<td>1.2</td>
</tr>
<tr>
<td>Ambulatory</td>
<td>1.3</td>
</tr>
</tbody>
</table>
Table 1B-2: Stress factors

<table>
<thead>
<tr>
<th>Stress Condition</th>
<th>Stress Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Burns</td>
<td></td>
</tr>
<tr>
<td>&lt;20% body surface area</td>
<td>1.5</td>
</tr>
<tr>
<td>20-40% body surface area</td>
<td>1.8</td>
</tr>
<tr>
<td>&gt;40% body surface area</td>
<td>1.8 to 2.0</td>
</tr>
<tr>
<td>Infection</td>
<td></td>
</tr>
<tr>
<td>Mild</td>
<td>1.2</td>
</tr>
<tr>
<td>Moderate</td>
<td>1.4</td>
</tr>
<tr>
<td>Severe</td>
<td>1.8</td>
</tr>
<tr>
<td>Starvation</td>
<td>0.85</td>
</tr>
<tr>
<td>Surgery</td>
<td></td>
</tr>
<tr>
<td>Minor</td>
<td>1.1</td>
</tr>
<tr>
<td>Major</td>
<td>1.2</td>
</tr>
<tr>
<td>Trauma</td>
<td></td>
</tr>
<tr>
<td>Skeletal</td>
<td>1.2</td>
</tr>
<tr>
<td>Blunt</td>
<td>1.35</td>
</tr>
<tr>
<td>Closed head injury</td>
<td>1.4</td>
</tr>
</tbody>
</table>


**Ireton-Jones Equations for Estimated Energy Expenditure (EEE) 1992***

Spontaneously breathing: \( EEE = 629 - 11(S) + 25(W) - 606(O) \)

\( A = \text{age(yrs)}; W = \text{actual wt(kg)}; O = \text{obesity(BMI > 27(present = 1, absent = 0)} \)

Critically Ill Patients (Ventilator-dependent)

**Ireton-Jones Equation for Estimated Energy Expenditure (EEE) 1992***

Ventilator-dependent: \( EEE = 1925 - 10(A) + 5(W) + 281(S) + 292(T) + 851(B) \)

\( A = \text{age(yrs)}; W = \text{actual wt(kg)}; S = \text{sex (male = 1, female = 0)} ; T = \text{trauma (present = 1, absent = 0)} ; B = \text{burn (present = 1, absent = 0)} \)

* The Critical Illness Workgroup of the American Dietetic Association Evidence Analysis Project reported the 1997 version of the Ireton-Jones equation was not recommended for use as it did not perform as well as the 1992 version.

**Indirect calorimetry**

Indirect calorimetry predicts REE by measuring respiratory gas exchange. This method requires access to a metabolic cart and a trained staff to perform studies; however, it is about 95% accurate when correctly performed. The results include the REE as well as the RQ, which identifies the calorie sources the body is consuming. This information can aid in adjusting nutrition support to reduce carbon dioxide production in those people with respiratory problems. As with the predictive formulas, multiply the REE by an activity factor to account for total calorie needs (Charney & Malone, 2009, pp. 168-169).

**Hypocaloric regimen for Obese Patients (BMI > 30)**

(recommended both for acutely ill & critically ill obese individuals)

22 kcal/kg ideal body weight
Protein Needs

The DRI reference factor defines the protein needs for healthy adults. Illness or malnutrition may result in a protein goal above or below this norm. Refer to Table 1B-3.

Table 1B-3: Daily protein requirement for adults

<table>
<thead>
<tr>
<th>Condition</th>
<th>Protein Requirement (grams per kilogram)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DRI reference</td>
<td>0.8</td>
</tr>
<tr>
<td>Adult maintenance</td>
<td>0.8 to 1</td>
</tr>
<tr>
<td>Older adults</td>
<td>1</td>
</tr>
<tr>
<td>Kidney disease</td>
<td></td>
</tr>
<tr>
<td>Chronic kidney disease (GFR(^a) 22 to 25 mL/min)</td>
<td>0.8</td>
</tr>
<tr>
<td>Chronic kidney disease (GFR(^a) 10 to 22 mL/min)</td>
<td>0.6</td>
</tr>
<tr>
<td>Hemodialysis</td>
<td>1.1 to 1.4</td>
</tr>
<tr>
<td>Peritoneal dialysis</td>
<td>1.2 to 1.5</td>
</tr>
<tr>
<td>CVVHD(^b)</td>
<td>1.5 to 2</td>
</tr>
<tr>
<td>Liver disease</td>
<td></td>
</tr>
<tr>
<td>Hepatitis, chronic or acute</td>
<td>1 to 1.5</td>
</tr>
<tr>
<td>Cirrhosis</td>
<td>1 to 1.2</td>
</tr>
<tr>
<td>Hepatic encephalopathy, acute</td>
<td>0.6 to 1.2</td>
</tr>
<tr>
<td>Hepatic encephalopathy, chronic</td>
<td>0.5</td>
</tr>
<tr>
<td>Cancer</td>
<td>1.0 to 1.5</td>
</tr>
<tr>
<td>Cancer cachexia</td>
<td>1.5 to 2.5</td>
</tr>
<tr>
<td>Pressure ulcers</td>
<td>1.25 to 1.5</td>
</tr>
<tr>
<td>Bone marrow transplant</td>
<td>1.5</td>
</tr>
<tr>
<td>Irritable bowel disease</td>
<td>1 to 1.5 as condition allows</td>
</tr>
<tr>
<td>Short bowel syndrome</td>
<td>1.5 to 2</td>
</tr>
<tr>
<td>Obesity, stressed</td>
<td>1.5 to 2 based on ideal body weight</td>
</tr>
<tr>
<td>Solid organ transplant</td>
<td></td>
</tr>
<tr>
<td>Immediate post-transplant</td>
<td>1.5 to 2</td>
</tr>
<tr>
<td>Long-term</td>
<td>1.0</td>
</tr>
<tr>
<td>Pregnancy</td>
<td>Add 25 g per day</td>
</tr>
<tr>
<td>Pulmonary disease</td>
<td>1.2 to 1.5</td>
</tr>
<tr>
<td>Critical illness</td>
<td>1.5 to 2</td>
</tr>
<tr>
<td>Stroke</td>
<td>1.0 to 1.25</td>
</tr>
</tbody>
</table>


\(^b\)GFR = glomerular filtration rate, which is the rate at which the kidney filters or clears the plasma of a standard substance per minute.

\(^b\)CVVHD = continuous veno-venous hemodiafiltration, which is a form of kidney dialysis and renal replacement therapy.

Fluid Needs

The goals of calculating fluid needs include ensure water and electrolyte balance, and tissue perfusion (Charney & Malone, 2009, p. 174). Tools for evaluating the outcomes of fluid management include

- weight records
- intake and output records
Section 1B: Calculating Adult Nutrition Needs

physical assessment of skin turgor
moistness of the mouth and lips
serum electrolyte levels

Some medical conditions cause more or less fluid to be required as compared to normal. Use the following methods to determine fluid requirements.

Method 1

With this method, use the factors in Table 1B-4 to determine fluid requirements. These factors use weight measured in kilograms to determine the milliliters of fluid needed per day. Note that the use of this method may underestimate the fluid needs of underweight people.

Table 1B-4: Fluid needs of adults

<table>
<thead>
<tr>
<th>Condition</th>
<th>Fluid Requirements (milliliters per kilogram)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adult, oral feeding</td>
<td>25 to 30</td>
</tr>
<tr>
<td>Adult, tube-fed</td>
<td>30 to 35</td>
</tr>
<tr>
<td>Adult with pressure ulcers</td>
<td>30 plus replacement of wound drainage for a minimum of 1500 mL/day</td>
</tr>
<tr>
<td>Adult with air-fluidized bed</td>
<td>As above, with an extra 300 mL/8 hours</td>
</tr>
</tbody>
</table>


Method 2

This method also calculates fluid requirements based on the weight of the person. It is appropriate for adults of all sizes (Chidester & Spangler, 1997, pp. 23-28). Use the person's weight in kilograms (convert pounds to kilograms by dividing by 2.2) in the following equation.

\[
\text{Milliliters fluid per day} = (\text{wt in kg} - 20) \times 15 + 1500
\]

References


Section 1B: Calculating Adult Nutrition Needs


More Information

CDC BMI Calculator
[www.cdc.gov/nccdphp/dnpa/bmi/calc-bmi.htm](http://www.cdc.gov/nccdphp/dnpa/bmi/calc-bmi.htm)

CDC Growth Charts
[www.cdc.gov/growthcharts/](http://www.cdc.gov/growthcharts/)
Pediatric Nutrition Assessment

The key difference between pediatric nutrition assessment and that of adults is the focus on change. The growth and development seen in the pediatric population is dramatic, while the stages of adulthood show a much slower rate of change. The classification of assessment data is similar for both groups; however, there are significant differences in the standards and the methods used.

Nutrition care is an essential part of the medical care for children of all ages
- neonates,
- infants (up to 12 months of age),
- preschoolers (1 to 5 years of age),
- school-age children (6 to 10 years of age), and
- adolescents (11 to 18 years of age).

Illness may cause both metabolic change and alterations in intake that result in an acute or chronic change in nutrition status and body composition (Pediatric Nutrition Practice Group [PNPG], 2003, p.145).

As with adults, pediatric nutrition screening uses selected nutrition risk factors to identify the children who need a full nutrition assessment. Refer to Table 1C-1 for a list of some of these risk factors. In many facilities, there is limited time to conduct an ideal, comprehensive, pediatric nutrition screening (PNPG, 2003, p.145); therefore, these factors may not be fully assessed until a nutrition assessment is done. The following components of nutrition assessment are covered in this section:
- medical diagnosis,
- patient history,
- anthropometric data,
- biochemical data, and
- nutrition-focused physical exam.

Medical Diagnosis

Some medical diagnoses require the attention of a nutrition professional because the conditions increase the risk of development of malnutrition and/or require specific nutrition interventions. Some common examples (PNPG, 2003, pp. 150-151) are
- premature birth,
- severe burns, infection, or trauma,
- cancer
- congenital heart disease,
- cystic fibrosis,
- developmental disabilities such as cerebral palsy,
- diabetes,
- failure-to-thrive,
- fever,
- GI problems such as diarrhea, malabsorption, or inflammation,
- HIV infection or AIDS,
- kidney disease,
- metabolic disorders, and
- pressure ulcers or open wounds.
Table 1C-1: Pediatric nutrition risk factors

| Clinical History | - a medical condition with nutrition implications  
|                  | - developmental delay (physical, motor, cognitive)  
|                  | - medications with nutrition implications, such as  
|                  |   steroids  
|                  |   anticonvulsants  
|                  |   pancreatic enzymes  
|                  |   anti-tumor agents  
|                  |   insulin  
|                  |   herbal, vitamin, or mineral supplements  
| Diet Factors | - NPO or hypocaloric intake for more than 3 to 5 days  
|              | - difficulty with chewing, swallowing, or suck/swallow  
|              |   coordination  
|              | - restricted diets or eating styles (such as vegan or macrobiotic)  
| Socioeconomic Factors | - insecure food supply  
|                     | - inadequate housing  
|                     | - abusive home situations  
|                     | - financial difficulties  
|                     | - ethnic barriers  
| Anthropometric Factors | - weight-for-age below 5th percentile  
|                      | - weight-for-length or height below 5th percentile  
|                      | - weight loss  
|                      | - BMI above the 85th percentile  
|                      | - weight-for-height above the 85th percentile  
| Biochemical Factors | - hemoglobin less than 11g/dL  
|                    | - hematocrit less than 33%  
|                    | - serum albumin less than 3.5g/dL  


Patient History

The patient history comes from multiple sources, as in the assessment of adults. Parents and other family members or caregivers may be the main sources of information for infants and very young children. Older children and adolescents may be able to provide better information on their eating habits and activity levels. Employ both interviews and observation of the child and caregivers. Mealtime observation can provide information about the child’s physical development to compare with age-specific standards, as well as information about the parent-caregiver-child interaction (PNPG, 2003, p. 152).

Medical and Health History

Review the medical history for factors such as  
chronic illness or trauma  
medications  
previous hospitalizations  
birth history of infants and young children, which includes  
o birth weight and length  
o gestational age  
o APGAR score  
family medical history
Section 1C: Pediatric Nutrition Assessment

**Social History**
- Socioeconomic status including
  - family structure
  - social support system
  - family income
  - food availability
    - use of supplemental food programs and food banks
  - cultural and religious beliefs influencing food selection and consumption
  - daily routines and activity patterns
  - physical activity level (helps to determine calorie needs)
  - education level of the child and the family
  - cognitive abilities of the child and the family

**Diet History**
- Food and beverage intake
  - type of feedings, frequency, and amounts
  - oral calorie or protein supplements
  - vitamin or mineral supplements
  - for infants,
    - type of milk feeding
    - introduction of solids and textures
  - tube feedings or parenteral nutrition support
  - food intake in institutions (may not be the same as at home)

- Eating patterns
  - meal environment
  - chewing, swallowing, or suck/swallow ability
  - feeding skills
  - recurrent nausea, vomiting, or reflux
  - bowel habits, constipation, or diarrhea

- Current diet modifications
  - modified diet or formula
  - diet restricted in one or more nutrients
  - food preferences, aversions, intolerances, or allergies

**Nutrition Knowledge**
- Regarding the primary caregiver's knowledge and beliefs about nutrition
- Self-monitoring and health management experiences
- Previous nutrition counseling experiences

**Meal Management**
- Regarding the primary caregiver's meal planning abilities
- Food purchasing habits
- Food preparation facilities and methods
- Food safety practices
Anthropometric Data

Body weight, recumbent length or height, and head circumference are the most important anthropometric data in children. If these basic growth chart indicators appear to be abnormal, additional anthropometric measurements, such as arm circumference, skinfold thickness, or determination of bone age, may be useful (PNPG, 2003, pp. 154-155). Measurements should be obtained using standardized procedures such as those in Lohman, Roche, and Martorell’s *Anthropometric standardization reference manual* (1988).

Normal growth and development follows a predictable pattern of increasing height and weight. Genetics and exercise, as well as nutrition, influence body structure and growth. The rate of growth slows after the first year of life, leading to decreased nutrition needs and appetite. In preschool age children, weight gains are steady but frequently may be irregular. The growth of school-age children tends to be more stable than that of preschoolers (PNPG, 2003, p. 154).

Evaluating a child's pattern of growth over time is more important than a single measurement. The pattern of growth is identified using periodic measurements that are tracked on standardized growth charts, such as those that the Centers for Disease Control and Prevention (CDC) provide. These are based on percentile distributions of a cross section of children from the United States (PNPG, 2003, p. 146).

The use of physical growth curves to assess the nutrition status of infants and children is an important tool that is not available in adult assessment. The Pediatric Nutrition Practice Group (2003, p. 154) suggests that these measurements may be used in the following ways:

- to estimate the onset of nutritional deprivation,
- to establish adequate growth (even when less than the 50th percentile),
- to monitor catch-up growth, and
- to identify changes in previously established growth patterns.

When plotting the growth of infants born prematurely, plot their measurements on the CDC growth charts at their *corrected gestational age (CGA)*. The CGA is based on the age the infant would be if the pregnancy had gone to term (40 weeks). Recommendations for how long corrected age should be used varies between 1 and 3 years (PNPG, 2003, p. 154).

Find the CGA by subtracting the number of weeks of prematurity from the chronological age. Plot the CGA rather than the chronological age on growth charts. For example, a 16-week-old infant born at 32 weeks gestation is 8 weeks premature. Subtract 8 weeks from 16 weeks for a CGA of 8 weeks. Plot the height, weight, and head circumference at 8 weeks rather than 16 weeks.

**Recumbent Length or Height**

The recumbent length or height is an indicator of linear bone growth. To evaluate infants and toddlers who cannot stand without help,

- use a length board with perpendiculars at each end, and
- use the procedure for recumbent length and the weight-for-length chart.

To evaluate children 2 to 5 years of age,

- use the procedure for standing height and the weight-for-height chart,
take measurements to the nearest 0.5 centimeters
Interpret the results of length- or height-for-age using the following guidelines.
Below the 5th percentile may indicate a severe deficit.
Between the 5th and 10th percentile may indicate nutritional deficit.
Evaluate the overall pattern of growth or growth velocity to distinguish between
Genetic factors and chronic malnutrition. Growth in height slows when protein
intake is inadequate or when there is a chronic calorie deficit (PNPG, 2003, p.
146).

**Weight**
To find weight,
use a balance scale, a chair scale, or a bed scale, and
take the weight to the nearest 0.1 kilogram.

**Evaluation of Body Weight**
Weight is affected sooner and to a greater extent than length or height when
calorie intake is inadequate or excessive. Slowed growth or weight loss results
when calorie intake is inadequate or calorie output is excessive (PNPG, 2003, p.
146).

- **Weight-for-age.** Use the weight-for-age charts to compare the current
  weight with the weight of other children of the same age and gender. This
  indicator can distinguish overweight or underweight from normal weight.

- **Weight-for-height.** Use the weight-for-height chart to compare the child's
  weight to its own height. Evaluate further if the results are
  less than the 5th percentile, or
  more than the 95th percentile.

- **Body Mass Index (BMI).** As with adults, BMI is used to assess the degree of
  obesity in children. The formula is the same.

  \[ \text{BMI} = \frac{\text{weight (in kg)}}{\text{height}^2 \text{ (in M)}} \]
  \[ \text{BMI} = \frac{\text{weight (in lb)}}{\text{height}^2 \text{ (in in)} \times 703} \]

  To interpret the results, use the CDC's gender specific BMI-for-age charts
  for children 2 to 20 years old.
  BMI at the 95th percentile or more suggests the child is
  overweight.
  BMI in the 85th to 95th percentiles means the child is at risk of
  overweight.
  BMI less than the 5th percentile indicates underweight.
  BMI is not applicable to children who weigh more because of
  increased muscle mass, such as athletes.
Section 1C: Pediatric Nutrition Assessment

Weight change. Recent weight loss may indicate acute nutrition issues. Find the percent weight change by dividing the weight change by the usual weight then multiplying by 100. Any weight loss in an infant more than 1 week old is significant. The following weight losses in children are considered significant (PNPG, 2003, p. 147):

- more than 2% in 1 week,
- more than 5% in 1 month,
- more than 7.5% in 3 months,
- more than 10% in 6 months.

The following formulas are also useful in evaluating body weight variations (PNPG, 2003, p. 147):

- **Percent ideal body weight (IBW):** divide the actual weight by the IBW at the 50th percentile for age, and then multiply by 100.
- **Percent usual body weight (UBW):** divide the actual weight by the UBW, and then multiply by 100.

Head Circumference

To find head circumference, use the following guidelines.

Use a flexible, narrow measuring tape.
Place the measuring tape firmly around the most prominent part of the frontal and occipital bulges to get the maximum circumference.
Take measurements to the nearest 0.5 centimeter.

Head circumference is the least sensitive indicator of nutrition status. It is the last to be affected by chronic protein-energy malnutrition. Abnormal values are less than the 5th percentile, and greater than the 95th percentile.

Measurements taken before 18 months of age can help identify abnormal conditions in infants such as hydrocephalus. Measurements that do not change or that change slowly may indicate problems with growth and development of the nervous system. After 3 years of age, head circumference is not significantly related to nutrition (PNPG, 2003, p. 148).

Waterlow classification

The Waterlow criteria are useful indicators for classifying acute or chronic nutrition status and the staging of nutrition deficits (PNPG, 2003, p. 147). The CDC growth charts are used to obtain the percentile figures.

Acute status = actual weight / expected weight-for-height at the 50th percentile x 100

<table>
<thead>
<tr>
<th>Stage</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 (normal)</td>
<td>greater than 90%</td>
</tr>
<tr>
<td>1 (mild)</td>
<td>80-90%</td>
</tr>
<tr>
<td>2 (moderate)</td>
<td>70-80%</td>
</tr>
<tr>
<td>3 (severe)</td>
<td>less than 70%</td>
</tr>
</tbody>
</table>

Chronic status = actual height / height-for-age at the 50th percentile x 100

<table>
<thead>
<tr>
<th>Stage</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 (normal)</td>
<td>greater than 95%</td>
</tr>
<tr>
<td>1 (mild)</td>
<td>90-95%</td>
</tr>
</tbody>
</table>
Section 1C: Pediatric Nutrition Assessment

Stage 2 (moderate): 85-90%
Stage 3 (severe): less than 85%

Biochemical Data

There are four types of biochemical parameters that are routinely available for the assessment of children:
- albumin or prealbumin,
- hemoglobin and hematocrit,
- serum cholesterol, and
- serum glucose.

The serum proteins and the hemoglobin and hematocrit are subject to the same limitations described for adults in Section 1A. The normal values vary among facilities, so check with the lab performing the tests.

Serum Glucose

Type 2 diabetes in children and adolescents is on the rise. Young people should be screened only if their BMI is greater than the 50th percentile and two of these high-risk factors are present:
- a family history that includes type 2 diabetes in close relatives,
- a high-risk genetic group, such as Native Americans, African Americans, Hispanic Americans, Asians, or Polynesians,
- signs of insulin resistance such as, acanthosis nigricans, hypertension, dyslipidemia, or polycystic ovary disease.

Screening tests should be repeated every 2 years from age 10 or from the onset of puberty, whichever is first (PNPG, 2003, p. 149).

Glossary

Acanthosis nigricans is a skin disorder in which there is dark, thick, velvety skin in body folds and creases. Obesity and endocrine disorders including diabetes may result in this condition (Kantor, 2004).

Polycystic ovary disease is an endocrine disorder characterized by enlarged ovaries with many small cysts and other abnormalities. Normal hormones are disrupted and insulin resistance is a key feature (Hart, 2004).

Serum Cholesterol

There is only a moderate correlation between elevated childhood lipid levels and those in adulthood. Research is lacking about the relationship of childhood cholesterol levels and the risk of coronary artery disease. For these reasons, most children do not need their lipid levels tested (PNPG, 2003, pp. 148-149). Those who should be screened at age 2 or more have these risk factors:
- a parent with cholesterol of 240 mg/dl or more,
- a family history of a parent or grandparent with coronary heart disease at less than 55 years.
Section 1C: Pediatric Nutrition Assessment

**Nutrition Focused Physical Exam**

A physical exam of the infant, child, or youth is essential for assessment of general functioning and development, body fat stores, lean body mass, signs of nutrient deficiencies, edema, and hydration status. The list of factors to assess is like that for adults (Charney & Malone, 2009, p. 40-42).

**General Survey**
- body positioning
- level of awareness
- ability to communicate
- functional ability with activities of daily living (ADLs), such as age appropriate ability to prepare simple meals or self-feed

**Physical Appearance**
- amputations
- musculature and fat stores, signs of wasting, stunting, or altered body composition
- changes in nails or hair

**Oral Health**
- condition of teeth and gums; ability to chew
- condition of lips and tongue; ability to swallow

**Skin**
- presence of bruises, wounds, or pressure ulcers
- presence of rashes or dermatitis
- moisture and texture
- condition of mucous membranes
- edema

**Cross References**

Section 1A: Adult Nutrition Assessment
Appendix 5A: Pediatric Growth Charts

**References**


Section 1C: Pediatric Nutrition Assessment


**More Information**

CDC BMI calculator
www.cdc.gov/nccdphp/dnpa/bmi/calc-bmi.htm

CDC growth charts
www.cdc.gov/growthcharts/
Section 1D: Calculating Pediatric Nutrition Needs

Calculating Pediatric Nutrition Needs

Nutrition requirements for infants, children, and adolescents depend on age, size, gender, activity level, and overall health, just as they do with adults. However, in young people, the rate of growth is an additional variable. Nutrient requirements related to growth are the highest in infancy and adolescence.

Energy Needs

Whatever method is used to estimate energy needs, adjust these estimations as needed to achieve desired outcomes for each individual. Use the RDAs listed in Table 1D-1 to estimate energy needs for normal infants and children.

Table 1D-1: Energy and protein needs in children through age 101

<table>
<thead>
<tr>
<th>Age</th>
<th>Average Energy Allowance (calories per kilogram)</th>
<th>Protein Requirements (grams per kilogram)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Birth to 6 months</td>
<td>108</td>
<td>2.2</td>
</tr>
<tr>
<td>6 to 12 months</td>
<td>98</td>
<td>1.6</td>
</tr>
<tr>
<td>1 to 3 years</td>
<td>102</td>
<td>1.2</td>
</tr>
<tr>
<td>4 to 6 years</td>
<td>90</td>
<td>1.1</td>
</tr>
<tr>
<td>7 to 10 years</td>
<td>70</td>
<td>1</td>
</tr>
</tbody>
</table>


The energy needs of adolescents are related more to the stage of growth and should be calculated using calorie factors based on height rather than weight. Multiply the adolescent’s height in centimeters by the factors listed in Table 1D-2 to calculate daily energy needs.

Table 1D-2: Energy needs of adolescents2

<table>
<thead>
<tr>
<th>Age</th>
<th>Reference Height (centimeters)</th>
<th>Average Energy Allowance (calories per day)</th>
<th>Energy Factors (calories per centimeter)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Males</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11 to 14 years</td>
<td>157</td>
<td>2500</td>
<td>15.9</td>
</tr>
<tr>
<td>15 to 18 years</td>
<td>176</td>
<td>3000</td>
<td>17</td>
</tr>
<tr>
<td>Females</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11 to 14 years</td>
<td>157</td>
<td>2200</td>
<td>14</td>
</tr>
<tr>
<td>15 to 18 years</td>
<td>163</td>
<td>2200</td>
<td>13.5</td>
</tr>
</tbody>
</table>


For acutely ill children, the Pediatric manual of clinical dietetics, 2nd Ed. offers a method of calculating energy needs based on the basal energy expenditure (BEE). Use this formula:

\[ \text{BEE} = 22.1 + 31.1 \times \text{(weight in kilograms)} + 1.16 \times \text{(height in centimeters)} \]
Section 1D: Calculating Pediatric Nutrition Needs

Adjust the BEE result for any of these factors that apply:

- for fever: add 13% BEE for each degree Celsius above a rectal temperature of 37.8°C
- for weight maintenance and growth: add 50% BEE
- for physical activity
  - for bed rest, add 10% BEE
  - for sitting or light activity, add 30% BEE
  - for standing or moderate activity, add 50% BEE
  - for vigorous play or heavy activity, add 75% BEE

When growth has been slowed by undernutrition or illness, during recovery the child can grow at a rate above the expected rate for the age. This rapid growth allows a child to catch up to the normal growth curve. To estimate energy needs for catch-up growth (American Dietetic Association [ADA], 2000, pp. 60-61),

1. calculate the **weight age**, that is, find the age that corresponds to the present weight at the 50th percentile
2. determine the **ideal weight-for-age**, which is the weight at the 50th percentile that corresponds to the child’s current age
3. use the following formula

\[
\text{calories per kilogram} = \frac{\text{ideal weight-for-age} \times \text{RDA calories/kg for weight age}}{\text{actual weight}}
\]

**Protein Needs**

Use the DRIs for estimating the protein needs of normal infants and children. (See Table 1D-1.) The protein needs for adolescents, like their energy needs, are related to the stage of growth. Use a factor of approximately 0.3 g protein per centimeter of height.

Protein requirements must be adjusted using disease specific factors to account for the metabolic changes due to the acute phase response in illness. Refer to more detailed guidelines in references such as the *Pediatric manual of clinical dietetics, 2nd Ed.*

Protein needs are a little higher for catch-up growth, as are the energy needs discussed above. To estimate these needs (ADA, 2000, pp. 60-61),

1. determine the **weight age** and the **ideal weight-for-age**, as described above
2. use the following formula:

\[
\text{grams protein per kilogram} = \frac{\text{ideal weight-for-age} \times \text{RDA protein/kg for weight age}}{\text{actual weight}}
\]

**Vitamin & Mineral Needs**

To be healthy, children should consume good food as the source of nutrients and other beneficial food constituents, according to the American Dietetic Association (Hunt & Dwyer, 2001, p. 116). In the *Pediatric Nutrition Handbook*, the American Academy of Pediatrics (AAP) suggests micronutrient supplementation for infants, children, or adolescents with these risk factors
Section 1D: Calculating Pediatric Nutrition Needs

from deprived socioeconomic homes;
with poor appetites, poor eating habits, or anorexia;
consuming vegetarian diets without dairy products,
who are obese and have erratic diets, and
during pregnancy in adolescence.

Fluid Needs

The fluid needs of healthy children can be calculated using the Holiday-Segar method shown in Table 1D-3.

<table>
<thead>
<tr>
<th>Body Weight (kilograms)</th>
<th>Fluid Needs</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 to 10</td>
<td>100 milliliters per kilogram</td>
</tr>
<tr>
<td>11 to 20</td>
<td>1000 mL plus 50 milliliters per kilogram over 10 kilograms</td>
</tr>
<tr>
<td>21 or more</td>
<td>1500 mL plus 20 milliliters per kilogram over 20 kilograms</td>
</tr>
</tbody>
</table>


Cross References

Section 2C: Feeding Infants
Section 2C: Feeding Children
Section 2C: Diet During Pregnancy and Lactation

References


More Information

American Academy of Pediatrics (AAP)
141 Northwest Point Boulevard
Elk Grove Village, IL 60007-1098
Phone: (847) 434-4000
www.aap.org
## Principles of Nutrition Care

The basic principles of nutrition care presented in this section are
- nutrition adequacy of the diet plan,
- selection, preparation and service of the food,
- individualizing the diet plan.

### Nutrition Adequacy

A diet should provide all the nutrients and energy in appropriate amounts for each person. A diet should be adequate at all times, including when it is modified to meet a specific need. Nutrition adequacy of diets must follow general standards and guidelines such as

- the Dietary Reference Intakes (DRIs),
- the U. S. Dietary Guidelines,
- the United States Department of Agriculture (USDA) Food Guide, or
- the Dietary Approaches to Stop Hypertension (DASH) Eating Plan,
- Nutrition Facts food labels.

### Dietary Reference Intakes (DRIs)

DRIs are nutrient standards based on the most current scientific literature. The Food and Nutrition Board, of the Institute of Medicine in the National Academy of Sciences, publish them. The standards are intended for healthy people in the United States and do not cover the special needs of those with an illness. These represent the standards released from 2004-2009. The DRIs are under continuous revision. The professional must access the revisions on a regular basis to ensure appropriate nutrition care.

### Glossary

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adequate Intakes (AIs)</td>
<td>Intake values used when sufficient scientific evidence is not available yet to estimate an average requirement.</td>
</tr>
<tr>
<td>Dietary Reference Intakes (DRIs)</td>
<td>A generic term to refer to four types of references: AIs, EARs, RDAs, and ULs.</td>
</tr>
<tr>
<td>Estimated Average Requirements (EARs)</td>
<td>Intake values that meet the nutrient needs of half of the individuals in a specific group.</td>
</tr>
<tr>
<td>Recommended Dietary Allowances (RDAs)</td>
<td>Intake values that meet the nutrient needs of almost all of the healthy individuals in a specific age and gender group.</td>
</tr>
<tr>
<td>Tolerable Upper Intake Levels (ULs)</td>
<td>Maximum intake values that are unlikely to pose risks of adverse health effects in almost all healthy individuals in a specific group (Food and Nutrition Board, 1997, p 2).</td>
</tr>
</tbody>
</table>
Section 2: Principles of Nutrition Care

2005 U. S. Dietary Guidelines for Americans

The USDA and the Department of Health and Human Services (HHS) jointly endorse the Dietary Guidelines every five years. These guidelines help form the basis for the diet plans in this manual.

The Dietary Guidelines are used to promote good health and to prevent disease. Based on current scientific knowledge, the guidelines provide advice for making food choices for healthy Americans aged 2 years and over. The guidelines recognize that eating a healthful diet is important in all stages of life. A proper diet can reduce the risk of many diseases such as cancer, diabetes, and heart disease.

The 2005 Dietary Guidelines list nine key recommendations that can be individualized with the recommendations for specific population groups. The number of servings suggested by the Food Guide varies depending on calorie needs. (See Table 2A-1.) Briefly, the key recommendations are

1. Adequate nutrients within calorie needs
   The emphasis is on nutrient dense foods and adopting a balanced diet plan. The suggested diet plans are the USDA Food Guide and the DASH Eating Plan.
   The recommendations for specific population groups include
   - people over age 50,
   - women of childbearing age who may become pregnant,
   - women of childbearing age who may become pregnant and those in the first trimester of pregnancy,
   - older adults, people with dark skin, and people exposed to insufficient sunlight.

2. Weight management
   It emphasizes balancing caloric intake with energy expenditure.
   The recommendations for specific population groups include
   - those who need to lose weight,
   - overweight children,
   - pregnant women,
   - breastfeeding women,
   - overweight adults and overweight children with chronic diseases and/or on medication.

3. Physical activity
   It promotes regular physical activity and reduction of sedentary activities for health benefits, psychological well-being, and a healthy body weight
   The recommendations for specific population groups include
   - children and adolescents,
   - pregnant women,
   - breastfeeding women,
   - older adults.

4. Food groups to encourage
   The emphasis is on consuming an increased amount and variety of fruits and vegetables; increased use of whole-grains with at least half of recommended
Section 2: Principles of Nutrition Care

grains being whole grains; and three cups per day of fat-free or low-fat milk or equivalent milk products.
It provides recommendations for children and adolescents.

5. **Fats**
It advises keeping fat intake to 20 to 35 percent of calories; saturated fat intake to 10 percent of calories or less; cholesterol intake to less than 300 milligrams per day; and keeping trans fat intake as low as possible.
It recommends food selection and preparation methods to reduce fat.
It provides recommendations for children and adolescents.

6. **Carbohydrates**
It encourages fiber-rich fruits, vegetables, and whole-grain choices.
It recommends preparation methods to limit added sugars or caloric sweeteners.

7. **Sodium and potassium**
It recommends consuming less than 2300 milligrams of sodium per day (about 1 teaspoon of salt).
It emphasizes consuming potassium-rich fruits and vegetables.
For these population groups it recommends 1500 milligrams sodium and 4700 milligrams potassium per day
- people with hypertension,
- blacks,
- middle-aged and older adults.

8. **Alcoholic beverages**
It recommends moderation in consumption of alcoholic beverages, defined as
- up to one drink per day for women
- up to two drinks per day for men.
It cautions against use of alcoholic beverages by those who need concentration and coordination to prevent accidental injury.
It lists population groups which should not consume alcoholic beverages such as
- those who cannot restrict their alcohol intake,
- women of childbearing age who may become pregnant,
- pregnant and lactating women,
- children and adolescents,
- individuals taking medications that can interact with alcohol,
- those with specific medical conditions.

9. **Food safety**
It encourages proper storage, preparation, and service of food to avoid foodborne illness.
There are additional recommendations for specific population groups including
- infants and young children,
- pregnant women,
- older adults,
- those whose immune system is compromised.
## Table 2A-1: USDA Food Guide by calorie level

<table>
<thead>
<tr>
<th>Calorie Level</th>
<th>1,000</th>
<th>1,200</th>
<th>1,400</th>
<th>1,600</th>
<th>1,800</th>
<th>2,000</th>
<th>2,200</th>
<th>2,400</th>
<th>2,600</th>
<th>2,800</th>
<th>3,000</th>
<th>3,200</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fruits</td>
<td>1 c</td>
<td>1 c</td>
<td>1.5 c</td>
<td>1.5 c</td>
<td>1.5 c</td>
<td>2 c</td>
<td>2 c</td>
<td>2 c</td>
<td>2 c</td>
<td>2.5 c</td>
<td>2.5 c</td>
<td>2.5 c</td>
</tr>
<tr>
<td>(2 srv)</td>
<td>(2 srv)</td>
<td>(3 srv)</td>
<td>(3 srv)</td>
<td>(3 srv)</td>
<td>(4 srv)</td>
<td>(4 srv)</td>
<td>(4 srv)</td>
<td>(4 srv)</td>
<td>(5 srv)</td>
<td>(5 srv)</td>
<td>(5 srv)</td>
<td>(5 srv)</td>
</tr>
<tr>
<td>Vegetables</td>
<td>1 c</td>
<td>1.5 c</td>
<td>1.5 c</td>
<td>2 c</td>
<td>2.5 c</td>
<td>2.5 c</td>
<td>3 c</td>
<td>3 sc</td>
<td>3.5 c</td>
<td>3.5 c</td>
<td>4 c</td>
<td>4 c</td>
</tr>
<tr>
<td>(2 srv)</td>
<td>(3 srv)</td>
<td>(3 srv)</td>
<td>(4 srv)</td>
<td>(5 srv)</td>
<td>(5 srv)</td>
<td>(6 srv)</td>
<td>(6 srv)</td>
<td>(7 srv)</td>
<td>(7 srv)</td>
<td>(8 srv)</td>
<td>(8 srv)</td>
<td>(8 srv)</td>
</tr>
<tr>
<td>Dark green veg</td>
<td>1 c/wk</td>
<td>1.5 c/wk</td>
<td>1.5 c/wk</td>
<td>2 c/wk</td>
<td>2.5 c/wk</td>
<td>2.5 c/wk</td>
<td>3 c/wk</td>
<td>3 sc/wk</td>
<td>3.5 c/wk</td>
<td>3.5 c/wk</td>
<td>4 c/wk</td>
<td>4 c/wk</td>
</tr>
<tr>
<td>Orange veg</td>
<td>0.5 c/wk</td>
<td>1 c/wk</td>
<td>1.5 c/wk</td>
<td>2 c/wk</td>
<td>2.5 c/wk</td>
<td>2.5 c/wk</td>
<td>3 c/wk</td>
<td>3 sc/wk</td>
<td>3.5 c/wk</td>
<td>3.5 c/wk</td>
<td>4 c/wk</td>
<td>4 c/wk</td>
</tr>
<tr>
<td>Legumes</td>
<td>.5 c/wk</td>
<td>1 c/wk</td>
<td>1.5 c/wk</td>
<td>2 c/wk</td>
<td>2.5 c/wk</td>
<td>2.5 c/wk</td>
<td>3 c/wk</td>
<td>3 sc/wk</td>
<td>3.5 c/wk</td>
<td>3.5 c/wk</td>
<td>4 c/wk</td>
<td>4 c/wk</td>
</tr>
<tr>
<td>Starchy veg</td>
<td>1.5c/wk</td>
<td>2.5 c/wk</td>
<td>2.5 c/wk</td>
<td>3 c/wk</td>
<td>3 c/wk</td>
<td>3 c/wk</td>
<td>3 c/wk</td>
<td>3 sc/wk</td>
<td>3.5 c/wk</td>
<td>3.5 c/wk</td>
<td>4 c/wk</td>
<td>4 c/wk</td>
</tr>
<tr>
<td>Other veg</td>
<td>4c/wk</td>
<td>4.5 c/wk</td>
<td>4.5 c/wk</td>
<td>5.5 c/wk</td>
<td>6.5 c/wk</td>
<td>6.5 c/wk</td>
<td>7 c/wk</td>
<td>7 sc/wk</td>
<td>8.5 c/wk</td>
<td>8.5 c/wk</td>
<td>10 c/wk</td>
<td>10 c/wk</td>
</tr>
<tr>
<td>Grains^4</td>
<td>3 oz-eq</td>
<td>4 oz-eq</td>
<td>5 oz-eq</td>
<td>5 oz-eq</td>
<td>6 oz-eq</td>
<td>6 oz-eq</td>
<td>7 oz-eq</td>
<td>8 oz-eq</td>
<td>9 oz-eq</td>
<td>10 oz-eq</td>
<td>10 oz-eq</td>
<td>10 oz-eq</td>
</tr>
<tr>
<td>Whole grains</td>
<td>1.5</td>
<td>2</td>
<td>2.5</td>
<td>3</td>
<td>3</td>
<td>3.5</td>
<td>4</td>
<td>4.5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Other grains</td>
<td>1.5</td>
<td>2</td>
<td>2.5</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>3.5</td>
<td>4</td>
<td>4.5</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Lean meat and beans</td>
<td>2 oz-eq</td>
<td>3 oz-eq</td>
<td>4 oz-eq</td>
<td>5 oz-eq</td>
<td>5 oz-eq</td>
<td>5.5 oz-eq</td>
<td>6 oz-eq</td>
<td>6.5 oz-eq</td>
<td>7 oz-eq</td>
<td>7 oz-eq</td>
<td>7 oz-eq</td>
<td>7 oz-eq</td>
</tr>
<tr>
<td>Milk</td>
<td>2 c</td>
<td>2 c</td>
<td>2 c</td>
<td>3 c</td>
<td>3 c</td>
<td>3 c</td>
<td>3 c</td>
<td>3 c</td>
<td>3 c</td>
<td>3 c</td>
<td>3 c</td>
<td>3 c</td>
</tr>
<tr>
<td>Oils^5</td>
<td>15 g</td>
<td>17 g</td>
<td>17 g</td>
<td>22 g</td>
<td>24 g</td>
<td>27 g</td>
<td>29 g</td>
<td>31 g</td>
<td>34 g</td>
<td>36 g</td>
<td>44 g</td>
<td>51 g</td>
</tr>
<tr>
<td>Discretionary calories^6</td>
<td>165</td>
<td>171</td>
<td>171</td>
<td>132</td>
<td>195</td>
<td>267</td>
<td>290</td>
<td>362</td>
<td>410</td>
<td>426</td>
<td>512</td>
<td>648</td>
</tr>
</tbody>
</table>

### Table 2A-1: USDA Food Guide by calorie levels

Note. ^1From Dietary Guidelines for Americans, 2005 p. 53
Food amounts are daily except for the vegetable subgroup amounts that are weekly. See note for quantity of foods in each group２.
Key: c = cup oz-equivalent = ounce equivalent srv = serving g = grams
Section 2A: Nutrition Adequacy

The USDA Food Guide

The 2005 USDA Food Guide was developed along with the U. S. Dietary Guidelines. The new MyPyramid symbol with its slogan, "Steps to a Healthier You" along with its interactive food guidance system replaced the 1992 Food Guide Pyramid. The icon shows a person walking up the steps of a pyramid. The food groups are turned on their sides and are roughly proportional to recommended numbers of servings per day from each group. Physical activity is a new element. While the icon is very simple the Website, www.mypyramid.gov, is more complex than the previous Pyramid. Each person can develop an individualized food and activity plan based on age, gender, and activity level.

The Food Label

The 1990 Nutrition Labeling and Education Act required disclosure of nutrition information for most foods. Food labels are under the jurisdiction of the U. S. Food and Drug Administration (FDA). Additionally, the USDA's Food Safety and Inspection Services (FSIS) regulates the labeling of meats and poultry products. FSIS also has developed mandatory food safety labeling on meats (USDA FSIS, 1993, p 10).

Not all foods are required to have labeling. Voluntary labeling is allowed for raw, single ingredient meat and poultry products. Voluntary labeling is also allowed for 20 of the most popular varieties of fresh fish, fruits and vegetables (Pennington, 1997, p 1299).

The information on food labels are listed as "Nutrition Facts" (Center for Food Safety and Applied Nutrition [CFSAN], 2004a) (See Figure 2A-1.) The following components are mandatory since 2006 (CFSAN, 2004c):

- total calories
- calories from fat
- total fat
- o saturated fat
- o trans fat
- cholesterol
- sodium
- total carbohydrate
- o dietary fiber
- o sugars
- protein
- vitamin A
- vitamin C
- calcium
- iron

The nutrient content listed is based on the serving size specified on the label. The serving size is an amount customarily eaten at one time. There is not conformity among serving sizes in different educational tools. The amount defined as a serving may be different in the USDA Food Guide, in the DASH eating plan, on a food label, and in educational tools such as Exchange lists.
Section 2A: Nutrition Adequacy

Glossary

Daily Values (DVs) are references expressed as percents to give consumers a basis for comparison when reading food labels. They are based on two sets of references, DRVs and RDIs.

Daily Reference Values (DRVs) are a set of dietary references that apply to fat, saturated fat, cholesterol, carbohydrate, protein, fiber, sodium, and potassium.

Reference Daily Intakes (RDIs) are a set of dietary references based on past editions of the Recommended Dietary Allowances for essential vitamins and minerals and, in selected groups, protein. The term "RDI" replaced the term "US RDA‖ (Kurtzweil, 1993, p. 40).

To conform to the 1990 law, FDA developed unique values for the nutrient listings on the food label (Kurtzweil, 1993a). These include the Daily Value (DV). The DV most often listed is based on a 2000 calorie diet. (See Figure 2A-1.) These standards are currently under revision to conform to the 1997-2004 DRIs.

Food labels contain additional information that is regulated by federal law. These include nutrient claims, health claims, and structure/function claims (CFSAN, 2004b). Nutrient claims define the terms that can be used on a label. The words –high‖ and –low‖ are examples (Kurtzweil, 1993b).

Dietary Supplements

A health claim makes a statement about the food’s relationship to health. There are different versions allowed by law. Structure and function claims speak to nutrient or food components that may contribute to specific functions in the body. Structure and function claims are most often used on dietary supplements. All health claims on foods are in constant revision.

Dietary supplements are widely used. The majority are vitamins and minerals. Congress defined the term "dietary supplement" in the Dietary Supplement Health and Education Act (DSHEA) of 1994. DSHEA places dietary supplements in a special category of foods. These products are regulated by the FDA (not the USDA), but as food, not as drugs. They must be clearly labeled as a dietary supplement, which means a

Figure 2A-1: Sample label for macaroni and cheese

<table>
<thead>
<tr>
<th>Nutrition Facts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serving Size 1 cup (228g)</td>
</tr>
<tr>
<td>Servings Per Container 2</td>
</tr>
<tr>
<td>Amount per serving</td>
</tr>
<tr>
<td>Calories 250</td>
</tr>
<tr>
<td>Calories from Fat 110</td>
</tr>
<tr>
<td>% Daily Value*</td>
</tr>
<tr>
<td>Total Fat 12g</td>
</tr>
<tr>
<td>Saturated Fat 3g</td>
</tr>
<tr>
<td>Trans Fat 3g</td>
</tr>
<tr>
<td>Cholesterol 30mg</td>
</tr>
<tr>
<td>Sodium 470mg</td>
</tr>
<tr>
<td>Total Carbohydrate 31g</td>
</tr>
<tr>
<td>Dietary Fiber 0g</td>
</tr>
<tr>
<td>Sugars 5g</td>
</tr>
<tr>
<td>Protein 5g</td>
</tr>
<tr>
<td>Vitamin A</td>
</tr>
<tr>
<td>Vitamin C</td>
</tr>
<tr>
<td>Calcium</td>
</tr>
<tr>
<td>Iron</td>
</tr>
</tbody>
</table>

*Percent Daily Values are based on a 2000 calorie diet. Your Daily Values may be higher or lower depending on your calorie needs.

<table>
<thead>
<tr>
<th>Calories:</th>
<th>2000</th>
<th>2500</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Fat</td>
<td>Less than 65g</td>
<td>80g</td>
</tr>
<tr>
<td>Sat Fat</td>
<td>Less than 20g</td>
<td>25g</td>
</tr>
<tr>
<td>Cholesterol</td>
<td>Less than 300mg</td>
<td>300mg</td>
</tr>
<tr>
<td>Sodium</td>
<td>Less than 2400mg</td>
<td>2400mg</td>
</tr>
<tr>
<td>Total Carbohydrate</td>
<td>300g</td>
<td>375g</td>
</tr>
<tr>
<td>Dietary Fiber</td>
<td>25g</td>
<td>30g</td>
</tr>
</tbody>
</table>
Section 2A: Nutrition Adequacy

product taken by mouth that contains a "dietary ingredient" intended to supplement the diet.

The dietary ingredients in these products may include: vitamins, minerals, herbs or other botanicals, amino acids, and substances such as enzymes, organ tissues, glandulars, and metabolites. They may be found in many forms, such as tablets, capsules, softgels, gelcaps, liquids, powders, extracts or concentrates. They can also be in other forms, such as a food bar. If the supplement is in the form of a food bar, the information on the label must not represent the product as a conventional food or a sole item of a meal or diet.

Dietitians must assess people's use of supplements since a large percentage of the micronutrient intake may come from dietary supplements in the form of vitamins and minerals (Millen, 2004, p. 943). Additionally people may take supplements of other types that may affect their food intake. For example, a supplement that contributes to nausea or gastrointestinal upset may reduce food intake (Stein, 2000, p. 412). Dietitians must be aware of ethical considerations in advising supplements (Fieber, 2000, p. 19). Web resources from regulatory agencies are the best way to stay current with supplements, their regulations, and their potentially adverse reactions.

In addition to a general nutrition label, the following mandatory components must be included on a supplements food label (National Institute of Health, Office of Dietary Supplements [ODS], 2009).

Name of product (including the word "supplement" or a statement that the product is a supplement)
Net quantity of contents
Name and place of business of manufacturer, packer, or distributor
Directions for use
If the dietary ingredient is a botanical, the scientific name of the plant or the common or usual standardized name standardized as well as the name of the plant part used
If the dietary ingredient is a blend exclusive to the manufacturer, the total weight of the blend and the components of the blend in order of predominance by weight
Non-dietary ingredients such as fillers, artificial colors, sweeteners, flavors, or binders

Cross References

Section 4G: DASH Eating Plan

References

Section 2A: Nutrition Adequacy


Section 2A: Nutrition Adequacy


**More Information**


Section 2A: Nutrition Adequacy


State Regulations

State laws specify rules and regulations governing the service of food in health care facilities. Specifications are listed also for the provider of the food. The selection of food served must provide the DRIs of the people served. The regulations do not specify how the food is prepared or which foods must be served. Indiana requires that at least one person with ServSafe certification be scheduled on each shift in food service. Food service is evaluated to determine compliance with the regulations. Selections from the current Indiana regulations are summarized below.

-Section 20.
(a) The facility must provide each resident with a nourishing, palatable, well-balanced diet that meets the daily nutritional and special dietary needs of each resident (Indiana State Department of Health, 2001, p. 48-9). Additional listings in Section 20 refer to the qualifications of the provider of the food.

-Section 21.
(a) Each resident receives and the facility provides the following:
(1) Food prepared by methods that conserve nutrient value, flavor, and appearance.
(2) Food that is palatable, attractive, and at the proper temperatures.
(3) Food prepared in a form designed to meet individual needs.
(4) Substitutes offered of similar nutritive value to residents who refuse food served.
(b) Therapeutic diets must be prescribed by the attending physician.
(c) Each resident receives and the facility provides at least three (3) meals daily, at regular times comparable to normal mealtimes in the community.
(d) There must be no more than fourteen (14) hours between a substantial evening meal and breakfast the following day, except as provided in subsection (f).
(e) The facility must offer snacks at bedtime daily.
(f) When a nourishing snack is provided at bedtime, up to sixteen hours may elapse between a substantial evening meal and breakfast the following day if a resident group agrees to this meal span and a nourishing snack is served. A nourishing snack is an offering of a minimum of a food item and a beverage.
(g) If a clear liquid diet is prescribed, the order shall be confirmed with the physician every forty-eight hours, if it is the only source of nutrition unless a different time is specified in the physician's order.
(h) The facility must provide special eating equipment and utensils for residents who need them (Indiana State Department of Health, 2001, p. 48-9).

Serving People With Disabilities

People with disabilities may need help to self-feed or may need to be fed. Self-feeding skills should be assessed with the goal of returning the person to independent feeding. People who must rely on others to feed them often have difficulty eating enough food. Occupational and physical therapists are trained to help people with disabilities
learn to self-feed. The Indiana Facilities Licensing and Operations Standards require adaptive feeding equipment be available as needed (Indiana State Department of Health, 2001, p. 48-9).

The following are useful ideas to help people feed themselves:

People who cannot see well need a consistent tray arrangement and food placement on their plates.
Adaptations to feeding equipment may involve adjusting the grip or utensil length, or providing stability.
Plate guards are useful to help pick up food with eating utensils.
If someone else must feed a person, follow these helpful pointers:
Seat the feeder in front of the person, face-to-face, to maintain eye contact.
Prevent distraction of the person or the feeder during feeding.
Identify the food being presented if the person cannot see.
Encourage the person to self-feed when possible.
Offer the person a variety of foods and flavors.
Present foods and beverages separately.
Feed slowly, waiting for a complete swallow before further feeding.
Encourage chewing; use verbal prompts.

Cross References

Appendix 5C: Weights and Measures

References


More Information


American Restaurant Association Educational Foundation
175 West Jackson Blvd., Suite 1500
Chicago, IL, 60604-2814
(800) 765-2122
www.nraef.org

Individualization of the Diet Plan

The diets in this manual provide a variety of food choices in addition to treating specific conditions or diseases. In general, the modified diet plans presented meet the standards for nutritional adequacy when no food group is omitted.

People accept a meal plan best when it is individualized for them. They will also follow food guidance better when they are comfortable with the suggested foods. This concept of individualization was addressed in the 2005 Dietary Guidelines which list key recommendations for a number of specific population groups and types of people including:

- pregnant women,
- women of childbearing age,
- older adults,
- people with dark skin,
- people over age 50,
- children and adolescents including those overweight,
- adults including those overweight,
- people with hypertension, and others.

The need for individualization also is emphasized by the development of versions of the USDA Food Guide for specific population groups. The remainder of this section covers the following situations:

- regular diet
- feeding infants
- feeding children
- diet in pregnancy and lactation
- diet for older adults
- food and drug interactions

Regular Diet

The regular diet, sometimes called a general diet, is planned to achieve and maintain optimal health. Requirements for calories and nutrients vary depending on each person's height, weight, gender, age, and activity level. The regular diet is used for people who do not require any nutrient or consistency modifications. The Dietary Guidelines, and a food guide such as the U.S. Food Guide, are the basis for planning the regular diet. Refer to Table 2A-1 to select the number of servings by calorie level.

Infant Nutrition: Birth to 12 months

Breastfeeding is the ideal feeding for healthy infants during the first year of life (Gartner, et al., 2005, p. 496; ADA, 2009, p.1926-1942; Fomon, 2001, p. 1002). If breastfeeding is not possible, iron-fortified infant formula is the next best choice (Kleinman, 2004, p. 87). (Refer to Table 5B-1 to 5B-3 located in the Appendix for further information about infant formula.) Breast milk provides adequate nutrition for about the first 6 months of an infant's life, as well as providing other benefits to both the infant and
Section 2C: Individualization of the Diet Plan


Feedings of expressed breast milk are an advantage to premature infants (ADA, 2009, p.1926-1942). Some low birth weight infants or infants who are not consuming adequate amounts of breast milk or standard formula may require specialized or high calorie formulas or supplements. (Refer to Tables 5C-4 and 5C-5 located in the Appendix.) These should be used only after consultation with the health care provider.

Infants need complementary foods, that is, foods other than breast milk or formula, when they are developmentally ready, usually by the time they are 4 to 6 months old (Kleinman, 2004, pp.105, 111). After 6 months, breastfed infants need additional nutrients from complementary foods (Butte, Cobb, Dwyer, Graney, Heird, & Rickard, 2004, p. 443; Gartner et al., 2005, p. 499). Complementary foods also provide exposure to new flavors and textures as well as the chance to master eating skills.

First solids usually are single ingredient foods such as rice cereal. The order of introduction of solids is important for breastfed infants who need iron-rich foods, such as baby cereals and baby meats, as first foods (Butte et al., 2004, pp. 443, 445-446). The order of introduction for fruits and vegetables does not matter (Butte et al., 2004, p. 444). Add new foods one at a time every 2 to 4 days, that is, 2 to 3 new foods each week, watching for adverse reactions before starting another. Baby fruit juices should not be given to infants before 6 months and should be offered only from a cup, and limited to 4 ounces or less per day (American Academy of Pediatrics [AAP], 2001, p. 1212).

Introduce textured foods, such as mashed or finely chopped table foods, between 6 and 10 months of age (Butte et al., 2004, p. 443). Texture should be advanced based on each infant's developmental level. Table 2C-1 provides a sample menu guide for older infants. Portion sizes are the ranges recommended for an adequate diet based on the Dietary Reference Intakes.

Whole, low fat, or skim cow milk, goat milk or any milk not designed for infants should not be used during the first 12 months of life (AAP, 1992, pp. 1107-1108). Infants may be advanced to whole cow's milk at one year of age.

Infants with a strong family history of food allergy should be breastfed for as long as possible and should not receive complementary foods before they are 6 months old (Butte et al., 2004, p. 451). The foods to avoid until well after age one are the 8 major allergens (Taylor & Hefle, 2001, p. 73; Wood, 2003, pp. 1633-1636):

- milk,
- eggs,
- wheat,
- soy,
- peanuts,
- tree nuts,
- fish, and
- shellfish.

Special hypoallergenic formulas and dietary restrictions should be used in consultation with the health care provider (Butte et al., 2004, p. 451).
Table 2C-1: Sample meal plan for older infants (6 to 12 months)

<table>
<thead>
<tr>
<th>Meal</th>
<th>Foods</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breakfast</td>
<td>-iron-fortified cereal</td>
<td>1 to 4 Tbs</td>
</tr>
<tr>
<td></td>
<td>-mashed or chopped soft fruit</td>
<td>1 to 4 Tbs</td>
</tr>
<tr>
<td></td>
<td>-breast milk or formula</td>
<td>4 to 8 oz</td>
</tr>
<tr>
<td>Lunch</td>
<td>-pureed, ground, or finely chopped meat</td>
<td>1 to 2 Tbs</td>
</tr>
<tr>
<td></td>
<td>-mashed or chopped soft vegetables</td>
<td>1 to 4 Tbs</td>
</tr>
<tr>
<td></td>
<td>-toast with butter</td>
<td>1/4 to 1/2 slice</td>
</tr>
<tr>
<td></td>
<td>-mashed or chopped soft fruit</td>
<td>1 to 4 Tbs</td>
</tr>
<tr>
<td></td>
<td>-breast milk or formula</td>
<td>4 to 8 oz</td>
</tr>
<tr>
<td>Afternoon Snack</td>
<td>-crackers</td>
<td>1 to 2 squares</td>
</tr>
<tr>
<td></td>
<td>-soft fruit (or fruit juice from a cup)</td>
<td>1/4 to 1/2 cup</td>
</tr>
<tr>
<td></td>
<td>OR</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-breast milk or formula</td>
<td>4 to 8 oz</td>
</tr>
<tr>
<td>Dinner</td>
<td>-ground meat &amp; noodles with sauce</td>
<td>1 to 4 Tbs</td>
</tr>
<tr>
<td></td>
<td>-mashed or chopped soft vegetables</td>
<td>1 to 4 Tbs</td>
</tr>
<tr>
<td></td>
<td>-mashed or chopped soft fruit</td>
<td>1 to 4 Tbs</td>
</tr>
<tr>
<td></td>
<td>-breast milk or formula</td>
<td>4 to 8 oz</td>
</tr>
<tr>
<td>Bedtime Snack</td>
<td>-breast milk or formula</td>
<td>6 to 8 oz</td>
</tr>
</tbody>
</table>

The diet is adequate in all nutrients if breast milk or infant formula intake is adequate. Total formula should be 20 to 40 ounces per day, depending upon the infant’s age and the amount of complementary foods consumed.

Infants and young children less than 4 years of age are more at risk for choking. To avoid choking or aspiration of food, the following foods should not be given to an infant or young child (Kleinman, 2004, pp. 111, 120-121):

- popcorn,
- nuts and seeds,
- grapes,
- raisins,
- hot dogs,
- hard pieces of raw foods like carrots and apple chunks, and
- hard candies.

The vitamin and mineral supplementation needs vary among infants depending on the type of milk feeding they receive. Breastfed babies need

200 IU of vitamin D per day starting between 2 weeks and 2 months of age to prevent rickets (Gartner, L. M., Greer, F. R., & the Section on Breastfeeding and Committee on Nutrition, AAP, 2003, p. 909), and

an iron intake of 11 milligrams per day by age 4 to 6 months, if they do not receive enough iron from complementary foods (Food and Nutrition Board, 2000, p. 324).

Infants who take adequate amounts of iron-fortified formula do not need a vitamin or mineral supplement, unless their formula intake is less than 16 ounces per day. These infants would benefit from a standard infant vitamin and mineral supplement of 0.5 mL per day, which provides about 50 percent of the DRIs.
Section 2C: Individualization of the Diet Plan

Feeding Children and Adolescents

The diets of preschool, school-age, and adolescent children are designed to promote normal growth and development. By the time a child reaches school age, good nutrition habits should be developing. Energy and nutrient requirements for children and adolescents vary with age, gender, stage of maturation, and physical activity levels. With adolescents, special attention may be needed to ensure a nutritionally adequate diet because

they eat more meals away from home with friends, at school, at work, or in restaurants;
they snack frequently; and
they skip meals, especially breakfast.

Table 2C-2 provides general meal plans for different ages. Portion sizes are the ranges recommended for an adequate diet based on the Dietary Reference Intakes and the USDA’s 2005 MyPyramid. The MyPyramid food guidance system provides a quick estimate of what and how much food to eat for a healthy diet for these age groups, as it does for adults. In addition, the MyPyramid Tracker offers a more detailed and personalized dietary and physical activity assessment along with related nutrition messages and links to nutrient and physical activity information.

Table 2C-2: Sample daily meal plans for preschool, school-age, & teenage children

<table>
<thead>
<tr>
<th></th>
<th>Preschool (2 to 6 years)</th>
<th>School-Age (7 to 10 years)</th>
<th>Teenage (11 to 18 years)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Milk</strong></td>
<td>2-3 cups</td>
<td>3 cups</td>
<td>4 cups</td>
</tr>
<tr>
<td><strong>Meat &amp; Beans</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(includes poultry,</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>fish, eggs, peas,</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>nuts, seeds)</td>
<td>2-5 ounces</td>
<td>3-6 ounces</td>
<td>5-7 ounces</td>
</tr>
<tr>
<td><strong>Fruits</strong></td>
<td>1-1 1/2 cups</td>
<td>1-2 cups</td>
<td>1 1/2 – 2 1/2 cups</td>
</tr>
<tr>
<td>-Vitamin C-rich fruit</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(offer daily)</td>
<td>1/2 cup</td>
<td>1/2 cup</td>
<td>1/2 cup</td>
</tr>
<tr>
<td><strong>Vegetables</strong></td>
<td>1-2 1/2 cups</td>
<td>1 1/2 – 3 cups</td>
<td>2-4 cups</td>
</tr>
<tr>
<td>-Vitamin A-rich</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>vegetables (offer 2-3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>times each week)</td>
<td>1/4 cup</td>
<td>1/2 cup</td>
<td>1/2 cup</td>
</tr>
<tr>
<td><strong>Grains</strong></td>
<td>3-6 ounces</td>
<td>4-7 ounces</td>
<td>5-10 ounces</td>
</tr>
<tr>
<td>(cereal, bread,</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>pasta, rice)</td>
<td>1/2 cup</td>
<td>1/2 – 1 cup</td>
<td>1 cup</td>
</tr>
<tr>
<td>Iron-fortified cereal</td>
<td>1/2 cup</td>
<td>1/2 – 1 cup</td>
<td>1 cup</td>
</tr>
</tbody>
</table>

Additional servings from any of these food groups or from fat are needed for adequate energy.

Note. 2From unpublished education material revised in 2005 by Mary Sue Brady. Department of Nutrition & Dietetics, School of Health & Rehabilitation Sciences, Indiana University Medical Center.
Section 2C: Individualization of the Diet Plan

**Diet in Pregnancy and Lactation**

Diet during pregnancy should provide adequate nutrition for both the pregnant woman and the growing fetus. Diet during lactation should provide adequate nutrition for both the lactating woman and the feeding infant. In both cases, a regular diet is appropriate with slight increases in calories, protein, vitamins, and minerals. The increase in calories during lactation is actually greater than for pregnancy. Most pregnant and lactating women would not be admitted to a hospital or other care facility other than for delivery. Therefore this section covers only key points of diet planning for pregnancy and lactation. Criteria for a healthy prenatal diet (Story & Stang, 2000, p. 45) include:

- provides enough calories adequate weight gain,
- is well-balanced and follows the MyPyramid food guide,
- tastes good and is enjoyable to eat,
- spaces meals and snacks throughout the day,
- provides adequate amounts of high fiber foods,
- includes 8 cups of fluid daily,
- limits caffeinated beverages to 2-3 servings or fewer per day,
- provides only moderate amounts of fat, saturated fat, cholesterol, sugar, and sodium,
- ensures a stable and continuous food supply,
- excludes alcoholic beverages.

Good nutrition ideally begins *before* conception. In 1991, the U. S. Public Health Service issued a policy statement recommending that all women of childbearing age consume 400 micrograms of folic acid every day to reduce the risk of birth defects including neural tube defects, such as spina bifida. Development of many neural tube defects begins during the first two months of pregnancy, before a woman knows she is pregnant, therefore it is important to begin the supplement before conception. Two public health endeavors have been successful in reducing the incidence of spina bifida: extensive prenatal education about folic acid and folic acid fortification of grain products. Still, many women do not get enough of this nutrient although a supplement of 400 micrograms of folic acid in addition to the folate from foods would meet the needs of most women (Kaiser & Allen, 2002, p. 1480).

All pregnant women should be assessed for factors that place them or their pregnancy at risk. There are over fifty factors that place a pregnancy into the high-risk category. Use of validated forms ensures a complete assessment and attention to all aspects of the pregnant woman’s environment. The Indiana Perinatal Network (IPN) provides guidelines for best practices in working with pregnant women. They also provide current and validated forms for prenatal screening, education, and counseling as well as for prenatal risk assessment.

The amount of weight to gain during pregnancy is based on the pre-pregnancy weight of the woman. (See Table 2C-3.) For most women, the weight gain should be slightly over 2 pounds during the first 3 months. The last 6 months require approximately one pound per week (Kaiser & Allen, 2002, p.1482). Obtain the pregnant woman’s weight and chart it on a growth grid at each appointment to assess for appropriate weight gain (Subcommittee on Nutritional Status and Weight Gain During Pregnancy [SNSWGDP], 1990, p 73-77).
Section 2C: Individualization of the Diet Plan

Table 2C-3: Recommended weight gain during pregnancy.

<table>
<thead>
<tr>
<th>Pre-pregnancy weight</th>
<th>Suggested total weight gain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Underweight (BMI &lt; 19.8)</td>
<td>28-40 pounds</td>
</tr>
<tr>
<td>Normal weight (BMI 19.8-26)</td>
<td>25-35 pounds</td>
</tr>
<tr>
<td>Overweight (BMI 26.1-29)</td>
<td>15-25 pounds</td>
</tr>
<tr>
<td>Obese (BMI &gt;29)</td>
<td>at least 15 pounds</td>
</tr>
</tbody>
</table>

Source: Kasier & Allen (2002)

For a full-term twin pregnancy a total weight gain of 35 to 45 pounds is consistent with a favorable outcome (SNSWGDP, 1990, p. 220). During the last 6 months expect a pound and a half weight gain each week. For triplet pregnancies a 50-pound total weight gain may be an adequate (Kaiser & Allen, 2002, p. 1482).

Food selection during pregnancy should meet the DRIs. The Dietary Guidelines and MyPyramid food guide can help plan the diet. Beginning in the third trimester, pregnant women need an estimated extra 300 calories each day though there are wide variations in energy needs. Calories and nutrient needs can be met each day with

- 1-2 additional cups of milk,
- 1 additional 2-3 ounce serving of cooked meat or meat substitute, and
- at least 1-2 additional servings of fruits and vegetables.

Fruits and vegetables should be chosen from all the subgroups suggested in the Dietary Guidelines. Fruits and vegetables, along with whole-grain breads and cereals, are helpful in treating constipation, which is a common problem in pregnancy.

A pregnant adolescent needs additional nutrients for her own development compared to an adult pregnant woman. Pregnant girls less than 14 years old need an extra 500 calories per day, while older teens need the same calories as adult women. The ranges of calorie levels and number of servings support individual meal plans for teens (Kaiser & Allen, 2002, p. 1483).

The intakes of iron and folic acid are most often inadequate in the diet during pregnancy. Therefore the physician routinely assesses hemoglobin values. Routine assessment will help to assess the presence of anemia. Due to the large blood volume expansion that normally occurs in pregnant women, normal hemoglobin values are different than in non-pregnant women. The Centers for Disease Control and Prevention proposed cut-off values for anemia based on the trimester:

- 11 grams/deciliter for the first trimester
- 10.5 grams/deciliter for the second trimester,

Folic acid and low-dose iron are recommended nutrient supplements during pregnancy. Careful instructions will help ensure that supplements are taken correctly. All supplements should be reviewed by the health care provider, since excessive amounts of some nutrients may cause birth defects (Kaiser & Allen, 2002, p. 1483).

A fetus is continually supplied with nutrients from the mother’s blood supply. Therefore it is important for the mother to eat regularly. Weight reduction dieting is not recommended during pregnancy, because it results in fewer nutrients available for the fetus. Eating regularly means three meals each day with one to two snacks.

Women may find eating small meals more frequently helps to reduce the nausea and vomiting of morning sickness. Other management tips include

- avoiding strong odors,
drinking beverages between meals,
eating high carbohydrate foods like crackers or toast.

Food served to the pregnant woman must be free of food-borne toxins and pathogens. Instruction on food safety should be part of all prenatal education programs. One illness, listeriosis, which is caused by the bacteria *Listeria monocytogenes*, is fatal in nearly 25 percent of people who contract it. To reduce the risk of this disease, women should heat all leftover foods and ready-to-eat foods, such as hot dogs, deli-style meats and poultry products, to at least 165°F for 15 seconds, since heat destroys the bacteria. If they cannot be reheated, they should not be eaten during pregnancy. Outbreaks have also been associated with inadequately pasteurized milk and soft cheeses, so these should be avoided during pregnancy (FSIS, 1999, p. 1; Kaiser & Allen, 2002, p. 1487).

In 2004 the Environmental Protection Agency (EPA) and the FDA issued a joint consumer advisory warning pregnant and lactating women, and small children to avoid certain fish to reduce risk of exposure to unsafe levels of methylmercury. This compound causes damage to the nervous system of the unborn child with effects similar to cerebral palsy. Large fish (shark, swordfish, king mackerel, tilefish) and some noncommercial fish caught in specific areas are often contaminated with methylmercury. The EPA Website maintains links to local Fish Advisories. The FDA also advises limiting intake of other fish to 12 ounces per week and albacore tuna to 6 ounces per week (James & Dobson, 2005, p. 814). Other substances are harmful in pregnancy as well (Kaiser & Allen, 2002, p. 1484-85). These include
- alcoholic beverages,
- illegal drugs such as marijuana and cocaine,
- tobacco, and
- excess caffeine.

Alcohol, caffeine, and drugs cross the placenta to the fetus. Tobacco use restricts the blood supply to the fetus thus limiting the flow of oxygen and nutrients as well as the removal of waste products. Mothers who consume alcohol and mothers who smoke tobacco have lower weight babies. The U.S. Public Health Service urges pregnant women to avoid all alcohol. Alcohol use increases the chances of mental retardation, learning disabilities, and birth defects such as fetal alcohol syndrome. Encourage consumption of less than 300 milligrams of caffeine during pregnancy since some studies have linked high caffeine intake to adverse outcomes. Carbonated beverages, coffee, and tea are the main dietary sources of caffeine.

Pica is the compulsive eating of non-food items such as dirt, clay, chalk, laundry starch, ice or freezer frost, ashes, or paint. These items can cause or aggravate nutrition problems such as iron deficiency or result in exposure to lead. People are usually secretive about pica so it can be difficult to assess and discuss with the pregnant woman. It should be considered when the pregnant woman is severely anemic (Horner, Lakey, & Kolasa, 1991, p. 34; Kaiser & Allen, 2002, p. 1486).

Breastfeeding offers many benefits to both the mother and the infant (James & Dobson, 2005, pp. 811-813). These include
- psychological benefits to both the mother and the infant
- nutritional, immunological, and morbidity benefits to the infant
- health and economic benefits to the mother.
Dietetic professionals play a supportive role by helping to eliminate barriers to breastfeeding.

The lactating woman's total calorie needs are 500 more than usual, or just 200 calories more than during the last trimester of pregnancy. The basic food groups to increase are the same as in pregnancy except for additional servings of milk and fluids.

Vegetarians

Many people around the world choose a diet that is plant-centered. Vegetarian is the term for this eating style because very few animal foods are used. A vegetarian diet, with carefully chosen foods, promotes health. It can prevent and even treat some diseases. It is appropriate for any life cycle stage (American Dietetic Association [ADA], 2010).

People who choose vegetarian eating have many different reasons for doing so. Some people want the health benefits. Others are concerned about treatment of animals or the environmental impact of raising animal foods. For many, their reasons are religious, economic, or political (ADA, 2010).

Diet for Older Adults

Americans are living longer than ever before and this trend is expected to continue. With this change in demographics, expectations are for older Americans to remain fully independent and more actively engaged than in past generations. As a result, the nutritional needs of older adults are receiving greater attention. The DRIs now have an age grouping for over 70 years old. The 2005 Dietary Guidelines address the needs of the older population with specific recommendations for nutrients, such as for vitamin B₁₂, vitamin D, sodium and potassium, and for physical activity and food safety (HHS, 2005).

Aging is a process often referred to as a continuum. Throughout the aging process, services should support this population group in maintaining a high level of independence. In the elderly, it is important to assess each person's calorie, protein, and fluid needs, ability to chew and to swallow, risk of food-drug interactions, overall quality and variety of food intake.

When nutritional problems do arise, develop a plan based on the person's past food experiences. For a vital elderly person, medical nutrition therapy is a cost-effective part of disease management. There is expanding coverage under Medicare Part B for disease management, MNT, and education for primary caregivers and family members (Kuczmarski & Weddle, 2005, p. 625). For the frail elderly in long-term care settings, there is support for liberalized diets due to the higher risk of malnutrition and dehydration in this population. (ADA, 2005, p. 1955-1965).

Solving chewing and swallowing problems should begin with a swallowing assessment by a qualified professional. Dietitians can become proficient in performing the swallowing assessment (Brody, Touger-Decker, VonHagen, & Maillet, 2000, p. 1029). Diets with specially modified consistency have been developed to help those diagnosed with dysphagia (National Dysphagia Task Force, 2002). Dysphagia diets include foods from all food groups.
Elderly people may have a decreased sense of taste and smell, which will contribute to lack of interest in food. Creative ways to enhance the flavor of food include using herbs, spices, and other flavorings in food preparation. Encourage each person to season their food with herbs and spices to their individual taste during mealtime. Most herbs and spices do not include salt, which older adults are advised to limit (Robinson & Leif, 2000, HHS, 2005).

Fluid needs in the elderly may need special attention. There is evidence the elderly lose their sense of thirst and may become dehydrated more easily than when they were young (Weinberg & Menaker, 1995, p. 1552). Conditions such as diarrhea, vomiting, generalized wasting, and medications such as diuretics all contribute to fluid loss. While increased fluids are needed, they should not replace solid food intake. Water, juices, gelatin, sodas, coffee, and tea are all good sources of fluids. Adequate fluid intake is essential in treating and preventing constipation.

**Food and Drug Interactions**

Medications used to treat specific health problems are, like nutrients in food, chemicals. Therefore interactions may occur when food or nutrients are consumed with some medications. Interactions can be mild and short term, or severe and long term. The healthcare team should actively collaborate to monitor potential food-drug interactions (Hager & Hutchins, 2003, p. 1363). Dietitians can follow protocols to identify drug-nutrient interactions. (Sanford, Ryan, Cummings, Hunt, & Hackes, 2002, p. 730). Medication assessment should include identifying

- the names and purposes of the medication,
- the dose and route of administration of the medication,
- possible nutrition interactions associated with the medication,
- diet modifications needed for use of the medication,

Certain situations pose greater risk for drug interactions. These include

- the drug is an antinutrient,
- the drug will be taken for a long period of time,
- the person is on a multidrug regimen,
- the person has a nutritionally inadequate diet,
- the person is malnourished,
- the person has malabsorption,
- the person is not instructed how to take the medication.

If the medication can cause nausea, it will usually be prescribed to be taken with food. It is also easier for a person to remember to take medication at mealtime. Medications should always be taken with a full glass of liquid, preferably water. Unless instructed to do so, medications should never be crushed or hidden in food.

While dietary supplements are not classed as drugs, they should be viewed as drugs because of the way they act in the body. Many have the potential to interact or interfere with other drugs. Because they have not undergone the same testing as drugs, there may also be unknown effects (Stein, 2000, p. 412).
Section 2C: Individualization of the Diet Plan

Cross References

Section 3C: Gestational Diabetes
Section 3E: Food Allergies & Intolerances
Section 4C: Dysphagia Diets
Section 4J: Vegetarian Diets
Appendix 5B: Infant Formulas

References


Section 2C: Individualization of the Diet Plan


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Section 2C: Individualization of the Diet Plan


**More Information**

**On feeding infants and children:**


Section 2C: Individualization of the Diet Plan


**On diet during pregnancy and lactation:**

Environmental Protection Agency Fish Advisory Website  

Indiana Perinatal Network (IPN) at www.indianaperinatal.org  
*Prenatal care guide* (PG1000).  
*Prenatal care coordination best practices guide* (PG1001).  
*Prenatal risk assessment form* (PG1006).  

**On diet for older adults:**

Section 2C: Individualization of the Diet Plan
Cancer

Background

The term "cancer" refers to over 100 forms of the disease. Cancer can occur in almost any tissue, and some tissues may develop several different types (Weinberg, 1996, p. 62). According to the National Cancer Institute (NCI) (2005), protein-calorie malnutrition is the most common secondary diagnosis in cancer patients. It may be present, as a result of the disease process, at diagnosis; it may develop as the disease progresses; or it may develop as a result or side effect of treatment.

Cancer cachexia is severe malnutrition related to metabolic abnormalities that are caused by the cancer itself. It is the immediate cause of death in 20 to 40 percent of all cancer patients (NCI, 2005). It is a complex syndrome that is not as well understood as chronic starvation. It presents itself through (Eldridge & Hamilton, 2003, p. 3)

- weight loss,
- anorexia,
- early satiety,
- muscle wasting,
- immunosuppression, and
- abnormalities in fluid status and energy metabolism.

In cancer cachexia, the body uses both fat and muscle equally as energy sources, unlike starvation where the body mainly uses fat stores for energy, and therefore, spares muscle tissue (Body, 1999, p. 256). Changes in carbohydrate metabolism result in high levels of lactic acid, which contribute significantly to anorexia. Compounds released by the tumors also cause some of the alterations found in cancer cachexia. Cancer cachexia has a profound effect on quality of life by (Puccio & Nathanson, 1997, p. 277)

- decreasing physical function,
- impairing performance of activities of daily living, and
- contributing to depression and decreased social interactions.

While some people with cancer cachexia respond to nutrition therapy, most will not see a complete reversal of its effects (NCI, 2005). The best approach to battling cachexia is prevention through proactive nutrition assessment and early intervention. Well-nourished people not only have a better quality of life, but also tolerate treatment better.

In cases where cancer is uncontrolled and incurable, nutrition care is a recognized part of palliative care to help maintain quality of life; manage symptoms such as pain, anorexia, nausea, or constipation; and address psychosocial and spiritual concerns. Each institution has established policies regarding artificial nutrition and hydration to be used to guide decisions in these situations.

Treatment for cancer usually involves surgery, chemotherapy, radiation therapy, or a combination of these. The treatment plan depends on the type and stage of the cancer, that is, the size of the tumor, and whether it is limited to one location, has spread to nearby tissue, or has metastasized to tissue farther away. Even when cancer is advanced, these cancer treatments may be given as palliative care to prolong life and provide comfort.
The first step in cancer treatment is often surgery to remove solid tumors. This requires a period of healing. The body may also have to adapt to the removal of the tissue, such as part of the digestive tract. Chemotherapy, radiation therapy, or both may follow surgery. Sometimes, if reducing the tumor size first will facilitate surgery, surgery follows the other treatments. Stem cell transplants occur after chemotherapy or whole body irradiation is used to destroy the person’s own malignant stem cells.

There are large numbers of chemotherapy agents and protocols. They vary in how long they are used, the frequency of their use, and the way they are administered (oral or intravenous). Many times, when there are side effects (like nausea and vomiting), the intensity or duration of side effects get worse with each treatment.

Radiation therapy treatment depends on the type of cancer and goals of treatment. External beam radiation is usually given 5 days a week for about 3 to 8 weeks. The actual treatment takes only minutes. Side effects (like fatigue and skin irritation) do not begin for most people for 2 to 3 weeks. If the digestive tract is in the radiation field, diarrhea or loose stools may result. There is also an increasing risk for dehydration and malabsorption of nutrients. If the mouth or throat is radiated, irritation of the area can cause severe pain and difficulty swallowing, which interfere with adequate intake.

Complementary and alternative medicines (CAM), many of which are nutrition-related, are widely sought by cancer patients (Cassileth, 2004, p. 81). Health professionals are often asked to provide an opinion on a variety of dietary supplements, including herbal preparations and the use of megadoses of vitamins and minerals in the prevention and treatment of cancer. The efficacy of these has not been proven, but they should be evaluated for their potential to cause harm. These harmful effects include risk of contamination, adulteration, misidentification, fake products, or illegal ingredients, lack of regulation or quality control, possible interactions that interfere with radiation and chemotherapy treatments, and
adverse effects, such as allergic reactions, nausea, vomiting, diarrhea, or sedation.

Nutrition has a recognized role to play in each stage of cancer development (initiation, promotion, and progression), so diet choices are important in preventing cancer, reducing the risk of recurrence, and reducing risk of other primary cancers. There is strong and consistent evidence that a plant-based diet protects against different cancers. Van Duyn and Pivonka (2000) reviewed the report commissioned by the World Cancer Research Fund and the American Institute for Cancer Research (AICR) that estimated that diets high in fruit and vegetables could prevent 20 percent of all cancer incidences. The AICR suggests that an optimum level of intake is 5 to 10 servings daily of a variety of fruit and vegetables. In addition, this report supports use of a low fat, minimally processed, and predominantly plant-based diet, and discourages the intake of alcohol, red meat, and refined sugar to a greater extent than have earlier cancer prevention guidelines (pp. 1512-1513).

There is growing research interest in phytochemicals (substances in plant foods with biological effects on the human body), and the role that phytochemicals play in the prevention and treatment of cancers. For example, organosulfur compounds found in cruciferous vegetables increase the activity of enzymes that detoxify carcinogens in the liver. Phytoestrogens (isoflavones and lignans) are of special interest because of their estrogen-like biological activity. They are found primarily in soybeans and soy foods, flax seeds, grains, fruits, and vegetables. At present, people are advised to consume whole foods containing phytochemicals (McCallum & Polisena, 2000, p. 146), and especially phytoestrogens, rather than concentrated supplements.

Objectives

The objectives of medical nutrition therapy are
- to restore or preserve nutrition status, body composition, and functional status prior to, during, and after cancer treatment,
- to improve strength, well-being, and quality of life, and
- to minimize food-related discomfort associated with cancer or its treatment.

Nutrition Care

Nutrition Assessment

Identify the primary tumor site and the stage of the malignancy.
Review the type and frequency of treatments and their potential effects.
Obtain a history of preexisting medical conditions, such as diabetes.
Consider the use of a validated, comprehensive nutrition assessment tool such as Ottery’s Patient-Generated Subjective Global Assessment (Lutheringer, 1998a, p. 3).
Obtain current weight and weight history. Weight loss is a major predictor of survival, response to therapy, and quality of life.
Weight loss signals nutritional risk if it is greater than 5 percent of body weight in 1 month, or greater than 10 percent in 6 months.

When weight gain is noted, identify causes of weight gain, such as use of certain medications, reduced physical activity while adequate intake continues, or fluid retention.

Check for changes in body composition for increased fat stores and reduced lean tissue mass. Weight is not a good measure of nutrition status if edema, ascites, or dehydration is present. The usefulness of skinfold measurements and height-weight standards is likewise limited.

Interpret lab results with care since cancer and cancer therapy frequently result in abnormal values independent of nutrition status. Diet and weight histories are usually more meaningful.

Use a 24-hour recall and a food frequency assessment to determine what effect the tumor is having on the adequacy of intake. Look into existing eating habits and ability, motivation to make dietary changes, family dynamics, and the use of food as a comfort or control measure.

Evaluate factors that impair digestion and absorption of nutrients. Identify the chemotherapy agents being used, and evaluate for their side effects. For instance, cisplatin can decrease serum electrolytes; therefore, magnesium deficiency, especially, may be severe and difficult to correct (Fischer, Knobf, & Durivage, 1993, p. 80).

Watch for nausea, vomiting, and diarrhea from chemotherapy, antibiotics, or radiation therapy, which lead to electrolyte imbalances and dehydration.

Evaluate for the need for vitamin and mineral supplementation in cases of prolonged general malnutrition. Normal metabolism of micronutrients may be altered in cancer, but it is not known whether cancer or its treatment increases micronutrient needs (Bloch & Charuhus, 2001, p. 653). Note that hypercalcemia resulting from bone cancer often does not respond to dietary calcium restriction (Whitmire, 2001, p. 70).

Establish whether the individual is using complementary or alternative medicine therapies of a nutritional nature, such as herbal preparations or megadoses of vitamin or mineral supplements. Determine the extent to which these replace or suppress conventional food intake. Evaluate the risk of interactions or potential toxicities with conventional treatment.
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Assess the ability for self-care and the degree of social support during treatment. These considerations include
- ability to shop for food and prepare meals, and
- the financial situation and need for financial assistance.

**Nutrition Intervention**

Develop a meal plan that includes all food groups and emphasizes foods the individual enjoys. If entire food groups are rejected, use creative ways to incorporate the foods into other dishes.

Ensure adequate calorie and protein intake. This does not mean that foods should be high in fat or sugar. On the contrary, aim for nutrient dense foods.

Consider liberalizing therapeutic diets for co-existing conditions, such as diabetes or cardiovascular disease. Opt for adjustments in medications instead of intensifying diet management. In the case of diabetes, it is important to maintain reasonable glucose control to avoid the adverse side effects of high or low blood sugar. However, dietary restrictions are seldom appropriate for the individual with terminal illness.

Consider the use of commercial supplements in the following cases:
- impaired ability to consume or prepare nutrient-dense foods and fluids,
- dysgeusia,
- lactose intolerance, or
- difficulty swallowing solid or semi-solid foods.

Provide information about homemade supplement alternatives and texture or flavoring modifications, since people may tire of the repeated use of commercial nutrition supplements.

Confer with the physician about the use of a daily multivitamin and mineral supplement for individuals whose micronutrient intake is limited for a prolonged period.

Use tube feeding or parenteral nutrition support to prevent or correct malnutrition when an adequate oral intake cannot be achieved.


Use parenteral nutrition with caution since research has shown an increase in infectious and mechanical complications in people receiving both chemotherapy and parenteral nutrition. Indications
Section 3A: Altered Metabolism

include (Puccio & Nathanson, 1997, p. 281)
- bowel obstruction,
- severe treatment side effects, or
- preoperative repletion over 7 to 14 days of people with moderate to severe malnutrition.

In the palliative care setting, focus on the pleasurable aspects of eating without concern for quantity or nutrient content. Tube feeding or parenteral nutrition support is rarely indicated. It should be considered only if it is mutually agreed upon by the individual and caregiver to improve quality of life.

Inform people about the potential side effects of treatment early in their treatment in order to prevent significant declines in nutrition status. These are listed in Table 3A-1, which is based on suggestions from Eldridge and Hamilton's *Management of nutrition impact symptoms in cancer* (2003) and the National Cancer Institute's *Eating hints for cancer patients: Before, during and after treatment* (2003).

Provide support and reassurance to help deal with side effects and loss of control of normal eating experiences and routines.

**Nutrition Monitoring**

The American Dietetic Association's medical nutrition therapy protocols call for a minimum of three sessions with a dietitian for surgical, medical, or radiation oncology therapy (Luthringer, 1998a, p. 1; 1998b, p. 1).

Aim to preserve weight and nutrition status.
Evaluate intake of food and fluids, weight, bowel function, and lab work.
Monitor nutrition status more often when significant side effects are expected.

**Glossary**

**Anorexia** is the loss of appetite.

**Ascites** is the accumulation of fluid in the peritoneal cavity.

**Chylous ascites** is ascites that contains chyle (absorbed fats and nutrients from digestion) from the lymphatic system that has leaked from the thoracic duct.

**Dysgeusia** is unpleasant or altered sense of taste.

**Dysphagia** is difficulty swallowing.

**Early satiety** is a feeling of fullness after eating a small amount.

**Mucositis** is the inflammation of mucous membranes of the digestive tract, such as in the mouth (mouth sores).

**Neutropenia** is an abnormally low number of neutrophils, a type of white blood cell.

**Odynophagia** is pain when swallowing.

**Proctitis** is inflammation of the rectum and anus.

**Xerostomia** is dry mouth.
Table 3A-1: Management of side effects of cancer and cancer therapy

<table>
<thead>
<tr>
<th>Side Effect</th>
<th>Interventions</th>
</tr>
</thead>
</table>
| Anorexia     | - Identify contributing factors, such as pain, constipation, or fatigue.  
              | - Make a list of high energy, high protein foods and liquids that are best liked and tolerated.  
              | - Suggest small, frequent meals and snacks.  
              | - Stress the importance of eating even when not hungry.  
              | - Encourage soft, moist solids, as these may be well tolerated.  
              | - Identify the time of day when appetite is best. Concentrate the intake of calorie-dense and nutrient-dense foods at that time.  
              | - Promote a relaxed, pleasant atmosphere for eating.  
              | - Limit low energy foods, such as coffee, tea, and clear soups.  
              | - Suggest the use of convenience foods, deli or take-out foods, time-saving appliances, Meals on Wheels, homemaker services, or family/friends to assist if fatigue or meal preparation is a problem.  
              | - Encourage physical activity as tolerated, if medically appropriate.  
              | - Push fluids, especially water and juices, to avoid dehydration.  
              | - Encourage viewing eating as a necessary part of treatment, since hunger signals may be few or absent.  
              | - Suggest scheduling meals and snacks.  
              | - Keep high protein/energy snacks near resting areas, in the car and in purses.  
              | - Confer with the physician about use of appetite stimulants.                                                                                                                                  |
| Early Satiety| - Recommend small, frequent meals.  
              | - To meet fluid needs provide energy dense liquids between meals.  
              | - Encourage drinking fluids 30 minutes before or after meals or snacks.  
              | - Limit intake of gas-producing foods.  
              | - Discourage intake of high fiber foods that are low in calories.  
              | - Adjust fat intake to a tolerated level, since fat slows stomach emptying.  
              | - Confer with the physician about use of gastric motility drugs.                                                                                                                               |
| Nausea       | - Identify contributing factors, such as constipation, pain, or medication.  
              | - Reinforce use of anti-nausea medications as prescribed.  
              | - Sip fluids at frequent intervals, separately from solid foods, to help maintain hydration and settle the stomach.  
              | - Discourage fasting, as it may worsen nausea or cause hypoglycemia.  
              | - Encourage small, frequent meals or snacks.  
              | - Offer dry foods, such as soda crackers or toast to settle the stomach.  
              | - Offer cold or room temperature foods to decrease aromas.  
              | - Avoid exposure to strong food odors during meal preparation or at mealtime.  
              | - Avoid serving poorly tolerated foods, such as high fat, high fiber, spicy, or gas-producing foods.  
              | - Discourage the use of alcoholic beverages.  
              | - Suggest wearing loose clothing.  
              | - Suggest that meals be eaten slowly in a relaxed atmosphere.  
              | - Advise against lying flat immediately after meals. Instead, recline with the head of the bed elevated.  
              | - Discourage eating favorite foods around treatment times to avoid inducing an aversion to these foods.  
              | - Encourage sleep at times when nausea is anticipated.                                                                                                                                            |
| Vomiting     | - Identify contributing factors, like taking medications on an empty stomach.  
              | - Encourage adequate fluid intake to prevent dehydration.                                                                                                                                                                                                                      |
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| **Mouth Sores or Mucositis** | - Encourage good oral hygiene practices to promote comfort, enhance taste, and stimulate appetite.  
  - Encourage the use of a baking soda mouth rinse before and after meals (dissolve 1 tsp baking soda and 1 tsp salt in 1 quart of water, swish, gargle and spit out).  
  - Discourage the use of commercial mouthwashes and alcohol, as they will contribute to dryness and irritation.  
  - Serve small, frequent, high calorie, high protein meals and snacks.  
  - Alter food texture: soft, moist, semisolid, or blenderized foods may be better tolerated. Avoid crisp or rough-textured foods.  
  - Recommend dunking or moistening dry foods in liquid.  
  - Discourage intake of irritants, such as tobacco and foods or fluids that are  
    - tart or acidic,  
    - spicy or salty, or  
    - very hot or very cold.  
  - Encourage adequate fluid intake.  
  - Provide a variety of foods to alleviate monotony.  
  - Confer with the physician about optimizing pain treatment and using topical anesthetic sprays or lozenges to numb or soothe the mouth and throat.  
  - Reinforce the use of analgesics before meals to reduce the pain associated with eating. |
| **Thick Saliva and Mucous** | - Encourage fluid intake to thin saliva and mucous.  
  - Minimize mucous buildup in the mouth and throat with frequent sips of liquids.  
  - If mucositis is not a problem, serve slightly tart beverages or foods to thin secretions and stimulate saliva production, such as  
    - lemon-flavored soft drinks, lemonade, or lemon ices,  
    - papaya or pineapple juice,  
    - sour lemon drops or other sour candies, or  
    - sports drinks.  
  - If milk products increase mucous production, before eliminating dairy products, suggest low-fat milk products or cooked items, such as custards or pudding, or suggest soy-based or rice-based beverage alternatives.  
  - Encourage consumption of soft, moist foods.  
  - Limit intake of hard or dry foods (such as tough meats or crackers) and viscous foods (such as thick syrups).  
  - Limit caffeine, alcohol, and spicy foods.  
  - Reinforce good oral hygiene practices, if there is decreased saliva production, to prevent dental caries.  
  - Encourage the use of club soda or baking soda (see mucositis) mouth rinse throughout the day. |
| **Swallowing Problems or Dysphagia** | - Arrange for a swallowing assessment by a speech language pathologist to identify aspiration risk, appropriate food consistencies, and swallowing techniques.  
  - Provide small, frequent, high-calorie, high-protein foods. |
### Section 3A: Altered Metabolism

<table>
<thead>
<tr>
<th>Section</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Moistened Foods</strong></td>
<td>- Moisten foods with spreads, sauces, salad dressing, or gravies. - When thin liquids are restricted, ensure fluid needs are met by other sources, such as thickened liquids and soups, and pureed foods. - If the individual feels as though foods stick in the throat, suggest using multiple swallows for each bite, or washing bites down with sips of beverages. - Offer homemade or commercial nutrition supplements if texturized foods or thickened liquids are not tolerated. - If vitamin and mineral supplementation is necessary, suggest crushing a tablet and taking it with food, or using a chewable tablet or liquid form. - If painful swallowing is a problem, confer with the physician about optimizing pain treatment and using topical anesthetic sprays or lozenges to numb or soothe the mouth and throat.</td>
</tr>
<tr>
<td><strong>Dry Mouth or Xerostomia</strong></td>
<td>- If dehydration is identified, encourage intake of noncaffeinated beverages. - Encourage consumption of foods that have lubricating effects, such as sauces, gravies, and salad dressings. - Serve soft, moist foods. - Advise taking sips of fluid with each mouthful of food to help with chewing and swallowing. - Suggest methods of moistening the mouth throughout the day: - suck on ice chips or sugar-free Popsicles, - use a water spray, - swab the mouth with a tasteless cooking oil, or - use a humidifier if the atmosphere is dry. - Stimulate secretion of saliva by using - mint or tart sugar-free gum/candy, - citric acid-containing fluids (preferably sugar-free), such as lemonade, or orange-flavored soft drinks, frozen juice bars, and sherbets. - Reduce the risk of tooth decay and mouth infections by - making a referral to a dentist, - encouraging daily use of fluoride gel and cleaning the teeth and mouth after each meal or snack, - rinsing the mouth often with water or baking soda rinse (see mucositis), - discouraging the use of commercial mouthwashes and alcohol since they contribute to dryness and irritation, - using sugar-free products, when possible, - discouraging intake of sweet, sticky, cariogenic foods, - encouraging taking cariogenic foods with other foods at meals, and - if the individual is unable to clean teeth after eating, encourage consuming artificial sweeteners, dairy products (especially cheddar cheese), and peanuts after a meal because they have a protective effect on teeth.</td>
</tr>
<tr>
<td><strong>Altered Taste</strong></td>
<td>- Identify specific changes in taste or smell. - Examine the inside of the mouth for indications of infection, such as white or brown coatings or plaques. - Reinforce proper oral care before and after meals to decrease unpleasant taste. - Encourage the use of baking soda rinse (see mucositis) throughout the day. - Encourage drinking fluids with meals to decrease unpleasant tastes. - Experiment with food flavors (sour, salty, sweet, bitter) to find tolerated foods. - Experiment with seasonings and flavorings. - Use tart foods because they can stimulate taste buds. - If meat tastes bitter or metallic, serve it - cold or at room temperature.</td>
</tr>
</tbody>
</table>
### Section 3A: Altered Metabolism

<table>
<thead>
<tr>
<th>Condition</th>
<th>Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Diarrhea</strong></td>
<td>- Identify and treat the underlying cause of diarrhea, if possible. &lt;br&gt;- Encourage use of antidiarrheal agents prescribed by physician as long as infections such as <em>Clostridium difficile</em> are not present. &lt;br&gt;- Encourage fluid intake of 1.5 to 2 liters daily, depending on output. &lt;br&gt;- Serve calorie-dense fluids if weight loss is a problem. &lt;br&gt;- If diarrhea is uncontrolled, use oral rehydration beverages. &lt;br&gt;- Avoid unnecessary diet restrictions by trying modifications one at a time: &lt;br&gt;  - limit bowel stimulants and natural laxatives, such as caffeine, alcohol, and prune juice, &lt;br&gt;  - adjust fat intake as tolerated, &lt;br&gt;  - restrict lactose, &lt;br&gt;  - restrict fiber, &lt;br&gt;  - limit gas-producing foods, which vary from person to person, or &lt;br&gt;  - limit foods or fluids that exacerbate symptoms. &lt;br&gt;- Encourage potassium-rich foods.</td>
</tr>
<tr>
<td><strong>Constipation</strong></td>
<td>- Identify contributing factors, such as pain medication, inactivity, or inadequate food intake. &lt;br&gt;- Prevent constipation by &lt;br&gt;  - providing regular meals and snacks, &lt;br&gt;  - increasing fluid intake to 8 or more cups per day, &lt;br&gt;  - regularly offering natural laxative foods, such as prunes or prune juice, dried fruit, rhubarb, and papaya, &lt;br&gt;  - encouraging physical activity as tolerated, &lt;br&gt;  - if pain medications are not in use, advising a gradual increase in dietary fiber, especially insoluble fiber, or &lt;br&gt;  - if pain medications are in use, advising against increasing insoluble fiber or bulk-forming laxatives because the large fluid volumes needed while taking bulk-forming laxatives are not well tolerated, and high-fiber foods are unappealing and may be ineffective. &lt;br&gt;- Implement a prophylactic bowel regimen (that often includes stool softeners and laxatives) when narcotic medications are used or constipation is present.</td>
</tr>
<tr>
<td><strong>Partial Bowel Obstruction</strong></td>
<td>- Identify contributing factors, such as impingement by the tumor, medication, fecal impaction, motility disorders, or fatigue of the intestinal muscle. &lt;br&gt;- Manage a partial obstruction to prevent total obstruction by &lt;br&gt;  - using medications, &lt;br&gt;  - pushing fluid consumption in frequent, small sips, and &lt;br&gt;  - providing a low fiber and low residue diet. &lt;br&gt;- Minimize oral intake when complete obstruction is suspected (McCallum &amp; Polisena, 2000, p. 146).</td>
</tr>
</tbody>
</table>
### Section 3A: Altered Metabolism

| Radiation Proctitis | - Encourage adequate fluid intake to promote a soft stool and prevent dehydration.  
|                     | - Reduce fiber intake to tolerated levels, which vary widely between people.  
|                     | - Avoid bowel stimulants, such as alcohol, caffeine, and prunes.  
|                     | - Avoid gas producing foods if flatulence is a problem.  
|                     | - Confer with the physician about anti-diarrheal/anti-gas medication if stools are loose, watery, and/or explosive. |

| Ascites | - Refer to interventions for early satiety, if there is pressure on the stomach.  
|         | - Assess adequacy of current oral intake prior to implementing restrictions.  
|         | - Use sodium and fluid restriction in the case of metastatic liver cancer, but not with peritoneal tumor spread.  
|         | - Encourage potassium-rich foods if taking potassium-wasting diuretics. |

| Chylous Ascites | - Implement a low-fat diet.  
|                | - If energy intake is inadequate, use  
|                |   - a medium-chain triglyceride (MCT) oil,  
|                |   - modular carbohydrate supplements, and  
|                |   - low-fat or MCT-containing nutrition supplements.  
|                | - Encourage high protein foods.  
|                | - Refer to interventions for early satiety. |

| Unintentional Weight Gain | - Obtain a detailed diet and weight history.  
|                          | - Identify emotional or environmental triggers to overeating.  
|                          | - Support the setting of realistic and achievable goals.  
|                          | - Emphasize healthful eating rather than dieting. Avoid, especially, the use of quick weight-loss diets.  
|                          | - Encourage increased consumption of whole grains, fruits, and vegetables.  
|                          | - Encourage reduction in fat intake.  
|                          | - Encourage exercise and physical activity, unless contraindicated.  
|                          | - Provide information about health risks of excessive weight. |

### References


American Dietetic Association.


More Information

American Cancer Society
(800) ACS-2345, (800) 227-2345
http://www.cancer.org/

American Institute for Cancer Research (AICR)
1759 R Street, NW
PO Box 97167
Washington, DC 20090-7167
(800) 843-8114
http://www.aicr.org/

Cancer Nutrition Info, LLC
1424 SW Westwood Court
Portland, OR 97239
(404) 876-3084
Fax: (503) 914-6233
www.cancernutritioninfo.com

National Cancer Institute (NCI)
Public Inquiries Office, Room 3036A
6116 Executive Boulevard, MSC 8322
Bethesda, MD 20892-8322
(800) 422-6237
www.cancer.gov
NCI's Eating hints for cancer patients: before, during and after treatment can be found online or ordered free of charge at http://www.cancer.gov/cancertopics/eatinghints

Oncology Nutrition Dietetic Practice Group
American Dietetic Association (ADA)
Chicago, IL
(800) 877-1600
http://www.oncologynutrition.org/

Complementary and Alternative Therapy Resources

Web sites

http://www.consumerlabs.com
http://dmoz.org/Health/Alternative/Herbs/
http://my.webmd.com/cp_drugs
http://www.naturaldatabase.com/
http://www.supplementwatch.com
http://www.quackwatch.org/
Section 3A: Altered Metabolism

**Books**


Cystic Fibrosis

Background

Cystic fibrosis (CF) is a genetic disease that mainly affects the lungs and digestive tract. Eighty-five to 90 percent of people with CF do not produce enough digestive enzymes. If not treated, these people will not be able to digest and absorb their food, and this may lead to malnutrition. Fortunately, pancreatic enzyme replacements may be taken. Because there is a strong link between poor nutrition status and poor lung function, it is essential to strive for optimal nutrition status. Long-term nutrition complications that may develop as a result of CF include

- fat soluble vitamin deficiencies due to maldigestion with resultant malabsorption,
- poor growth due to maldigestion and the increased energy demand associated with breathing
- CF related diabetes due to pancreatic involvement,
- bone disease caused by factors such as glucocorticoid therapy, delayed pubertal maturation, malabsorption of vitamin D, poor nutritional status, and inactivity, and
- CF related liver disease.

Due to improvements in healthcare, the median age of survival for people with CF is now about 38 years old. Newborn screening for CF is available in all 50 states.

Objectives

The goals of nutrition therapy for children with CF are (Borowitz et al., 2002, p. 1888)

- appropriate weight gain,
- appropriate linear growth,
- height greater than 5th percentile,
- weight-for-length or body mass index greater than the 50th percentile,
- adequate vitamin stores,
- adequate body fat, and
- normal bone mineralization.

The goals of medical nutrition therapy in adults are

- prevention of malnutrition,
- appropriate body mass index,
- adequate vitamin stores,
- adequate body fat, and
- normal bone mineralization.

Nutrition Care

**Nutrition Assessment**

Nutrition evaluation may include

- weight,
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- length or height,
- biological parents' heights,
- head circumference up to 2 years of age,
- mid arm circumference,
- triceps and subscapular skinfolds,
- diet history, 24-hour diet recall, or food records,
- vitamin and mineral history,
- use of nutrition supplements,
- recent change in appetite, and
- stool history.

The fecal elastase test should be done to assess pancreatic sufficiency or insufficiency. The 72-hour fecal fat collection may be used to determine whether the dose of pancreatic enzymes is adequate. A precise food record of fat intake must be kept at the same time the stool collection is done. A normal value is 85 to 92 percent. Calculate the coefficient of fat absorption with this equation:

\[
= \frac{\text{grams fat ingested} - \text{grams fat excreted in stool} \times 100}{\text{grams fat ingested}}
\]

Other lab tests used to assess fat soluble vitamin status, to check for CF related diabetes or liver disease, or iron status include
- vitamin A,
- vitamin D (25-OH),
- vitamin E,
- vitamin K (PIVKA-II) or PT/INR (elevated levels would indicate low vitamin K),
- glucose,
- 2-hour glucose tolerance test, yearly, for patients over 12 years old,
- liver enzymes, and
- hemoglobin and hematocrit.

Look for signs of maldigestion and malabsorption, such as
- poor weight gain despite a good appetite,
- frequent, loose, or large bowel movements,
- foul smelling stools,
- mucus or oil in the stools,
- excessive gas and/or stomach pain, or
- abdominal distention or bloating.

A bone densitometry study is used to evaluate bone mineral density. This may be done by ordering a dual-energy x-ray absorptiometry (DEXA) scan.

**Nutrition Intervention**

Nutrition conditions requiring intervention in children may include
- weight loss,
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- BMI or weight for length less than the 50th percentile,
- low serum vitamin levels, and
- abnormal DEXA scan.

Nutritional conditions requiring intervention in adults may include
- weight loss,
- suboptimal BMI,
- low serum vitamin levels, and
- abnormal DEXA scan.

The diet for people with CF should be high in calories and fat. Table 3A-1 provides guidelines for supplementation of fat-soluble vitamins by age. Recommendations for low serum vitamin D levels may be found in the Consensus statement: Guide to bone health and disease in cystic fibrosis (Aris, Merkel, Bachrach, Borowitz, Boyle, Elkin, et al., 2005, p. 15).

Table 3A-1: Recommended fat-soluble vitamin supplementation

<table>
<thead>
<tr>
<th>Age</th>
<th>Vitamin A (IU)</th>
<th>Vitamin E (IU)</th>
<th>Vitamin D (IU)</th>
<th>Vitamin K (mg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Birth - 1 year</td>
<td>1500</td>
<td>40-50</td>
<td>400</td>
<td>0.3-0.5</td>
</tr>
<tr>
<td>1 - 3 years</td>
<td>5000</td>
<td>80-150</td>
<td>400-800</td>
<td>0.3-0.5</td>
</tr>
<tr>
<td>4 - 8 years</td>
<td>5000-10,000</td>
<td>100-200</td>
<td>400-800</td>
<td>0.3-0.5</td>
</tr>
<tr>
<td>more than 8 years</td>
<td>10,000</td>
<td>200-400</td>
<td>400-800</td>
<td>0.3-0.5</td>
</tr>
</tbody>
</table>


People with CF need a high salt diet due to the risk of hyponatremia. Infants may be given 1/8 teaspoon of salt per day. Older children and adults should sprinkle salt on their food and eat salty foods (Borowitz et al., 2002, p. 253).

For malabsorption, pancreatic enzyme replacements are prescribed. Enteric coated pancreatic enzyme replacements (Creon, Pancreaze, and Zenpep) contain lipase, amylase, and protease in varying concentrations. (See Table 3A-2.) Generic pancreatic enzyme replacements should not be used for patients with CF because they are not effective (Hendeles, Dorf, Stencenko, & Weinberger, 1990, p. 2460).

Table 3A-2: Comparison of pancreatic enzyme replacements

<table>
<thead>
<tr>
<th>Enzyme</th>
<th>Lipase units/capsule</th>
<th>Amylase units/capsule</th>
<th>Protease units/capsule</th>
</tr>
</thead>
<tbody>
<tr>
<td>Creon-6000</td>
<td>6,000</td>
<td>30,000</td>
<td>19,000</td>
</tr>
<tr>
<td>Creon-12,000</td>
<td>12,000</td>
<td>60,000</td>
<td>38,000</td>
</tr>
<tr>
<td>Creon-24,000</td>
<td>24,000</td>
<td>120,000</td>
<td>76,000</td>
</tr>
<tr>
<td>Pancreaze-4200</td>
<td>4,200</td>
<td>17,500</td>
<td>10,000</td>
</tr>
<tr>
<td>Pancreaze-10,500</td>
<td>10,500</td>
<td>43,750</td>
<td>25,000</td>
</tr>
<tr>
<td>Pancreaze-16,800</td>
<td>16,800</td>
<td>70,000</td>
<td>40,000</td>
</tr>
<tr>
<td>Pancreaze-21,000</td>
<td>21,000</td>
<td>61,000</td>
<td>37,000</td>
</tr>
<tr>
<td>Zenpep-5000</td>
<td>5000</td>
<td>27,000</td>
<td>17,000</td>
</tr>
<tr>
<td>Zenpep-10,000</td>
<td>10,000</td>
<td>55,000</td>
<td>34,000</td>
</tr>
<tr>
<td>Zenpep-15,000</td>
<td>15,000</td>
<td>82,000</td>
<td>51,000</td>
</tr>
<tr>
<td>Zenpep-20,000</td>
<td>20,000</td>
<td>109,000</td>
<td>68,000</td>
</tr>
</tbody>
</table>
Pancreatic enzyme replacements are dosed on the basis of age and weight. (See Table 3A-3.) Lipase units are the number of fat digesting units per capsule. The total daily dose should not exceed 10,000 lipase units per kilogram for any age (Borowitz, Grand, Durie, & the Consensus Committee, 1995, p. 683). Fecal fat testing may be done for people who appear to have poor digestion on maximum enzyme dose.

Table 3A-3: Dosing guidelines for pancreatic enzyme replacements²

<table>
<thead>
<tr>
<th>Age</th>
<th>Initial Dose (lipase units/kilogram/meal)</th>
<th>Maximum Dose (lipase units/kilogram/meal)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 years and younger</td>
<td>1000</td>
<td>2500</td>
</tr>
<tr>
<td>older than 4 years</td>
<td>500</td>
<td>2500</td>
</tr>
</tbody>
</table>


**Nutrition Monitoring**

At subsequent visits, track changes in weight and height.

For people whose nutrition status is not improving, evaluate the following:
- adherence with prescribed regimen,
- adequacy of the pancreatic enzyme dose,
- behavioral, psychosocial, and economic factors,
- development of other conditions such as diabetes, distal intestinal obstructive syndrome, or other maldigestive diseases, such as celiac disease, and
- suboptimal lung function.

Consider revising the nutrition care plan
- to add or change types, amounts, or timing of oral nutrition supplements, and
- to use tube feedings via either nasogastric or gastrostomy routes.

**Cross References**

Section 3I: Nutrition Support
Section 4A: High Calorie Diet

**References**


Section 3A: Altered Metabolism


More Information

The Cystic Fibrosis Foundation
6931 Arlington Road
Bethesda MD 20814
(800) 344-4823
www.CFF.org
HIV Infection & AIDS

Background

AIDS is a chronic, life-threatening condition caused by the human immunodeficiency virus (HIV). By damaging the immune system, HIV interferes with the body's ability to fight off viruses, bacteria and fungi that can cause disease. It also increases susceptibility to certain types of cancers and to infections the body would normally resist. The virus and the infection itself are known as HIV. "Acquired immunodeficiency syndrome (AIDS)" is the name given to the later stages of an HIV infection (Mayo Clinic, 2010).

Approximately 39.5 million people worldwide have HIV (Mayo Clinic, 2010). Incidence of AIDS and HIV has declined in recent years in countries where there is access combination therapy, known as highly active antiretroviral therapy (HAART). Weight loss and wasting in patients has decreased, though even a 5% weight loss has been associated with an increased risk of mortality and opportunistic infection in an HIV infected individual. Although chronic HIV infection may lead to nutrition compromise over time, some HIV-infected patients may experience malnutrition at baseline. In addition, some patients may have comorbidities that require nutrition intervention regardless of their HIV status. Maintenance of nutritional status can be a challenge for both the patient and their health care providers (ADA, 2010).

Glossary

**Acquired immune deficiency syndrome (AIDS)** is the most severe form of HIV infection. This diagnosis is made when certain diseases appear or counts of key immune cells drop to a very low level.

**Body cell mass (BCM)** is the part of lean tissue that includes cellular components and intra-cellular water. It reflects total body protein and metabolically active tissue.

**AIDS wasting syndrome** is involuntary weight loss of 10 percent of usual body weight plus either diarrhea or weakness and fever for more than 30 days without a known cause.

**Highly active antiretroviral therapy (HAART)** is the use of multiple classes of antiviral drugs to treat HIV infection. It is more effective than use of a single drug and helps to prevent development of viral resistance.

**HIV infection** is the gradual destruction of the immune system by HIV, leading to progressive loss of immune functions.

**Human immunodeficiency virus (HIV)** is a retrovirus that attacks parts of the immune system that regulate the body's defenses against opportunistic infections, tumors, and autoimmune disease.

**Lipodystrophy** is a disturbance in the way the body produces, uses, or distributes fat. In HIV, it is caused by some of the antiviral drugs. There is fat loss in the face and limbs, fat deposits in the abdomen and between the shoulder blades, and, in women, narrowing of the hips and enlargement of the breasts. Insulin resistance, high cholesterol, and high triglycerides are common. (HIV/AIDS Treatment Information Service [ATIS], 2002)
Section 3A: Altered Metabolism

Objectives

Nutrition therapy goals and objectives are individualized based on identified problems. In general they include:

- Achieve and maintain healthy body weight, body composition, and lab values
- Assure food security
- Prevent food-borne illness and infection
- Strengthen immune system
- Management of symptoms, side effects, disease complications and
- Support medication therapy

Nutrition Care

Nutrition Assessment

Complete nutrition assessment as soon as possible in disease progression.

Compare actual measures with estimates of optimal levels for body cell mass and fat.

<95% of ideal suggests wasting and associated complications of reduced body functions.

As BCM declines, additional body functions are compromised according to the severity of BCM loss, including hormonal stasis, ability to sit, ability to swallow, and ability to breathe.

- <55% is associated with the timing of death

Identify alterations from baseline or expected patterns of body fat deposition.

Identify client profile (e.g., wasting, optimal, obesity):

- Weight gains and losses >5% should be evaluated for causes and consequences.
- >5% unintentional loss is associated with increased risk of morbidity and mortality.
- >5% unintentional gain is associated with increased risk for central fat accumulation.

Identify potential nutrient deficiencies or toxicities.

Use tools such as subjective global assessment of functional ability and lean muscle stores to evaluate nutrition status.

Use the waist to hip ratio to assess fat redistribution from lipodystrophy.

Evaluate serum proteins, fasting lipid levels and blood glucose, liver panel, renal panel, electrolytes, and micronutrients.

Note patient and family history of diabetes, heart disease, kidney disease, or digestive disorders.

Evaluate hydration status.

Note condition of mouth and throat, as well as chewing and swallowing abilities.
Section 3A: Altered Metabolism

**Nutrition Intervention**

Develop a nutrition care plan for each person with other members of the health care team (Fields-Gardner & Fergusson, 2004, p. 1430). Nutrition interventions will depend on the problems identified by nutrition diagnosis. Determining the etiologies of problems may be complicated by confounding issues that include

- HIV co-infections,
- gastrointestinal complications,
- lipodystrophy,
- wasting syndrome,
- drug therapy, and
- alternative therapy (CAM).

Provide adequate energy for weight maintenance for those with normal body weight and for anabolism for those who are undernourished. Determining energy needs is a problem since there are no reliable diagnosis-specific prediction equations for HIV infection or AIDS (Coyne-Meyers & Trombley, 2004, p. 340). It is clear, however, that REE is increased at every stage of the disease. Factors to consider are

- clinical condition,
- metabolic rate,
- activity level, and
- viral load.

Refer to Tables 3A-4 and 3A-5 for the nutrition guidelines that were recommended in 2002 for feeding groups of people with HIV by the Association of Nutrition Services Agencies (ANSA) (Parenteau, Edelman, Glynn, & House, 2004). Make individual adjustments to account for other factors that influence nutrition needs.

### Table 3A-4: Nutrition needs based on stage of HIV disease

<table>
<thead>
<tr>
<th>Goal</th>
<th>Calorie needs (using Harris-Benedict equation)</th>
<th>Protein needs (grams per kilogram)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Weight maintenance</strong></td>
<td>BEE x 1.3</td>
<td>1 to 1.4</td>
</tr>
<tr>
<td><strong>Anabolism</strong></td>
<td>BEE x 1.3 plus 5 to 10 calories/kilogram</td>
<td>1.5 to 2</td>
</tr>
</tbody>
</table>

### Table 3A-5: Nutrition needs based on stage of HIV disease

<table>
<thead>
<tr>
<th>Stage</th>
<th>Calorie needs (calories/kilogram)</th>
<th>Protein needs (grams per kilogram)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A asymptomatic HIV, persistant generalized lymphadenopathy, acute HIV</td>
<td>30-35</td>
<td>1.1-1.5</td>
</tr>
<tr>
<td>B symptomatic HIV, complications by HIV</td>
<td>35-40</td>
<td>1.5-2</td>
</tr>
<tr>
<td>C CD4 cell count less than 200, plus AIDS-defining condition or opportunistic infection</td>
<td>40-50</td>
<td>2-2.5</td>
</tr>
<tr>
<td>C (severely malnourished)</td>
<td>begin with 20, gradually increase as tolerated</td>
<td>2-2.5 do not re-feed too fast</td>
</tr>
</tbody>
</table>

80
Section 3A: Altered Metabolism

Provide a vitamin and mineral supplement with 100 percent of the RDI plus a B-complex supplement daily for all people with HIV infection (Coyne-Meyers & Trombley, 2004, p. 348). Provide guidance about symptom management from Table 3A-6. Use information about the common side effects and food-drug interactions of anti-retroviral drugs from Table 3A-7 to plan counter measures.

Table 3A-6: Symptom management for HIV/AIDS

<table>
<thead>
<tr>
<th>Problem</th>
<th>Possible causes</th>
<th>Nutrition interventions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decreased oral intake and anorexia</td>
<td>-depression</td>
<td>-eat small, frequent meals</td>
</tr>
<tr>
<td></td>
<td>-HIV-related dementia</td>
<td>-schedule eating times</td>
</tr>
<tr>
<td></td>
<td>-medication side effect</td>
<td>-use calorie dense supplements between meals</td>
</tr>
<tr>
<td></td>
<td>-weakness and fever</td>
<td>-eat in a relaxed atmosphere</td>
</tr>
<tr>
<td></td>
<td>-elevated cytokines</td>
<td>-use prepared foods or home-delivered meal services</td>
</tr>
<tr>
<td></td>
<td>-substance abuse</td>
<td>-arrange for homemaker services</td>
</tr>
<tr>
<td></td>
<td>-food insecurity</td>
<td>-use appetite stimulants</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chewing or swallowing difficulties</td>
<td>-oral and esophageal lesions</td>
<td>-modify food texture to liquid, puree, or mechanical soft</td>
</tr>
<tr>
<td></td>
<td>-tumors causing pain or obstruction</td>
<td>-provide appropriate dysphagia diet</td>
</tr>
<tr>
<td></td>
<td>-neurologic impairments</td>
<td>-avoid acidic or salty foods</td>
</tr>
<tr>
<td></td>
<td>-medication side effects</td>
<td>-serve foods and beverages frozen, chilled, or at room temperature</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-use a straw to ease swallowing</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-use medication to numb the mouth</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nausea and vomiting</td>
<td>-infection</td>
<td>-drink plenty of liquids (but not alcohol or caffeine-containing items)</td>
</tr>
<tr>
<td></td>
<td>-digestive disorders</td>
<td>-try juices or juices diluted with water, ginger ale, lemon-lime carbonated beverages</td>
</tr>
<tr>
<td></td>
<td>-cancers</td>
<td>-use medical nutrition supplements as sipping beverages</td>
</tr>
<tr>
<td></td>
<td>-medication side effects</td>
<td>-keep plenty of convenient snacks on hand</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-consume small, more frequent meals instead of large meals</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-some people prefer to avoid their favorite foods when they feel nauseated to avoid</td>
</tr>
<tr>
<td></td>
<td></td>
<td>developing an aversion</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-reduce fat</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-avoid food odors between meals</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-eat foods at room temperature or chilled</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-eat in well-ventilated area</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-have someone else prepare foods or order take-out (follow food safety suggestions)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-eat meals without beverages; drink</td>
</tr>
</tbody>
</table>
beverages 1-2 hours before and after meals
- drink cold beverages (lemon-lime or ginger-ale) between meals
- allow an hour or so before lying down after a meal and keep your upper body elevated until nausea subsides
- use antiemetics and antinauseants
- adjust administration time of nausea inducing medications

| Diarrhea and malabsorption | infections of the digestive tract | - drink plenty of liquids (not alcohol- or caffeine-containing foods or beverages) |
| ------------- | ----------------- | ----------------- |------------------ |
|              | surgery of the digestive tract | - try juices or diluted juices if diarrhea has been severe |
|              | bacterial overgrowth in the intestines | - talk with pharmacist and dietitian about medical nutrition supplements |
|              | abnormalities of intestinal villi | - consume small, frequent meals instead of large ones |
|              | malnutrition | - eat foods at or near room temperature to slow down the gastrointestinal tract |
|              | medication side effects | - reduce irritating spices such as cinnamon, pepper, or chili pepper |
|              |               | - reduce fat |
|              |               | - reduce crude or insoluble fibers |
|              |               | - increase soluble fibers |
|              |               | - try applesauce, apple juice, pear juice |
|              |               | - try instant oatmeal, mashed or baked potatoes |
|              |               | - talk with doctor or dietitian about adding a psyllium fiber supplement |
|              |               | - if milk seems to cause diarrhea, try low-lactose alternatives |
|              |               | - use a low fat, bland, caffeine-free, and low lactose diet. |
|              |               | - use MCT oil or supplements made with MCT oil |
|              |               | - use supplements with hydrolyzed protein |
|              |               | - use parenteral nutrition, if the problem is severe |
|              |               | - use probiotics and prebiotics |
|              |               | - use antidiarrheal medications |

Note. © Source American Dietetic Association (2010)
### Section 3A: Altered Metabolism

<table>
<thead>
<tr>
<th>Drug class: fusion inhibitor</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>-enfuvirtide</strong></td>
</tr>
<tr>
<td><strong>-Fuzeon</strong></td>
</tr>
<tr>
<td><strong>-T-20</strong></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Drug class: non-nucleoside reverse transcriptase inhibitors</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>-delavirdine</strong></td>
</tr>
<tr>
<td><strong>-Rescriptor</strong></td>
</tr>
<tr>
<td><strong>-delavirdine mesylate</strong></td>
</tr>
<tr>
<td></td>
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<td></td>
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<td></td>
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<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Drug Class: nucleoside reverse transcriptase inhibitors</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>-abacavir</strong></td>
</tr>
<tr>
<td><strong>-Ziagen</strong></td>
</tr>
<tr>
<td><strong>-abacavir sulfate</strong></td>
</tr>
<tr>
<td><strong>-In combinations: Epzicom, Trizivir</strong></td>
</tr>
<tr>
<td></td>
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<tr>
<td></td>
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<tr>
<td></td>
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<tr>
<td></td>
</tr>
</tbody>
</table>

| **-didanosine**              | -pancreatitis  | -Take with water 30 minutes before or 2 hours after meals. |
| **-Videx**                  | -nausea and vomiting  | -Avoid alcohol. |
| **-dideoxyinosine**         | -diarrhea  | |
| **-ddi**                    | -lactic acidosis  | |
| **-emtricitabine**          | -peripheral neuropathy  | |
| **-Emtriva, FTC**           | -enlarged, fatty liver  | |
| **-In combinations: Truvada** | -body fat redistribution | |
### Drug Class: nucleoside reverse transcriptase inhibitors (continued)

<table>
<thead>
<tr>
<th>Generic name Other names</th>
<th>Nutrition-related side effects</th>
<th>Food-drug interaction recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>lamivudine</strong></td>
<td>-lactic acidosis -pancreatitis -peripheral neuropathy</td>
<td><strong>Avoid alcohol.</strong></td>
</tr>
<tr>
<td><strong>Epivir</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>3TC</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>In combinations:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Combivir</strong>, <strong>Epszicom</strong>, <strong>Trizivir</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>** stavudine**</td>
<td>-anorexia</td>
<td></td>
</tr>
<tr>
<td><strong>Zerit</strong></td>
<td>-lactic acidosis</td>
<td></td>
</tr>
<tr>
<td><strong>d4T</strong></td>
<td>- periphery neuropathy</td>
<td></td>
</tr>
<tr>
<td><strong>tenofovir DF</strong></td>
<td>-diarrhea</td>
<td></td>
</tr>
<tr>
<td><strong>Viread</strong></td>
<td>-nausea and vomiting</td>
<td></td>
</tr>
<tr>
<td><strong>In combinations:</strong></td>
<td>-anorexia</td>
<td></td>
</tr>
<tr>
<td><strong>Truvada</strong></td>
<td>-lactic acidosis</td>
<td></td>
</tr>
<tr>
<td><strong>zalcitabine</strong></td>
<td>-peripheral neuropathy</td>
<td></td>
</tr>
<tr>
<td><strong>Hivid</strong></td>
<td>-lactic acidosis</td>
<td></td>
</tr>
<tr>
<td><strong>dideoxycytidine</strong> ddC</td>
<td>-enlarged, fatty liver</td>
<td></td>
</tr>
<tr>
<td><strong>ddC</strong></td>
<td>-nausea and vomiting</td>
<td></td>
</tr>
<tr>
<td><strong>zidovudine</strong></td>
<td>-diabetes</td>
<td></td>
</tr>
<tr>
<td><strong>Retrovir</strong></td>
<td>-liver toxicity</td>
<td></td>
</tr>
<tr>
<td><strong>Azidothymidine (AZT)</strong></td>
<td>-nausea</td>
<td></td>
</tr>
<tr>
<td><strong>ZDV</strong></td>
<td>-anorexia</td>
<td></td>
</tr>
<tr>
<td><strong>In combinations:</strong></td>
<td>- peripheral wasting</td>
<td></td>
</tr>
<tr>
<td><strong>Combivir</strong>, <strong>Trizivir</strong></td>
<td>-body fat redistribution</td>
<td></td>
</tr>
<tr>
<td><strong>Drug Class: protease inhibitors</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>amprenavir</strong></td>
<td>-abdominal pain</td>
<td>-Do not take with a high fat meal.</td>
</tr>
<tr>
<td><strong>Agenerase</strong></td>
<td>-diarrhea</td>
<td>-Contains vitamin E, so supplements are not needed.</td>
</tr>
<tr>
<td></td>
<td>-nausea and vomiting</td>
<td>-Avoid St. John’s Wort, alcohol, and grapefruit juice.</td>
</tr>
<tr>
<td></td>
<td>-taste changes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-strange mouth sensations</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-high blood glucose</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-lipodystrophy</td>
<td></td>
</tr>
<tr>
<td><strong>atazanavir</strong></td>
<td>-abdominal pain</td>
<td>-Take with food.</td>
</tr>
<tr>
<td><strong>Reyataz</strong></td>
<td>-diarrhea</td>
<td>-Avoid St. John’s Wort.</td>
</tr>
<tr>
<td></td>
<td>-nausea and vomiting</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-jaundice</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-lactic acidosis</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-high blood glucose</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-lipodystrophy</td>
<td></td>
</tr>
</tbody>
</table>

Section 3A: Altered Metabolism

Provide information on food and water safety including
- hand-washing technique,
- using safe water for preparing food, drinking (water and ice), and cleaning food contact surfaces,
- cooking hazardous foods like eggs, meat, poultry, and fish thoroughly,
- preventing cross-contamination between raw and cooked foods,
- limiting time that food is in the temperature danger zone, and
- storing food safely.

**Nutrition Monitoring**

The ADA recommends follow-up counseling every 6 to 12 months for adults and every 3 to 12 months for children or teens with asymptomatic HIV infection. When the disease becomes symptomatic or progresses to AIDS, then follow-up with adults every 2 to 3 months, and with children and teens every 1 to 3 months. More frequent visits are needed when there are nutrition-related changes in clinical status or ongoing clinical complications (Fenton, Silverman, & Vazzo, 1998, p. 4; Heller, Morris, Rothpletz-Puglis, & Paphakis, 1998, p. 1). If use of a high calorie diet or oral supplements is not effective in countering weight loss, consider use of tube feedings. Use parenteral nutrition only if the digestive tract cannot be accessed, weight loss is greater than 20 percent, or malabsorption is severe.

**Cross References**

Section 3I: Nutrition Support
Section 4A: High Calorie Diet
Section 4C: Mechanical Soft Diet
Section 4C: Dysphagia Diets
Section 4D: Cholesterol Control Diet
Section 4D: Low Fat Diet
Section 4E: Low Fiber Diet
Section 4F: Low Lactose Diet
Section 4I: High Protein Diet
Section 4K: Caffeine-Free Diet

**References**


Section 3A: Altered Metabolism


**More Information**

Section 3A: Altered Metabolism


Pressure Ulcers and Wound Healing

Background

A pressure ulcer is localized injury to the skin and underlying tissue, usually over a bony prominence, as a result of pressure or pressure in combination with shear and/or friction (NPUAP 2007). Unintentional weight loss, undernutrition, protein energy malnutrition (PEM), and dehydration deficits are known risk factors for pressure ulcer development (Lyder et al, 1998; Thomas, 2008). Additional nutrition-related risk factors linked to an increased risk of pressure ulcers include low body mass index (BMI), reduced food/fluid intake, and increased dependence on other for eating.

The most common areas for pressure ulcers to develop are the sacrum, heels, trochanter (hips), lateral foot and ischium. The Center for Medicare and Medicaid Services (CMS) Federal Tag F 314 lists common examples of risk factors for developing pressure ulcers:

- Impaired/decreased mobility and decreased functional ability
- Co-morbid conditions, such as end stage renal disease, thyroid disease or diabetes mellitus
- Drugs such as steroids that may affect wound healing
- Impaired diffuse or localized blood flow, for example, generalized atherosclerosis or lower extremity arterial insufficiency
- Resident refusal of some aspects of care and treatment
- Cognitive impairment
- Exposure of skin to urinary and fecal incontinence
- Under nutrition, malnutrition and hydration deficits
- A healed ulcer

The 2009 International NPUAP/EPUAP Pressure Ulcer Classification System describes the following Category/Stages for pressure ulcers. This system is incorporated in the 3.0 Minimum Data Set (MDS) for long term care facilities.

**Suspected Deep Tissue Injury:** Depth Unknown

Purple or maroon localized area of discolored intact skin or blood-filled blister due to damage of underlying soft tissue from pressure and/or shear. The area may be preceded by tissue that is painful, firm, mushy, boggy, warmer, or cooler as compared to adjacent tissue.

- **Further description:** Deep tissue injury may be difficult to detect in individuals with dark skin tones. Evolution may include a thin blister over a dark wound bed. The wound may further evolve and become covered by thin eschar. Evolution may be rapid, exposing additional layers of tissue even with optimal treatment.

**Category/Stage I: Nonblanchable Erythema**

Intact skin with non-blanchable redness of a localized area, usually over a bony prominence. Darkly pigmented skin may not have visible blanching; its color may differ from the surrounding area.

- **Further description:** The area may be painful, firm, soft, warmer, or cooler as compared to adjacent tissue. Stage I may be difficult to detect in
individuals with dark skin tones. May indicate "at risk" persons (a heralding sign of risk).

*Category/Stage II: Partial Thickness Skin Loss* Partial thickness loss of dermis presenting as a shallow open ulcer with a red or pink wound bed, without slough. May also present as an intact or open/ruptured serum-filled blister.

- **Further description:** Presents as a shiny or dry shallow ulcer without slough or bruising (bruising indicates suspected deep tissue injury). This stage should not be used to describe skin tears, tape burns, perineal dermatitis, maceration, or excoriation.

*Category/Stage III: Full Thickness Skin Loss* Full thickness tissue loss. Subcutaneous fat may be visible but bone, tendon, or muscle is not exposed. Slough may be present but does not obscure the depth of tissue loss. May include undermining and tunneling.

- **Further description:** The depth of a stage III pressure ulcer varies by anatomical location. The bridge of the nose, ear, occiput and malleolus do not have subcutaneous tissue and stage III ulcers can be shallow. In contrast, areas of significant adiposity can develop extremely deep stage III pressure ulcers. Bone and tendon is not visible or directly palpable.

*Category/Stage IV: Full Thickness Tissue Loss* Full thickness tissue loss with exposed bone, tendon, or muscle. Slough or eschar may be present on some parts of the wound bed. Often include undermining and tunneling.

- **Further description:** The depth of a stage IV pressure ulcer varies by anatomical location. The bridge of the nose, ear, occiput, and malleolus do not have subcutaneous tissue and these ulcers can be shallow. Stage IV ulcers can extend into muscle and supporting structures (e.g., fascia, tendon, or joint capsule), making osteomyelitis possible. Exposed bone and tendon is visible or directly palpable.

*Unstageable: Depth Unknown* Full thickness tissue loss in which the base of the ulcer is covered by slough (yellow, tan, gray, green, or brown) or eschar (tan, brown, or black) in the wound bed.

- **Further description:** Until enough slough and eschar is removed to expose the base of the wound, the true depth, and therefore stage, cannot be determined. Stable (dry, adherent, intact without erythema or fluctuance) eschar on the heels serves as "the body's natural (biological) cover" and should not be removed.

Guidelines are systematically developed statements which assist both clinicians and individuals make appropriate health care decisions about specific conditions. A rigorous methodology was used to develop the NPUAP/EPUAP prevention and treatment guidelines for nutrition. Evidence based research for the role of nutrition and wound healing is limited. The registered dietitian (RD) or Dietetic Technician, Registered (DTR)
must use clinical judgment and evaluate each individual prior to adapting any guideline. Research and technology rapidly change and the RD and DTR are responsible for maintaining a working knowledge of any new research. Each recommendation is supported by strength of evidence rating. The NPUAP/EPUAP Pressure Ulcer Prevention & Treatment Clinical Practice Guideline includes rationale and the references for nutrition guidelines (National Pressure Ulcer Advisory Panel, 2009).

Nutrition Care

Nutrition Assessment

Screen and assess nutritional status for each individual with a pressure ulcer at admission and with each condition change and/or when progress toward pressure ulcer closure is not observed.

- Refer all individuals with a pressure ulcer to the dietitian for early assessment and intervention of nutritional problems.
- Assess weight status for each individual to determine weight history and significant weight loss from usual body weight (>5% change in 30 days or >10% in 180 days).
- Assess ability to eat independently.
- Assess adequacy of nutrient intake (food, fluid, oral supplements, enteral/parenteral feedings.)

Nutrition Intervention

Provide sufficient calories.

- Provide 30-35 Kcalories/kg body weight for individuals under stress with a pressure ulcer. Adjust formula based on weight loss, weight gain or level of obesity. Individuals who are underweight or who have had significant unintentional weight loss may need additional Kcalories to cease weight loss and/or regain lost weight.
- Revise and modify (liberalize) dietary restrictions when limitations result in decreased food and fluid intake. This is to be done by a dietitian or medical professional.
- Provide enhanced foods and/or oral supplements between meals if needed.
- Consider nutritional support (enteral or parenteral nutrition) when oral intake is inadequate. This must be consistent with individual goals.

Provide adequate protein for positive nitrogen balance for an individual with a pressure ulcer.

- Offer 1.25 - 1.5 grams protein/kg body weight for an individual with a pressure ulcer when compatible with goals of care, and reassess as condition changes.
- Assess renal function to ensure high levels of protein are appropriate for the individual

Provide and encourage adequate daily fluid intake for hydration.
Section 3A: Altered Metabolism

- Monitor individuals for signs and symptoms of dehydration: changes in weight, skin turgor, urine output, elevated serum sodium or calculated serum osmolality.
- Provide additional fluid for individuals with dehydration, elevated temperature, vomiting, profuse sweating, diarrhea or heavily draining wounds.

Provide adequate vitamins and minerals.
- Encourage consumption of a balanced diet which includes good sources of vitamin and minerals.
- Offer vitamin and mineral supplements when dietary intake is poor or deficiencies are confirmed or suspected.


**Nutrition Monitoring**

Closely monitor the person's acceptance of the individualized care plan. Use the scores from standardized assessments such as the Braden scale to monitor risk of skin breakdown (Escott-Stump, 2002, p. 72). Re-assess the condition and staging of the wound periodically. A standardized scale such as the Sessing Scale of Healing is useful (Escott-Stump, 2002, p. 72). Adjust the care plan as needed. Fluid intake and output should be closely monitored in Stage 3 or 4 wounds.

**Research Needs**

RD's and DRT's should be alert to new research addressing the following areas.
- Research for pediatric and neonates with pressure ulcers
- Role of appetite stimulants and anabolic steroids to promote pressure ulcer healing
- Appropriate caloric range for obese individuals (those with BMI ≥30) with pressure ulcers Weight loss diets may need to be modified or postponed temporarily to provide adequate nutrients for pressure ulcer healing.
- Research to demonstrate the effectiveness of branched chain or individual amino acids, such as arginine and glutamine, in the treatment of pressure ulcers.

**Cross References**
- Section 4A: High Calorie Diet
- Section 4G: Vitamin A Rich Foods & Vitamin C Rich Foods
- Section 4H: High Protein Diets
Section 3A: Altered Metabolism

References


More Information

Dietetics in Health Care Communities: Pocket Resource for Nutrition Assessment 2009 Edition
Section 3A: Altered Metabolism


National Pressure Ulcer Advisory Panel
1925 Thomas Jefferson Street, NW
Suite 500
Washington, D.C. 2007
http://www.npuap.org
Respiratory Disease

Background

In lung diseases, the exchange of gases between the air and the blood is altered. Blood gas levels of carbon dioxide and/or oxygen become abnormal in advanced disease. Serious respiratory diseases with nutritional implications include:

- chronic obstructive pulmonary disease (COPD), including chronic bronchitis and emphysema,
- pulmonary fibrosis,
- acute respiratory failure (ARF), and
- acute respiratory distress syndrome (ARDS).

Glossary

**Acute respiratory distress syndrome (ARDS)** is a condition in which the lungs become inflamed and the air sacs collapse or fill with fluid. It is the most serious type of respiratory failure with a mortality rate of 30%. It results from trauma, infection, inhalation injury, or blood loss.

**Acute respiratory failure (ARF)** occurs when there is a sudden failure of the lungs to function without mechanical assistance. It can be associated with chronic lung disease, asthma, heart failure, or ARDS. It is usually reversible once the underlying problem is effectively treated.

**Chronic bronchitis** involves narrowing of the bronchial airways due to bronchospasms and excessive secretions. People are usually normal weight or overweight and often have edema due to heart failure.

**Emphysema** results from extensive damage to the small air sacs called alveoli. People are often thin and have progressive weight loss. Heart failure is not typical.

**Pulmonary fibrosis** is the result of fibrotic changes in lung tissue that make the lungs less elastic.

**Respiratory quotient (RQ)** refers to the ratio of carbon dioxide produced to oxygen inhaled. RQ is normally 0.9. Excessive energy intake contributes to carbon dioxide production and a high RQ. This increases the work of breathing. (American Dietetic Association, 2000, p. 583)

A complex inter-relationship exists between respiratory disease and malnutrition (ADA, 2000, p. 584). Progressive malnutrition associated with respiratory disease may include (Dark & Pingleton, 1994; Grant, 1994, p. 11; Landbo, Prescott, Lange, et al., 1999, p. 1856)

- anorexia secondary to dyspnea, halitosis, and fatigue that results in weight loss including loss of diaphragm muscle mass,
- decline in immune function that increases the risk of pneumonia and other infections,
- poor wound healing, and
- increased secretions with a tracheostomy.
Section 3A: Altered Metabolism

Recent evidence suggests that the malnutrition present in many lung conditions is also due to a systemic inflammatory response that results in a hypercatabolic state (Mallampalli, A., 2004, p. 554).

Objectives

The objectives of medical nutrition therapy are
- to provide adequate calorie and protein intake to prevent malnutrition,
- to support pulmonary rehabilitation, and
- to optimize breathing function.

Nutrition Care

Nutrition Assessment

In an acute respiratory crisis, the person may not be able to provide information due to shortness of breath, so consult family members or other caregivers as well. Identify the type of respiratory disease and other co-morbidities that are present. Anthropometric data and physical examination are essential to determining nutrition status. Look for signs of fat and muscle wasting and for the presence of edema. People with emphysema are often thin, but people with other conditions are often normal weight or overweight. Do not overlook unplanned weight loss in these people or in those who are edematous (ADA, 2000, p. 584).

Note medications used that affect nutrition therapy, such as antibiotics, bronchodilators, and corticosteroids (Inman-Felton, A. E., 1998, p. 3). Assessment of usual dietary intake that may reveal that energy intake is much higher than predicted by formulas. Calorie needs vary considerably between people as well as during stages of acute crisis.

- Overfeeding increases carbon dioxide production and raises the RQ greater than 1. Therefore avoid excessive calories from any source (ADA, 2000, p. 585).
- Indirect calorimetry is the best method to determine calorie needs.
- When indirect calorimetry is not available, apply a stress factor of 1.2 to 1.5 to the resting energy expenditure (REE) to estimate calorie needs. Adjust the actual weight measurement to account for edema to avoid setting feeding goals too high.
- The energy needs of critically ill people on mechanical ventilators may be lower if they are chemically paralyzed.

Nutrition Intervention

Develop a meal plan with a normal distribution of caloric sources:

- 40 to 60 percent carbohydrate
- 15 to 20 percent protein (1 to 2 grams per kilogram body weight)
- 20 to 40 percent fat
Section 3A: Altered Metabolism

Provide self-management training for people with stable disease to reach outcomes such as
- achieving or maintaining body weight,
- improving activity levels,
- improving breathing, and

Optimize oral intake of poor eaters (Escott-Stump, 2002, p. 192) by
- offering smaller more frequent feedings;
- modifying food consistency to mechanical soft or puree when fatigue and shortness of breath interfere with chewing and swallowing;
- ensuring adequate flavor of foods since foods such as meat, vegetables, and coffee may taste bland due to changes in acid-base balance; and
- providing additional suctioning for people with a tracheostomy prior to eating.

Provide 2 to 3 liters of fluid daily unless there is a problem with edema or a need for a fluid restriction due to other conditions. Dehydration thickens lung secretions. People on oxygen via nasal cannula often have a dry mouth.

If edema is present, limit sodium intake and increase potassium intake (Escott-Stump, 2002, p. 192).
Antioxidants from fruits, whole grains, salmon, mackerel, and tuna may support lung function and promote healing (Escott-Stump, 2002, p. 191).

Arrange for extra oxygen before or after eating because digestion and absorption increase oxygen needs.

Tube feedings may be used when oral intake is inadequate or when it is impossible during mechanical ventilation. Some clinicians are convinced that use of omega-3 polyunsaturated fat sources can counteract the alterations in immune function seen in ARDS (Mizock & DeMichele, 2004, p. 564). There is not enough evidence to justify use of specialized high fat formulas.

**Nutrition Monitoring**

Especially in an acute crisis, review serum levels of phosphorus, magnesium, potassium, and calcium frequently as they are needed for muscle function.

Monitor changes in nutrition needs if diarrhea develops secondary to antibiotic treatment.

Recently hospitalized people with COPD need to be counseled to increase their oral intake of food or nutrition supplements in order to improve their nutrition status (Thorsdottir, 2002).
Section 3A: Altered Metabolism

Cross References

- Section 3I: Nutrition Support
- Section 4A: High Calorie Diet
- Section 4C: Consistency Modification
- Section 4G: Sodium Controlled Diet
- Section 4H: High Protein Diet

References


More Information

American Association for Respiratory Care provides online patient education about lung diseases at www.yourlunghealth.org
Cerebral Palsy

Background

Cerebral palsy (CP) is a group of chronic disorders that impair control of voluntary movement. CP is caused by faulty development of or damage to the motor area of the brain, so it may be present at birth, or may be acquired in the first few years of life. It generally does not worsen over time, but often changes. Sometimes seizures and mental impairment are present, but CP does not always involve profound handicap (National Institute of Neurological Disorders and Stroke, 2010). Muscle coordination difficulties may include problems with posture, muscle tone, and motor coordination.

There are four broad types of CP, traditionally classified by the type of movement disturbance (NINDS, 2010):
- Spastic CP (70 to 80 percent of cases),
- Athetoid or Dyskinetic CP (10 to 20 percent of cases),
- Ataxic CP (5 to 10 percent of cases), and
- Mixed CP.

CP is associated with a high incidence of growth problems and feeding difficulties. There is an increased risk for underweight or overweight, depending on muscle tone, feeding ability, and activity level. According to the United Cerebral Palsy Research and Education Foundation (UCPREF, 2000), one third of children with CP experience growth and nutrition problems. Failure-to-thrive is common, and may be due to damage to parts of the brain that involve growth and development. Most studies show that impaired growth is linked to inadequate food intake due to feeding problems and inadequate control of the mouth and tongue. On average, mothers spend 3.5 hours daily feeding their children with CP, compared to 0.8 hours for those without CP (UCPREF, 2000).

Glossary

**Ataxic CP** involves problems with sense of balance and depth perception.

**Athetoid CP** refers to uncontrolled, slow, writhing movements of the extremities and sometimes the face and tongue. Energy needs are often increased in older children and adults.

**Contractures** are deformities or distortions of body parts affected by spasticity.

**Hypertonicity** refers to increased muscle tone or spasticity. Muscles are rigid or stiff.

**Hypotonicity** refers to low or decreased muscle tone. Muscles are relaxed and flaccid.

**Mixed CP** means there is a combination of the other three types of CP, most often athetoid and spastic.

**Spastic CP** refers to the continuous contraction of certain muscles that result in stiffness. Calorie needs are often lower because mobility is impaired.

(NINDS, 2010)
Section 3B: Developmental Disability

Objectives

The goals of nutrition therapy for people with CP include
- optimizing growth and development,
- promoting independence, such as the ability to self-feed,
- correcting feeding and eating problems,
- correcting constipation, and
- preventing obesity, nutrition deficiencies, and inadequate hydration.

Nutrition Care

Nutrition Assessment

Coordinate nutrition assessment and care with the evaluations and care plans of the physical, occupational, and speech therapists. Obtain accurate measurements using special equipment if needed, since people with CP are often difficult to measure.

Evaluate the person’s
- growth parameters,
- feeding skills,
- positioning needs,
- medications, such as anticonvulsants, and
- nutrient intake.

Nutrition Intervention

Determine calorie needs on an individual basis. Use the RDA for people without motor dysfunction. There is little research on calorie needs, but Bandini, Patterson, and Ekvall (1993, p. 95-96) cite older research suggesting the following guide for children 5 to 11 years old based on degree of motor dysfunction
- mild to moderate: 13.9 calories per centimeter of height;
- severe: 11.1 calories per centimeter of height.

Adjust the calorie intake to promote appropriate growth of infants and children. Provide tube feedings if oral intake is inadequate to meet needs.

Develop a multidisciplinary plan to improve oral-motor skills to optimize oral intake and promote self-feeding skills.
- Provide a diet appropriate for the child’s developmental level.
- Adjust the food texture, if needed.
- Use adaptive feeding equipment and appropriate positioning, if necessary.

Ensure adequate fluid intake along with a high fiber diet for constipation.

Assure the nutrition adequacy of low calorie diets.

If the person is on an anticonvulsant therapy (true in 30 percent of CP cases), make sure folate, biotin, vitamin B₁₂, and vitamin D intakes are
adequate. If not, arrange for supplements that are appropriate for the age and feeding ability.

**Nutrition Monitoring**
Continue to monitor anthropometric measurements.
Monitor the intake of folate, biotin, vitamin B₁₂, and vitamin D for adequacy.
Evaluate the intake of food for adequate nutrition and caloric density.
Evaluate children who cry persistently during and after feedings for gastroesophageal reflux.
Monitor bowel regularity.

**Cross References**
- Section 2B: Serving People with Disabilities
- Section 3D: Constipation
- Section 3D: Gastroesophageal Reflux Disease
- Section 3H: Protein-Calorie Malnutrition
- Section 3I: Tube Feeding
- Section 4A: Calorie Controlled Diet
- Section 4A: High Calorie Diet
- Section 4C: Puree, Mechanical Soft, and Dysphagia Diets
- Section 4E: High Fiber Diet

**References**


**More Information**

Down Syndrome

Background

Down syndrome (DS) is the most common chromosomal abnormality associated with mental retardation. The incidence is 1 in every 733 births. There are more than 400,000 people living with Down syndrome in the United States. Many people with Down syndrome also have other congenital abnormalities. Heart defects, for example, occur in 30 to 60 percent of the cases (Down Syndrome Medical Interest Group [SMIG] 2010). Infants with DS may be at risk for underweight, but older children and adults have an increased risk of overweight and obesity due to heart defects, low muscle tone, decreased physical activity, or, in some cases, hypothyroidism. Other nutrition problems include poor suck in infancy, constipation, and dental disease.

Objectives

The goals of nutrition therapy for people with DS include
- optimizing growth and development,
- promoting independence, such as ability to self-feed,
- correcting feeding and eating problems,
- correcting constipation, and
- preventing obesity, nutritional deficiencies, and inadequate hydration.

Nutrition Care

Nutrition Assessment

Plot the length/height, weight, and head circumference growth parameters, using Down syndrome growth charts. With older children and adults, plot BMI on standard charts to assess for obesity. Review feeding skills and behavior around food. Infants may have problems coordinating suck and swallow, so lactation or feeding specialist may be consulted. Toddlers may find the progression of food textures difficult. Evaluate muscle tone. Hypotonicity can result in problems with constipation.

Assess dietary intake, particularly the caloric and nutrient density and the adequacy of fluid consumption and fiber intake, and

Assess calorie intake. Calorie intake should be based on height, rather than on age or weight, and should be related to the level of activity (Patterson & Ekvall, 1993). Use the following factors for children aged 1 to 14 years old
- boys: 16.1 calories per centimeter, and
- girls: 14.3 calories per centimeter.
**Nutrition Intervention**

Adjust the calorie intake to promote the appropriate growth of infants and children. Provide tube feedings if oral intake is inadequate to meet needs.

Intervene early to improve oral-motor skills and to promote self-feeding skills.
- Adjust the diet texture, if needed.
- Use adaptive feeding equipment, when necessary.

Provide adolescents and adults with a well-balanced and low-calorie diet.

Encourage appropriate physical activity.

Ensure adequate fluid intake along with a high fiber diet for constipation.

Limit the intake of simple carbohydrates to prevent dental caries and periodontal disease.

**Nutrition Monitoring**

Plot serial weight and length/height growth measurements. Some physicians calculate and plot ideal body weight serially. Weight should be 90 to 100 percent of ideal weight.

For older children and adults, determine the BMI.

Review changes in medical history. Infections, particularly in the respiratory tract, diabetes mellitus, and celiac disease are more prevalent in people with DS.

Provide for adequate nutrient density in the person's diet.

Evaluate elimination habits.

Reinforce good dental hygiene practices, and ensure that routine dental care is provided.

**Cross References**

- Section 2B: Serving People with Disabilities
- Section 3D: Constipation
- Section 3H: Protein-Calorie Malnutrition
- Section 4A: Calorie Controlled Diet
- Section 4A: High Calorie Diet
- Section 4C: Puree, Mechanical Soft, and Dysphagia Diets
- Section 4E: High Fiber Diet

**References**

Section 3B: Developmental Disability


**More Information**


National Down Syndrome Society
Down Syndrome growth charts
www.ndss.org
Diabetes Mellitus

Background

Diabetes mellitus is a group of metabolic diseases characterized by elevated blood glucose levels (hyperglycemia) resulting from defects in insulin secretion, insulin action, or both. Recent research also identifies several other pathophysiologic defects that contribute to hyperglycemia. These include elevated postprandial glucagon levels, an accelerated rate of gastric emptying, and inability to achieve satiety, which are due to deficiencies of amylin and glucagon-like peptide-1 (GLP-1) (Aronoff, Berkowitz, Shreiner, & Want, 2004).

Insulin is a hormone manufactured by the beta cells of the pancreas. Cells throughout the body need insulin in order to use glucose from digested food as an energy source. Amylin is co-secreted with insulin in response to food and determines how much and how fast glucose enters the circulation. GLP-1 is a gut hormone that has multiple modes of action including enhancing insulin secretion in a glucose-dependent manner (Riddle & Drucker, 2006). Chronic high blood glucose leads to damage to or failure of various organs including the eyes, kidneys, nerves, heart, and blood vessels. As a result, diabetes is a leading cause of:

- visual impairment and blindness,
- chronic kidney disease,
- nerve damage,
- amputations,
- heart disease, and
- stroke.

There are four major factors that influence the ability to control diabetes and they are:

- food intake (especially carbohydrate source foods),
- exercise/physical activity,
- medications, and
- stress (physical and/or emotional).

Types of Diabetes

Type 1
- The beta cells no longer produce insulin or amylin.
- Daily injections of insulin and possibly amylin analog are required to control blood glucose.
- Usually diagnosed during childhood or early adolescence.
- It affects 1 in 600 children

Type 2
- The beta cells do not make enough insulin.
- The insulin does not act effectively due to the insulin resistance at the cellular level.
- In the early stages, blood glucose is managed with lifestyle modifications such as reduced food intake and increase physical activity.
- Later, oral glucose-lowering medications an incretin mimetic (GLP-1 injection) may be prescribed (Riddle & Drucker, 2006).
Finally, with the progression of beta cell dysfunction, Type 2 diabetes advances to an insulin-requiring state.
More often diagnosed during adulthood. However, with the increasing incidence of childhood obesity, the number of children and youth diagnosed with Type 2 diabetes is also increasing.
People from certain ethnic or racial groups (African-American, Native American, Hispanic, and Asian/Pacific Islander) and those with a family history of Type 2 diabetes have a higher risk of developing Type 2 diabetes.

Three major factors that influence glucose control in diabetes:
- Food intake (especially carbohydrate-containing foods)
- Exercise and/or physical activity
- Medications

**Carbohydrate Counting**
Dietary carbohydrate, found in foods that contain various types of starch and sugar, has the largest impact on blood glucose levels after eating. Individuals with diabetes monitor carbohydrate intake with one of two methods of carbohydrate counting. One method involves counting carbohydrate servings that each contain about 15 grams of carbohydrate consumed.

**Monitoring Blood Glucose**
Self-monitoring of blood glucose (SMBG) is recommended with both types of diabetes. People who take insulin should monitor a minimum of 2-4 times a day, depending on their insulin regimen. SMBG before each meal and the bedtime snack is helpful to assess the insulin dose needed and to make changes, if needed. Individuals managing their diabetes with lifestyle modifications or oral medications should monitor before breakfast and at least one other time each day.

In addition, SMBG 2 hours after a meal provides information about the effectiveness of meal time treatment. If 2 hour post-meal glucose levels are greater than 180 mg/dl, the person needs to decrease carbohydrate intake, increase activity, or adjust medications. Monitoring at 2-3 a.m. is useful for evaluating nighttime low blood glucose (hypoglycemia) and high blood glucose in the morning.

Continuous glucose sensors are also available for use in conjunction with SMBG. Continuous glucose monitoring is done through the measurement of interstitial glucose, but requires calibration with the SMBG. These sensors are not used to replace SMBG, but to define trends in blood sugars that could aide in the management of a patient's diabetes. The patient still must complete a fingerstick before making treatment decisions related to their diabetes. The continuous glucose sensors have alarms associated with hyper and hypoglycemic levels defined by the patient. The sensor tracks the trend of the blood glucose and will notify the patient of glucose levels that are above or below the set parameters, thus hopefully assisting and avoidance of these acute situations.

**Insulin & Injectables**
Currently there are many types of insulin available. They may be delivered by a number of methods including
Section 3C: Diabetes Mellitus

- vial and syringe,
- insulin pens, and
- insulin pumps

Often a combination of different types of insulin, with different actions, may be used to mimic normal insulin secretion as closely as possible. The number of insulin injections per day varies. The insulin dose depends on basal needs, sensitivity to insulin, food intake (especially carbohydrates), and the amount of physical activity performed.

Rapid acting insulin analogs may be given before, during or immediately after a meal. Short-acting insulin should be injected 30-45 minutes prior to the first bite of food. Administration of analogs after a meal may help reduce the higher glucose levels that occur after a high fat meal. Changes in the dose of rapid-acting insulin can be individualized according to an algorithm that increases the dose for higher glucose levels and decreases the dose when glucose levels are lower.

In addition to insulin, there are also injectable medications for the treatment of diabetes that are not insulin. These are known as incretin mimetics. This class of medications are hormones that are released from the gastrointestinal tract as food enters the digestive system. They are known as glucose-dependent insulinotropic peptide (GIP) and glucagon-like peptide-1 (GLP-1). Their first function is to increase the amount of insulin that will be excreted. The amount secreted is dependent on the amount of glucose ingested. Due to this, they must be dosed within 60 minutes of the meal and should not be dosed after the meal is finished. In addition, other functions of incretin mimetics are to slow gastric emptying and increase satiety. In addition, GLP-1 has the function of preventing the release of glucagon. These medications can be used alone or in combination with other diabetes drugs to improve glycosylated hemoglobin levels.

**Oral Medications**

For Type 2 diabetes, there are also several kinds of oral glucose-lowering medications. These medications help to lower blood levels by several different mechanisms including

- increasing insulin production by the pancreas,
- decreasing glucose production by the liver,
- improving insulin sensitivity,
- delaying carbohydrate absorption, and
- slow breakdown of incretin hormones. This will increase the response of insulin to glucose levels and decreasing glucagon concentration.

Refer to Table 3C-1 for comparison of the classes of oral agents currently available.

**Exercise**

Physical activity is another factor that affects glucose levels. Exercise may improve insulin sensitivity independent of weight loss. It is important to find out what activities the person enjoys and to identify easy ways for becoming more active. At least 30 minutes of exercise 5 to 7 times a week is recommended.
Hypoglycemia
Hypoglycemia is an abnormally low blood glucose level. It is also referred to as low blood sugar, insulin reaction or insulin shock. In hypoglycemia, blood glucose is less than 70 mg/dl. There are many things that can cause hypoglycemia. The most common culprits include too much insulin, extra physical activity or exercise, not enough food (particularly carbohydrate sources), and delayed meals or snacks. Hypoglycemia may occur at any time, but is most likely before meals, during the peak action time of insulin, and during or after exercise. Hypoglycemia should be treated as follows:

- Blood sugar should be checked to affirm symptoms are from hypoglycemia
- 15 grams of carbohydrate should be given. (i.e., ½ cup of fruit juice or 3 glucose tablets)
- Recheck blood sugar in 15 minutes. If still less than 70 mg/dl, repeat treatment with an additional 15 grams of carbohydrate.
- Once blood sugar had returned above 70 mg/dl and symptoms have resolved, the individual needs to follow this treatment with a meal or snack containing carbohydrate, protein and fat. (i.e., ½ sandwich or peanut butter and crackers). This will prevent a rapid drop in blood sugar again.
- Frequent occurrences of hypoglycemia may indicate adjustments need to be made in medications or treatment plans.

Diabetes and Medical Nutrition Therapy
The objective of Medical Nutrition Therapy (MNT) for all ages include (Diabetes Care, January 2008, p. S61-S78):

- optimizing blood glucose levels, lipids and blood pressure,
- preventing and treating chronic complications such as obesity, heart disease, retinopathy, hypertension, and nephropathy,
- improving health by promoting healthy food choices and regular physical activity, and
- accounting for individual's differences by considering age, culture, lifestyle, and the individual's wishes and willingness to change.

In addition, for children and youth with Type 1 diabetes
- Provide food intake adequate for normal growth and development.
- Integrate insulin regimens into usual eating and physical activity habits.

In addition, for children and youth with Type 2 diabetes
- Provide healthy food choices and opportunities for regular physical activity.

In addition, for pregnant and lactating women
- Provide adequate energy and nutrients needed for optimal outcomes.

In addition, for older adults
- Help meet the nutritional and psychosocial needs of the aging.
**Nutrition Care**

**Nutrition Assessment**
Assess weight, height, body mass index, and recent weight changes. Evaluate the person's usual food intake, meal and snack times, portion sizes, and food preparation methods. Obtain information on the daily schedule including
- day care, school and work,
- physical activity,
- family and cultural and habits,
- educational level,
- psychosocial and economic issues,
- diabetes knowledge, and
- insulin or other medication regimen

**Nutrition Intervention**
Develop an individualized meal plan based on the person's food preferences, daily schedule and medical needs. Recommend consistency in the amount of carbohydrate eaten at meals and snacks and the timing of meals and snacks for people on conventional insulin therapy and for those who do not calculate carbohydrate intake and corrective doses of insulin. Provide a meal plan that is approximately
- 50-60% carbohydrate
- 10-20% protein
- 30% fat
Limit saturated fat to less than 10% of total calories and dietary cholesterol to less than 300 mg per day to help reduce the risk of heart disease. Guidelines for dietary fiber and sodium are the same as for the general population.
It is not necessary to restrict sugar and sugar-containing foods to control blood glucose. Teach people with diabetes to estimate the amount of carbohydrate eaten and include it in their meal plan goals. This will allow them to eat many common foods, such as sweetened cereal, cookies, brownies, and ice cream, in the context of healthy eating.
For children and youth with Type 1 diabetes, provide adequate food intake to promote normal growth and development and a healthy body mass index.
For the newly diagnosed person, focus on improving blood glucose by educating them about carbohydrate counting and the effects of food and physical activity on blood glucose. A meal plan with regular meals and snacks, along with carbohydrate goals that are moderately less than their usual intake, will help to control blood glucose and may allow weight to stabilize or begin to drop.
The elderly person with diabetes is more likely to be normal or underweight rather than overweight. Nutrition goals should focus on

Educate the person to recognize symptoms of hypoglycemia and to treat and prevent it. For example, for physical activity beyond the usual routine:

- Eat or drink 15 grams of carbohydrate before exercising, for every hour of the activity
- For strenuous exercise lasting more than one hour, include protein with the carbohydrate
- Adjust these guidelines depending on the insulin regimen.

If the blood glucose level is 70-100 mg/dl before the evening snack:
- Eat or drink an additional 15 grams of carbohydrate before the evening snack.

If the blood glucose level is less than 70 mg/dl before the evening snack:
- Treat the low blood sugar first with 15 grams of carbohydrate or glucose, then wait 15 minutes and retest
- If the blood glucose is still less than 70 mg/dl, eat or drink another 15 grams of carbohydrate
- If the blood glucose is more than 70 mg/dl, have the regular evening snack with an additional 15 grams of carbohydrate.

Provide information about how to safely consume alcoholic beverages, if appropriate. Although some alcoholic beverages contain carbohydrate, the alcohol itself is not converted to glucose and may cause a low blood sugar and contribute to impaired judgment. The following are the guidelines to prevent low blood glucose levels with alcohol use:

- Do not skip meals or snacks when drinking alcohol.
- Consume additional carbohydrate if drinking more than the equivalent of two alcoholic beverages.
- Inform someone with you that you have diabetes.
- Do not drive after drinking.
- Do not take extra insulin when drinking.

Negotiate and establish goals with the person for ongoing nutrition and diabetes education.

**Nutrition Monitoring**

Monitor diabetes control in relation to medication or lifestyle changes. Review SMBG and food intake records. Evaluate adherence to the nutrition care plan. Note changes in body mass index. Improved blood glucose control may result in unwanted weight gain unless the meal plan or activity routine is adjusted. With Type 1 diabetes, tight glucose control may lead to more frequent hypoglycemia that requires additional carbohydrates and calories. Examine the pattern of weight gain or loss, and listen carefully to the individual's concerns about weight and body image. Chronic high blood sugars with reported large insulin doses and unexplained weight loss may
indicate intentional under-dosing or insulin omission in an attempt to lose weight. Young women, especially, may be tempted by this strategy.

While the incidence of eating disorders is no greater in those with diabetes than those without diabetes, take advantage of counseling sessions to regularly discuss healthy eating, regular physical activity, and acceptance of the diversity of body shapes and sizes.

For people with diabetes who are overweight, once their glucose is controlled, discuss healthy weight management strategies.

Abnormal lipid profile results may improve as blood glucose levels normalize. If cholesterol and triglyceride levels do not improve, try to promote weight loss, implement cholesterol and triglyceride lowering nutrition therapy, or treat with a lipid-lowering medication.
### Table 3C-1: Oral Agents and Insulin Types used to treat Diabetes

<table>
<thead>
<tr>
<th>Drug Class</th>
<th>Modes of Action</th>
<th>Brand &amp; Generic Names</th>
<th>Manufacturer</th>
<th>Dosage Range</th>
<th>Special Considerations</th>
<th>Side Effects</th>
<th>Indications</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>First Generation Sulfonylureas (SFUs)</strong></td>
<td>-insulin secretagogue</td>
<td>Diabinase (chlorpropamide)</td>
<td>Pfizer</td>
<td>100-500 mg daily</td>
<td>-Rarely used anymore</td>
<td>-Hypoglycemia</td>
<td>Type 2 diabetes</td>
</tr>
<tr>
<td></td>
<td>-hypoglycemic agent</td>
<td>Tolnase (Tolazamide)</td>
<td>UpJohn Pharma</td>
<td>100-1000 mg in divided doses</td>
<td>-Very long acting (up to 72 hours)</td>
<td>-Weight gain</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-works in fasting and postprandial periods</td>
<td>Orinase (Tolbutamide)</td>
<td>Pharma</td>
<td>500-3000 mg in divided doses</td>
<td>-Use with caution in elderly and those with kidney disease</td>
<td>-Rash</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-May cause Antabuse reaction if used with alcohol</td>
<td>-Nausea and Vomiting</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-May cause low sodium levels</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Second Generation Sulfonylureas (SFUs)</strong></td>
<td>-insulin secretagogue</td>
<td>Amaryl (glimepiride)</td>
<td>Aventis</td>
<td>1-8 mg Daily</td>
<td>Give with first meal of the day.</td>
<td>-Fewer side effects than first generations.</td>
<td>Type 2 diabetes</td>
</tr>
<tr>
<td></td>
<td>-hypoglycemic agent</td>
<td>DiaBeta (glyburide)</td>
<td>Aventis</td>
<td>1.25-20 mg</td>
<td>Give daily or divided doses</td>
<td>-Less interactions with other medications</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-works in fasting and postprandial periods</td>
<td>Micronase (glyburide)</td>
<td>Pharma &amp; Upjohn</td>
<td>1.25-20 mg</td>
<td>Give daily or divided doses</td>
<td>-Hypoglycemia</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Glynase (glyburide)</td>
<td>Aventis</td>
<td>0.75-12 mg</td>
<td>Give daily with first meal or in divided doses</td>
<td>-Weight gain</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-Rash</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Glucotrol (glipizide)</td>
<td>Pfizer</td>
<td>2.5-40 mg</td>
<td>Give 30 minutes before meals</td>
<td>-Nausea and Vomiting</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Glucotrol XL (glipizide, extended-release tablets)</td>
<td>Pfizer</td>
<td>5-20 mg</td>
<td>Give with breakfast</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Meglitinides</strong></td>
<td>-insulin secretagogue</td>
<td>Prandin (repaglinide)</td>
<td>Novo Nordisk</td>
<td>0.5-16 mg</td>
<td>-Given in divided dose from 0.5-4 mg at each meal</td>
<td>-Hypoglycemia (mild)</td>
<td>Type 2 diabetes</td>
</tr>
<tr>
<td></td>
<td>-hypoglycemic agent</td>
<td></td>
<td></td>
<td></td>
<td>-Give within 30 minutes of each meal. If meal skipped, don’t take.</td>
<td>-URI</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-works in postprandial period</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-Headache</td>
<td></td>
</tr>
<tr>
<td>Drug Class</td>
<td>Modes of Action</td>
<td>Brand &amp; Generic Names</td>
<td>Manufacturer</td>
<td>Dosage Range</td>
<td>Special Considerations</td>
<td>Side Effects</td>
<td>Indications</td>
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<td>-------------</td>
<td>---------------------------------------------------------------------------------</td>
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<td>--------------</td>
<td>------------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------</td>
<td></td>
</tr>
</tbody>
</table>
| D-Phenylalanines | -insulin secretagogue  
- hypoglycemic agent  
- works in post prandial period | Starlix (nateglinide) | Novartis     | 180-360 mg in divided doses (60-120 mg with each meal)                       | - works faster than SFUs with shorter duration of action  
- do not use with SFUs  
- can use with metformin  
- give within 30 minutes of each meal. Skip dose if meal is skipped  
- use with caution in patients with liver disease | - may cause hypoglycemia  
- less weight gain than SFUs                                                                                      |
| Biguanides  | - decrease hepatic glucose output  
- increases peripheral glucose uptake and utilization  
- decreases intestinal absorption of glucose | Glucophage (metformin)  
Riomet (liquid)  
Glucophage XR (metformin extended release)  
Fortamet  
Glumetza | Bristol-Myers Squibb (Teva Pharmaceuticals for generic form)  
Ranbaxy  
Bristol-Myers Squibb  
First Horizon Pharmaceutical  
Biovail Pharmaceuticals | 1000-2550 mg in divided doses (1000-2000 mg in divided doses for pediatric patients age 10-16)  
500-2000 mg with evening meal  
1000-2550 mg with evening meal  
1000-2000 mg with evening meal | - give with food  
- less weight gain  
- do not use in patients with liver or kidney disease or alcohol abuse  
- use cautiously in the elderly  
- avoid in patients medically treated for heart failure  
- do not take for 48 hours following a procedure that uses contrast dye. Assess renal function before restarting | - diarrhea  
- nausea  
- flatulence  
- lactic acidosis  
- reduced B12 levels  
- extremely rare hypoglycemia with monotherapy |
### Alphaglucosidase Inhibitors

- Slows intestinal absorption of some carbohydrates by inhibiting digestive enzymes
- Works postprandially

**Brand & Generic Names**
- Precose (Acarbose)
- Gyset (Miglitol)

**Manufacturer**
- Bayer
- Parmacia & Upjohn

**Dosage Range**
- ≤ 60 kg body weight, 50 mg three times a day with meals
- >60 kg body weight, 100 mg three times a day with meals
- 75-300 mg in divided doses (25 mg – 100 mg per meal. Titrate up)

**Special Considerations**
- Gradually increase dose to minimize side effects.
- Give with the first bite of each meal.
- Must treat hypoglycemia with glucose tablets or gel.
- No hypoglycemia with monotherapy

**Side Effects**
- Flatulence
- Diarrhea
- Abdominal pain

**Indications**
- Type 2 diabetes

### Thiazoladinediones (glitazones or TZDs)

- Insulin sensitizer
- Improves muscle cell response to insulin, thus using glucose more efficiently
- Inhibits hepatic glucose production
- Works during fasting periods

**Brand & Generic Names**
- Avandia (Rosiglitazone)
- Actos (Pioglitazone)

**Manufacturer**
- GlaxoSmithKline
- Eli Lilly/Takeda

**Dosage Range**
- 4-8 mg in single or divided doses
- 15-45 mg daily

**Special Considerations**
- Liver toxicity, liver function tests must be done routinely
- Use with caution in CHF. Not recommended for use in class III or IV heart failure
- Requires 4-6 weeks to see full effect
- Anovulatory pre-menopausal females may ovulate
- Use with insulin Avandia: at max dose of 4 mg daily, Actos 30 mg

**Side Effects**
- Fluid retention (may contribute to heart failure)
- Decrease in hemoglobin & hematocrit
- Loss of effect of some oral contraceptives with Actos
- No hypoglycemia with monotherapy

**Indications**
- Type 2 diabetes

### Dipeptidyl Peptidase-4 Inhibitor (DPP-4 Inhibitor)

- Slows inactivation/breakdown of incretin hormones, ↑ insulin response to glucose levels & ↓ glucagon concentration.

**Brand & Generic Names**
- Januvia (Sitagliptin)

**Manufacturer**
- Merck

**Dosage Range**
- 100 mg daily
- 50 mg daily in moderate renal insufficiency; 25 mg daily in severe renal insufficiency

**Special Considerations**
- Give daily with or without food
- Recommended renal function assessment prior to initiation

**Side Effects**
- Upper respiratory infection
- Nasopharyngitis
- Headache

**Indications**
- Type 2 diabetes
### Section 3C: Diabetes Mellitus

<table>
<thead>
<tr>
<th>Drug Class</th>
<th>Modes of Action</th>
<th>Brand &amp; Generic Names</th>
<th>Manufacturer</th>
<th>Dosage Range</th>
<th>Special Considerations</th>
<th>Side Effects</th>
<th>Indications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Combinations</td>
<td>Varies depending on combination. See individual drug actions of both medications in the combination.</td>
<td>Glucovance (Glyburide and Metformin)</td>
<td>Bristol-Meyers Squibb</td>
<td>1.25 mg/250 mg – 20 mg/2000 mg</td>
<td>-same as for glyburide and metformin</td>
<td>same as for glyburide and metformin</td>
<td>Type 2 diabetes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Metaglip (Glipizide and Metformin)</td>
<td>Bristol-Meyers Squibb</td>
<td>2.5 mg/250 mg daily. Do not exceed 20 mg/2000 mg daily.</td>
<td>-same as for glipizide and metformin</td>
<td>-same as for glipizide and metformin</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Avandamet (Rosiglitazone and Metformin)</td>
<td>GlaxoSmithKline</td>
<td>Gradually titrate dose up. Do not exceed 8 mg/2000 mg daily</td>
<td>-same as for rosiglitazone and metformin</td>
<td>-same as for rosiglitazone and metformin</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Actoplus Met (Pioglitazone and Metformin)</td>
<td>Takeda Pharmaceuticals</td>
<td>15 mg/500 mg – 45 mg/2550 Gradually titrate. Do not exceed 45mg/2550 mg.</td>
<td>-same as for pioglitazone and metformin</td>
<td>-same as for pioglitazone and metformin</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Avandaryl (Rosiglitazone and glimepiride)</td>
<td>GlaxoSmithKline</td>
<td>4 mg/1 mg with first meal of the day and carefully titrated, do not exceed 8 mg/4 mg daily.</td>
<td>-same as rosiglitazone and glimepiride</td>
<td>-same as rosiglitazone and glimepiride</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Duetact (Pioglitazone and Glimepiride)</td>
<td>Takeda Pharmaceuticals</td>
<td>30 mg/2 mg daily Do not exceed 30 mg/4 mg daily</td>
<td>-same as pioglitazone and glimepiride</td>
<td>-same as pioglitazone and glimepiride</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Janumet (Sitagliptin and Metformin)</td>
<td>Merck</td>
<td>100 mg/1000 mg twice daily with meals Do not exceed 100 mg/2000 mg daily</td>
<td>-same as sitagliptin and metformin</td>
<td>-same as sitagliptin and metformin</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Prandimet (Repaglinide and Metformin)</td>
<td>Novo Nordisk and Sciele</td>
<td>1 mg/500 mg or 2mg/500 mg. Max daily dose of 10 mg/2500 mg. Give over 2-3 meals. Max per meal is 4 mg/1000 mg.</td>
<td>-same as repaglinde and metformin</td>
<td>-same as repaglinde and metformin</td>
<td></td>
</tr>
</tbody>
</table>
## Section 3C: Diabetes Mellitus

<table>
<thead>
<tr>
<th>Drug Class</th>
<th>Mode of Action</th>
<th>Brand Name</th>
<th>Generic</th>
<th>Dose</th>
<th>Adverse Effects</th>
<th>Implications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incretin mimetic</td>
<td>Increases glucose sensitive insulin secretion, slows gastric emptying</td>
<td>Byetta</td>
<td>Exenatide</td>
<td>Start at 5 mcg twice a day within 1 hour of start of meal. Increase to 10 mcg twice a day within 1 hour of start of meal.</td>
<td>Nausea may occur with initiation. Usually will lessen with time. Observe for signs and symptoms of acute pancreatitis including severe abdominal pain with possible vomiting.</td>
<td>Used in people who still have functioning beta cells. Give within 1 hour of 2 largest meals of the day. Store unused pens in refrigerator. Once used store less than 77 degrees Fahrenheit. Discard after 30 days.</td>
</tr>
<tr>
<td>Amylin</td>
<td>Secreted by the pancreatic beta cells and works with insulin to affect post-meal glucose levels. Suppresses post-meal release of glucagon Slows gastric emptying and can decrease appetite.</td>
<td>Symlin</td>
<td>Pramlintide</td>
<td>In on insulin prior to Symlin the decrease premeal insulin by 50%. Basal dose may also need to be decreased to avoid severe hypoglycemia. For Type 1 diabetes start with 15 mcg prior to meals, increase to 30, 45 or 60 mcg if no persistent nausea. Decrease to 30 mcg as maintenance, if persistent nausea. For Type 2 diabetes start with 60 mcg prior to each meal and increase to 120 mcg if no nausea</td>
<td>Hypoglycemia if prior insulin doses are not decreased when initiated. Nausea, vomiting, and anorexia may occur with initiation. This will usually subside over time.</td>
<td>Used with people taking insulin. Pre-meal and/or total daily dose may be less. Doses are ordered in micrograms. Administered with insulin syringe or pen. Give immediately prior to meals or snack more of more than 30 grams of carbohydrate. Do not take if meal is skipped. Store at less than 77 degrees F.</td>
</tr>
</tbody>
</table>
### Insulin T

<table>
<thead>
<tr>
<th>Insulin Type</th>
<th>Onset</th>
<th>Peak</th>
<th>Effective Duration</th>
<th>Maximum Duration</th>
<th>Implications</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Rapid-Acting</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Humalog (Lispro)</td>
<td>Within 15 minutes</td>
<td>½ - 1 ½ hours</td>
<td>3-4 hours</td>
<td>4-6 hours</td>
<td>Should be dosed within 15 minutes of eating.</td>
</tr>
<tr>
<td>NovoLog (Aspart)</td>
<td>Within 15 minutes</td>
<td>½ - 1 ½ hours</td>
<td>3-4 hours</td>
<td>4-6 hours</td>
<td></td>
</tr>
<tr>
<td>Apidra (Glulisine)</td>
<td>Within 15 minutes</td>
<td>½ - 1 ½ hours</td>
<td>2.5 - 3 hours</td>
<td>3-4 hours</td>
<td></td>
</tr>
<tr>
<td><strong>Short-Acting</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Humulin R (Regular)</td>
<td>½ - 1 hour</td>
<td>2 - 3 hours</td>
<td>3-6 hours</td>
<td>6-8 hours</td>
<td>Should be dosed within 30 minutes of eating.</td>
</tr>
<tr>
<td>Novolin R (regular)</td>
<td>½ - 1 hour</td>
<td>2 - 3 hours</td>
<td>3-6 hours</td>
<td>6-8 hours</td>
<td></td>
</tr>
<tr>
<td><strong>Intermediate Acting</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Humulin N (NPH)</td>
<td>2-4 hours</td>
<td>6-10 hours</td>
<td>10-16 hours</td>
<td>14-18 hours</td>
<td>Higher risk of hypoglycemia at peak times if meals are skipped.</td>
</tr>
<tr>
<td>Novolin N (NPH)</td>
<td>2-4 hours</td>
<td>6-10 hours</td>
<td>10-16 hours</td>
<td>14-18 hours</td>
<td></td>
</tr>
<tr>
<td><strong>Long-Acting</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lantus (glargine)</td>
<td>2-4 hours</td>
<td>No distinct peak of action. The action of these insulin is relatively flat throughout their duration.</td>
<td>24 hours</td>
<td>24 hours</td>
<td>Should not be mixed with any other insulin in the same syringe.</td>
</tr>
<tr>
<td>LeveMir (detemir)</td>
<td>45 minutes - 2 hours</td>
<td></td>
<td>3-14 hours</td>
<td>Up to 24 hours</td>
<td></td>
</tr>
<tr>
<td><strong>Fixed Combinations</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Humulin 70/30 (70% N &amp; 30% R)</td>
<td>½ - 1 hour</td>
<td>Same as N and R</td>
<td>10-16 hours</td>
<td>14-18 hours</td>
<td>Humalog and Novolog mixes should be given within 15 minutes of eating.</td>
</tr>
<tr>
<td>Humulin 50/50 (50% N &amp; 50% R)</td>
<td>½ - 1 hour</td>
<td>Same as N and R</td>
<td>10-16 hours</td>
<td>14-18 hours</td>
<td></td>
</tr>
<tr>
<td>Novolin 70/30 (70% N &amp; 30% R)</td>
<td>½ - 1 hour</td>
<td>Same as N and R</td>
<td>10-16 hours</td>
<td>14-18 hours</td>
<td></td>
</tr>
<tr>
<td>Humalog Mix 75/25 (75%)</td>
<td>Within 15 minutes</td>
<td>1-6 ½ hours (2 ½ hours on average)</td>
<td>Same as N and Lispro</td>
<td>Same as N and Lispro</td>
<td></td>
</tr>
<tr>
<td>Humalog Mix 75/25 (75%)</td>
<td>Within 15 minutes</td>
<td>1-6 ½ hours (2 ½ hours on average)</td>
<td>Same as N and Lispro</td>
<td>Same as N and Lispro</td>
<td></td>
</tr>
<tr>
<td>Humalog Mix 75/25 (75%)</td>
<td>Within 15 minutes</td>
<td>1-4 hours</td>
<td>Same as N and Lispro</td>
<td>Same as N and Lispro</td>
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<tr>
<td>Lispro protamine &amp; 25% Lispro</td>
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</tr>
<tr>
<td>Humalog Mix 50/50 (50% Lispro protamine &amp; 50% Lispro)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Novolog 70/30 (70% Aspart Protamine &amp; 30% Aspart)</td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>
Cross References

- Section 3C: Gestation Diabetes
- Section 3F: Cardiovascular Disease
- Section 3J: Obesity
- Section 4A: Calorie Controlled Diet
- Section 4B: Carbohydrate Controlled Diet
- Section 4D: Cholesterol Controlled Diet
- Section 4D: Triglyceride Controlled Diet

References:


More Information:

American Association of Diabetes Educators
100 West Monroe Street, Suite 400
Chicago, IL  60603-1901
Section 3C: Diabetes Mellitus

(312) 424-2426
www.diabeteseducator.org

American Diabetes Association
1701 North Beauregard Street
Alexandria, VA 22311
(800) DIABETES or (800) 342-2383
www.diabetes.org

American Dietetic Association
Evidence Analysis Library: Diseases and Conditions:
Adult diabetes 1 and 2 evidence analysis project.
www.eatright.org

Centers for Disease Control and Prevention
www.cdc.gov

International Diabetes Center
www.icdpublishing.com

National Diabetes Information Clearinghouse
www.diabetes.niddk.nih.gov

The following manufacturer's websites provide information for these new medications:
www.symlin.com
www.byetta.com
www.amylin.com
Gestational Diabetes

Background

Gestational diabetes mellitus (GDM) is defined as any degree of glucose intolerance with onset or first recognition during pregnancy. The definition applies whether insulin or only diet modification is used for treatment, and whether or not the condition persists after pregnancy. Approximately 7% of all pregnancies are complicated by GDM, resulting in more than 200,000 cases annually (American Diabetes Association, 2010, p. S15).

GDM results in increased health risk to both the woman and her child, both in the perinatal period and in the long term (American Diabetes Association, 2010, p. S15). Fasting blood glucose greater than 105 mg/dl may be linked to increased fetal death in the last 1-2 months of pregnancy. In less severe cases, the baby is also more likely to have macrosomia, neonatal hypoglycemia, jaundice, hypocalcemia, and polycythemia. For the mother, GDM increases the risk of hypertensive disorders, infections and a need for cesarean section in the event of macrosomia.

Women with GDM are more likely to develop diabetes later in life, particularly Type 2. Children of women with GDM are more likely to develop obesity, glucose intolerance, and diabetes as children or young adults.

Risk assessment for GDM should be done on the first prenatal visit. Clinical risk factors include (American Diabetes Association, 2010, p. S16)

- obesity,
- personal history of GDM,
- presences of glucose in the urine,
- diagnosis of polycystic ovarian syndrome, and
- family history of diabetes

Women with these characteristics should have their glucose tested as early as possible, then (if normal) again at 24-28 weeks of gestation along with the testing of women with average risk of GDM. Only women meeting all of the following characteristics may be excluded from testing

- age less than 25 years,
- weight normal before pregnancy,
- member of an ethnic group with low prevalence of diabetes,
- no known diabetes in first-degree relative,
- no history of abnormal glucose tolerance, and
- no history of poor obstetric outcome

Diagnosis of GDM is made with several types of glucose testing (American Diabetes Association, 2010, p. S13, S16).

High risk women may be diagnosed with GDM by the same methods the general diagnosis of diabetes is made:

- If they have two results of either fasting blood glucose \( \geq 126 \text{ mg/dl} \)
- If they have a glucose tolerance test (GTT) performed and their blood glucose is \( \geq 200 \text{ mg/dl} \), 2 hours after a 75 gram glucose load.
- If classic symptoms are present and random blood glucose is \( \geq 200 \text{ mg/dl} \)
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A1C ≥ 6.5%

For other women, diagnosis of GDM is made by either a one step or two step approach done between weeks 24-28 of gestation.

Two step approach:
Step One: Perform a 1 hour GTT after 50 gram glucose load. If blood glucose is ≥ 140 mg/dl, then proceed to step two.
Step Two: Perform a 3 hour GTT after 100 gram glucose load. To make the diagnosis of GDM at least two of the following criteria must be found:
   o Fasting ≥ 95 mg/dl
   o 1 – hour ≥ 180 mg/dl
   o 2 – hour ≥ 155 mg/dl
   o 3 – hour ≥ 140 mg/dl

One step approach:
This approach skips the one hour GTT screening and simply performs the 3 hour test. This approach may be used in clinics with high prevalence of GDM.

Objectives

The medical nutrition therapy objectives for GDM (American Diabetes Association, 2004b, p. S42) are to
achieve and maintain normal blood glucose
ensure adequate nutrition for maternal and fetal health, growth, and development, and
prevent ketone production that results from too little carbohydrate

Nutrition Care

Nutrition Assessment
The American Dietetic Association's (2001) nutrition practice guidelines for GDM recommend assessing
current weight, pre-pregnancy weight, and the weight gain goal for pregnancy,
results of glucose tolerance tests, hemoglobin and hematocrit,
appetite, discomforts, intolerances, cravings, aversions, presence of pica, and
the woman's infant feeding plan.

Nutrition Intervention
The primary nutrition intervention for GDM is a carbohydrate controlled meal plan. Develop the meal plan in collaboration with each woman in order to individualize care. Refer to Table 3C-2 for a summary of nutrition recommendations for GDM.
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Typically, the meal plan (American Diabetes Association, 2004b, p. S42-S43) includes
- Three small-to-moderate sized meals
- 2-4 snacks
- Limited carbohydrate at breakfast when it is least tolerated, and
- Careful distribution of carbohydrate intake

Specific recommendations are based on individual assessment of self-blood glucose monitoring and results.

Determine calorie needs (American Diabetes Association, 2001) using the Harris-Benedict equation with either actual prepregnancy weight or adjusted body weight for obese women plus 150 to 300 additional calories per day to meet the energy needs of pregnancy during the 2nd and 3rd trimesters. Adjusted body weight = [(actual body weight-desired body weight) x 0.25] + desired body weight.

An alternative way to determine calorie needs supported by some studies is to use 30-34 kcal/kg for normal weight women and 23-25 kcal/kg current weight for obese women (American Diabetes Association, 2001).

Typically, carbohydrate comprises 40-45 percent of the total calories; however, the ideal amount of carbohydrate is unknown. Distribute carbohydrate among 6 to 8 meals and snacks throughout the day, with smaller amounts (15 to 45 grams) of carbohydrate at breakfast and snacks (American Diabetes Association, 2001).

An evening snack is usually required to prevent starvation ketosis overnight. The snack should include a source of carbohydrate and may also include a source of protein (American Diabetes Association, 2001).

Use self-monitoring of blood glucose (SMBG) data to evaluate the glycemic response to particular foods at different times of the day to determine the appropriate foods and timing of foods for each woman. Limit foods high in sucrose, such as soft drinks, lemonade, other sweetened beverages, candies, and desserts, due to the low nutrient density of these foods (American Diabetes Association, 2001).

Advise moderation in use of nonnutritive sweeteners. Aspartame, acesulfame-K, and sucralose are all considered safe during pregnancy. Since saccharin crosses the placenta and may remain in fetal tissue due to slow fetal clearance, the American Dietetic Association suggests careful use of saccharin in pregnancy (American Diabetes Association, 2001).

Protein rich foods in meals and snacks do not significantly affect blood glucose, so they can replace carbohydrate rich foods as a source of calories (American Diabetes Association, 2001).
Moderate exercise has been shown to lower maternal blood glucose (American Diabetes Association, 2004a, p. S90). Women without medical contraindications should be encouraged to continue or start a program of moderate exercise.

### Table 3C-2: Summary of nutrition recommendations for GDM

<table>
<thead>
<tr>
<th>Calories</th>
<th>-Sufficient to promote adequate weight gain and avoid ketonuria.</th>
</tr>
</thead>
</table>
| Carbohydrate distribution | -Based on effect of intake on blood glucose levels. Distributed throughout the day.  
                              -Frequent feedings, smaller portions, in order to avoid ketonuria. |
| Sucrose and other caloric sweeteners | -May be included based on ability to maintain blood glucose goals, nutritional adequacy of food intake, and contribution to total meal plan. |
| Protein   | -The protein needs of pregnancy are an additional 10 grams above the RDA, which is 0.8 gm/kg of desirable body weight for adult women. |
| Fat       | -Often increased due to increased protein intake; limit saturated fat. |
| Sodium    | -Not routinely restricted. |
| Fiber     | -May be increased for relief of constipation. |
| Nonnutritive sweeteners | -Generally safe in pregnancy.  
                           -Moderation is advised. |
| Vitamins and Minerals | -Assess for specific individual needs.  
                         -Iron at 12 weeks.  
                         -Folic acid supplementation ideally should start before pregnancy. |
| Alcohol   | -Avoid |
| Caffeine  | -Limit to less than 300 mg/day. |


**Nutrition Monitoring**

- Review SMBG and food intake records.
- Track weight changes and compare to the weight gain goal.
- Monitor results of urine ketone and urine protein testing, and blood pressure.
- Evaluate how well the woman is adhering to the care plan. Listen to her concerns and answer her questions.
- If nutrition therapy is not enough to control glucose levels, medication may also be prescribed. Insulin, as opposed to oral medications, shows the most consistent results. Educate the woman about more careful carbohydrate intake to avoid episodes of hypoglycemia.

**Cross References**

Section 4B: Carbohydrate Controlled Diet
Section 3C: Diabetes Mellitus

References


More Information

American Association of Diabetes Educators  
100 West Monroe Street, Suite 400  
Chicago, IL 60603-1901  
(312) 424-2426  
[www.diabeteseducator.org](http://www.diabeteseducator.org)

American Diabetes Association  
1701 North Beauregard Street  
Alexandria, VA 22311  
(800) DIABETES or (800) 342-2383  
[www.diabetes.org](http://www.diabetes.org)

American Dietetic Association  
[www.eatright.org](http://www.eatright.org)

Diabetes Care and Education Dietetic Practice Group of the American Dietetic Association  
[www.dce.org](http://www.dce.org)
Constipation

Background

Constipation has several definitions including having hard stool, having bowel movements less often than every 24 to 72 hours, or straining to have a bowel movement. The number of bowel movements that is considered normal varies from person to person. Constipation often has multiple causes, and inadequate intake of fiber and fluid may contribute to the problem. Common causes include lack of exercise, poor bowel habits, and overuse of laxatives. In addition, constipation is a side effect of many medications. Constipation is frequently seen in conditions such as cerebral palsy, spinal cord injury, spina bifida, multiple sclerosis, diabetic neuropathy, Parkinson's disease, pregnancy, and stroke.

There are two types of constipation: spastic and atonic (Escott-Stump, 2002, p. 306). Spastic constipation results from lack of exercise, immobility, or bowel obstruction. Atonic constipation happens when the muscles of the bowel do not work properly. This can be caused by chronic laxative use and poor bowel habits.

Some conditions, such as intestinal adhesions or intestinal strictures, may require a low fiber, low residue diet to reduce the bulk of stool, rather than an increase in fiber.

Objectives

The objectives of medical nutrition therapy are to develop eating strategies to decrease the time for food to move through the digestive tract, to select foods that help form softer, larger stools, to modify dietary fiber intake, and to correct dehydration and maintain adequate fluid intake.

Nutrition Care

Nutrition Assessment

Evaluate the factors contributing to the constipation. These factors are medical diagnosis, hydration status, bowel habits, prescription and over-the-counter medications, fiber and fluid intake, and activity level. Identify the type of constipation, spastic or atonic.
Section 3D: Digestive Disorders

**Nutrition Intervention**
For appropriate conditions, provide a high fiber diet using the U.S. Food Guide's recommended number of servings of fruits, vegetables, and whole grains based calorie needs.
Provide 8 to 12 cups of fluid each day.
For spastic constipation,
- use a low fiber diet until the pain decreases, and
- gradually increase use of high fiber foods to 20 to 38 grams each day.
For atonic constipation,
- use a high fiber diet with 20 to 38 grams fiber each day, and
- ensure adequate consumption of fluid.
Fiber supplements may be needed for people who have poor food intake. High fiber foods are the best source of fiber since they provide other nutrients and often are less expensive than commercial fiber supplements. There are greater health risks with fiber supplements than high fiber foods if inadequate fluids are taken with them (Beyers, 2000, p. 669).
Other healthcare interventions include
- retraining bowel habits,
- giving enemas,
- providing prokinetic drugs, laxatives, or stool softeners, and
- increasing exercise.

**Nutrition Monitoring**
Track the amount of fiber and fluid consumed. It may be simpler to count the number of servings of high and low fiber foods eaten rather than grams of fiber.
Evaluate the person's response to the change in dietary fiber by noting symptoms of cramping, bloating, and passing gas.
Also, monitor bowel sounds, stool consistency, and frequency.

**Cross References**
Section 2A: The USDA Food Guide
Section 4E: High Fiber Diet
Section 4E: Low Fiber Diet

**References**

Section 3D: Digestive Disorders

More Information

National Digestive Diseases Information Clearinghouse
2 Information Way
Bethesda, MD 20892-3570
Phone: (800) 891-5389
http://digestive.niddk.nih.gov/

American Gastroenterological Association
Patients/Public Site, Patient Information Resources: Constipation
http://www.gastro.org/clinicalRes/brochures/constipation.html
Diarrhea

Background

Diarrhea is rapid passage of food through the digestive tract resulting in frequent, liquid stools. There is reduced digestion of food, reduced absorption of nutrients and fluid, and increased losses of fluid and electrolytes.

Acute (short term) diarrhea lasts for one day up to several weeks. The cause is usually an infection. Chronic (long term) diarrhea lasts longer than 4 weeks, and it is caused by disorders that are functional (such as irritable bowel syndrome) or inflammatory (such as Crohn's disease).

Diarrhea is classified into three types: osmotic, secretory, and functional. Some people have a combination of these types.

Glossary

**Osmotic diarrheas** are caused by the presence in the bowel of dissolved particles that draw water to them by osmosis. Fasting is an effective treatment. In lactose intolerance, for example, undigested lactose draws water into the colon resulting in watery stools. The diarrhea of "dumping syndrome" is also this type (Escott Stump, 2002, p. 293).

**Secretory diarrheas** are caused by active secretion of water and electrolytes by the lining of the intestines. This type results from bacterial infections, viral infections, bile acids, laxatives, and increased intestinal hormones. Fasting does not help with this type. It is often the most serious (Escott-Stump, 2002, p. 293).

**Functional diarrheas** result from the digestive tract not working correctly. When all other causes of diarrhea are ruled out, then diarrhea is termed "functional." It may not be present all the time, but must be present most of the time for at least three months of the year to fit this classification. Stools are watery or mushy (International Foundation for Functional Gastrointestinal Disorders, 2005).

Objectives

The goal of the medical team is to diagnose and treat the underlying cause of the diarrhea (Beyers, 2000, p. 671). The objectives of medical nutrition therapy are to correct dehydration and electrolyte depletion, and to correct any nutrition deficiencies.

Nutrition Care

**Nutrition Assessment**

Use weight, physical exam, and blood work to assess the degree of dehydration and electrolyte abnormalities.

Conduct a physical exam, such as subjective global assessment, to evaluate malnutrition.

Dietary intake history will help to identify nutrition deficits and eating habits that contribute to the problem.
Review the person's medication list to identify drugs that may contribute to the diarrhea. Note that liquid forms of medications may contain sugar alcohols that cause osmotic diarrhea.

Nutrition Intervention

In the initial rehydration stage, the physician will order intravenous fluid and electrolytes if dehydration is severe enough. Oral rehydration solutions may be given as well. For infants, the rehydration phase should last only 3-4 hours. Breast-fed infants should continue to breastfeed. Formula-fed infants should resume their regular formula. Lactose-free formulas, such as Isomil, Prosobee, or Nutramigen, are not necessary unless the infant is severely dehydrated or malnourished. Use of dilute formula prolongs symptoms and delays nutrition recovery (King, Glass, Bresee, & Duggan, 2003).

For older children and adults with acute diarrhea, after rehydration, provide a regular diet with these slight modifications (King et al., 2003):

- Limit serving sizes of lactose sources such as milk and foods made with milk.
- Avoid alcoholic beverages and excessive caffeine intake.
- Avoid beverages with high osmolality, such as fruit juices and regular carbonated beverages. Limit foods high in simple sugars, such as pre-sweetened cereal, sweetened gelatins, and candy.
- Avoid excessively restrictive diets, such as the BRAT (Bananas, Rice, Applesauce, and Toast) Diet because they do not provide adequate nutrition.
- Avoid foods and medications with sugar alcohols, such as mannitol, sorbitol and xylitol.
- Provide a controlled fiber diet that limits sources of fiber that promote laxation, such as wheat bran. Encourage a variety of starches and cereals, fruits and vegetables, and lean meats.

Give vitamin and mineral supplements to correct any deficiencies. Provide sources of prebiotics. Breastmilk has prebiotic properties. Pectin helps to decrease diarrhea. Bananas and apples are among the best food sources of pectin. Fructooligosaccharide (FOS) is often added to commercial tube feeding formulas (Bengmark & Martindale, 2005, pp. 252-253).

Provide sources of probiotics, such as cultured yogurt with live active cultures (Jenkins, Holsten, Bengmark & Martindale, 2005, pp. 262-263; King et al).

Nutrition Monitoring

Review stool frequency and consistency and the resolution of fluid and electrolyte abnormalities.
Monitor tolerance to and effectiveness of over-the-counter and prescription drugs.
Evaluate the adequacy of nutrition intake whether it is oral, by feeding tube, or a parenteral route.

**Glossary**

**Osmolality** is the measure of the oncotic pressure exerted by the concentration of particles in a solution. The higher the osmolality, the more likely the solution will draw fluid into the bowel from the body and contribute to diarrhea and dehydration.

**Prebiotics** are types of dietary fiber and other substrates that microbes in the gut digest to provide food for the cells of the colonic mucosa.

**Probiotics** are types of non-pathogenic microbes as food or dietary supplements that provide a variety of health benefits. Examples are *Lactobacilli* or *Bifidobacterium* supplements. Dietary supplements are not regulated by the federal government so may be highly variable.

**Cross References**

- Section 3D: Inflammatory Bowel Disease
- Section 3E: Lactose Intolerance
- Section 4C: Clear Liquid Diet
- Section 4C: General Liquid Diet
- Section 4D: Low Fat Diet
- Section 4E: Low Fiber Diet
- Section 4F: Low Lactose Diet

**References**


Section 3D: Digestive Disorders


More Information

American College of Gastroenterology (ACG)
http://www.acg.gi.org

American Gastroenterological Association (AGA)
http://www.gastro.org

Ceralyte (an oral rehydration solution)
http://www.ceralyte.com

Rehydration Project
http://www.rehydrate.org
Diverticular Disease

Background

Diverticular disease is common in developed and industrialized countries where low-fiber diets are common. The disease is rare in countries where people eat high-fiber diets (National Institute of Diabetes and Digestive and Kidney Diseases [NIDDK], 2005). Diverticulosis afflicts about 50 percent of Americans by age 60 and nearly all by age 80. Only a small percentage of those with diverticulosis have symptoms and even fewer will ever require surgery (American Society of Colon & Rectal Surgeons [ASCRS], 2005).

Glossary

- **Diverticula** are small pouches or herniations of the mucosal layer of the colon that bulge outward through weak spots. **Diverticulum** refers to a single pouch.
- **Diverticulitis** is a complication of diverticulosis, which occurs when the diverticula become infected and inflamed.
- **Diverticulosis** is a condition in which multiple diverticula are present.

Most people with diverticulosis do not have any discomfort or symptoms. Common symptoms include mild cramping, bloating, and constipation (NIDDK, 2005). Diverticular disease is difficult to distinguish from irritable bowel syndrome and other digestive disorders. Diagnosis is often made by exclusion (ASCRS, 2005).

Diverticulitis occurs when the diverticula become infected or inflamed by stool or bacteria caught in the diverticula. This happens in 10 to 25 percent of people with diverticulosis (NIDDK, 2005). An attack of diverticulitis can develop suddenly and without warning. The most common symptom is abdominal pain with tenderness around the left side of the lower abdomen. If infection is the cause, fever, nausea, vomiting, chills, cramping, and constipation may occur. The severity of symptoms depends on the extent of the infection and complications (NIDDK, 2005). More intense symptoms are associated with serious complications, such as perforation, abscess, or fistula formation (ASCRS, 2005).

Diverticulosis can usually be diagnosed by barium enema or by colonoscopy (American Dietetic Association [ADA], 2010). Diverticulosis is usually treated by a high fiber diet to prevent onset of diverticulitis. Diverticulitis, on the other hand, requires more intense management. Treatment focuses on clearing up the infection and inflammation, resting the colon, and preventing or minimizing complications. An attack of uncomplicated diverticulitis may respond to antibiotics within a few days if treated early. Bed rest, a liquid diet, and pain relievers may be prescribed to help the colon rest. An acute attack with severe pain or severe infection may require a hospital stay. Most acute cases of diverticulitis are treated with intravenous antibiotics and a liquid diet. Surgery is reserved for recurrent episodes, complications, or severe attacks when there is little or no response to medication (NIDDK, 2005).
Section 3D: Digestive Disorders

Objectives

The physician's objectives for diverticular disease are to (Mayo Clinic, 2005):

- rule out other intestinal conditions,
- identify the presence of an infection,
- conduct a test to visualize the pouches that are inflamed or infected, and
- prescribe antibiotic therapy and pain medication.

The medical nutrition therapy objectives for diverticulosis are to (ADA, 2010):

- prevent onset of diverticulitis, and
- prevent development of more diverticula.

The medical nutrition therapy objectives for diverticulitis are to (ADA, 2010):

- resolve intestinal inflammation and pain,
- assist with bowel preparation for potential surgery,
- provide a gradual diet transition to recommended fiber levels, and
- provide counseling on a high fiber diet for diverticulosis.

Nutrition Care

Nutrition Assessment

Determine if the person has diverticulitis or diverticulosis.
Complete a 24-hour recall, food history, or food frequency to identify current intake of dietary fiber.
Identify the person's preferences for high fiber foods.
Determine if fiber supplements should be recommended.

Nutrition Intervention (Diverticulosis)

To prevent attacks of diverticulitis, people with diverticulosis should be counseled to consume a high fiber diet with a total of 26 to 45 grams of fiber per day. This is 6 to 10 grams of fiber beyond the standard recommendations of 20 to 35 grams per day (ADA, 2010).
Add fiber to the diet gradually to ensure tolerance. Emphasize sources of insoluble fiber (ADA, 2010).
Counsel people to avoid nuts, popcorn hulls, sunflower, pumpkin, caraway, and sesame seeds (ADA, 2010).
Prescribe a fiber supplement if dietary intake is not sufficient to provide adequate fiber (ADA, 2010).

Nutrition Intervention (Diverticulitis)

During an acute attack of diverticulitis, nutrition intervention includes nothing by mouth, with bowel rest until bleeding and diarrhea resolve, followed by oral intake with clear liquids (ADA, 2010).
Introduce solids slowly with a low fiber diet until inflammation and bleeding are no longer a risk (ADA, 2010).
Once symptoms improve – often within a few days – gradually increase the amount of fiber in the diet. Start by adding about 5 to 15
grams of fiber a day to allow the digestive system to adjust to the higher fiber intake (Mayo Clinic, 2005).
Provide guidance for high fiber nutrition therapy, as described above for diverticulosis, after the acute episode is resolved (Mayo Clinic, 2005).

**Nutrition Monitoring**
Track the amount of fiber and fluids consumed.
Evaluate the person's response to the change in dietary fiber by noting symptoms of cramping, bloating, constipation, and passing gas (ADA, 2010).
Review the person's understanding of when to use each therapy:
- Routinely use a high fiber diet or fiber supplements for prevention of diverticula and complications.
- Consume a low fiber diet during treatment of the inflammation.

**Cross References**
Section 4C: Clear Liquid Diet
Section 4E: Low Fiber Diet
Section 4E: High Fiber Diet

**References**


Section 3D: Digestive Disorders

More Information


Gastroesophageal Reflux Disease

Background

There is a muscular valve between the esophagus and stomach that clamps down to keep the stomach contents out of the esophagus. If this valve relaxes, stomach acid leaks back into the esophagus causing a burning sensation in the throat or chest; chest pain, hoarseness, dry cough, bad breath, or swallowing trouble. Common names for this are "heartburn" or "acid indigestion." If symptoms occur several times a week, then it is called gastroesophageal reflux disease (GERD) (National Institutes of Diabetes, Digestive and Kidney Diseases [NIDDK], 2007).

GERD is not only uncomfortable, it can cause serious health problems, including bleeding ulcers in the esophagus, formation of scar tissue that leads to swallowing problems, asthma, pulmonary fibrosis, or tissue changes called Barrett's esophagus that can become cancerous (NIDDK, 2007).

People of all ages can have GERD, even infants and children. It is common in those with a hiatal hernia. Other factors associated with GERD (NIDDK, 2007) are alcohol use, overweight, pregnancy, and smoking.

The severity of the disease varies between people, so care must be individualized.

Objectives

The medical nutrition therapy objectives (American Dietetic Association [ADA], 2010) are to reduce reflux of gastric contents into the esophagus, and to limit foods known to cause GERD.

Nutrition Care

**Nutrition Assessment**

Complete a diet history or food frequency form to identify eating habits that cause GERD.

**Nutrition Intervention**

Plan smaller, more frequent meals. Avoid eating the following foods (NIDDK, 2007):

- alcoholic beverages,
- carbonated beverages,
- chocolate,
- citrus fruits,
- coffee, regular and decaffeinated,
- tea and soft drinks with caffeine,
- fried or fatty foods,
Section 3D: Digestive Disorders

- mint flavorings,
- spicy foods like pizza or chili, and
- tomatoes and tomato products.

Plan a diet for weight loss, if the person is obese and ready to make the necessary eating and exercise changes. Counsel the person to avoid habits that cause swallowing of air such as
- chewing gum,
- using straws to drink, and
- talking while eating.

Provide information about making lifestyle changes (NIDDK, 2007) such as
- wearing loose-fitting clothing;
- avoiding lying down, bending over, or straining for 45 to 60 minutes after eating;
- avoiding eating less than 2 to 3 hours before bed;
- raising the head of the bed 6 to 8 inches by putting blocks of wood under the bedposts; and
- stopping the use of tobacco.

There are 3 classes of medication that are used to treat GERD (ADA, 2010):
- antacids,
- agents that reduce acid production in the stomach (H2 blockers and proton-pump inhibitors), and
- drugs that help the stomach to empty (prokinetic agents).

When nutrition therapy, lifestyle changes, and medications are ineffective, surgery is another treatment option (NIDDK, 2007).

Nutrition Monitoring

Evaluate problems with compliance with nutrition interventions and lifestyle changes.
Review the effectiveness and possible side effects of medications. For example, antacids may cause diarrhea or constipation.

Cross References

Section 3J: Obesity Section
4D: Low Fat Diet Section 4K:
Caffeine-Free Diet

References

http://nutritioncaremanual.org/content.cfm?ncm_content_id=82394
Section 3D: Digestive Disorders


More Information

National Digestive Diseases Information Clearinghouse
2 Information Way
Bethesda, MD 20892-3570
Phone: (800) 891-5389
Barrett’s esophagus fact sheet from NIDDK
http://digestive.niddk.nih.gov/ddiseases/pubs/gerd

GERD Information Resource Center, sponsored by AstraZeneca LP
http://www.gerd.com

Pediatric and Adolescent Gastroesophageal Reflux Association (PAGER)
http://www.reflux.org
Section 3D: Digestive Disorders

Inflammatory Bowel Disease

Background

Inflammatory bowel disease (IBD) is an umbrella term referring to two conditions that share similar symptoms: Crohn's disease or regional enteritis, and ulcerative colitis. Indeterminate colitis refers to IBD in which there is difficulty distinguishing between Crohn's disease and ulcerative colitis. Over time a definite diagnosis is usually made (Kalibjian, 2003, p. 8).

The onset of IBD generally occurs between the ages of 15 and 30, with a second, lesser peak of onset between ages 50 and 80. Unfortunately, at the time of diagnosis, many people with IBD already show signs of malnutrition (Escott-Stump, 2002a, p. 315). Both diseases can remain in remission with periodic acute flare-ups, or become chronic. The treatment for IBD usually begins with medication along with nutritional care, but may eventually involve surgery.

Glossary

**Crohn’s disease** or **regional enteritis** is an inflammation of all the layers of the digestive tract. It can appear any place, from the mouth to the anus, but most commonly appears in the small intestine (Bonci, 2003, p. 74-75). It can also occur in different locations simultaneously. Symptoms can include diarrhea (which is sometimes bloody), abdominal pain (commonly on the lower right side), nausea, vomiting, fever, weight loss, malnutrition, and fatigue. Some people develop fistulas, and may also experience inflamed, painful, stiff, and swollen joints; skin rashes; eye inflammation; kidney stones; or gallstones (Bonci, 2003, p. 75-76). There is no known cure.

**Fistulas** are abnormal connections between internal organs or between an organ and the surface of the skin. They can lead to nutrient malabsorption and to infection (King, 2004, p. 106). Malabsorption is especially common when a fistula develops between the small intestine and the colon, resulting in nutrients bypassing part of the absorptive surface of the small intestines.

**Ostomy** refers to a surgically-created artificial opening made for the drainage of waste products.

**Toxic megacolon** occurs when the inflamed colon becomes immobilized and unable to expel stool and gas, causing it to become distended. Signs and symptoms include abdominal pain and swelling, fever, and weakness, along with gogginess or disorientation. Left untreated, the colon can rupture, leading to peritonitis, a potentially fatal condition. Anti-diarrheals may increase risk of toxic megacolon (Mayo Clinic, other medications section, anti-diarrheal paragraph).

**Ulcerative colitis** is an inflammation of only the inner lining of the colon or rectum. It does not involve the rest of the digestive tract. Symptoms can include diarrhea (which is sometimes bloody), abdominal pain (more common on the left), cramping, anemia, and fever. Toxic megacolon is a serious complication occurring in 2 to 8 percent of cases (King, 2004, p. 108-109). The only cure for ulcerative colitis is surgical removal of the colon and rectum, which may require temporary or permanent placement of an ostomy.
The risk for malnutrition is high in IBD due to a number of factors including decreased intake due to associated pain, bloating, and diarrhea, altered digestion and absorption, increased nutrient losses, increased nutrient requirements, and drug-nutrient interactions (American Dietetic Association (ADA), 2000, p. 411).

Objectives

The medical nutrition therapy objectives are to minimize irritation and inflammation of the bowel, to prevent occurrence of bowel obstruction, to keep the disease in a state of remission, to minimize the need for medication, to replenish depleted nutrition stores, to correct and maintain fluid and electrolyte balance during the acute stage, to promote normal growth and development of children, and to improve the quality of life.

Nutrition Care

Nutrition Assessment

Obtain an accurate diet and weight history to determine risk for malnutrition and possible nutrient deficiencies. Micronutrients that may be deficient include iron, calcium, selenium, zinc, magnesium, folate, thiamin, riboflavin, pyridoxine, vitamin B₁₂, and vitamins A, D, and E (ADA, 2000, p. 411). Use a physical exam and blood work to assess hydration status and electrolyte imbalances. Assess for lactose intolerance, which is common in IBD, and also for wheat and gluten intolerance.

Nutrition Intervention (general)

Plan diet therapy for IBD based on individual food tolerance and the current disease stage. Avoid unnecessary diet restrictions to maximize nutrient intake. During the acute stage, bowel rest or a low-fiber diet are often prescribed to minimize symptoms and to prevent stenosis and bowel obstruction (ADA, 2000, p. 411). Replace fluid and electrolytes lost through diarrhea, and ensure that sources of potassium are increased, if needed. Encourage adequate hydration. Dehydration increases the risk of kidney stones in some people with IBD (Miskovitz & Betancourt, 2005, p. 206). To prevent kidney stones related to sulfasalazine.
therapy, reinforce the need to drink 8 to 10 glasses of fluid per day (ADA, 2000, p. 412).

For individuals at risk for malnutrition, use a high-calorie and a high-protein diet divided into small, frequent meals, and, if needed, oral supplements.

Following surgery, in cases where only a short length of small intestine remains, permanent parenteral nutrition may be essential (Escott-Stump, 2002a, p. 315; 2002b, p. 318).

When IBD is in remission or under control, use a high-fiber diet (as tolerated) to stimulate peristalsis and improve the tone of the muscular walls of the GI tract, especially the colon (ADA, 2000, p. 411).

If raw fruits and vegetables are bothersome, try steaming, baking, or stewing them. Some possibly better tolerated ones (cooked without skin and seeds) include: butternut squash, carrots, asparagus, spinach, and sweet potato.

Some foods that may seem to make symptoms worse may include: beans, cabbage, broccoli, raw fruit juices and raw fruits - especially citrus fruits - spicy food, popcorn, alcohol, and foods and drinks that contain caffeine (Warner & Barto, 2007, p. 124-125).

Consider use of yogurt with active cultures, since it has shown to be helpful in aiding recovery (Miskovitz & Betancourt, 2005, p. 206).

Provide education on chewing foods well, and on avoiding swallowing air by sipping beverages slowly (Bonci, 2003, p. 88; Escott-Stump, 2002a, p. 317).

Foster a pleasant, relaxing atmosphere around mealtimes as an important part of treatment, since people with IBD are often fearful of eating due to the resulting discomfort (Escott-Stump, 2002b, p. 319).

Omega-3 fatty acid supplements may be beneficial because of their anti-inflammatory effect. If fish is tolerated, increase intake of fatty fish (such as salmon, mackerel, herring, and sardines) in 3-ounce servings several times a week. Check with the physician before using fish oil supplements, however, since these sometimes cause stomach upset, heartburn, or a bad taste in the mouth (Bonci, 2003, p. 91).

The amino acid glutamine is particularly important in the diet of the IBD patient, because one of its functions is to maintain the health of the cells of the intestinal mucosa. Also, glutamine aids in tissue restoration during an episode of inflammation (Kane, 2010, p. 162). During an inflammatory episode, the best food sources of glutamine are poultry and fish. Some other good food sources to recommend are red meat, beans and dairy products; but these foods may be more easily tolerated after the gut is better recovered.

**Nutrition Intervention (Crohn’s disease)**

Provide adequate calories (Escott-Stump, 2002a, p. 316):

- for adults, use a factor of 1.5 x BEE,
- for infants, use 120 calories per kilogram;
Use a diet relatively high in fat to improve energy balance, unless fat malabsorption is a problem. If the small intestine is involved, fat may be passing through making diarrhea worse.

If fat malabsorption is present, also limit intake of oxalate-containing foods (rhubarb, nuts, nut butters, chocolate, teas, draft beer, etc.), which can contribute to kidney stones (Bonci, 2003, p. 93).

Limit fat intake if steatorrhea occurs. Consider the use of medium-chain triglyceride (MCT) oil as an alternative fat source (Escott-Stump, 2002a, p. 316).

In severe cases, the physician may prescribe complete bowel rest and nutrition support (that is, elemental diets administered orally or by tube feeding, or parenteral nutrition). Use of elemental diets has led to improvement in nutrition parameters, reduction of inflammation, and even high remission rates, but elemental diets are unpalatable, and relapse is common once they are stopped (ADA, 2000, p. 412).

When strictures or fistulas are present, use an elemental diet or a low-residue and low-fiber diet that is high in calories, and that has a high protein content of 1 to 1.5 grams per kilogram, focusing on high biologic value proteins (Escott-Stump, 2002a, p. 315). A high fiber diet is contraindicated when strictures or fistulas are present.

Confer with the physician regarding the use of antioxidant therapy and nutrient supplements of vitamins C, D, E, B₆, folate, iron, zinc, copper, calcium, potassium, and magnesium. Vitamins A and K should be given every other day (Escott-Stump, 2002a, p. 316).

**B12** is absorbed in the terminal ileum, a part often affected by Crohn's Disease. Inflammation (or surgical removal) of the terminal ileum may interfere with absorption of B12, therefore life-long B12 injections may be required (Kane, 2010, p.163).

**Nutrition Intervention (ulcerative colitis)**

In the acute stage, the physician may prescribe an elemental diet (administered orally or by tube feeding) to minimize fecal volume (ADA, 2000, p. 412).

If specialized nutrition support is needed during the acute phase, consider use of a glutamine-containing tube feeding formula (ADA, 2000, p. 412), though parenteral nutrition may be required for a few weeks.

As the person's condition improves, use a high-protein and high-calorie diet, given in six small feedings. This is especially important for infants (Escott-Stump, 2002b, p. 318).

Because the small intestine is not affected, ulcerative colitis does not cause malabsorption. However, a patient may be malnourished as a
result of being ill with severe colitis and having a history of not eating enough (Warner & Barto, 2007, p. 119). As symptoms subside, gradually resume the usual diet by slightly increasing the portions to determine what feels comfortable (Bonci, 2003, p. 89). Educate the person about eating behaviors to improve diet tolerance (Bonci, 2003, p. 89; Escott-Stump, 2002b, p. 319). Include the following cautions:

- Stop eating 2 to 3 hours before bedtime.
- Avoid foods known to trigger diarrhea in individual people.
- Avoid temperature extremes in food or beverage.
- Avoid iced or carbonated beverages, which may stimulate peristalsis in times of discomfort.
- Avoid sugar alcohols (sorbitol, mannitol, or xylitol), often found in sugarless gum and candies and in over-the-counter and prescription medications.
- Avoid alcoholic beverages, since they can be irritating to the digestive tract.

The use of 20 grams per day of psyllium seed mixed in juice or water may help by:

- encouraging the growth of beneficial bacteria in the colon, and
- increasing the production of butyrate, a fatty acid with anti-inflammatory action (Bonci, 2003, p. 90-91).

Confer with the physician regarding the use of nutrient supplements such as: multivitamins and minerals, especially thiamine, folic acid, vitamin E, zinc, calcium, and iron. Vitamin D may also be needed if bone disease is present (Escott-Stump, 2002b, p. 318). There are some specifically formulated multivitamins for IBD, such as Forvia (by Inovera), that contain more vitamin B12, iron and folic acid (Kane, 2010, p. 148-149.)

**Nutrition Monitoring**

Re-evaluate dietary intake periodically. Monitor mineral and trace element levels in particular to ensure adequacy (Escott-Stump, 2002a, p. 315).

Prevent or correct metabolic bone disease, such as osteopenia, osteoporosis, or arthropathies (Escott-Stump, 2002a, p. 315). Drug therapy, which may include sulfasalazine, corticosteroids, antidiarrheals, immune system suppressors, and antibiotics may cause some digestion-related side effects. Check for:

- anorexia,
- metallic taste in mouth,
- heartburn,
- diarrhea,
- nausea,
- vomiting, and
Section 3D: Digestive Disorders

- gastrointestinal distress (ADA, 2000, p. 412).

With sulfasalazine therapy, reinforce the need to drink 8 to 10 glasses of fluid per day to prevent kidney stones. Note that this drug is also associated with decreased serum folate levels, so these levels should be monitored, and folic acid supplements prescribed as needed (ADA, 2000, p. 412).

Cross References

- Section 3D: Diarrhea
- Section 3D: Ostomy Management
- Section 3E: Lactose Intolerance
- Section 4A: High Calorie Diet
- Section 4E: High Fiber Diet
- Section 4E: Low Fiber Diet
- Section 4F: Low Lactose Diet
- Section 4H: High Protein Diet

References


Section 3D: Digestive Disorders


More Information

Crohn's and Colitis Foundation of America
www.ccfa.org

Crohn's Disease Resource Center
www.healingwell.com/ibd

National Digestive Diseases Information Clearinghouse
www2.niddk.nih.gov
How to Cook for Crohn’s and Colitis by Brenda Roscher (Cumberland House Publishing, Inc. 2007)
Liver Disease

Background

The liver is the largest organ in the human body. The liver acts as a depot for receiving, processing and storage. The functions of the liver include

- metabolism of carbohydrate, protein and fat,
- storage, activation and transport of vitamins and minerals,
- bile production and excretion,
- detoxification of alcohol and drugs,
- conversion of ammonia to urea,
- filtering of the blood, and
- storage of glucose as glycogen, and provision of glucose when the cells need energy.

Liver disease is a broad term that covers diseases such as infectious hepatitis, cirrhosis, and alcoholic liver disease. Liver failure is a condition in which liver function is 25% or less (Hasse & Matarese, 2000, p.695).

Hepatitis

Background

Hepatitis refers to either an acute or chronic inflammation of the liver. There are five different viruses that cause viral hepatitis: A, B, C, D and E. Viral hepatitis can cause symptoms such as

- Abdominal pain
- Nausea and vomiting
- Anorexia
- Fatigue and fever
- Diarrhea
- Jaundice
- Dark urine and light colored stool

Glossary

**Hepatitis A** is caused by feces to oral contact (anal/oral sex), or consumption of feces contaminated water or food. This virus does not lead to chronic disease.

**Hepatitis B** is caused by contact with infected blood, other body fluids, contaminated needles, sexual contact and infected mother to newborn. This virus can cause liver damage, cirrhosis and cancer in about 10% of those infected.

**Hepatitis C** is caused by infected blood, needle sticks, razors, tattoo and body piercing tools. It is not easily spread through sex. This virus can cause liver damage, cirrhosis and cancer.

**Hepatitis D** is caused by contact with infected blood, contaminated needles and sexual contact with an infected person. This virus only infects those who have Hepatitis B.

**Hepatitis E** is caused by fecal/oral contact. It is associated with contaminated water. It is rarely seen in the United States. It does not become a chronic disease.

Section 3D: Digestive Disorders

Objectives

The goals of medical nutrition therapy are to:
- prevent further liver damage,
- promote regeneration of liver cells,
- promote adequate calorie and protein intake to maintain a healthy weight, and
- prevention of malnutrition and vitamin-mineral deficiencies.

Nutrition Care

Nutrition Assessment

- Weight history
- Assess laboratory values, especially for hypoglycemia and electrolyte imbalances. Hypoglycemia is due to decreased availability of glucose from glycogen and inability of the liver to participate in gluconeogenesis.
- Presence of nausea, vomiting, diarrhea and anorexia
- Use of diet history to assess for potential vitamin and mineral deficiencies

Nutrition Intervention

- During acute hepatitis, provide a diet high in calories and protein to help prevent protein catabolism and to regenerate liver cells
  - 30 - 35 calories per kilogram of body weight
  - 1 - 1.2 grams of protein per kilogram of body weight
  - If steatorrhrea (extra fat in the stool) is present, limit fat to less than 30% of total calories. (American Dietetics Association, NCM®, Calculations for Nutrition Assessment, accessed 6/2/2010)
- Limit sodium to 2000 mg when ascites and/or edema is present
- Encourage fluids except when hyponatremia is present
- A well balanced diet is all that is needed in most cases. However, if the disease is advanced or other medical conditions exist (diabetes, ascites, encephalopathy) diet modifications may be needed.
- Use the Food Guide Pyramid and U. S. Dietary Guidelines as educational tools to provide specific and accurate information.
- Counsel people to achieve and maintain an ideal body weight. If overweight, encourage a gradual weight loss by healthy eating habits and moderate physical activity. Obesity accelerates liver damage.
- For those with chronic hepatitis without advanced liver disease, encourage moderate physical activity.
- If anorexia, nausea or fatigue is present, recommend 4 – 6 small meals per day that are high in calories and protein. The least restrictive diet may also be beneficial. Breakfast, frequently, is the best tolerated meal of the day.
- Liquid supplements such as Ensure or Carnation Instant Breakfast may also be used to help maintain weight when appetite is poor.
- Strongly advise to avoid alcohol
Section 3D: Digestive Disorders

- A vitamin or mineral supplement may be indicated for people with a poor appetite or poor food choices. Advise against taking vitamin and/or mineral supplements above the RDA.
- A vitamin without iron may be necessary if a person's iron level is elevated.
- Use of herbal supplements should be discouraged.

Nutrition Monitoring

- Monitor for weight loss. Symptoms of hepatitis or medication side effects may make it difficult for a person to consume adequate calories and protein to maintain weight.
- Monitor for new symptoms or side effects that may affect appetite.
- Monitor for signs and symptoms of advanced liver disease such as ascites and adjust diet accordingly.

References


Cirrhosis

Background

Cirrhosis is a condition that causes irreversible scarring of the liver. As scar tissue replaces normal tissue, blood flow through the liver is affected. It becomes increasingly more difficult for the liver to function. Cirrhosis rarely causes symptoms in the early stages. But, as the liver deteriorates fatigue, nausea, unplanned weight loss, ascites, edema and jaundice begin to appear. The damage from cirrhosis is irreversible and can result in liver failure. However, the disease progression is usually slow and symptoms are often controllable.

The primary causes of cirrhosis are chronic alcohol abuse and chronic infection with hepatitis C. (MayoClinic.com Health Library, Cirrhosis, accessed 6/2/2010) Other causes of cirrhosis include

- hepatitis B and D,
- nonalcoholic steatohepatitis or (NASH)-excessive fat in the liver which then promotes inflammation of the liver,
- primary biliary cirrhosis is a disease of the bile ducts (the bile ducts become damaged or blocked and progress to inflammation),
- hemochromatosis (iron overload),
- Wilson's disease,
- deficiency of Alpha 1-antitrypsin,
- glycogen storage diseases,
- sclerosing cholangitis, and

Glossary – Complications of ESLD

**Portal hypertension** occurs when the blood flow through the liver becomes obstructed. The scarring promotes fibrous tissue that blocks the vessels.

**Ascites** is fluid in the abdomen. A paracentesis is the process of removing the fluid.

**Hepatic encephalopathy** presents as a behavioral change or decline in mental status. This may range from mild confusion to coma. Lactulose, Neomycin and Metronidazole are used to control the encephalopathy.

**Esophageal varice** is bleeding in the esophagus. Strictures or narrowing in the esophagus can also occur. This is caused by portal hypertension.

**Spontaneous bacterial syndrome (SBP)** is an infection of ascitic fluid without an apparent source. It is treated with antibiotics. SBP can result in further liver damage (Merck Manual Professional, Ascites: Approach to the Patient with Liver Disease, accessed 6/2/2010)

**Steatorrhrea** is extra fat in stool. It is common when bile ducts are damaged or obstructed.

**Fulminant hepatitis** is acute hepatitis with encephalopathy. Unless a timely transplant can occur the fatality is 50% (RD 411, Liver Disease: the Role of Nutrition, accessed 6/2/2010)
Malnutrition is present in all forms of liver disease. This is due to the disease process, ascites, feeling “full” or early satiety, lack of appetite, decreased absorption of nutrients, medications and overly restrictive diets. (Krenitsky, “Nutrition for Patients with Hepatic Failure‖, 2003)

Objectives

The goals of medical nutrition therapy are to
- prevent or correct malnutrition and vitamin/mineral deficiencies,
- provide adequate calories to preserve liver function and meet energy needs,
- provide appropriate protein intake, and
- provide the appropriate medical nutrition therapy for such co-conditions of ascites, steatorrhea, varices and encephalopathy

Nutrition Care

Nutrition Assessment

Obtain a weight history. If ascites is present, determine dry weight. Request patient to be weighed after a paracentesis.

Subjective Global Assessment (SGA) can be used to determine muscle and fat loss.

Use of urinary creatinine excretion and midarm muscle mass are reliable measures of nutrition status in patients without fluid overload. Whereas, creatinine height index is more reliable in those with ascites and edema. (DiCecco & Francisco-Ziller, “Nutrition in Alcoholic Liver Disease‖, p. 247)

Determine presence of edema, mouth sores, altered sense of taste, temporal wasting, night blindness and skin turgor.

Obtain laboratory values especially for possible hypoglycemia, hyponatremia, electrolyte imbalances, elevated ammonia, and vitamin/mineral deficiencies.

Determine presence of steatorrhea, varices, encephalopathy, and other conditions (diabetes, kidney disease, etc.)

Complete a diet history for potential deficiencies

Nutrition Intervention

Adjust calorie and protein needs to individual symptoms and co-morbidities such as diabetes and renal function.

Calculate calorie and protein needs on dry or estimated weight. Weigh patient after paracentesis or adjust weight by:

- With mild ascites subtract 3 – 5 kg
- With moderate ascites subtract 7 – 9 kg
- With severe ascites subtract 14 – 15 kg (Krenitsky, “Nutrition for Patients with Hepatic Failure‖, p. 32)
The European Society of Parenteral and Enteral Nutrition (ESPEN) suggest 25 – 35 calories per kg, and 1 – 1.5g protein per kg. (DiCecco & Francisco-Ziller, -Nutrition in Alcoholic Liver Disease‖, p. 247) Encourage the obese patient to gradually lose weight through diet, exercise and behavior modification. Remember, obese patients can still be malnourished.

Low protein diets do not benefit patients with bouts of encephalopathy. Tolerance of cooked meats is optimal when eaten in 2 – 3 ounce serving size at meals. Vegetable proteins are felt to be well tolerated; however, the food volume required may not be practical in those patients with early satiety. It may also be necessary to adjust protein intake for renal disease. (DiCecco & Francisco-Ziller, -Nutrition in Alcoholic Liver Disease‖, p. 249)

Those with chronic encephalopathy may benefit from a diet high in dairy and vegetable protein in place of meat/animal protein.

If steatorrhea is present limit fat to less than 30% of total calories. If ascites is present limit sodium to 2000mg per day. Restrict fluid when hyponatremia is present.

- Limit fluid to 1200 -1500 ml when sodium is <128 mg/dL
- Limit fluid to 1000 – 1200 ml when sodium is <125 mg/dL (ADA, NCM®, Gastrointestinal Disease>Cirrhosis, 6/2/2010)

Encourage 4 – 6 small meals per day.

To prevent and treat malnutrition, begin with meals and supplements. It is most important to avoid a fasting state. If oral intake is not adequate then consider enteral or parenteral nutrition.

Encourage patient to avoid alcohol.

Avoid unpasteurized milk, dairy products and juices, raw or undercooked meat, eggs, and fish/shellfish; unwashed fruits and vegetables, and raw vegetable sprouts because of high risk of food born illness

Supplementation of vitamins/minerals may be necessary. The most common deficient nutrients are folic acid, B₁₂, thiamine (B₁), pyridoxine (B₆), vitamins A, D, E, zinc, and calcium. Iron status should be assessed early to determine the appropriate vitamin and/or mineral supplement to use. As iron overload is common. (DiCecco & Francisco-Ziller, -Nutrition in Alcoholic Liver Disease‖, pp. 250-251)

**Nutrition Monitoring**

- Monitor weight
- Meal intakes, supplements and nutrition support
- Side effects of medications on appetite
- Laboratory values
- Management of symptoms
- Signs/symptoms of vitamin/mineral deficiencies
- Sense of well being (ADA, NCM®, Gastrointestinal Disease>Nutrition Therapy Efficacy, accessed 6/6/2010)
Section 3D: Digestive Disorders

References


Krenitsky, Joseph, –Nutrition for Patients with Hepatic Failure‖, *Practical Gastroenterology‖*, vol.27, issue #6, June 2003.


Alcoholic Liver Disease

Background

Alcoholic liver disease is from excessive intake of alcohol. It is the fourth leading cause of death in middle-aged Americans. Those at risk are female, use of other drugs combined with alcohol, family history, poor nutrition, obesity, hyperglycemia, age, and infection of hepatitis C. The current threshold for potential development of alcoholic liver disease is thought to be a daily intake of alcohol above four drinks in men and two drinks in women. Of these, 90% of chronic alcoholics will have fatty liver changes on biopsy, whereas 10% - 35% will have a biopsy consistent with alcoholic hepatitis. In addition, 5% - 15% of them will go on to develop cirrhosis. (DiCecco & Francisco-Ziller, "Nutrition in Alcoholic Liver Disease," p245) The three stages of alcoholic liver disease include

hepatic steatosis—a fatty liver disease, reversible if drinking stops,
hepatits—reversible if drinking stops, and

Objectives

The medical nutrition therapy goals are to
- prevent further damage to the liver and promote regeneration of liver cells,
- assure adequate calories and protein,
- replete vitamin and mineral deficiencies, and
- ensure total avoidance of alcohol.

Nutrition Care

Nutrition Assessment

Obtain weight history.
Evaluate for protein calorie malnutrition--triceps skinfold, arm muscle circumference, BMI, and handgrip strength or use subjective global assessment (SGA).
Determine presence of edema and ascites.
Presence of mouth sores, altered taste, complaints of night blindness, temporal wasting and skin turgor.
Review laboratory values to assess for electrolyte imbalances and vitamin/mineral deficiencies.
Complete a diet history and evaluate for calories, protein, vitamin and mineral intakes.
Evaluate for appetite, early satiety, feeling of fullness when eating, anorexia, and diarrhea or constipation.
Section 3D: Digestive Disorders

**Nutrition Intervention**
Counsel patients to eat a well balanced diet. Use the Food Guide Pyramid and the U. S. Dietary Guidelines.
If obese, counsel patient to lose weight. Obesity can accelerate steatorrhea and liver damage.
Promote regular exercise.
Completely avoid alcohol.

**Nutrition Monitoring**
Evaluate the need for calorie and protein adjustments to maintain an appropriate weight and prevent protein calorie malnutrition.
Monitor for vitamin and mineral deficiencies.
If alcoholic liver disease has advanced to hepatitis or cirrhosis, follow previous recommendations for hepatitis and cirrhosis.

**References**


RD411.com, *Liver Disease: The Role of Nutrition*,
Liver Transplant

Background

Liver transplant has become the treatment option for end stage liver disease. Malnutrition is common and must be treated prior to transplant. These patients usually have such symptoms as:
- ascites,
- edema,
- jaundice,
- protein calorie malnutrition,
- vitamin and mineral deficiencies,
- encephalopathy,
- renal failure, and
- weight loss.

Aggressive medical nutrition therapy is needed to promote a favorable outcome.

Objectives

The goals of medical nutrition therapy are to
- replenish malnutrition,
- maintain the status of those with adequate muscle and energy reserve,
- promote weight loss in those with excessive weight as per BMI, and
- management of patient symptoms to maximize quality of life (eMedicine, –Nutritional Requirements of Adults Before Transplant‖ accessed 6/6/2010)

Nutrition Care

Nutrition Assessment

It is important to remember that all methods commonly used for nutritional assessment, are influenced by the presence of liver disease in combination with renal failure, alcohol ingestion, and expansion of the intracellular water compartment. However, nutritional assessment is beneficial in all patients awaiting organ transplant.

Standard nutritional parameters are often invalid. The combination of objective and subjective information has been established as the best approach.

BMI and mid-arm muscle circumference should be used in combination with a detailed diet history.

Evaluate laboratory values for hemoglobin, hematocrit, transthyretin (prealbumin), and electrolytes. (eMedicine, –Nutritional Requirements of Adults Before Transplant‖ accessed 6/6/2010)
**Nutrition Intervention Pretransplant**

Provide 25 – 30 calories per kg based on estimated dry weight. For repletion provide 35 – 40 calories per kg. If weight loss is needed provide 20 calories per kg.

Provide 1 – 1.5g protein per kg based on estimated dry weight. For repletion provide 1.5 – 2g per kg. If weight loss is needed provide 0.8 – 1 g per kg.

Fat should provide 30% of total calories. For repletion increase fat for total energy intake. If weight loss if needed decrease fat to less than 30% of total energy needs.

Limit sodium to 2000mg per day.

Limit fluids to 1000 – 1500ml per day if hyponatremia exists

Oral supplements and enteral or parenteral nutrition may also be needed.

(eMedicine, –Nutritional Requirements of Adults Before Transplant‖ accessed 6/6/2010)

**Nutrition Intervention for Two Months Post Transplant**

Provide moderate calorie intake based on basal energy needs + 15% - 30%.

Provide 1.2 – 1.75g protein per kg, based on estimated dry weight.

Limit fat to 20% - 30% of nonprotein calories.

Limit carbohydrates to 70% of nonprotein calories.

Limit sodium to 2000 – 4000mg ( or as indicated by other co-conditions).

Provide fluid as needed.

Provide 800 – 1200mg of calcium.

Provide a daily multivitamin/mineral supplement to RDA levels; provide additional water and fat soluble vitamins as indicated.

Early enteral nutrition support may help achieve a positive nitrogen balance and promote healing.

(Hasse & Matarese, 2000, p.713)

**Nutrition Intervention Long Term Post Transplant**

Adjust calorie needs to maintain an appropriate weight. For weight maintenance determine basal energy needs + 10% – 20%.

Provide moderate protein intake of 1g per kg, based on estimated dry weight.

Limit fat to 30% of total calories or less.

Limit simple carbohydrates.

Limit sodium to 2000 – 4000mg.

Fluid does not need to be limited.

Provide 1200 – 1500mg of calcium.

Provide a daily multivitamin/mineral supplement to RDA for one year (Hasse & Matarese, 2000, p.713).
Section 3D: Digestive Disorders

*Nutrition Monitoring*
Monitor for obesity, dyslipidemia, hypertension, diabetes and adjust diet accordingly.

Cross References

Section 3I: Tube Feeding Section
4A: High Calorie Diet Section 4G:
Sodium Controlled Diet Section 4H:
High Protein Diet Section 4I: Fluid Management

References


More Information

American Liver Foundation
800-GO-LIVER (465-4837; 888-4HEP USA (443-7872)
[www.liverfoundation.org](http://www.liverfoundation.org)

Canadian Liver Foundation
800-563-5483; 416-491-3353
[www.liver.ca/Home.aspx](http://www.liver.ca/Home.aspx)

Digestive Disease National Coalition
202-544-7497
[www.ddnc.org](http://www.ddnc.org)

Primary Biliary Cirrhosis (PBCERS) PBCers Organization
[www.pbcers.org](http://www.pbcers.org)

National Digestive Diseases Information Clearinghouse
800-891-5389; 301-654-3810
[www.niddk.nih.gov/healthnddic.htm](http://www.niddk.nih.gov/healthnddic.htm)

National Institute of Diabetes and Digestive and Kidney Disease (NIDDK)
301-496-3583
[www.niddk.nih.gov](http://www.niddk.nih.gov)
Ostomy Management

Background

The treatment of some conditions of the digestive or urinary tracts may require a surgical procedure called an ostomy diversion. There are four types of bowel ostomy diversions in which a portion of the intestines is re-routed either to an external opening and pouch, which is conventional, or to an internal opening connected to the anus or to a surgically created pouch, which is less common (Brewer, 2002, p. 1). In some cases, where the bowel has been bypassed rather than removed, the ostomy may be surgically reversed after a time.

Glossary

Colostomy refers to an opening in the abdominal wall leading to the ascending, transverse, or descending sections of the colon, after part of the colon is removed or bypassed. The nutrition therapy for ostomies into the ascending colon is similar to that for ileostomies. Ileostomy refers to an opening in the abdominal wall leading to the ileum that is made after the entire colon, rectum, and anus are removed or bypassed.

Conditions that most commonly involve treatment with a bowel diversion ostomy include (American Dietetic Association are [ADA], 2000, p. 421)

- diverticulitis,
- Crohn's disease,
- ulcerative colitis,
- colorectal cancer,
- familial polyposis,
- intestinal trauma,
- bowel ischemia, and
- radiation enteritis.

Usually the surgery involves removing a portion of the intestines. The type of nutrition therapy needed depends on the location of the ostomy and the type and extent of intestine remaining. Partial as well as complete removal of lengths of jejunum and ileum result in the malabsorption of many nutrients.

The underlying conditions may cause pre-operative nutrition compromise. Post-operatively, people with ostomies vary in their tolerance of food though most see gradual improvement in the first few months to a year after surgery. Delays in return to adequate oral intake can also result in nutrition deficiencies.

Objectives

The medical nutrition therapy objectives are

- to reduce risk of physical obstruction of the outlet
- to prevent fluid and electrolyte imbalances
- to reduce excessive output
- to minimize production of gas and unpleasant odors. (ADA, 2010)
Section 3D: Digestive Disorders

Nutrition Care

**Nutrition Assessment**
Identify pre-existing nutrition deficits by reviewing the usual diet, weight history, and completing a physical assessment or subjective global assessment.
Identify the location of the ostomy and the extent of both current and past bowel resection.
Assess the functioning of the ostomy and the amount and consistency of the output. The stool from a colostomy from the transverse or descending colon will most likely be soft or formed. Conventional ileostomy and high-end colostomy output will be liquid to semi-liquid. Internal ileostomy output will be a semi-liquid to paste consistency (Brewer, 2002, pp. 4-5).

**Nutrition Intervention**
Initiate an oral diet with fluids then progress to solid foods that are low in fiber and cooked to be soft and tender. Serve at least 4 meals to as many as 8 meals per day according to individual tolerance. Skipping meals and fasting increases the risk of watery stools and increased gas (Brewer, 2002, p 6).
To reduce risk of bowel obstruction educate the person about chewing foods very well, drinking fluids with solid foods, and avoiding foods that don’t digest completely including
- vegetables that are raw; that remain fibrous after cooking (such as bean sprouts, cabbage, or spinach; that have hulls and thick skins (such as corn, cucumbers or pickles, peas, and bell peppers); and that contain edible seeds,
- fruit that is dried (such as raisins or prunes); that contains edible seeds and thick peels; and pineapple,
- meat that is tough or fibrous, as well as casings of sausages, and
- nuts, seeds, coconut, and popcorn.
Provide at least 8 to 10 cups of fluids per day to reduce risk of dehydration. More fluids are needed if the person has diarrhea or excessive ostomy output. If output is more than 4 cups per day then an oral electrolyte solution should be given.
Ensure that people with ileostomies or high-end colostomies consume adequate sodium and potassium to offset inadequate absorption and losses in feces. Do not restrict sodium in the diet.
Reduce excessive ostomy output using the guidelines provided in the section on diarrhea. Diarrhea will increase if eating is avoided. With ileal resections bile salt deficiency may result because these salts are normally reabsorbed in the ileum. This leads to fat malabsorption and steatorrhea. Refer to the low fat diet section to manage this problem.
Educate the person about common causes of gas or stool odor that makes some people uncomfortable socially. These problems can be managed by learning each person's tolerance. Some people use cultured buttermilk or
yogurt; fresh parsley or spearmint; and tomato, orange, or cranberry juices to improve stool odor (Brewer, 2002, p. 12).

**Foods that may cause odor**
- cooked dried beans, peas, and lentils
- onions and garlic
- broccoli
- cabbage
- turnips
- asparagus
- fish and fish oil
- eggs
- strong flavored cheese
- vitamin supplements

**Foods that may cause gas**
- cooked dried beans, peas, and lentils
- onion and chives
- vegetables in the cabbage family:
  - broccoli, Brussels sprouts, cabbage, cauliflower, kale, kohlrabi and turnips
- eggs
- cucumbers
- melons
- peppers
- carbonated drinks
- alcoholic beverages
- chewing gum

**Nutrition Monitoring**
Check to make sure that the person has resumed normal eating by 6 to 8 weeks after surgery, unless a longer time is indicated to allow for intestinal adaptation following extensive removal of the small intestine.

**Cross References**

Section 3D: Diarrhea Section
4D: Low Fat Diet Section 4E:
High Fiber Diet Section 4E:
Low Fiber Diet Section 4F:
Low Lactose Diet
Section 4G: Potassium Rich Foods

**References**


More Information

For more details on bowel diversions and information about dietary management of urostomies contact:
United Ostomy Association
19772 MacArthur Boulevard, Suite 200
Irvine Ca 92612-2405
(800) 826-0826
www.uoa.org
Food Allergy and Food Intolerance

Background

People may have a variety of sensitivities to foods. Some of these are food intolerances that do not involve the immune system. These usually affect the digestive tract but sometimes cause headache or skin reactions. Food allergies are an extreme immune response to exposure to proteins in foods called allergens. Food allergy can affect many parts of the body. The response usually happens within 2 hours after eating the food, but can happen within minutes or take as long as several days. Some allergic reactions are mildly uncomfortable while others are life threatening. Signs of an allergic reaction can appear in the skin or eyes; the stomach or intestines; or the nose, throat or lungs (American Dietetic Association (ADA), 2000, p. 194).

Any food can cause an allergic reaction. However, eight foods cause 90 percent of allergic reactions to food: milk, eggs, peanuts, soybeans, tree nuts, wheat, fish, and shellfish (Koerner & Munoz-Furlong, 1998, p. 31). Since 2006, food manufacturers are required to list the presence of these allergens on food labels. Corn allergy is rare, so it is not listed on food labels, but it is difficult to manage because ingredients made from corn are widely used in processed foods (Koerner & Munoz-Furlong, 1998, p.43).

Approximately one in 25 people suffers from a food allergy. They are slightly more common in young children and in people who have a family history. Most food allergies develop early in life, though many are outgrown by age five. It is common for people to believe they are allergic to foods when they are not. More than 160 foods are known to cause food allergies. Eight of these foods make up 90 percent of all food-allergic reactions: milk, soy, wheat, eggs, peanuts, tree nuts, fish, and shellfish.

The main reason that infant and childhood allergy rates are higher is that the linings of their intestinal tracts are not fully mature. This allows food allergens to cross the barrier and trigger an allergic reaction. Breastfeeding and delaying introduction of solid foods until six months of age are thought to lower the risk of food allergies (Melina, Stepaniak, & Aronson, 2004, p. 25).

Diagnosing food allergy is difficult. Used alone, blood tests and prick-skin tests are only partly useful since the results may be either false positive or false negative. False positive means that the test indicates a sensitivity that does not exist. False negative means there is a normal response to a sensitivity that does exist. These tests are relatively cheap and easy to do. Dietary methods should be used to confirm suspected food allergies. They take some time and effort, but food challenge tests are the most accurate way to identify a food allergy (ADA, 2000, pp. 196-200).

Food additives may also contain food allergens. These allergens have not always been indicated on food labels. However, true allergic reactions to food additives are very rare. Many such reactions cause the release of histamines from mast cells, which is the same response triggered by the body’s immune system. Additives that are most commonly reported to cause intolerance reactions are benzoates, BHA and BHT, FD&C dyes Yellow No. 5 and Red No. 3, monosodium glutamate (MSG), nitrates and nitrites, and sulfites (Perkins, 1990, pp. 134-145).

Cross-reactivity is a concern with some foods. The practice of avoiding foods from similar botanical families for fear of cross-reaction has been modified. Groupings of
foods with similar allergens (that may not be related botanically) are used instead. These are confirmed by further testing and food challenges.

There are also cross-reactions, such as latex allergy, between environmental allergens and food allergens. Natural rubber latex allergy may involve as many as 35 different allergens (Perkins, 2000, p. 1381). Some of these allergens have the potential to cross-react with food proteins. People with latex allergy should be tested for these food allergies rather than being told to avoid all foods with the potential for a cross-reaction to latex. Additionally, anyone with latex allergy should be informed about the possibility of the cross reactions to these foods.

Objectives

The medical nutrition therapy objectives are
to prevent adverse reactions to foods, and
to maintain adequate nutrition intake despite dietary restrictions due to food allergy.

Nutrition Care

Nutrition Assessment
The first step in nutrition care may be helping to identify the food allergy.
○ Teach the person to make detailed records or diaries of food intake and symptoms to narrow down the list of possible allergens.
○ Next provide an elimination diet consisting of a limited variety of hypoallergenic foods.
○ Lastly assist with planning oral food challenges.
Evaluate the person’s need for guidance on meal planning, food label reading, grocery shopping, food preparation, and eating away from home. With some severe, life-threatening food allergies, these skills are literally survival skills.
Assess the impact a food allergy has on the adequacy of the person's diet based on age-specific nutrition needs. Some food allergies have little impact on the overall quality of the diet. Others, because of the food's presence in many processed food products, require careful planning to ensure adequacy. This is especially true when more than one food allergy is present.

Nutrition Intervention
Once a specific food allergy is confirmed, provide information about foods, food ingredients, and food additives that may contain the allergen.
Discuss the problem of cross-contamination during food processing and preparation.
Nutrition Monitoring

Evaluate the person's understanding of the changes required and compliance with the therapy.
Evaluate the effectiveness of the therapy. Document outcomes.

Cross References

Refer to specific information on diets for the following allergies and food intolerances located in Section 4F:

- Corn Allergy Diet
- Egg Allergy Diet
- Fish Allergy Diet
- Latex Allergy
- Milk Allergy Diet
- Peanut Allergy Diet
- Shellfish Allergy Diet
- Soybean Allergy Diet
- Tree Nut Allergy Diet
- Wheat Allergy Diet
- Citrus Fruit Intolerance
- Gluten Free Diet
- Low Lactose Diet
- Monosodium Glutamate Intolerance
- Strawberry Intolerance
- Sulfite Intolerance
- Tartrazine Intolerance
- Tomato Intolerance

References


Section 3E: Food Allergy & Food Intolerance


**More Information**

The Allergy and Asthma Foundation of America  
1233 20th St. NW, Suite 402  
Washington, DC 20036  
(800) 7-ASTHMA  
http://www.aafa.org/  

Food Allergy & Anaphylaxis Network  
11781 Lee Jackson Highway, Suite 160  
Fairfax, VA 22033-3309  
(800) 929-4040  
http://www.foodallergy.org
Celiac Disease

Background

Celiac disease (CD) affects an estimated 1 percent of Americans. The condition is a genetic autoimmune disorder that results in inflammation of the lining of the small intestines after exposure to gluten in food. This leads to varying degrees of malabsorption and discomfort, as there is much variation in the severity of the disease among people. Some ethnic groups are more predisposed to developing gluten intolerance than others, from both their genetic make-up and their dietary habits. In the past, physicians thought of CD as a disease of children. They now recognize that it can develop at any age, though the symptoms may differ in adults (American Dietetic Association [ADA], 2010).

Glossary

Celiac Disease (CD) is a type of inflammatory bowel disease of genetic origin. Stress or trauma appears to trigger sensitivity to glutens in specific grains: wheat, rye, barley, and triticale. It is also called celiac sprue, nontropical sprue, and gluten-sensitive enteropathy.

Dermatitis herpetiformis is a type of celiac disease where the skin rather than the intestines becomes inflamed. People with this condition may not have digestive symptoms; nevertheless they must adhere to a gluten free diet.

Gluten is a term used to refer to storage proteins (prolamines) in wheat, rye, barley, and triticale.

In CD there is a great reduction in absorptive surface area and fewer mucosal enzymes, resulting in classic signs and symptoms of carbohydrate and fat malabsorption (Escott-Stump, 2002, p. 300):

- diarrhea,
- steatorrhea (foul-smelling, pale, foamy stools), and
- bloating and flatulence.

Other signs and symptoms of CD include (ADA, 2010)

- weight loss,
- fatigue,
- iron- or folate-deficiency anemia (that is not responsive to supplementation),
- secondary lactose intolerance,
- growth retardation or failure,
- rickets or osteoporosis, and
- delayed puberty.

Untreated CD has long-term risks beyond nutrition deficiencies. People are more likely to develop cancers of the digestive tract, lymphoma, or other autoimmune diseases such as thyroid disease, type 1 diabetes mellitus, and connective tissue disease (Case, 2001, p. 8).

The definitive diagnosis of CD is made by intestinal biopsy plus resolution of the disease following treatment with a gluten-free diet. Less invasive serum antibody tests are used to screen for people who should have the biopsy done. It is possible to have negative blood tests and still have CD. Dermatitis herpetiformis is diagnosed with a skin.
biopsy. A gluten-free diet should not be started until after the blood tests and biopsy confirm suspected gluten sensitivity. Otherwise the correct diagnosis may not be made (Case, 2001, p. 7).

Objectives

The medical nutrition therapy objectives for CD are (ADA, 2000, p. 181)

- to provide a gluten-free diet to promote healing of the intestinal mucosa,
- enable patients to list common foods that contain wheat, barley, and rye
- enable patients to read a food label and know how to identify sources of gluten
- enable patients to identify nonfood items that may be sources of gluten, such as supplements and medications
- to correct any nutrition deficiencies that arise from malabsorption,
- to reduce diarrhea, bloating, flatulence, and other symptoms,
- to reduce risk of long-term complications, and
- to treat dermatitis herpetiformis.

Nutrition Care

Nutrition Assessment

Evaluate growth in infants and young children and BMI in older children and adults.
Evaluate body composition in all ages.
Review the person's usual intake and food preferences to decide if the diet would provide adequate nutrients when malabsorption is corrected. Also identify the extent of food preparation skills.
Review lab work for evidence of iron-deficiency anemia or combined iron and folate deficiency anemia. Assess serum calcium, magnesium, phosphorous, and potassium levels (Escott-Stump, 2002, p. 300).
Assess the severity of the disease to decide if lactose intolerance, fat malabsorption, or vitamin and mineral malabsorption are likely to be present.

Nutrition Intervention

Escott-Stump (2002, p. 301) summarizes the interventions that may be needed:

Provide a gluten-free diet that excludes wheat, rye, and barley. The restriction of oats is also indicated in the United States due to frequent contamination of oats with the other grains. Some research findings suggest that some people with celiac disease may tolerate small amounts of oats that are free of contaminants, but there is no consensus among the experts yet.
For adults, plan a diet that provides 35 to 40 calories and 1 to 2 grams of protein per kilogram of body weight.
Provide education about the foods, ingredients, and additives that contain gluten, as well as how to avoid cross-contamination with the restricted grains. Direct people to alternative sources for ready-made gluten-free foods and for recipes and gluten-free ingredients for home food preparation.

Encourage participation in a support group for people with celiac disease.

Initially provide a low lactose diet with gradual reintroduction of lactose once the intestinal mucosa has recovered.

Provide calcium supplements, if needed, because of the reduction in proteins on the villi that promote calcium absorption.

If fat malabsorption is present, then use of medium-chain triglyceride (MCT) oil is helpful.

Provide information on a diet rich in iron as well as on factors that promote or impair iron absorption.

Ensure adequate intake of water-soluble forms of vitamins A, D, E, and K as well as B-complex vitamins, particularly thiamine, folate, and B₁₂.

**Nutrition Monitoring**

A gluten-free diet must be adhered to permanently. Provide emotional support as well as information for making and sustaining the dramatic changes required. Help the person develop a plan for change, set and prioritize goals, and identify potential barriers to be overcome.

Improvement will begin within days of starting a gluten-free diet. Full recovery in children and younger adults usually occurs in 3-6 months. With older adults, full recovery may take 2 years (National Institute of Diabetes and Digestive and Kidney Diseases, 2005).

Evaluate results of interventions on growth, body composition, anemia, osteoporosis, and micronutrient deficiencies.

Once the diarrhea subsides, evaluate the adequacy of B-vitamin and dietary fiber intake since the allowed cereal grains are often not as good sources of these nutrients (ADA, 2010).

**Cross References**

Section 3E: Lactose Intolerance  
Section 4E: High Fiber Diet  
Section 4F: Gluten-Free Diet  
Section 4G: Iron Rich Foods

**References**

Section 3E: Food Allergy & Food Intolerance


More Information

Celiac Disease Foundation (CDF)
13251 Ventura Boulevard Suite #1
Studio City, CA 91605-1838
Phone: (818) 990-2379
www.celiac.org

The Gluten Intolerance Group of North America (GIG)
15110 10th Avenue SW, Suite A
Seattle, WA 98166-1820
Phone: (206) 246-6652
www.gluten.net
Lactose Intolerance

Background

Signs and symptoms of lactose intolerance are bloating, passing gas, cramps, abdominal pain, and, in some cases, diarrhea. These problems result from fermentation of undigested lactose by bacteria in the colon.

An inadequate amount of the digestive enzyme lactase causes lactose intolerance. Lactase digests lactose, the natural sugar in milk. In most of the world’s people, the adults do not make as much lactase as the children. This is the most common cause of lactose intolerance. In the United States, it is most often found in people of African, Hispanic, Native American, Asian, and Jewish descent (American Dietetic Association [ADA], 2010).

There are other conditions (ADA, 2010) that can cause temporary lactose intolerance in people who usually have no trouble digesting milk:
- celiac disease,
- Crohn’s disease (regional enteritis),
- HIV/AIDS enteritis,
- infections of the intestines by parasites, viruses or bacteria,
- surgical procedures,
  - gastrectomy
  - extensive bowel resection
  - gastric bypass
- ulcerative colitis.

Lactose intolerance is diagnosed indirectly by noting the presence of signs and symptoms after consuming lactose. The breath hydrogen test measures the hydrogen gas produced by fermentation of lactose in the colon. It is used to clinically diagnose lactase deficiency.

Glossary

*Crohn’s disease* (regional enteritis) is a chronic inflammation of the bowel that is most common in the ileum and cecum.

*Ulcerative colitis* is chronic ulceration of the lining of the colon or rectum.

Objectives

The objectives of medical nutrition therapy are
- to reduce or eliminate symptoms by controlling lactose intake,
- to provide adequate calcium, vitamin D, and riboflavin in the diet,
- to individualize care since tolerance varies, and may improve over time, and
- to provide nutrition education to ensure consumption of a nutritious eating pattern adequate in all nutrients.
Nutrition Care

Nutrition Assessment
Evaluate the person's usual diet patterns to identify sources and amounts of lactose. Relate the presence of symptoms with lactose intake to assess the degree of intolerance.
Assess the adequacy of calcium, vitamin D, and riboflavin sources in the diet.
Review the person's list of prescription and over-the-counter medications. Lactose is a filler in many medications. While there is usually not more than 0.5 grams in each dose, this could be a problem for a person taking multiple drugs who is very sensitive to lactose (Escott-Stump, 2005, p. 305).

Nutrition Intervention
A low lactose diet can improve the condition in 3 to 5 days. Start with foods that have Milk of all types is the main source of lactose. Lactose may be found in many foods however.
There are over-the-counter, commercial products with lactase enzyme. These are in the form of drops, to treat liquid milk, or tablets, to take with solid foods or medications containing lactose. Instruct people to use these correctly to make sure they are effective.
Lactose-reduced, ready-to-use milk also is available in grocery stores.
Develop a meal plan that limits lactose but assures adequate calcium, vitamin D and riboflavin. Supplemental sources may be needed.

Nutrition Monitoring
Review the person's tolerance to their meal plan. To avoid symptoms, increase the lactose content gradually. Many adults can adapt to up to 12 grams lactose or more per day if small portions are eaten separately (Escott-Stump, 2005, p. 304).

Cross References
Section 4F: Low Lactose Diet
Section 4G: Calcium Rich Foods

References
Retrieved July 9, 2010 from
http://nutritioncaremanual.org/content.cfm?highlight=lactose%20intolerance&ncm_content_id=82658

Section 3E: Food Allergy & Food Intolerance

More Information


National Digestive Diseases Information Clearinghouse
2 Information Way
Bethesda, MD 20892-3570
Phone: (800) 891-5389
Lactose intolerance

Information from two companies who sell lactose-free or lactose-reduced milk and milk products as well as lactase enzyme tablets or drops can be found at

- Land O Lakes Dairy Ease
  1-800-331-4536
  [http://www.dairyease.com](http://www.dairyease.com)

- Lactaid (McNeil Consumer Products)
  1-800-435-7548
  [http://www.lactaid.com](http://www.lactaid.com)
Cardiovascular Disease

Background

Cardiovascular disease (CVD) is a broad term that covers diseases of both the heart and the blood vessels. In the United States alone, approximately 81,100,000 men and women have some form of heart and/or blood vessel disease (American Heart Association [AHA], 2010, p. 6). Approximately 38 percent of all deaths in the United States are caused by cardiovascular disease (Rolfes, Pinna, Whitney, 2010, pp. 841). In addition, each year approximately 795,000 Americans are expected to have a stroke. (American Heart Association [AHA], 2010, p. 14).

Glossary

Atherosclerosis is a general term for the thickening and hardening of the arteries. This thickening is referred to as plaque, and it may partially or totally block blood flow.
Cerebrovascular accident (CVA), commonly called a stroke, is the shutting off of blood flow to the brain by blood clots or hemorrhage.
Coronary artery disease (CAD) refers to the buildup of plaque in the lining of the arteries that lead to the heart muscle itself.
Myocardial infarction (MI) or heart attack refers to the death of some muscle cells of the heart as a result of blockage of coronary arteries.
Peripheral vascular disease (PVD) refers to plaque buildup in the linings of arteries that go to tissues other than the heart.

Of the many risk factors for heart disease, some can be modified and are called lifestyle-related risk factors. These risk factors include
National Cholesterol Education Program [NCEP], 2004
- high blood cholesterol,
- high blood LDL cholesterol,
- high blood triglycerides,
- low blood HDL cholesterol,
- high blood pressure,
- diabetes,
- obesity (especially central obesity),
- lack of exercise,
- tobacco use,
- a diet high in saturated fat and trans fatty acids,
- a diet low in antioxidants that are typically found in fruits and vegetables, and
- a diet low in whole grains.

Metabolic syndrome is a condition that raises the risk of developing CVD and type 2 diabetes. Diagnosis includes at least three of the following (Rolfes, Pinna, Whitney, 2010, pp. 836)
- central obesity,
- hyperglycemia, insulin resistance or glucose intolerance,
hypertriglyceridemia (high blood triglycerides),
low HDL cholesterol levels, and
hypertension (blood pressure greater than 130/85),

Glossary

**High Density Lipoprotein (HDL)** is a type of lipoprotein that can remove cholesterol from within the arteries, and transport it back to the liver for excretion. HDL cholesterol is often referred to as the "good" cholesterol.

**Lipoproteins** are organic compounds with both protein and fat components. They carry fats and cholesterol in the bloodstream.

**Low Density Lipoprotein (LDL)** refers to carriers that transport fats from the liver to the tissues in the body. LDL cholesterol is referred to as "bad‖ cholesterol because high LDL levels are linked to cardiovascular disease.

**Triglycerides** are the storage and transport form of fat in the body. High levels increase risk of CVD.

(AHA, 2005b)

The National Cholesterol Education Program (NCEP) has set standards for blood lipid levels, body mass index (BMI), and blood pressure. (Refer to Table 3F-1.)

### Table 3F-1: Blood Lipid Level, BMI, and Blood Pressure Recommendations

<table>
<thead>
<tr>
<th>Classification</th>
<th>Total blood cholesterol (mg/dl)</th>
<th>LDL cholesterol (mg/dl)</th>
<th>HDL cholesterol (mg/dl)</th>
<th>Triglycerides, fasting (mg/dl)</th>
<th>Body Mass Index (BMI)</th>
<th>Blood pressure systolic/diastolic (mm/Hg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very High</td>
<td></td>
<td>190 or more</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>240 or more</td>
<td>160-189</td>
<td>39 or less</td>
<td>200 to 499</td>
<td>30 or more</td>
<td>140 or more/90 or more</td>
</tr>
<tr>
<td>Borderline High</td>
<td>200 to 239</td>
<td>130 to 159</td>
<td>59 to 40</td>
<td>150 to 199</td>
<td>25 to 29.9</td>
<td>120/180</td>
</tr>
<tr>
<td>Near/above Optimal</td>
<td>100 to 129</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Optimal</td>
<td>199 or less</td>
<td>99 or less</td>
<td>60 or more</td>
<td>149 or less</td>
<td>18.5 to 24.9</td>
<td>less than 120/less than 80</td>
</tr>
</tbody>
</table>


The physicians’ treatment plan for CVD includes the following:
- identification of risk factors,
- making lifestyle changes to reduce risk factors,
- nutrition therapy,
- medication, and
- invasive procedures such as angioplasty or coronary artery bypass graft (CABG) or PVD surgery.

CVD has both risk and protective dietary factors. Many have been identified for decades, but ongoing research is continually refining our understanding of the relationship between foods and CVD. Most of the cholesterol found in the blood is
Section 3F: Heart & Blood Vessel Disease

actually manufactured by the body and does not come from dietary sources. Saturated fat and trans fat contribute to high LDL levels, while trans fat also lowers HDL levels. The unsaturated types of fat are protective in CVD because they lower LDL levels and may raise HDL levels.

**Glossary**

*Saturated Fats* are usually solid at room temperature and come chiefly from animal food products. These fats tend to raise the level of blood cholesterol.

*Unsaturated Fats,* which include *monounsaturated* fats and *polyunsaturated* fats, are liquid at room temperature and come from plant oils. These fats tend to lower the level of cholesterol in the blood.

*Cholesterol* is a fat-like substance that performs vital functions, such as the production of sex hormones and bile acids. An excess of cholesterol contributes to deposits in the walls of blood vessels and reduced blood flow.

*Trans Fats* are created when unsaturated (liquid) oils are hydrogenated. This process changes the fat molecule to a "trans" shape, which results in a more solid and stable fat. Trans fats are similar to saturated fats but may also lower HDL levels. Labeling regulations now require the food industry to list the grams of trans fat per serving of the product.

(International Food Information Council, 2005, p. 4)

**Objectives**

The physicians' objectives for treatment of CVD are to reduce underlying causes and to treat associated lipid and non-lipid risk factors.

The medical nutrition therapy objectives for the treatment of CVD are to support lowering of LDL cholesterol and triglycerides, to support raising HDL cholesterol, to assist in management of blood pressure, diabetes, and obesity, and to promote increased physical activity.

**Nutrition Care**

*Nutrition Assessment*

The NCEP (2004) recommends the following plan.

- Assess the lipid profile factors listed in Table 3F-1.
- Identify co-morbid conditions, such as diabetes and high blood pressure, and the current degree of control.
- Calculate the BMI from weight and height data.
- Obtain the waist circumference to assess central obesity.
- Identify current medications used to treat any of the above conditions.
**Nutrition Intervention**

Review the general guidelines for prevention and treatment of cardiovascular disease, including
- the 2005 U.S. Dietary Guidelines for Americans,
- the (Dietary Approach to Stop Hypertension (DASH) diet for the management of high blood pressure,
- the Therapeutic Lifestyle Changes (TLC) guidelines (AHA, 2005c).

Set up an individualized meal plan based on the following TLC guidelines.

Aim for total calories to maintain or achieve desirable body weight.
- Provide about 15 percent of daily calories as protein.
- Provide 50 to 60 percent of daily calories from carbohydrate.
- Provide 25 to 35 percent of daily calories from fat with
  - less than 7 percent of total calories from saturated fat,
  - less than 10 percent of total calories from polyunsaturated fat,
  and
  - up to 20 percent of total calories from monounsaturated fats.

Limit dietary cholesterol to less than 200 milligrams per day.

Encourage increasing fiber intake to 20 to 30 grams per day, particularly viscous (soluble) fiber to 10 to 25 grams per day.

Add 2 grams per day plant sterol esters or plant stanol esters from foods if further reductions in LDL are needed to meet target levels.

If triglycerides remain at 200 mg/dl or more after the LDL goal is reached, set a secondary goal for non-HDL cholesterol [Total – HDL] at 30 mg/dl higher than the LDL goal.

If metabolic syndrome is present, encourage weight management and increased physical activity.

**Nutrition Monitoring**

Nutrition monitoring includes reassessment of the following (ADA, 2004)
- current medical condition and medical treatment plans,
- current laboratory values,
- weight and weight changes, and
- readiness to learn more.

Evaluate LDL response every 6 weeks until the goal is reached.

Continue lifestyle therapy, if the LDL goal is achieved.

**Cross References**

Section 3J: Obesity
Section 4A: Calorie Controlled Diet
Section 4D: Cholesterol Control Diet
Section 4D: Triglyceride Control Diet
Section 4E: High Fiber Diet
Section 4G: DASH Diet
Section 3F: Heart & Blood Vessel Disease

References


More Information


National Heart, Lung, and Blood Institute
Stay young at heart—Healthy eating (reproducible handouts)

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Congestive Heart Failure

Background

Congestive heart failure (CHF) is a result of the damage from other conditions that overwork the heart, such as coronary artery disease, diabetes, or high blood pressure. Most people with CHF also have high blood pressure and one third have diabetes. CHF is the most common diagnosis among hospitalized patients (Escott-Stump, 2002b, p. 239).

Signs and symptoms of CHF include shortness of breath, tiredness, swelling in ankles, feet, and legs, and, sometimes, in the abdomen. Shortness of breath and fatigue are symptoms of fluid build-up around the lungs, a condition that is termed pulmonary edema. Other signs of pulmonary edema include a cough that is worse at night or when lying down, weight gain from fluid build-up, and frequent urination. An estimated 50 to 68 percent of people with CHF are malnourished (American Dietetic Association [ADA], 2000, p. 261).

In advanced stages of CHF there are problems with low blood pressure, listlessness, anorexia, nausea, vomiting, weak pulse, sepsis, and cardiac cachexia (Escott-Stump, 2002b, p. 239). Cardiac cachexia is associated with malnutrition and inflammation. The person has significant loss of lean body mass, as well as edema. The lean tissue loss may be the result of burning calories at a higher rate, but inflammation may also play a role (ADA, 2000, p. 261). Poor nutrition can affect the heart muscle significantly.

Objectives

The goals of medical treatment are to improve the symptoms, to stabilize the disease, and to treat the underlying causes of the heart failure, so that the person can live longer and have a better quality of life. The objectives are

- to improve fitness and promote a more active lifestyle with prescribed exercise,
- to decrease demands on the heart,
- to decrease or eliminate fluid build up,
- to improve breathing, and
- to stop or reduce smoking, if applicable.

Medical nutrition therapy objectives are

- to reduce the workload of the heart,
- to reduce edema and shortness of breath,
- to reduce body weight, if overweight, in order to decrease oxygen and nutrient demands,
to maintain lean body mass and overall nutrition status,
to correct any nutrient deficiencies, and
to prevent development of pressure ulcers due to decreased mobility and poor circulation (ADA, 2000, p. 259; Escott-Stump, 2002b, p. 239).

Nutrition Care

Nutrition Assessment
Identify the stage of CHF and the signs and symptoms the person experiences.
Review the medical history for underlying causes of CHF or other conditions that influence nutrition needs.
Obtain current height and weight, calculate the BMI, measure abdominal girth, and note the presence of ascites or edema.
Review the current medication list for potential food-drug interactions.
Evaluate the person's functional ability as related to grocery shopping and meal preparation.

Nutrition Intervention
Sodium should be limited to less than 2 g per day for patients with heart failure.
Fluid restrictions for mild heart failure are to consume less than 2 L per day; in severely decompensated HF, 1,000 to 1,500 ml per day is needed for diuresis.
Texture and timing of foods should be adjusted to allow adequate energy intake without discomfort.
Nutritionally adequate diet. Thiamin supplementation may be necessary to compensate for losses in patients on loop diuretics (Brady, 2006).
Generally limit alcohol intake to one drink per day. In patients in whom alcohol is believed to be a causative factor in the heart failure, abstinence from alcohol is mandatory. (ADA, 2009)

Nutrition Monitoring
Nutrition reassessment for heart failure should include the following:
- Current medical condition
- Medical treatment plans
- Current laboratory values (urinary sodium level can be used to assess adherence to sodium restriction)
- Ability to chew, swallow, and consume adequate nutrients
- Weight and fluid changes
- Physical activity patterns
- Readiness for education

Follow-up nutrition intervention for heart failure should include adjusting nutrition goals and treatment plans according to a patient's response to the current treatment. Care should be given to assess that a patient's energy
Section 3F: Heart & Blood Vessel Disease

and protein intakes are adequate while sodium intake is limited. (ADA, 2009)

Cross References

Section 3J: Obesity
Section 4A: Calorie Controlled Diet
Section 4A: High Calorie Diet
Section 4G: Calcium Rich Foods
Section 4G: DASH Diet
Section 4G: Potassium Rich Foods
Section 4G: Sodium Controlled Diet
Section 4H: High Protein Diet
Section 4I: Fluid Management

References


More Information


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High Blood Pressure

High blood pressure or hypertension is frequently called the "silent killer." When hypertension strikes it usually has no symptoms. Risk factors for high blood pressure include family history, obesity, diabetes mellitus, smoking, physical inactivity, excessive alcohol use, excessive salt use, and age (>55 years for men and >65 years for women). Hypertension is the leading risk factor for heart and kidney disease. If left untreated, high blood pressure can lead to damage of the heart, kidney, brain, peripheral arteries and eyes. There are approximately 60 million Americans with high blood pressure. This number is expected to rise as the population ages. Worldwide the incidence of high blood pressure increases to one billion.

A blood pressure (BP) measurement includes two numbers. The top number is the systolic blood pressure (SBP) and the bottom number is the diastolic blood pressure (DBP). The systolic pressure is the amount of force exerted on the walls of the arteries when the heart pumps. The diastolic pressure measures the force on the arteries when the heart is at rest. Hypertension is diagnosed when the average of two or more blood pressure measurements on different visits to a healthcare provider fall into the following categories in the table below.

<table>
<thead>
<tr>
<th>BP Classification</th>
<th>Systolic BP mm Hg</th>
<th>Diastolic BP mm Hg</th>
<th>Lifestyle Modification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>&lt;120</td>
<td>and &lt;80</td>
<td>Encourage</td>
</tr>
<tr>
<td>Prehypertension</td>
<td>120-139</td>
<td>or 80-89</td>
<td>Yes</td>
</tr>
<tr>
<td>Stage 1 Hypertension</td>
<td>140-159</td>
<td>or 90-99</td>
<td>Yes</td>
</tr>
<tr>
<td>Stage 2 Hypertension</td>
<td>&gt;160</td>
<td>or &gt;100</td>
<td>Yes</td>
</tr>
</tbody>
</table>


Medical Care

The *Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure* added a new category termed "Prehypertension." This classification is to help reduce the levels of high blood pressure and to prevent the development of high blood pressure in the general population. The treatment involves only lifestyle modifications. Medications are added to the lifestyle modifications when hypertension is at Stages 1 and 2. The goals of medical therapy are reduction of cardiovascular and renal morbidity and mortality, target blood pressure control to <140/90, and adoption of healthy lifestyle (weight loss, physical activity, DASH eating plan and moderation of alcohol intake)
Nutrition Care

The Executive Summary of Recommendations from the American Dietetics Association's Evidence Based Practice Guideline includes:

- Blood pressure measurement should be used to classify blood pressure as Normal, Perhypertensive, or Hypertension (Stage 1 or Stage 2).
- Blood pressure measurement should be used to monitor and evaluate the effectiveness of therapy.
- Dietitians should assess food/nutrient medication interactions in patients that are on antihypertensives. Many antihypertensives interact with food and nutrients.
- Patients should be encouraged to adopt the Dietary Approaches to Stop Hypertension (DASH) dietary pattern. This pattern is rich in fruits, vegetables, low fat dairy, and nuts, low in sodium, total fat and saturated fat.
- Encourage patients to engage in 30 minutes of aerobic activity on most days of the week.
- Dietary sodium should be limited to no more than 2300 mg per day.
  - If the patient demonstrates adherence to a 2300 mg diet but has not achieved the treatment goal, then the dietitian should recommend the DASH eating plan and/or sodium reduction to 1600mg per day. (1600 mg + DASH has a similar effect to single drug therapy)
- Optimal body weight should be achieved and maintained (BMI 18.5-24.9).
- The consumption of omega 3 fatty acids does not appear to lower blood pressure.
- The consumption of protein may or may not be beneficial for the reduction of blood pressure, since the effect is unclear.
- Consumption of soluble fiber may or may not be beneficial for the reduction of blood pressure, since the effect is unclear.
- Advise patients to consume adequate food sources of potassium as part of Medical Nutrition Therapy.
- Consumption of vitamin C may or may not be beneficial on the reduction of blood pressure, since the effect is unclear.
- Consumption of vitamin E may or may not be beneficial for the reduction of blood pressure, since the effect is unclear.
- If magnesium is proposed as a therapy to reduce blood pressure, advise that the effect of magnesium as a single nutrient on blood pressure in healthy or hypertensive adults is unknown. The effect of dietary patterns with magnesium intake above the DRI on blood pressure in healthy or hypertensive adults is minimal. However, some dietary patterns that contain magnesium lower than recommended levels (DRI) may be associated with elevated blood pressure.
- If calcium is proposed as a therapy to reduce blood pressure, advise that the effect of calcium as a single nutrient on blood pressure in healthy or hypertensive adults is unknown. The effect of dietary patterns with calcium intake above the DRI on blood pressure in healthy or hypertensive adults is minimal. However, some dietary patterns that contain calcium lower than recommended levels (DRI) may be associated with elevated blood pressure.
hypertensive adults is unclear. Epidemiological studies report that dietary patterns containing calcium lower than recommended levels (DRI) may be associated with elevated blood pressure. The effect of dietary patterns with calcium intake above the DRI on blood pressure in healthy or hypertensive adults is minimal.

Consume at least five to ten servings of fruits and vegetables per day. Consumption of soy foods may or may not be beneficial, since the effect is unclear.

Consumption of garlic may or may not be beneficial, since the current evidence is inconclusive.

Consumption of cocoa or chocolate may or may not be beneficial, since the current research is inconclusive.

For those who consume caffeine, advise blood pressure monitoring; while acute intake of caffeine increases blood pressure, the effect of chronic caffeine intake is unclear.

Consumption of alcoholic beverages should be limited to no more than two drinks (24 oz. beer, 10 oz. wine, or 3 oz. of 80-proof liquor) per day for men and no more than one drink per day for women. (For those who can safely consume alcohol)

Management of elevated blood pressure should be based on a comprehensive program including lifestyle modification (weight reduction, medical nutrition therapy and physical activity) and pharmacologic therapy. Comprehensive therapy has been shown to prevent organ damage and improve cardiovascular outcomes.


**Nutrition Assessment**

Anthropometrics of weight, height and abdominal obesity (measured around the abdomen at the iliac crest). Skinfold measurement and bioelectrical impedance may also be used. Indirect calorimetry is not necessary.

Determine body mass index. A healthy goal is 18.5-24.9.

Determine total daily energy needs based on BMI, assessment of weight, and weight goals.

Determine daily fat intake (grams); calculate percentage of energy from fat (Multiply desired percentage by the total calories, and divide by nine to equal fat grams).

Determine saturated fat goal (grams); calculate 7% of daily energy needs, and divide by nine.

Complete food history/recall of each meal and snacks.

Quantities of food consumed.

Where and how food is prepared, cooking techniques used, and who does the cooking and shopping.

Examples of frequently consumed meals, desserts, snacks, canned foods, frozen foods, processed foods, and food ingredients.
Section 3F: Heart & Blood Vessel Disease

Salt used in cooking and high sodium foods.
Frequency of use of fruit, vegetables, low fat dairy and unsalted nuts.
Assessment of alcohol use

(ADA, 2010)

**Nutrition Intervention**

Limit sodium to 1500-2400 mg per day

The DASH eating plan:
- Seven to eight servings of grains daily, three of which are whole grains
- Four to five servings of fruits daily
- Four to five servings of vegetables daily
- Two to three servings of low fat or nonfat dairy daily
- Two or fewer servings of lean meat, fish or poultry daily
- Four or five servings of nuts, seeds, legumes weekly
- Limited fats and sweets
- Fluid is limited with the presence of edema, peripheral vascular disease, heart failure, or related co-morbidities to the hypertension.
- Maintain normal body weight (BMI 18.5-24.9)
- Engage in regular aerobic exercise, such a brisk walk, for at least 30 minutes most days of the week
- Limit consumption of alcohol to two drinks per day for men and one drink per day for women

(ADA, 2010)

**Monitoring and Evaluation**

Nutrition reassessment should include
- medical condition, diagnosis and medical treatment plans,
- current blood pressure,
- current lab values,
- current intake of meals, snacks, and nutritional supplements
- ability to chew, swallow and consume adequate nutrition
- physical activity habits
- weight and weight changes
- readiness for education

Patient goals should include
- achieve and maintain a healthful weight
- reduce blood pressure
- reduce risk for diabetes mellitus, kidney disease and cardiovascular disease
- select foods that follow the prescribed eating plan
- limit alcohol intake
- reduce sodium intake
- identify and limit sources of saturated fat, cholesterol and sodium
Section 3F: Heart & Blood Vessel Disease

- identify the section of the plan that emphasizes vegetables, fruits, low fat dairy, and whole grains,
- describe salt free seasonings and alternatives for high sodium sauces,
- demonstrate use of food label to monitor sodium and fat,
- identify strategies to use when selecting foods away from home,
- identify water as an important part of the meal plan and the need to increase fluids as fiber is increased,
- identify food quantities to maintain or achieve a healthy weight, and
- begin or continue an exercise program appropriate to needs and abilities

(ADA, 2010)

Cross References

- Section 4A: Calorie Controlled Diet
- Section 4G: DASH Diet
- Section 4G: Sodium Controlled Diet

References


Section 3F: Heart & Blood Vessel Disease


**More Information**

American Heart Association, http://www.americanheart.org


Acute Kidney Injury

Background

Acute kidney injury (AKI) is the sudden and often reversible loss of kidney function. It is associated with various conditions including cancer, pregnancy, pulmonary-renal syndrome, liver disease, nephrotic syndrome, HIV infection, trauma, cardiac surgery, and post renal transplant (Bickford & Schatz, 2004, p.30).

AKI typically occurs in hospitalized patients and carries a high degree of mortality (Gonyea & McCarthy, 2004, p. 2). There are substantial alterations in protein, carbohydrate, and lipid metabolism, as well as disturbances in fluid and electrolyte balance (Bickford & Schatz, 2004, p. 31). Eighty-five percent of all AKI cases require renal replacement therapy and the type of therapy selected will determine nutrition needs. Common renal replacement therapies used for AKI include hemodialysis and continuous renal replacement therapy (CRRT) (Bickford & Schatz, 2004, p.33).

Glossary

Renal Replacement Therapy (RRT) is the removal of waste products and excess fluid from the body through diffusion and ultra filtration. There are several methods for this including hemodialysis, peritoneal dialysis, and continuous processes.

Hemodialysis uses a machine to filter blood through a semi-permeable membrane outside the body. The blood travels in and out of the body through a surgically placed access.

Continuous Renal Replacement Therapy (CRRT) is used with people who are too hemodynamically unstable for conventional hemodialysis. Blood passes slowly and continuously through an external hemofilter.

Objectives

The primary medical nutrition therapy goals in the management of AKI are to correct and treat complications from AKI, provide adequate support to maintain function of other organs (Bickford & Schatz, 2004, p.33), minimize uremic toxicity, preserve lean muscle mass, and treat the underlying cause of the AKI (Wiggins, 2002, p.7)
Nutrition Care

Nutrition Assessment
Evaluate the underlying causes of AKI.
Identify concurrent conditions contributing to catabolism.
Review weight history to establish edema-free body weight.

Nutrition Intervention
Guidelines for Nutrition Care of Renal Patients recommends an initial consult with AKI patients, and then suggests a daily follow up or a minimum of 1 to 3 visits per week for the stable patient for at least two weeks or as indicated (Wiggins, 2002. p.61).
Refer to Table 3G-1 for more specific diet information related to acute renal failure.
Calorie and protein needs should be based on the clinical condition, degree of catabolism, current electrolyte and fluid balance, and type of renal replacement therapy.
- Protein breakdown is accelerated by multiple causes.
- The acute phase response leads to peripheral insulin resistance and other changes that result in hyperglycemia the diet should provide for moderate carbohydrate intake. Blood glucose should be closely monitored.
- Lipid metabolism and clearance is altered but exogenous lipids are well metabolized (Bickford & Schatz, 2002, p.31)
Refer to the end-stage kidney disease section for nutrition guidelines for hemodialysis therapy
When CRRT is used:
- Avoid exposure to excess lactate since it will increase protein catabolism.
- Account for the calories from the dextrose in the dialysate solution. Glucose absorption from these solutions may be 35% to 45%.
- With use of continuous hemodiafiltration closely monitor the serum levels of phosphorus, and possibly, calcium and water soluble vitamins (Bickford & Schatz, 2002, p.34).

Nutrition Monitoring
During the acute phase daily review monitor
- glucose levels secondary to insulin resistance,
- intakes and outputs are important to monitor fluid status and balance,
- BUN elevations that indicate excess protein infusion,
- feeding complications, and
- serum electrolytes since nutrient needs will change with change in kidney function, intake, and RRT changes (Wiggins, 2002, p.7),
When the person is discharged from the hospital
- if released to the care of a nephrologist, arrange for follow-up as for chronic kidney disease, and
- if released to an in-center dialysis unit, follow-up care will be provided by
Section 3G: Kidney Disease


Cross References

Section 3G: Chronic Kidney Disease (Stages I to IV)
Section 3G: End-Stage Kidney Disease (Stage V)
Section 4B: Carbohydrate Controlled Diet
Section 4G: Sodium Controlled Diet
Section 4I: Kidney Disease Diet

References


More Information


Kidney School, a program of the Medical Education Institute, Inc., is an interactive web based learning program available at [www.kidneyschool.org](http://www.kidneyschool.org)
### Table 3G-1: Nutrient needs for adults with kidney disease based on stage and type of therapy

<table>
<thead>
<tr>
<th>Therapy</th>
<th>Energy</th>
<th>Protein</th>
<th>Carbohydrate</th>
<th>Sodium</th>
<th>Potassium</th>
<th>Phosphorus</th>
<th>Calcium</th>
<th>Fluid</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Acute Kidney Injury</strong></td>
<td>25-35 kcal/kg</td>
<td>0.8-1.2 g/kg noncatabolic, no dialysis</td>
<td>50-60% of calories</td>
<td>2-3 grams may need to increase to replace losses from diuresis</td>
<td>2-3 grams may need to increase to replace losses from diuresis</td>
<td>8-15 mg/kg needs may increase with CRRT, daily dialysis, or return of kidney function</td>
<td>monitor serum levels for need to supplement**</td>
<td>urine output plus 500 mL</td>
</tr>
<tr>
<td>60 yr old or more</td>
<td>30-35 kcal/kg</td>
<td>0.75-1.0 g/kg</td>
<td>50-60% of calories</td>
<td>2 grams depending on comorbid conditions</td>
<td>no restriction, may need to increase to replace losses from diuresis</td>
<td>monitor and restrict if serum levels are more than 4.6</td>
<td>1.2-1.5 g/d maintain low-normal serum level**</td>
<td>no restriction</td>
</tr>
<tr>
<td>less than 60 yr old</td>
<td>35 kcal/kg</td>
<td>1.2-1.5 g/kg/d during stress</td>
<td>20-30 grams fiber</td>
<td>2 grams depending on comorbid conditions</td>
<td>no restriction unless serum level is high</td>
<td>800-1000 mg/d or 10-15 mg/g protein</td>
<td>do not exceed 2000 mg/d, maintain low-normal serum level**</td>
<td>urine output plus 1000 mL</td>
</tr>
<tr>
<td>Chronic Kidney Disease Stages I, II, III</td>
<td></td>
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<td>Chronic Kidney Disease Stage IV</td>
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### Table 3G-1 continued

<table>
<thead>
<tr>
<th>Therapy</th>
<th>Energy</th>
<th>Protein</th>
<th>Carbohydrate</th>
<th>Sodium</th>
<th>Potassium</th>
<th>Phosphorus</th>
<th>Calcium</th>
<th>Fluid</th>
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</thead>
<tbody>
<tr>
<td><strong>Chronic Kidney Disease Stage V</strong></td>
<td></td>
<td></td>
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<tr>
<td><strong>Hemodialysis</strong></td>
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<td></td>
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<td></td>
<td>urine output plus 1000mL</td>
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<tr>
<td>30-35 kcal/kg 60 yr old or more or obese</td>
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<td></td>
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<tr>
<td>35 kcal/kg less than 60 yr old</td>
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<td><strong>Chronic Kidney Disease Stage V</strong></td>
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<tr>
<td><strong>Peritoneal Dialysis</strong></td>
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<tr>
<td>30-35kcals/kg allow for calories from dialysate solution</td>
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<td></td>
<td></td>
<td></td>
<td>1-3 liters/day maintain fluid balance</td>
</tr>
<tr>
<td><strong>Chronic Kidney Disease Stage V</strong></td>
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<tr>
<td><strong>Transplant</strong></td>
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<td></td>
<td></td>
<td></td>
<td>no restriction unless fluid overload</td>
</tr>
<tr>
<td>30-35kcals/kg</td>
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<td></td>
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</tbody>
</table>

**Note.** 1Source: A clinical guide to nutrition care in kidney disease (2004) Bickford & Schatz, p. 37; Fedje & Karalis, p. 24; Biesecker & Stuart, p. 46; McCann, p. 64; Cochran & Kent, p. 75.

**Stage I** - GFR>90 with CKD risk factors
**Stage II** - GFR 60-89
**Stage III** - GFR 30
**Stage IV** - GFR 29-15
**Stage V** - GFR<15

**GFR** - Glomerular Filtration Rate
**CRRT** - Continuous Renal Replacement Therapy
**DBW** - Desirable Body Weight
**DRI** - Dietary Reference Intake
**HBV** - High Biological Value

**Serum total calcium should be corrected for hypoalbuminemia**
Chronic Kidney Disease (Stages I-IV)

Background

The National Kidney and Urologic Diseases Information Clearinghouse (NKUDIC) states the prevalence of chronic kidney disease (CKD) in the United States is about 11.5 percent, which means an estimated 25 million adults have chronic kidney disease. Diabetes and hypertension cause two-thirds of all cases of chronic kidney disease (NKUDIC, 2010).

Chronic kidney disease is classified into stages based on the glomerular filtration rate (GFR):

- Stage I is a GFR greater than 90 with other risk factors
- Stage II is a GFR 60 to 89
- Stage III is a GFR 30 to 59
- Stage IV is a GFR 15 to 29.

As GFR declines, the nutrition care changes. Monitoring of lab work and nutrition status will be more frequent. Table 3G-1 lists nutrient needs based on the stage of the disease and the type of therapy. Anorexia is very common in advanced stages of CKD increasing risk of malnutrition and impaired functioning (Fedje & Karalis, 2004, p.21-26).

Glossary

*Glomerular filtration rate* is a measure of kidney function based on the amount of filtrate formed per minute based on the total surface area available for filtration (DiBenedetto Barba & Goode, 2004, p.13). GFR is estimated from serum creatinine in combination with age, sex, and race factors. The calculator is available at many web sites including www.kidney.org/kls/professionals/gfr_calcMain.cfm

*Chronic Kidney Disease Mineral and Bone Disorder (CKD-MBD)* refers to bone disease resulting from CKD. When the kidneys lose the ability to activate Vitamin D, this decreases calcium absorption, increases phosphorus retention and secondary elevated parathyroid hormone (PTH), and promotes calcium release from the bone (DiBenedetto Barba & Goode, 2002, p.15-16).

Objectives

The primary medical nutrition therapy goals in managing CKD are to

- prevent protein calorie malnutrition,
- minimize uremic toxicity,
- control underlying conditions,
- delay the progression of kidney disease, and
- prevent secondary hyperparathyroidism and metabolic acidosis.

Nutrition Care

*Nutrition Assessment*

Gather baseline data including labs and medical history.
Section 3G: Kidney Disease

Evaluate diet history and knowledge.
Determine functional ability and exercise capacity.
Evaluate psychosocial and economic issues as well as skill level (Wiggins, 2002, p.6-7).

Nutrition Intervention

Establish health care team goals.

Guidelines for nutrition care of renal patients recommends that people
with CKD receive an initial consult with a follow up at one month and
then quarterly (Wiggins, 2002. p.5). Medicare Part B provides MNT
benefits for people with kidney disease with a GFR less than 50 who
are not on dialysis. (This includes CKD Stages III, IV, and V.)

Refer to Table 3G-1 for specific diet guidelines related to the stage of
kidney disease and treatment type.

Control diabetes and hypertension, the most common underlying
conditions, using carbohydrate and sodium control. Encourage weight
control.

Develop a meal plan with a moderate protein restriction and adequate
calories both to preserve kidney function and decrease uremic
symptoms. Extreme protein restrictions are not supported by research
evidence and increase the risk of inducing malnutrition.

Implement potassium restriction as needed based on assessment of
labwork and medications.

To prevent CKD-MBD, monitor labwork for bone disease indicators in
all stages of CKD. Phosphorous levels are usually normal in Stages I,
II, and III. Dietary phosphorous restriction and phosphate binders are
the main interventions needed in Stages IV and V. For 1,25 dihydroxy
Vitamin D needs monitor PTH levels and calculate the serum ion
calcium x phosphorous product, which should be 55 or less.

Base sodium modification on blood pressure, fluid balance, and
requirements of other conditions such as congestive heart failure.

Base fluid restriction on assessment of each individual's degree of
fluid retention and urinary output.

In the more advanced stages of CKD, advice use of a prescription
vitamin formulation designed for people with kidney disease. These
include vitamin B complex and vitamin C. Individualize zinc and iron
supplementation. As discussed previously, active Vitamin D (1,25
Dihydroxy) supplementation should be based on lab values and
treatment of bone disease. Studies do not support routine
supplementation of other fat soluble vitamins. Over the counter
multivitamin and mineral preparations should be avoided (Fedje &

Nutritional 25-Hydroxy Vitamin D (25 (OH)) should be monitored and
corrected using treatment recommendations for the general population.
(KDIGO)
**Nutrition Monitoring**

Monitor the nutrition status of people with a GFR less than 20 every 1 to 3 months.

In Stage IV prepare the person for renal replacement therapy options (Fedje & Karalis, 2004, p.26).

Monitor labs (Wiggins, 2002, p.6-7).

**Cross References**

- Section 3G: End Stage Kidney Disease (Stage V)
- Section 4B: Carbohydrate Controlled Diet
- Section 4G: Sodium Controlled Diet
- Section 4I: Kidney Disease Diet

**References**


**More Information**


Section 3G: Kidney Disease

*Kidney Disease Quality Outcomes Initiative (K/DOQI): Clinical Practice Guidelines.*

Section 3G: Kidney Disease

End Stage Kidney Disease (Stage V)

Background

Stage V CKD, termed end stage kidney disease, occurs when the GFR is less than 15, or
is greater than 15, but requires renal replacement therapy. Replacement therapy includes hemodialysis, peritoneal dialysis, and kidney transplant. According to the NKUDIC over 392,000 people in the United States are being treated for end stage kidney disease in 2001 at a cost of $22.8 billion (NKUDIC, 2004).

Glossary

**Dialysate** refers to a solution of water and electrolytes that is used to remove excess fluids and wastes from the blood during dialysis by osmosis and diffusion.

**Dialysis** is the removal of waste products and excess fluid from the body through diffusion and ultra filtration.

**Hemodialysis (HD)** uses a machine to filter blood through a semi-permeable membrane outside the body. The blood travels in and out of the body through a surgically placed access. Typically hemodialysis is performed three times per week for an average of 4 hours per treatment.

**Peritoneal dialysis (PD)** uses the membrane of the peritoneum as a filter. Dialysate is infused into and then removed from the peritoneal cavity through a surgically placed access.

Usually HD is performed in ambulatory care centers by specially trained staff three times per week for an average of four hours per session. More options are becoming available however including home hemodialysis, nocturnal hemodialysis, and short daily hemodialysis.

Nocturnal HD provides two to three times more dialysis time since it is performed for six to ten hours on 3 to 6 nights each week. The benefits include less restrictive diet, decreased blood pressure medications, decreased hospitalizations and total hospital days; as well as reported improved quality of life. There are a growing number of centers in the country that offer nocturnal HD. Currently Medicare only pays for three hemodialysis treatments per week (McPhatter, 2004, p. 233-235). Short, daily nocturnal HD is performed for two to three hours per treatment on 5 to 7 nights per week and provides benefits similar to nocturnal HD.

Home HD has been an option since 1960, but availability has been limited by the size of the equipment, water treatment systems, and shortage of trained personnel. Recent advancements in technology have produced smaller, more portable equipment and more centers train patients and care givers to perform home hemodialysis themselves. Their care is monitored at monthly check-ups with the physician.

Two common types of PD are continuous ambulatory peritoneal dialysis (CAPD) and continuous cyclic peritoneal dialysis (CCPD). With CAPD, dialysate is instilled into the peritoneum manually and left to dwell for four to six hours before being drained and this process repeated four to five times each day. With CCPD a machine called a cycler instills and drains the dialysate in more rapid intervals over eight to twelve hours at night.
The continuous therapy that PD provides, compared to standard hemodialysis, promotes better fluid and electrolyte balance. Fewer dietary restrictions are needed but the therapy itself leads to other issues. PD can cause potassium depletion, increased protein losses, feelings of fullness, and decreased gastrointestinal transit time.

Kidney transplant therapy is limited by the availability of donors. Based on Organ Procurement and Transplantation Network (OPTN) data as of August 2010, more than 85,000 people in the United States are awaiting a kidney transplant and an additional 2100 are on the waiting list for combined kidney and pancreas transplant. The average waiting time for a kidney transplant can be 2-5 years and 10 months to 2 years for a kidney and pancreas.

The transplant dietitian’s nutrition assessment and nutrition diagnoses are part of the transplant team’s evaluation of the candidate’s eligibility for receiving a transplant. The dialysis facility dietitian may assist in addressing nutrition concerns of the candidate.

**Objectives**

The medical nutrition therapy objectives in end stage kidney disease depend on the therapy option the person and physician decide to pursue. When dialysis or transplant are either not appropriate or not desired, the team’s goals are palliative care, to optimize comfort and well-being.

The medical nutrition therapy goals of dialysis (Wiggins, 2002, p.21) are to
- minimize the effects of uremia,
- maintain good nutrition status,
- maintain electrolyte balance, and
- prevent or reduce fluid accumulation.

The nutrition goals of the transplant team depend on the phase of care. The pre-transplant goals are to
- achieve the goals of the current therapy,
- optimize nutrition status, and
- address body weight criteria for transplant surgery (guidelines vary a little between facilities but typically a BMI of 22 to 30 has shown the best survival).

During the acute phase (up to eight weeks after transplant) the metabolic stress of surgery and higher doses of immunosuppressive agents determine nutrition needs. The acute phase goals are to
- maintain protein stores,
- promote healing,
- prevent infection, and
- normalize electrolyte levels.

In the last, or chronic phase the goals are (Wiggins, 2002, p.73) to
- achieve and maintain good overall nutrition,
- prevent or minimize effects of immunosuppressive therapy including
  - hyperlipidemia,
  - obesity,
  - hypertension,
  - glucose intolerance or diabetes, and

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- bone disease.

Nutrition Care

Refer to Table 3G-1 for specific diet guidelines for each type of renal replacement therapy. Individualize further for other co-morbid conditions.

**Nutrition Assessment (dialysis)**

Obtain an accurately measured height since it is necessary for calculating the adequacy of dialysis. Stated height is frequently inaccurate due to loss of stature from bone mineral loss.

Estimated dry weight to use to calculate needs. Estimated dry weight for HD is defined as the weight after a treatment (DiBenedetto Barba & Goode, 2004, p. 9).

Anticipate the presence of malnutrition as it is common among people with advanced kidney disease.

Use Subjective Global Assessment (SGA), a nutrition screening tool based on medical history and physical exam. It is a valid and clinically useful measure of protein calorie nutrition in dialysis patients (DiBenedetto Barba & Goode, 2004, p12-13.).

Assess for the possibility for pica, a practice which involves intense craving for and eating of non-food items such as clay, ashes, ice and laundry starch. The behavior is often kept secret. The chelating action and the potassium and phosphorus content of some of the material commonly consumed results in higher risk in CKD.

**Nutrition Intervention (dialysis)**

*Guidelines for nutrition care of renal patients* (2002, p. 19) recommends an initial consult with dialysis patients within one month of initiation of treatment, then a follow up each month and a more extensive quarterly update. People receiving dialysis through an outpatient facility will be followed by the facility renal dietitian on an ongoing basis.

Use a variety of strategies to address malnutrition.

Provide more protein due to increased metabolism, acidosis, and losses with dialysis. Protein needs for PD are higher due to greater losses in dialysate and may be very high if peritonitis occurs.

Limit total fat to less than 30 percent of calories and saturated fat less than 10 percent due to increased risk of abnormal lipid metabolism. In peritoneal dialysis simple sugars and saturated fat should be limited due to increased risk of cardiovascular disease.

Calculations of dietary energy needs must account for the calories from the peritoneal dialysate solutions, which can be considerable. (See Table 3G-2.) Use the following simple equation for estimating calories absorbed in PD (McCann, 2004, p. 62):
Calories absorbed = glucose infused (in gm) x 3.4 calories/gram dextrose x 60%

<table>
<thead>
<tr>
<th>Dextrose concentration</th>
<th>Grams dextrose</th>
<th>Factor</th>
<th>Calories absorbed per liter</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.5%</td>
<td>15</td>
<td>3.4 x 0.6</td>
<td>31</td>
</tr>
<tr>
<td>2.4%</td>
<td>25</td>
<td>3.4 x 0.6</td>
<td>51</td>
</tr>
<tr>
<td>4.25%</td>
<td>42.5</td>
<td>3.4 x 0.6</td>
<td>86.7</td>
</tr>
</tbody>
</table>

Hemodialysis patients must limit sodium and fluid intake so interdialytic weight gain (weight gained between HD treatments) is no more than 2 to 5 percent of dry weight or about 5 to 6 pounds. Sodium and fluid goals are also based on residual function (urine output) and blood pressure.

In contrast, with PD, severe restrictions are unnecessary. Fluid balance is maintained by adjusting the dextrose concentration of the dialysate. If the diet is excessive in fluid or sodium, a higher dextrose solution may be used to correct the fluid balance up to a point. Prolonged use of high dextrose dialysate has drawbacks that are discussed later.

Prevent serum potassium from increasing to dangerous levels between hemodialysis treatments. Potassium allowance is related to both residual function and dietary intake. With peritoneal dialysis, potassium is easily removed and can actually be low, requiring increased dietary intake or a supplement.

Control serum phosphorus by dietary restriction of high phosphorus/low protein foods and appropriate use of phosphorus binders. Since protein rich foods are also rich in phosphorous, increased protein needs make phosphorus restriction difficult.

Provide an active form of 1,25 Dihydroxy Vitamin D (calcitriol). This therapy is used to suppress PTH, increase calcium absorption, and delay the progression of CKD-MBD (Knapp & Liftman, 2004, p.195). Nutritional 25-Hydroxy Vitamin D (25 (OH)) should be monitored and corrected using treatment recommendations for the general population. (KDIGO)

Total calcium intake, including calcium from phosphate binders, should be limited to 2000 milligrams per day. In some cases low serum calcium develops and can be treated with supplemental calcium. The combined calcium load of diet, dialysis, and binders increases the risk of soft tissue calcifications. (Knapp & Liftman, 2004, p. 202 )

Encourage compliance with taking disease specific renal micronutrient supplements. These preparations were developed to address needs related to impaired metabolism, altered urine losses, restricted diet sources, and losses in dialysate. Vitamins include vitamin B complex and vitamin C. Individualize zinc and iron supplementation. Studies do not support routine supplementation of fat soluble vitamins other than vitamin D. Over the counter multivitamin and mineral preparations
Section 3G: Kidney Disease

should be avoided (Smith & Garney, 2004, p. 192).

**Nutrition Monitoring (dialysis)**

Evaluate the adequacy of HD treatment on a monthly basis to ensure optimal treatment since morbidity and mortality is correlated with the delivered dose of dialysis. There are two clinical measures of adequacy derived urea kinetic modeling (a mathematical description of the generation and clearance of urea):

- **Urea Reduction Ratio (URR)** is the measure of the change in urea concentration between pre and post dialysis blood tests. It should be greater than 65.
- **Kt/V** is a calculation performed by the laboratory that takes into consideration urea clearance, patient size, and treatment time. It should be greater than 1.2 in HD.

Evaluate the adequacy of PD at least every four months. Kt/V can also be calculated for PD and weekly Kt/V should be 2 to 2.2 (DiBenedetto Barba & Goode, 2004, p.14).

**Total Creatinine Clearance (CrCl)** in liters per week is another accepted tool to measure adequacy in PD. CrCl should be at least 60 liters per week (Wiggins, 2002, p.21). These calculations can help detect patient compliance as well changes in the peritoneum’s transport characteristics (Wiggins, 2004, p.120).

### Table 3G-3: Desired outcomes for dialysis therapy²

<table>
<thead>
<tr>
<th>Measure</th>
<th>Normal Range (varies by lab)</th>
<th>Goal with Dialysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>BUN (mg/dl)</td>
<td>6 to 20</td>
<td>60 to 80</td>
</tr>
<tr>
<td>Creatinine (mg/dl)</td>
<td>0.4 to 1.1</td>
<td>2 to 15</td>
</tr>
<tr>
<td>(stabilize)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Albumin (gm/dl)</td>
<td>3.2 to 5.2</td>
<td>greater than 4</td>
</tr>
<tr>
<td>Potassium (mEq/L)</td>
<td>3.3 to 5.1</td>
<td>3.5 to 5.5</td>
</tr>
<tr>
<td>Phosphorus (mg/dl)</td>
<td>2.7 to 4.5</td>
<td>3.5 to 5.5</td>
</tr>
<tr>
<td>Calcium (mg/dl)</td>
<td>8.4 to 10.2</td>
<td>8.4 to 9.5</td>
</tr>
<tr>
<td>Calcium x phosphorus product</td>
<td>multiply serum values of both components</td>
<td>less than 55</td>
</tr>
<tr>
<td>Parathyroid hormone (PTH) (pg/dl)</td>
<td>10 to 65</td>
<td>2-9 x upper limit of normal</td>
</tr>
<tr>
<td><em>Intact PTH</em></td>
<td></td>
<td>~ 150-600</td>
</tr>
<tr>
<td>Hematocrit (%)</td>
<td>37 to 47</td>
<td>33 to 36</td>
</tr>
<tr>
<td>Hemoglobin (gm/dl)</td>
<td>11.5 to 16.5</td>
<td>11.0 to 12.0</td>
</tr>
<tr>
<td>Ferritin (ng/dl)</td>
<td>15 to 150</td>
<td>100 to 800</td>
</tr>
<tr>
<td>Transferrin saturation (%)</td>
<td>9 to 71</td>
<td>a20 to 50</td>
</tr>
</tbody>
</table>

*KDIGO
Monitor labs monthly for adherence to care plans or to make needed diet adjustments. Refer to Table 3G-3 for desired outcomes. In HD, monitor dry weight and fluid balance by reviewing interdialytic weight changes. Evaluate fluid balance and weight in PD by reviewing recorded daily weights. Monitor the response to medications that are often used to treat common conditions associated with CKD. (See Table 3G-4.) Evaluate dietary alternatives to use of high dextrose dialysate in PD, since it can lead to increased blood glucose, higher triglycerides, and insulin resistance. Furthermore, chronic use can damage the peritoneum (McCann, 2004, p. 67).

Table 3G-4: Medications commonly prescribed in chronic kidney disease

<table>
<thead>
<tr>
<th>Medical condition</th>
<th>Drug</th>
<th>Nutrition implications</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Anemia</strong></td>
<td><strong>Erythropoietin</strong></td>
<td>May increase appetite and need for iron, folic acid, and Vitamin B₁₂.</td>
</tr>
<tr>
<td></td>
<td>- darbepoeitin alfa (Aranesp)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- epoetin alfa (Epogen, Procrit)</td>
<td></td>
</tr>
<tr>
<td><strong>Iron preparations</strong></td>
<td>Oral</td>
<td>Oral commonly causes constipation. Avoid taking oral iron at the same time as phosphate binders and calcium. IV iron is often needed with hemodialysis.</td>
</tr>
<tr>
<td></td>
<td>Intravenous</td>
<td></td>
</tr>
<tr>
<td><strong>Anorexia</strong></td>
<td><strong>Appetite stimulants</strong></td>
<td>Tachycardia, nervous system effects. Constipation or diarrhea, dyspepsia, nausea, and vomiting, hyperglycemia.</td>
</tr>
<tr>
<td></td>
<td>- dronabinol (Marinol)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- megestrol (Megace)</td>
<td></td>
</tr>
<tr>
<td><strong>Hyperkalemia</strong></td>
<td><strong>Potassium-removing resins</strong></td>
<td>Diarrhea is common. May see stomach irritation, anorexia, nausea, vomiting and constipation with high doses. May cause sodium retention.</td>
</tr>
<tr>
<td></td>
<td>- sodium polystyrene sulfonate (Kayexalate)</td>
<td></td>
</tr>
<tr>
<td><strong>Renal osteodystrophy</strong></td>
<td><strong>Phosphate binders</strong></td>
<td>Must be taken with meals and snacks. Use aluminum binders for only one month. Potential for hypercalcemia. Limit total calcium from binders to 1500 mg/day. May cause constipation. Magnesium binders are mildly laxative. Magnesium is removed by dialysis, but overload can occur. Sevelamer may increase calcium absorption if used with calcium salts. Potential lanthanum accumulation</td>
</tr>
<tr>
<td></td>
<td>- aluminum hydroxide (Amphojel)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- calcium salts</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Calcium Acetate (Phoslo)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Calcium Carbonate</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- magnesium carbonate (Magnebind)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- sevelamer hydrochloride (Renagel/Renvela)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Lanthanum Carbonate (Fosrenol)</td>
<td></td>
</tr>
<tr>
<td><strong>Vitamin D preparations</strong></td>
<td>Oral or Intravenous</td>
<td>Monitor for hypercalcemia and vitamin D toxicities. Do not give if these are present. Mineral oil and cholestyramine may impair absorption of the oral forms. May cause constipation, nausea or vomiting.</td>
</tr>
<tr>
<td></td>
<td>- paricalcitol (Zemplar)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- doxercalciferol (Hectorol)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- calcitriol (Calcijex/Rocaltrol/Generic)</td>
<td></td>
</tr>
<tr>
<td><strong>Calcimetics</strong></td>
<td>- cinacalcet HCL (Sensipar)</td>
<td>Monitor the calcium and phosphorus ion product</td>
</tr>
</tbody>
</table>

Note. ³Source: Smith & Garney, 2004, pp. 176-177, p. 186, pp. 189-190. KDIGO
Kidney Transplant


The main areas of concern (Blue, 2002, p. 44-57) in assessing each candidate's eligibility for kidney transplant include:

- **Weight status.** Severe overweight and underweight increase risk of post-transplant complications. Transplant centers may have weight criteria which can make a candidate ineligible for transplant.
- **Blood glucose control.** Hgb A1C is used as a measure of compliance with diet and/or medication regimens. Demonstration of improved compliance may be required prior to transplant since side effects of corticosteroids and calcineurin inhibitors in the post-transplant phase include the development or worsening of high blood glucose.
- **Lipid history.** Hyperlipidemia is common in CKD. Restricting fats along with the other dietary restrictions needed for CKD/dialysis may be too burdensome. Use of lipid lowering medications may be more appropriate before transplant.
- **Phosphorus.** High serum phosphorus levels are common in CKD Stages 4 and 5, though after transplant low serum phosphorous levels are common due to hyperparathyroidism. (PTH excretion remains high for some time even after normal kidney function has been established.) Effective control of hyperparathyroidism prior to transplant reduces post-transplant problems with low phosphorous levels.
- **Potassium.** Potassium restriction is generally not needed after a successful kidney transplant. Calcineurin inhibitors can cause retention of potassium. Potassium restriction may be needed until the dosage of calcineurin inhibitors can be reduced.
- **Fluid control.** Fluids are usually not restricted with successful kidney transplant. However, a history of noncompliance with fluid restriction and/or missed or shortened dialysis treatments may make a candidate ineligible. Demonstration of improved compliance may be required prior to transplant.

**Nutrition Intervention (transplant)**

Prior to transplant, the dialysis center dietitian can assist the transplant center dietitian with reaching weight goals or improving glucose, lipid, phosphorous, potassium and fluid control to meet transplant criteria. *Guidelines for nutrition care of renal patients* recommends an initial consult with transplant patients during the acute phase (within 72 hours of surgery) and as needed until discharge from the hospital (Wiggins, 2002, p.73).

During the acute post-transplant phase the transplant dietitian provides care to manage common post-surgical complications and educates in
the appropriate diet to reduce these complications (Cochran & Kent, 2004, p. 75; Blue, 2002, p. 44-57) including
- high blood glucose,
- gastrointestinal distress,
- low phosphorous levels,
- low magnesium levels, and
- high potassium levels.
Except for high phosphorous, all can be caused by immunosuppressive drugs.
Treat low phosphorous levels with a high phosphorus diet. Intravenous or oral supplementation may also be required.
Low magnesium is a dose-related effect of calcineurin inhibitors.
Provide oral supplements as needed.
Adjust dietary potassium levels based on labs until calcineurin inhibitor dosage can be reduced.
Treat high blood pressure and certain sodium and fluid imbalances with sodium restriction. Calcineurin inhibitors can raise blood pressure and corticosteroids can cause fluid retention.
Encourage fluid intake. Fluid restriction is not needed.
Address chronic post-transplant nutrition concerns related to
- preexisting conditions and
- complications from maintenance immunosuppressive drug therapy.
Develop individualized care plans with each person. In general, advise a diet similar to the healthy population. The most common side effects of long term immunosuppressive therapy are high blood glucose and lipid abnormalities.
Treat blood glucose aggressively with medication and tailored diet and exercise programs.
Control lipids with diet, exercise and medication regimens.
General multivitamins may be used, although studies have shown vitamin A is elevated in CKD and can be high for as long as three years post transplant (Cochran & Kent, 2004, p. 79-80; Blue, 2002, p. 44-57).

**Nutrition Monitoring (transplant)**

During the chronic post-transplant phase the transplant dietitian continues to provide care. Nutrition intervention is recommended at 1-2 months post surgery, at six months post surgery, and as needed after that (Wiggins, 2002, p. 73).
Evaluate labs to assess adherence to diet and treatment plans or to make needed diet adjustments.
Maintain stable glucose control, acceptable lipid levels, a reasonable weight, and appropriate blood pressure control (Wiggins, 2002, p. 76-77).
Monitor the condition of bones. Use of calcium, vitamin D, calcitriol/alfacalcidol or bisphosphonate drugs to may be necessary to
Section 3G: Kidney Disease

control bone loss.
Monitor for other long term side effects of immunosuppressive therapy.

| Table 3G-5: Nutrition implications of maintenance immunosuppressive drugs
<table>
<thead>
<tr>
<th>Drug</th>
<th>Nutrition implications/Common side effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>-azathiaprine (Imuran)</td>
<td>More frequent infections, delayed healing, mouth ulcers, folate deficiency, and diarrhea, nausea, vomiting, and anorexia.</td>
</tr>
<tr>
<td><strong>Calcineurin inhibitors</strong></td>
<td>Hyperglycemia, hypertension, high potassium and low magnesium levels, diarrhea, anorexia, nausea, and vomiting. With CsA also monitor for hyperlipidemia and overgrowth of gum tissue. With tacrolimus avoid use of grapefruit or grapefruit juice and raw or undercooked shellfish.</td>
</tr>
<tr>
<td>-cyclosporine A, CsA (Sandimmune, Neoral)</td>
<td>Hyperglycemia, hypertension, high potassium and low magnesium levels, diarrhea, anorexia, nausea, and vomiting.</td>
</tr>
<tr>
<td>-tacrolimus (Prograf, FK506)</td>
<td>Hyperglycemia, hypertension, high potassium and low magnesium levels, diarrhea, anorexia, nausea, and vomiting.</td>
</tr>
<tr>
<td><strong>Corticosteroids</strong></td>
<td>Hyperglycemia, hyperlipidemia, sodium retention, protein catabolism, cushingoid features, increased appetite, gastrointestinal ulcers, nausea and vomiting.</td>
</tr>
<tr>
<td>-prednisone</td>
<td>Constipation, diarrhea, abdominal pain, nausea, and vomiting, heartburn.</td>
</tr>
<tr>
<td>-prednisolone</td>
<td>Constipation, diarrhea, abdominal pain, nausea, and vomiting, heartburn.</td>
</tr>
<tr>
<td>-Solumedrol</td>
<td>Constipation, diarrhea, abdominal pain, nausea, and vomiting, heartburn.</td>
</tr>
<tr>
<td>-mycophenolate mofetil (CellCept)</td>
<td>Constipation, diarrhea, abdominal pain, nausea, and vomiting, heartburn.</td>
</tr>
<tr>
<td>-sirolimus (Rapamycin, Rapamune)</td>
<td>Hyperlipidemia, low potassium levels, delayed wound healing, nausea and vomiting, swelling of hands and feet. Avoid use of St. John’s Wort, grapefruit or grapefruit juice, and raw or undercooked shellfish.</td>
</tr>
</tbody>
</table>

Note. *Sources: Cochran & Kent, 2004, pp. 72-74; United Network for Organ Sharing, 2010

Cross References

Section 4B: Carbohydrate Controlled Diet
Section 4G: Sodium Controlled Diet
Section 4I: Kidney Disease Diet

References


Section 3G: Kidney Disease

More Information


Kidney School, a program of the Medical Education Institute, Inc., is an interactive web based learning program available at www.kidneyschool.org

The National Kidney Foundation www.kidney.org

Find further information on transplantation on the Organ Procurement and Transplantation Network Website at http://www.OPTN.org

Home Dialysis Central Web Site. Medical Education Institute, Inc. Madison, WI. www.homedialysis.org
Iron Deficiency Anemia

Background

Iron deficiency develops slowly. It usually starts with inadequate dietary iron intake. In time, iron stores decrease. Iron deficiency anemia occurs when stored iron is deficient and blood levels of iron cannot meet the person's daily iron needs. Iron deficiency anemia may result from poor intake of iron rich foods and foods that promote iron absorption, malabsorption of iron (as a result of diarrhea, loss of part or all of the stomach, decreased stomach acid, gastric bypass surgeries, or damage or surgery to the duodenum), blood loss (the most common reason for anemia in the elderly), periods of rapid growth (pregnancy, infancy, childhood, and adolescence) closely repeated pregnancies, chronic disease (kidney disease, arthritis, Celiac, Crohn's, and cancer), or drug interactions with tetracycline, pancreaticin, cholestyramine, antacids, cimetadine (Tagamet®), or ranitidine (Zantac®).

Signs of iron deficiency anemia include feeling tired and weak, decreased work and school performance, slow cognitive and social development during childhood, difficulty maintaining body temperature, decreased immune function, which increases susceptibility to infection, and glossitis (an inflamed tongue) (Office of Dietary Supplements, 2007, p.5)

Objectives

The medical goal is to find the underlying cause of the anemia and to treat and correct the iron deficiency. The medical nutrition therapy objectives are to support the use of iron supplements when prescribed, optimize dietary iron intake and absorption, and prevent inadequate intakes of iron rich foods and foods that promote iron absorption

Nutrition Care

Nutrition Assessment

Complete a thorough diet history.
Assess for pica (consuming nonfood items—ice, clay, plaster, paint chips) or eating food items to excess such as hard candy, lettuce, celery, chips, chocolate or ice. Pica generally will disappear when the deficiency is corrected.
Assess for coffee and tea consumption.
Determine amount of fiber consumed.
Use of iron fortified cereals.
Intake of vitamin/mineral supplements.
Evaluate laboratory values—serum iron, total iron binding capacity (TIBC), transferrin, transferring saturation, reticulocyte count, folic acid, vitamin B₁₂, copper, zinc, ceruloplasma, and complete blood count (CBC).

**Nutrition Intervention**
Oral iron supplements are the preferred treatment. *Elemental iron* is the term used for the amount of available iron that a supplement contains (Office of Dietary Supplements, 2007, p.7).
Iron supplements are available in two forms
- Ferric salts
- Ferrous salts
  - Ferrous fumarate: Femiron, Feostat, Fumerin, Hemocyte, Ircon
  - Ferrous gluconate: Fergon, Ferryt, Simron
  - Slow release ferrous sulfate: Slow Fe

Ferrous iron is the best absorbed.
Iron supplements are usually prescribed to be taken two to three times per day. It is often better tolerated when taken with meals.
Enteric coated or delayed-release versions have fewer side effects, but are not absorbed as well, and are usually not recommended.
Supplements may cause a change in stool color to green, tarry, or black.
Provide reassurance this is harmless.
Calcium from supplements and dairy foods may inhibit iron absorption.
If zinc is recommended while taking an iron supplement, it is best to consume with food for improved absorption of both.
Antacids reduce iron absorption, so take them at another time.
Iron supplements reduce the effectiveness of other drugs (such as tetracycline, penicillamine, ciprofloxacin, methyldopa, levodopa, and carbidopa); therefore, take iron supplements and these drugs two hours apart (Escott-Stump, 2002, p. 501).
If oral supplementation fails, then intravenous iron dextran may be needed when there is
- uncontrolled blood loss,
- intolerance to oral iron tablets,
- failure to take oral supplements as prescribed, or
- intestinal malabsorption (Beutler, Hoffbrand, & Cook, 2003, p.24)

Provide a diet that will ensure adequate iron intake (See Table 3H-1) The Adequate Intake (AI) of iron for infants 0 – 6 months is 0.27 mg per day. It is based on the amount of iron in breast milk. (Office of Dietary Supplements, 2007, p. 3).
The typical American diet provides about 5-7mg of iron per 1000 calories. People should avoid intakes greater than 200mg of iron (from supplements and food combined) since the body can produce no more than 5-10mg of hemoglobin per day (Escott-Stump, 2002, p. 501).
Section 3H: Malnutrition

The adequacy of dietary iron intake depends on the degree of iron absorption. Only 10% of the iron in the average American diet is absorbed. Table 3H-2 compares the two types of dietary iron: heme and nonheme. Both types of iron are better absorbed when iron stores are low.

Table 3H-1: Recommended Dietary Allowances for Iron

<table>
<thead>
<tr>
<th>Age</th>
<th>Males (milligrams/day)</th>
<th>Females (milligrams/day)</th>
<th>Pregnancy (milligrams/day)</th>
<th>Lactation (milligrams/day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>7-12 months</td>
<td>11</td>
<td>11</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>1-3 years</td>
<td>7</td>
<td>7</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>4-8 years</td>
<td>10</td>
<td>10</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>9-13 years</td>
<td>8</td>
<td>8</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>14-18 years</td>
<td>11</td>
<td>15</td>
<td>27</td>
<td>10</td>
</tr>
<tr>
<td>19-50 years</td>
<td>8</td>
<td>18</td>
<td>27</td>
<td>9</td>
</tr>
<tr>
<td>51+ years</td>
<td>8</td>
<td>8</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Note: Source: Office of Dietary Supplements, 2007, p.3.

Table 3H-2: comparison of the two forms of dietary iron

<table>
<thead>
<tr>
<th>Food Sources</th>
<th>Heme Iron</th>
<th>Nonheme Iron</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>50-60% of iron in meat, poultry and fish</td>
<td>40-60% of iron in meat, poultry and fish</td>
</tr>
<tr>
<td></td>
<td>Eggs, cheese, and milk</td>
<td>Eggs, cheese, and milk</td>
</tr>
<tr>
<td></td>
<td>Nuts, seeds, dry beans and peas</td>
<td>Nuts, seeds, dry beans and peas</td>
</tr>
<tr>
<td>absorbs?</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Percent absorbed</td>
<td>15-35%</td>
<td>2-3% when eaten alone 8-20% when eaten with foods that increase absorption</td>
</tr>
<tr>
<td>Diet factors increasing absorption</td>
<td>N/A</td>
<td>Sources of vitamin C-cantalope, citrus fruit, strawberries, broccoli, raw cabbage, peppers, potatoes tomatoes Sources of hem iron-meat, poultry and fish</td>
</tr>
<tr>
<td>Diet factors decreasing absorption</td>
<td>N/A</td>
<td>Calcium in dairy products &amp; supplements EDTA a food preservative Oxalic acid in spinach, Swiss Chard, berries and chocolate Phosvitin in eggs Phytates in legumes, beans, and whole grains Tannins in coffee, tea, and red wine</td>
</tr>
</tbody>
</table>

**Nutrition Monitoring**

Evaluate diet intake for the iron content and factors that affect iron absorption.

Review laboratory values. Especially reticulocyte count, hemoglobin, and ferritin

Monitor for side effects of iron supplements and make appropriate recommendations

Iron toxicity can occur because very little iron is excreted. Both dietary iron and recycling of iron in the body maintain iron stores. Bleeding is the main form of iron loss. It is especially important to protect children from excessive iron intake. Advise caregivers to keep iron supplements tightly capped and out of reach of children at all times. A child can die from consuming 200mg of iron (Office of Dietary Supplements, 2007, p.9). In 2001, the Institute of Medicine of the National Academy of Sciences set Upper Tolerable Limits for iron intakes for healthy people (See Table 3H-3) A physician may prescribe higher intakes when iron levels are deficient.

**Table 3H-3: Upper tolerable limits of iron**

<table>
<thead>
<tr>
<th>Age</th>
<th>Males (milligrams/day)</th>
<th>Females (milligrams/day)</th>
<th>Pregnancy (milligrams/day)</th>
<th>Lactation (milligrams/day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>7-12 months</td>
<td>40</td>
<td>40</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>1-13 years</td>
<td>40</td>
<td>40</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>14-18 years</td>
<td>45</td>
<td>45</td>
<td>45</td>
<td>45</td>
</tr>
<tr>
<td>19+years</td>
<td>45</td>
<td>45</td>
<td>45</td>
<td>45</td>
</tr>
</tbody>
</table>


**References**


Section 3H: Malnutrition

Folic Acid Deficiency Anemia

Background

Folic acid/folate is one of the B vitamins. It is needed to produce and maintain new cells. This is especially important during times of rapid cell growth and division such as in pregnancy and childhood. Folate is needed for DNA and RNA. Children and adults need folate to make normal red blood cells and to prevent anemia. Folate is also needed to maintain normal levels of the amino acid homocysteine. (Office Dietary Supplements, 2009, p.1)

Folic acid/folate deficiency has many causes:

Inadequate intake of naturally occurring food folate and foods fortified with folic acid.

Deficiency of vitamin B12 which prevents an inactive form of folic acid from becoming a usable form.

Conditions that increase folic acid needs such as

- pregnancy,
- diseases that promote rapid cell growth such as leukemia, or
- hemolytic anemias such as sickle cell.

Conditions that impair absorption or increase loss of folic acid such as

- alcoholism, since alcohol interferes with absorption as well as increased urinary loss of folic acid,
- celiac disease,
- Crohn's disease,
- hemodialysis therapy, and
- loss of the jejunum

Medications that interfere with how the body uses folic acid including

- anticonvulsants (such as dilantin, phenytoin and primidone),
- metformin or glucophage (used to treat type 2 diabetes),
- sulfasalazine (treatment for ulcerative colitis and Crohn's disease),
- triamterene (diuretic),
- methotrexate (used for cancer and rheumatoid arthritis), and
- barbiturates (sedatives) (Office of Dietary Supplements, 2009, p4)

Symptoms of folic acid/folate deficiency are often subtle.

- Diarrhea
- Loss of appetite
- Weight loss
- Sore tongue
- Headaches
- Irritability
- Forgetfulness
- Behavioral disorders
- Heart palpitations

Slowed growth rate in children
Greater risk for low birth weight, premature and/or neural tube defects in babies born to folate deficient mothers
Increased risk for cardiovascular disease
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It is important to remember that many of these symptoms are very subtle and may be caused by other medical conditions. A physician needs to evaluate the symptoms for appropriate medical care.

**Glossary**

*Folate* is a water soluble B vitamin that occurs naturally in food

*Folic acid* is the form used in supplements and fortified foods

*Dietary Folate Equivalents (DFE)* was developed to help account for the differences in the absorption of naturally occurring dietary folate and the synthetic folic acid.

1 DFE = 1 µg (microgram) food folate = 0.6 µg folic acid from supplements and fortified foods (Office of Dietary Supplements, 2009, pp 1 & 3.

**Objectives**

The medical goal is to replete folic acid stores. The medical nutrition therapy goals are to ensure adequate intake of dietary and supplement forms of folic acid and provide adequate intake of nutrients to promote red blood cell production.

**Nutrition Care**

*Nutrition Assessment*

- Assess the medical history and medications to identify conditions associated with folic acid deficiency or increased need for folic acid.
- Assess intake of food sources of folate.
- Calculate intake of folic acid from supplements and fortified foods.
- Assess laboratory values such as folic acid, vitamin B\textsubscript{12}, and complete blood count (CBC).
- Assess intakes for calories, protein, vitamin B\textsubscript{12}, folic acid, iron and copper.
- Evaluate eating habits, food preparation and storage practices that may promote loss of folic acid. Remember folic acid is a water soluble and heat sensitive vitamin.

*Nutrition Intervention*

- Provide adequate sources of food folate and fortified foods.
- Folic acid supplementation may be necessary.
- Folic acid requirements for infants from birth to 12 months is based on the folic acid content of breast milk. The Adequate Intakes are
  - Infants 0 – 6 months of age require 65 micrograms
  - Infants 7 – 12 months of age require 80 micrograms
Table 3H-4: Recommended Dietary Allowance for folic acid (micrograms of DFE per day)

<table>
<thead>
<tr>
<th>Ages (years)</th>
<th>Males &amp; Females (micrograms per day)</th>
<th>Pregnancy (micrograms per day)</th>
<th>Lactation (micrograms per day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 - 3</td>
<td>150</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>4 - 8</td>
<td>200</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>9 - 13</td>
<td>300</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>14 - 18</td>
<td>400</td>
<td>600</td>
<td>500</td>
</tr>
<tr>
<td>19+</td>
<td>400</td>
<td>600</td>
<td>500</td>
</tr>
</tbody>
</table>

Source: Office of Dietary Supplements, 2009, p.3

Food sources of folate are green leafy vegetables, citrus fruits, dried beans, dried peas, whole grain breads and cereals, and liver. Whole grain products are a significant, natural source of folate. Since 1998 enriched flour, bread, rolls, farina, corn grits, cornmeal, rice, and pasta products are fortified with folic acid. One serving provides 10 percent of daily folic acid needs. (Kurtzweil, 1999, p. 3). The body easily absorbs folic acid from supplements and fortified foods.

Provide a vitamin C source with meals. Vitamin C promotes absorption of folic acid.

Encourage drinking of remaining milk from breakfast cereal. The water soluble folic acid from the cereal will dissolve in the milk. Include tender crisp cooked vegetables or raw vegetables since heat from cooking destroys folic acid.

Those patients 50+ years should have vitamin B_{12} levels checked before taking a folic acid supplement. Consider recommending a supplement that contains both folic acid and vitamin B_{12}.

**Nutrition Monitoring**

Folic acid supplements can replete folic acid stores in two to three weeks. Symptoms may improve in as little as two to three days. (Kasdan, 2000, p.795).

There is no danger from consuming large amounts of food folate. However, folic acid from supplements and fortified foods should be limited to 1000 micrograms per day as not to trigger symptoms of vitamin B_{12} deficiency.

Table 3H-5: Tolerable Upper Limits for folic acid

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>Males &amp; Females (micrograms per day)</th>
<th>Pregnancy (micrograms per day)</th>
<th>Lactation (micrograms per day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 - 3</td>
<td>300</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>4 - 8</td>
<td>400</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>9 - 13</td>
<td>600</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>14 - 18</td>
<td>800</td>
<td>800</td>
<td>800</td>
</tr>
<tr>
<td>19+</td>
<td>1000</td>
<td>1000</td>
<td>1000</td>
</tr>
</tbody>
</table>

Source: Office of Dietary Supplements, 2009, p.6
Section 3H: Malnutrition

Cross References

Section 4G: Folate and Folic Acid Rich Foods
Section 4G: Vitamin C Rich Foods

References


Pernicious Anemia & Vitamin B$_{12}$ Deficiency Anemia

Background

Vitamin B$_{12}$ cannot be absorbed unless it is first separated from its carrier protein by stomach acid, and afterwards linked to intrinsic factor. Vitamin B$_{12}$ deficiency related to inadequate dietary intake is rare. Problems with absorption are the principle causes of the deficiency. With the advent of folic acid fortification in 1998, vitamin B$_{12}$ deficiency has become a more common cause of anemia, especially among the elderly. (Carmel, Green, Rosenblat, & Watkins, 2003, p.2)

Vitamin B$_{12}$ is needed for the formation of red blood cells, neurological function, and DNA synthesis. It is also used as a co-factor in several metabolic processes.

Glossary

**Cobalamin** is another name for vitamin B$_{12}$.

**Extrinsic factor** is the term for the vitamin B$_{12}$ part of the protein complex that is needed for absorption of the vitamin.

**Intrinsic factor** is the term for the protein produced in the stomach that is essential for vitamin B$_{12}$ to be absorbed.

**Pernicious anemia** is an autoimmune disease that affects the gastric mucosa. The stomach then is unable to produce gastric intrinsic factor.

**Vitamin B$_{12}$ deficiency anemia** is the result of vitamin B$_{12}$ deficiency (extrinsic factor) that results from poor intake or malabsorption.

Vitamin B$_{12}$ deficiency anemia can be caused by

- inadequate vitamin B$_{12}$ intake, such as long term adherence to a vegan diet,
- masking of vitamin B$_{12}$ deficiency by folic acid supplementation,
- malabsorption related to pancreatic insufficiency, loss of part or all of the stomach including stomach surgery for treating obesity, and loss of or damage to the ileum,
- celiac or Crohn's diseases,
- use of the drug metformin/glucophage for diabetes, or taking 500mg or more of vitamin C with a meal or up to one hour after a meal, which destroys or decreases the availability of vitamin B$_{12}$ (Groff & Gropper, 2000m p.299).

The symptoms of vitamin B$_{12}$ deficiency include

- fatigue, weakness,
- constipation, loss of appetite, weight loss,
- numbness and tingling in the hands and feet,
- depression, confusion, dementia, poor memory, and soreness of the mouth and tongue.

The neurological symptoms of vitamin B$_{12}$ deficiency can occur without anemia, so early diagnosis and intervention is important to avoid irreversible damage. (Office of Dietary Supplements, 2010, page 4)
Some medications can interfere with vitamin B₁₂ absorption.

- **Chloramphenicol**—possible interference with red blood cell response to supplemental vitamin B₁₂.

- **Proton pump inhibitors (Prilosec® and Prevacid®)**—interferes with food absorption due to decreased gastric acid. Evidence is conflicting. However, healthcare providers should monitor vitamin B₁₂ status in patients on proton pump inhibitors for prolonged periods of time.

- **Histamine H₂ receptors antagonists (Zantac® and Previcid®)**—deficiency may be more likely in those with inadequate vitamin B₁₂ stores, and the medication has been used for more than two years.

- **Metformin/glucophage**—a possible risk of vitamin B₁₂ deficiency. It has been suggested that supplemental calcium might help improve the vitamin B₁₂ malabsorption caused by metformin. However, not all researchers agree (Office of Dietary Supplements, 2010, pp.7-8).

### Objectives

The medical goal is to find the underlying cause of the anemia and to reverse the anemia. The medical nutrition therapy goals are:

- Correction of the deficiency and maintaining remission by ensuring adequate intake or provision of vitamin B₁₂ and
- Providing adequate intake of other nutrients needed for red blood cell production.

### Nutrition Care

**Nutrition Assessment**

- Review the medical history and medication use to identify possible conditions associated with deficiency or malabsorption of vitamin B₁₂.
- Complete a diet history. Especially important to include food sources, fortified foods, and supplements of vitamin B₁₂.
- Evaluate amount of folic acid/folate intake from diet, fortified foods, and supplements.
- Assess the need for supplements of iron, vitamin C, folic acid, and copper (Kasdan, 2000, p.792).
- Determine if other signs and symptoms of deficiency, such as sore mouth or tongue that would impair chewing and swallowing, or loss of balance or fatigue that would make meal preparation difficult.

**Nutrition Intervention**

The medical treatment for vitamin B₁₂ deficiency is large doses of supplemental vitamin B₁₂. These may be given orally unless the cause is inadequate intrinsic factor. In that case, intramuscular injections or a nasal spray (Nascobol®) must be used.
Table 3H-6: Recommended Dietary Allowance for vitamin B\textsubscript{12}

<table>
<thead>
<tr>
<th>Age</th>
<th>Males &amp; Females (micrograms per day)</th>
<th>Pregnancy (micrograms per day)</th>
<th>Lactation (micrograms per day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Birth – 6 months</td>
<td>0.4</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>7 – 12 months</td>
<td>0.5</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>1 – 3 years</td>
<td>0.9</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>4 – 8 years</td>
<td>1.2</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>9 – 13 years</td>
<td>1.8</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>14+ years</td>
<td>2.4</td>
<td>2.6</td>
<td>2.8</td>
</tr>
</tbody>
</table>


Tolerable Upper Intake level: maximum daily intake unlikely to cause adverse health effects.

Provide a diet with adequate vitamin B\textsubscript{12} (See above table).

The Institute of Medicine recommends adults 50+ should obtain most of their vitamin B\textsubscript{12} from vitamin supplements or fortified foods.

Most nutritional yeasts are not a reliable source of vitamin B\textsubscript{12}.

Fortified breakfast cereals are one of the few sources of vitamin B\textsubscript{12} from plants and can be used as a dietary source of vitamin B\textsubscript{12} for strict vegetarians and vegans.

To maintain remission of pernicious anemia, vitamin B\textsubscript{12} supplements usually continue throughout life. Any neurological damage that has occurred will not be reversed.

Food sources of vitamin B\textsubscript{12} are

- meat, poultry, fish and shellfish (especially clams and oysters),
- egg yolk,
- milk and milk products, and
- foods fortified with vitamin B\textsubscript{12} such as breakfast cereal, and other foods.

If needed, provide 1.5 grams of protein per kilogram of body weight (Kasdan, 2000, p.792).

Cross References

Section 4I: High Protein Diet
Section 4J: Vegetarian Diet

References


Section 3H: Malnutrition


Protein-Calorie Malnutrition

Background

Malnutrition is so common that it is often not recognized. Many times the symptoms of malnutrition mimic disease symptoms. Malnutrition affects physical, emotional, psychological, and social aspects of the individual. Ancel Keys (1950) in his classic work on *The Biology of Human Starvation* demonstrated the profound effect of severe and prolonged dietary restriction on human physical and psychological systems. Emotional and personality changes including mood swings, irritability, anger, anxiety, and apathy occurred. Garner (1997) confirmed this observation in clients with documented eating disorders.

The proteins of the body are functional, so the loss of body protein means a loss of body function. Protein is present in the muscles, organs, antibodies, enzymes, and hormones. The body does not store protein. During times of injury or illness, as well as during starvation, protein is broken down to glucose to provide energy. This loss of protein leads to loss of lean body mass, muscle weakness, reduced strength, poor motor control, increased risk for fall and fractures, loss of function, and a reduced overall quality of life (IOM, 2000; Jensen & Hsiao, 2010).

With the loss of body muscle and weight, there is an overall slowing of the body's physiological processes (Zamboni 2008). Body temperature, heart rate, respiration, and basal metabolic rate (BMR) decrease. Other physical changes associated with malnutrition include GI tract discomfort, dizziness and headaches, depression, hysteria, hypochondria, hypersensitivity to noise and light, swelling, hair loss, cold hands and feet, inability to focus, eye aches, and "spots" in front of the eyes, ringing in the ears, abnormal tingling or prickling sensations, especially in the hands or feet, impaired concentration, alertness, comprehension, and judgment. (Keys 1950; Garner 1997)

Glossary

Cachexia is involuntary loss of body cell mass or fat free mass without or with little weight loss. This wasting results from metabolic stress, e.g., cytokine-induced malnutrition.

Fasting or total fasting is the exclusion of all food energy; usually hydration is maintained.

Protein-calorie malnutrition (or protein-energy malnutrition) results when a person does not eat enough protein and/or food energy to meet the body's needs. Inadequate food intake leads to poor growth in children and to weight loss and wasting in adults.

Sarcopenia is a syndrome characterized by progressive and generalized loss of skeletal muscle mass, muscle strength, and low physical performance in older persons.

Semi-starvation is another term for inadequate intake, and assumes some food is being consumed (50 percent or less of nutrition needs are met).

Starvation is a physiologic condition that develops when the intake of protein, calories, or both is inadequate. It is sometimes confused with fasting.

Short-term starvation refers to inadequate intake for 1 to 7 days.

Long-term starvation refers to a prolonged inadequate intake (for more than 7 days).

Wasting is involuntary weight loss.
Diagnosis of Malnutrition

Numerous definitions for adult malnutrition syndromes are found in medical and nutrition literature. There are fourteen (14) ICD-9 Codes for the medical diagnostic categories of malnutrition (Hart, 2003). The majority of these are derived from pediatric values and applied to the adult (Jenson 2009).

Malnutrition due to compromised protein intake alone is very unusual. In the clinical setting, chronic inflammation in addition to malnutrition erodes body cell mass and contributes to muscle loss and loss of function. The inflammatory state increases nutrient requirements. –Disease related malnutrition” is when a decrease in body cell mass is associated with functional impairment in the presence of persistent inflammation (Jenson 2009). Underlying micronutrient deficiencies are most likely present and should be corrected.

An International Guideline Committee (Jenson 2010) proposes nomenclature for nutrition diagnosis in adults in the clinical setting. The proposed nomenclature for adult malnutrition in the clinical setting are

“Starvation-related malnutrition”- chronic starvation without inflammation e.g. anorexia nervosa; treat with appropriate nutrition intervention,

”Acute disease or injury related malnutrition”- inflammation is acute and of severe degree e.g. major infection, burns, trauma or closed head injury; treatment includes intensive nutritional intervention while condition is medically managed, and

–Chronic disease related malnutrition‖-inflammation is chronic and of mild to moderate degree, e.g. organ failure, rheumatoid arthritis, sacropenic obesity; treatment includes nutrition support while condition is medically managed

Objectives

Nutrition is the key intervention in the treatment of malnutrition. Adequate nutrition along with aggressive physical therapy and exercise programs is needed to support protein synthesis, improve muscle function, and the person’s quality of life. Corrective intervention is a team effort among all members of the health care team.

The physician's role is to

prevent further effects of malnutrition,
diagnoses the type of malnutrition present, and
medically manage the underlying disease process (Jensen 2010).

The medical nutrition therapy objectives are to

to establish an eating plan to correct malnutrition,
to monitor compliance with and effectiveness of the care plan, and
to identify creative ways to ensure ongoing compliance with nutrition rehabilitation (ADA 2011).
The physical therapist role is to 
enhance muscle development, and 
enhance muscle strength and performance (Cruz-Jentoff 2010).

Nutrition Care

**Nutrition Assessment**

The nutrition assessment provides fundamental data for making a nutrition diagnosis of malnutrition. Factors to include are
- anthropometric measurements,
- biochemical lab values,
- clinical exam, and
- diet history

**Nutrition Intervention**

Medical nutrition therapy needs to be individualized to address the cause and type of malnutrition.

It should provide adequate amounts of energy and protein along with vitamins and minerals to correct underlying micronutrient deficiencies. Adequate provision of protein is essential to support growth, and repair and maintenance of body tissues.

The current Dietary Reference Intake (DRI) for protein may not be sufficient for elderly people. Research among elderly women showed that those who ate a diet with 0.4 grams protein per kilogram of body weight lost body cell mass, while a group receiving 0.8 grams protein per kilogram maintained body cell mass.

The Health ABC cohort suggests approximately 15% to 20% of total calorie intake as protein (or 1.5 gm/kg/day) to maximize muscle protein synthesis. Energy intake needs to be enough to prevent protein from being used as a fuel source (Kinney 2004; Beasley 2010).

The method of nutrient delivery may be a regular diet, high calorie or high protein diet. Sometimes tube feeding or parenteral nutrition based on the medical status of the patient.

**Nutrition Monitoring and Evaluation**

In an inpatient setting (Speters 2009)
- Monitor weight; if underweight, the goal is to gain one pound per week.
- Monitor daily food intake to ensure that enough energy, protein, fat, micronutrients are consumed.
- Evaluate physical therapy interventions to assess improvement in muscle strength, endurance and function
- Monitor the primary clinical measurements used to make the nutrition diagnosis

In an out patient setting
Section 3H: Malnutrition

- Monitoring of nutrition is more subtle because changes appear slowly over time. It may take more than 24 months for a person to recover from malnutrition. Some indirect outcomes to consider are morbidity, infection rates, re-admission rates, drug utilization, number of physician and nurse visits, quality of life, performed activities during daily living, mental and emotional health, family and social interaction, and patient’s self-assessment.

### Table 3H-7: Medical diagnostic categories of malnutrition

<table>
<thead>
<tr>
<th>ICD-9 Codes</th>
<th>Description</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>260</td>
<td>kwashiorkor</td>
<td>nutritional edema with dyspigmentation of the skin and hair</td>
</tr>
<tr>
<td>261</td>
<td>marasmus</td>
<td>nutritional atrophy, severe calorie deficiency, severe malnutrition not-otherwise specified</td>
</tr>
<tr>
<td>262</td>
<td>other protein-calorie malnutrition</td>
<td>nutritional edema without mention of dyspigmentation of hair and skin</td>
</tr>
<tr>
<td>263</td>
<td>malnutrition of moderate degree</td>
<td>weight-for-age 60% to &lt;75% of standard</td>
</tr>
<tr>
<td>263.1</td>
<td>malnutrition of mild degree</td>
<td>weight-for-age 75% to &lt;90% of standard</td>
</tr>
<tr>
<td>263.2</td>
<td>arrested development following protein-calorie malnutrition; nutritional dwarfism; physical retardation due to malnutrition</td>
<td></td>
</tr>
<tr>
<td>263.8</td>
<td>other protein-calorie malnutrition</td>
<td></td>
</tr>
<tr>
<td>263.9</td>
<td>unspecified protein-calorie malnutrition; dystrophy due to malnutrition; excludes nutritional deficiency 269.9</td>
<td></td>
</tr>
<tr>
<td>269.2</td>
<td>unspecified nutritional deficiency</td>
<td></td>
</tr>
<tr>
<td>783.1</td>
<td>abnormal weight gain</td>
<td></td>
</tr>
<tr>
<td>783.2</td>
<td>abnormal loss of weight; and underweight</td>
<td></td>
</tr>
<tr>
<td>783.3</td>
<td>feeding difficulties and mismanagement</td>
<td></td>
</tr>
<tr>
<td>783.7</td>
<td>adult failure to thrive</td>
<td></td>
</tr>
<tr>
<td>783.9</td>
<td>other symptoms concerning nutrition, metabolism, and development</td>
<td>excludes abnormal BMR (794.7), dehydration (276.5), electrolyte and acid-base balance (276.0 to 276.9)</td>
</tr>
</tbody>
</table>


**Cross References**

Section 3I: Nutrition Support  
Section 4A: High Calorie Diet
Section 3H: Malnutrition

Section 4H: High Protein Diet

References


Parenteral Nutrition Support

The information contained in this section provides guidelines for the care of **ADULTS**. For infants or children requiring parenteral nutrition support, contact a healthcare professional certified in pediatric nutrition support.

**Background**

Parenteral nutrition is given intravenously into either a central vein or peripheral vein. Types of parenteral nutrition (PN) are named by the access route, which is not defined by the point of entry into the vascular system, but rather by the position of the distal catheter tip (Krzywda, 2001, p.228). When parenteral nutrition is given in a central vein, it is referred to as total parenteral nutrition (TPN), central parenteral nutrition (CPN), or central venous nutrition (CVN). Parenteral nutrition given into a peripheral vein is called peripheral parenteral nutrition (PPN). The terms hyperalimentation or hyperalimentation feeding (HAF) are no longer routinely used.

The Society of Critical Care Medicine (SCCM) and American Society for Parenteral and Enteral Nutrition (A.S.P.E.N.) (2009) suggests the following indications for the use of parenteral nutrition for patients who cannot consume adequate calories, protein and other nutrients orally, if EN is not appropriate and evidence of protein-calorie malnutrition is present (usually defined by recent weight loss of >10%-15% or actual body weight <90% of ideal body weight), when the gastrointestinal tract is nonfunctional or cannot be accessed, or for patients with inadequate oral intake for 7 to 14 days, or in those patients in whom inadequate oral intake is expected for more than a 7 to 14 day period.

In addition, patients must be hemodynamically stable and be able to tolerate the fluid, carbohydrates, protein, and lipid doses to provide adequate nutrition. The use of parenteral nutrition maybe beneficial in these conditions (American Dietetic Association [ADA], 2010)

- prolonged nausea, vomiting, diarrhea, and abdominal distention,
- cancer treatments that cause the above symptoms for more than one week,
- critically ill patients with hypermetabolism that is expected to last more than four to five days and who do not tolerate tube feeding,
- severely malnourished patients with impaired gastrointestinal tracts,
- conditions that prevent the use of the gastrointestinal tract for more than seven to ten days, and
- failed tube feeding due to high gastric residuals, pulmonary aspiration, or inability to achieve enteral access.

Examples of medical conditions that have warranted the use of parenteral nutrition includes (ADA, 2010)

- short bowel syndrome,
- congenital bowel disease with atresia or malformations,
- acute inflammatory bowel disease,
Section 3I: Nutrition Support

enterocutaneous and enteroenteric fistulas,
malabsorptive disorders (AIDS with cryptosporidiosis, diarrheal disorders, and radiation enteritis),
hemodynamically stable, critically ill patients with paralytic ileus, acute GI bleeding, or complete bowel obstruction,
intestinal dysmotility,
severe, acute necrotizing pancreatitis,
perioperative support of patients with upper GI cancer, and allogenic bone marrow transplantation.

Parenteral nutrition may be contraindicated in the following situations:
presence of a normal, functioning digestive tract ("If the gut works: Use it!")
and
terminal illnesses or conditions that do not warrant aggressive medical treatment.

TPN is infused via central venous access—the catheter tip is in the distal vena cava or right atrium. The most common sites for venipuncture are the subclavian, jugular, femoral, cephalic and basilic veins. It is also administered through peripherally inserted central venous catheters (PICCs) whose tips lie in a central vein. This route is not limited by drug pH, osmolarity, or volume. TPN can provide complete nutrition needs for weeks to years. It may be prescribed when patients are severely malnourished or unable to use the digestive tract for adequate nutrition. It may be used in hospitals, nursing homes, rehab facilities, assisted living facilities, or in the home.

PPN is infused via peripheral venous access—the catheter tip is in a peripheral vein in the arm. The most common complication is thrombophlebitis resulting from irritation from the PPN. These vessels do not tolerate concentrations greater than 900 milliosmoles per liter, so nutrient concentrations must be lower to achieve this goal. The duration of peripheral access is also limited to less than two weeks. PPN usually does not provide total calorie and protein needs and is not appropriate in those who require a fluid restriction, since the solution must be dilute. It may be appropriate when oral intake provides an inadequate amount of calories and protein, and in cases of mild to moderate malnutrition.

Glossary

**Refeeding syndrome** is the metabolic and physiologic consequence of the depletion, repletion, compartmental shifts, and interrelationships fluid and electrolytes (phosphorus, potassium, magnesium, glucose, vitamins) in severely malnourished patients undergoing refeeding that can occur with all routes of nutrition (Katzman 2005).

The nutrition components of PN solutions include macronutrients: carbohydrate, amino acids and lipid; and micronutrients: vitamins, electrolytes and trace elements. Some medications may also be added. PN is mixed in two forms: a 2-in-1 admixture or a 3-in-1 admixture. The 2-in-1 admixture combines the amino acids and the carbohydrate with other additives such as electrolytes, vitamins, and trace elements. The lipid emulsion is infused through another line joined to the main IV tube ("piggybacked") and administered continuously or intermittently. The 3-in-1 admixture, also termed total
nutrient admixture (TNA), combines the lipid emulsion with the solution of amino acids, carbohydrate, and other additives.

Dextrose is the most common form of carbohydrate used. It has 3.4 calories per gram and comes in concentrations of 2.5% to 70%. The osmolarity depends on the concentration. Concentrations of 10% or greater are reserved for CPN solutions to prevent inflammation of smaller veins. The sugar alcohol, glycerol, is used infrequently as a carbohydrate source. It has 4.3 calories per gram. Glycerol is protein sparing and may induce a smaller insulin response than dextrose based mixtures.

Crystalline amino acids provide the equivalent of protein. They have 4 calories per gram with concentrations ranging from 3% to 20%. Standard mixtures provide essential and nonessential amino acids however amino acid formulas for specific metabolic disorders (such as hepatic encephalopathy or renal failure) are available. The amino acids may also contain electrolytes and/or buffers.

Fat in the form of a lipid emulsion contributes both calories and essential fatty acids. Lipids have 9 calories per gram. Lipid emulsions are available in 10% (1.1 calorie per mL), 20% (2 calorie per mL) and 30% (3 calories per mL) concentrations. Lipids should not exceed 60% of total calories. The only approved lipid concentration for triple nutrient mixtures is 30%. Lipid emulsions are primarily soybean oil or combinations of safflower and soybean oils. The emulsions may also include egg yolk phospholipids (as emulsifiers), glycerin (to make it isotonic), vitamin K, and sodium hydroxide (to adjust the pH).

Electrolytes are added at therapeutic or maintenance levels based on individual needs. Refer to Table 3I-2 for recommendations for electrolyte requirements. The electrolytes (Clarian Health, pp. 18-19) are

- sodium chloride, acetate or phosphate; fluid balance determines needs,
- potassium chloride, acetate or phosphate; it maintains cell volume, pH, enzyme function, protein synthesis, and cell growth; include assessment of kidney function in determining needs,
- chloride versus acetate depends on the acid-base status; when all electrolytes are given as chloride, acidosis is common,
- acetate is used when metabolic acidosis is present,
- phosphorus is an intracellular anion needed for cellular metabolism,
- calcium, added as gluconate, is an extracellular cation that regulates neuromuscular and enzyme functions, and
- magnesium, added as sulfate, is a cofactor in the metabolism of carbohydrate and protein.

### Table 3I-2: Daily requirements for electrolytes

<table>
<thead>
<tr>
<th>Electrolyte</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sodium</td>
<td>1-2 mEq/kg</td>
</tr>
<tr>
<td>Potassium</td>
<td>1-2 mEq/kg</td>
</tr>
<tr>
<td>Chloride</td>
<td>As needed to maintain acid-base balance with acetate.</td>
</tr>
<tr>
<td>Calcium</td>
<td>10-15 mEq</td>
</tr>
<tr>
<td>Magnesium</td>
<td>8-20 mEq</td>
</tr>
<tr>
<td>Phosphorus</td>
<td>20-40 mmol</td>
</tr>
</tbody>
</table>

Section 3I: Nutrition Support

Fat-soluble and water-soluble vitamins may be given separately or with the PN solution. The intravenous multivitamins typically include A, C, D, E, K, thiamin, riboflavin, niacin, folic acid, pyridoxine, pantothenic acid, biotin, and cyanocobalamin. Refer to Table 3I-3 for recommended levels.

Trace elements are zinc, copper, chromium, manganese, and selenium. These are available as single products or in combinations. Others that may be added include molybdenum, iodine, and iron. Iron is only available as a single product. Refer to Table 3I-4 for requirements for trace elements.

Table 3I-3: Daily requirements for vitamins

<table>
<thead>
<tr>
<th>Vitamins</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thiamin (vitamin B₁)</td>
<td>6 milligrams</td>
</tr>
<tr>
<td>Riboflavin (vitamin B₂)</td>
<td>3.6 milligrams</td>
</tr>
<tr>
<td>Niacin (vitamin B₃)</td>
<td>40 milligrams</td>
</tr>
<tr>
<td>Folic Acid</td>
<td>600 micrograms</td>
</tr>
<tr>
<td>Pantothenic acid</td>
<td>15 milligrams</td>
</tr>
<tr>
<td>Vitamin B₆ (pyridoxine)</td>
<td>6 milligrams</td>
</tr>
<tr>
<td>Vitamin B₁₂ (cyanocobalamin)</td>
<td>5 micrograms</td>
</tr>
<tr>
<td>Biotin</td>
<td>60 micrograms</td>
</tr>
<tr>
<td>Choline</td>
<td>Not defined</td>
</tr>
<tr>
<td>Ascorbic acid (vitamin C)</td>
<td>200 milligrams</td>
</tr>
<tr>
<td>Vitamin A</td>
<td>3300 IU</td>
</tr>
<tr>
<td>Vitamin D</td>
<td>200 IU</td>
</tr>
<tr>
<td>Vitamin E</td>
<td>10 IU</td>
</tr>
<tr>
<td>Vitamin K</td>
<td>150 micrograms</td>
</tr>
</tbody>
</table>


Table 3I-4: Daily requirements for trace elements

<table>
<thead>
<tr>
<th>Trace element</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chromium</td>
<td>10 to 15 micrograms</td>
</tr>
<tr>
<td>Copper</td>
<td>0.3 to 0.5 milligrams</td>
</tr>
<tr>
<td>Fluoride</td>
<td>Not well defined</td>
</tr>
<tr>
<td>Iodine</td>
<td>Not well defined</td>
</tr>
<tr>
<td>Iron</td>
<td>Not routinely added</td>
</tr>
<tr>
<td>Manganese</td>
<td>60 to 100 micrograms</td>
</tr>
<tr>
<td>Molybdenum</td>
<td>Not routinely added</td>
</tr>
<tr>
<td>Selenium</td>
<td>20 to 60 micrograms</td>
</tr>
<tr>
<td>Zinc</td>
<td>2.5 to 5 milligrams</td>
</tr>
</tbody>
</table>


Administration methods of PN may be continuous or cyclic. Cyclic PN is an intermittent infusion that is usually given for 8 to 12 hours during the night. With this method, patients can have 12 to 16 hours when they are free to be more mobile. Continuous PN is infused for 24 hours per day.

Some medications may be prescribed as part of the PN solution. A review of medical literature and manufacturer's information is critical before adding medications to PN to ensure they are compatible. Albumin should not be added as a protein source due to a risk for bacterial and fungal contamination. Medications routinely added to PN (Clarian Health p. 20) include

H₂ antagonists—famotidine, ranitidine, and cimetidine, insulin, and
heparin,

ASPLN has proposed ethical and legal practice guidelines related to use of nutrition support (2010) that include the following:

Legally and ethically, specialized nutrition support should be considered a medical therapy.

Care providers should be familiar with current evidence of the benefits and burdens of specialized nutrition support.

Patients should be encouraged to have living wills and/or advance directives and to discuss with their loved ones their wishes in the event of a serious or terminal accident or disease.

Adult patients or their legally authorized surrogates have the right to accept or to refuse specialized nutrition support.

The benefits and burdens of specialized nutrition support, and the interventions required to deliver it, should be considered before offering this therapy.

Institutions should develop clear policies regarding the withdrawal or withholding of specialized nutrition support and communicate these policies to patients in accordance with the Patient Self-Determination Act.

Objectives

Medical nutrition therapy objectives for the use of parenteral nutrition support include

maintenance or repletion of lean body mass,

improvement in quality of life, and

reduced morbidity and mortality.

Clinical outcomes should include cost and decreased length of hospital stay. Regular evaluations should be made to determine if the treatment objectives are being met and treatment should continue.

Nutrition Care

Nutrition Assessment

Determine if the patient is malnourished or is at risk for malnutrition.

Assess diet history.

Gather anthropometric data including

- height,
- current weight and weight history,
- body mass index, and
- mid-arm circumference and mid-arm muscle circumference.

Complete a physical assessment including

- general appearance,
- hydration status: dry skin and mucous membranes, edema, ascites,
- presence of fat stores,
- bulk and tone of muscles.
Section 3I: Nutrition Support

Review laboratory values, particularly noting electrolyte and acid-base abnormalities.

Obtain a detailed medical history and co-morbid conditions.

Assess risk of refeeding syndrome. High risk conditions (ASPEN, 2009) include
- prolonged fasting such as NPO 7 to 10 days,
- prolonged IV hydration,
- elderly with multiple medical conditions and poor nutrition intake,
- marginal nutrient stores and metabolic stress of disease or medical therapy,
- chronic malnutrition,
- chronic alcoholism,
- anorexia nervosa, or
- morbid obesity with massive weight loss.

Nutrition Intervention

Complete a written summary of protein, calorie, fluid, and micronutrient needs. Base macronutrient needs on the patient's underlying condition. Use Tables 3I-2, 3I-3 and 3I-4 for guidelines for micronutrients.

Confer with the physician about routes and methods of administration, treatment goals, and monitoring parameters.

Reduce the risk of refeeding syndrome (ASPEN, 2009) by
- avoiding overfeeding,
- correcting electrolyte abnormalities before initiating PN,
- monitoring pulse rate,
- monitoring intake and output,
- monitoring electrolyte levels, and
- providing appropriate vitamin supplementation.

Follow these initiation guidelines during the first 24 hours:
- Start with 1 liter or less for 24 hours.
- Use a 10 to 15 percent dextrose solution to help reduce the risk of refeeding syndrome and hyperglycemia.
- Amino acids can usually be given at the goal amount.
- Start lipids if the patient can tolerate the fluid volume and serum triglycerides are less than 400 milligrams per deciliter (4.5 millimoles per liter).
- Provide electrolytes and trace elements (minerals) as indicated by lab values.

After 24 hours, follow these guidelines:
- By the second day, in most cases, advance the infusion to the goal prescription.
- Check hydration status daily.
- Monitor blood and urine glucose. Maintain blood glucose levels as close to normal as possible, keeping the levels to 130 milligrams per deciliter to reduce risk of infections.
Nutrition Monitoring

More frequent monitoring of hemodynamics and metabolic tolerance must be done until the patient's condition is stable. After that, weekly monitoring is sufficient (Zeman, 1998, p. 177). Review the following regularly:

- daily weights for fluid overload until stable in a normal range,
- fever, chills, tachycardia, sudden hyperglycemia, and elevated white count,
- daily blood and urine glucose for hyperglycemia,
- blood urea nitrogen (BUN) for adequacy of hydration, kidney function, and electrolyte balance, and
- liver function tests: ALT, AST, ALK PHOS, LDH, and bilirubin.

Monitor regularly for mechanical and metabolic complications. Refer to Table 31-5 for a list of problems, causes and solutions.

Manage the transitional feeding process from PN to tube feeding or to oral feeding.

- Maintain adequate nutrition intake during this process.
- Start tube feedings at a low rate to establish gastrointestinal tolerance. As the enteral rate is increased, decrease the parenteral rate while adhering to the overall nutrition goal.
- Before resuming oral feedings evaluate chewing and swallowing ability.
- Consider a change from continuous to cyclic PN at night to help improve daytime appetite.
- Provide the patient's preferred foods as an incentive to eat. Use small, frequent feedings or between meal snacks to optimize intake.
- Decrease the rate of the PN when the patient is consuming 500 calories or more each day (Zeman, 1998, p.179).
- Discontinue PN when the tube feeding is about 75% of the goal rate or the patient is consistently eating 75% of nutrient needs.

Monitor the patient's and family members' satisfaction with their care and their attitudes and feelings toward the patient's current level of functioning. Maintaining or improving the patient's quality of life is an important consideration in care planning. Address concerns they have regarding psychosocial issues such as...
Section 3I: Nutrition Support

- Nutrition intervention’s effects on physical functioning, activities of daily living, recreation, fatigue level, and overall health status,
- depression, anxiety, or fear,
- body image changes,
- social interactions, and
- financial concerns.

Table 3I-5: Prevention and treatment of parenteral nutrition problems

<table>
<thead>
<tr>
<th>Problem</th>
<th>Cause</th>
<th>Prevention or solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overhydrated</td>
<td>Excess fluid</td>
<td>-monitor input and output</td>
</tr>
<tr>
<td></td>
<td>Acute or chronic kidney disease</td>
<td>-monitor osmolarity</td>
</tr>
<tr>
<td></td>
<td>Liver failure</td>
<td>-restrict fluids</td>
</tr>
<tr>
<td></td>
<td>Congestive heart failure</td>
<td>-use diuretics and/or dialysis</td>
</tr>
<tr>
<td>Dehydrated</td>
<td>Inadequate fluid intake</td>
<td>-monitor input and output</td>
</tr>
<tr>
<td></td>
<td>Excessive diuresis</td>
<td>-monitor BUN and osmolarity</td>
</tr>
<tr>
<td>High serum sodium</td>
<td>Excessive fluid loss</td>
<td>-monitor input and output</td>
</tr>
<tr>
<td></td>
<td>Osmotic diuresis</td>
<td>-replenish fluids</td>
</tr>
<tr>
<td></td>
<td>Inadequate fluid intake</td>
<td>-monitor BUN and osmolarity</td>
</tr>
<tr>
<td>Low serum sodium</td>
<td>Excessive fluid intake</td>
<td>-restrict fluid intake</td>
</tr>
<tr>
<td></td>
<td>Congestive heart failure</td>
<td>-monitor kidney and heart function</td>
</tr>
<tr>
<td></td>
<td>Cirrhosis with ascites</td>
<td>-monitor input and output</td>
</tr>
<tr>
<td></td>
<td>Persistant nausea and vomiting</td>
<td>-increase sodium, if dehydrated</td>
</tr>
<tr>
<td>High serum potassium</td>
<td>Excessive potassium</td>
<td>-decrease potassium content</td>
</tr>
<tr>
<td></td>
<td>Acute or chronic kidney disease</td>
<td>-medications to decrease potassium</td>
</tr>
<tr>
<td></td>
<td>Acidosis</td>
<td>-monitor drug nutrient interactions</td>
</tr>
<tr>
<td>Low serum potassium</td>
<td>Diuretics</td>
<td>-correct potassium before initiating PN</td>
</tr>
<tr>
<td></td>
<td>Diarrhea</td>
<td>-increase potassium content</td>
</tr>
<tr>
<td></td>
<td>Acute or chronic kidney disease</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Intestinal fistulas</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Inadequate potassium content</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Potassium shift from extracellular to intracellular spaces</td>
<td></td>
</tr>
<tr>
<td>High blood glucose</td>
<td>Rapid infusion of dextrose</td>
<td>-provide insulin</td>
</tr>
<tr>
<td></td>
<td>Sepsis</td>
<td>-decrease total dextrose load</td>
</tr>
<tr>
<td></td>
<td>Pancreatitis</td>
<td>-decrease the rate of infusion</td>
</tr>
<tr>
<td></td>
<td>Use of corticosteroids</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Multiple sources of dextrose (oral and IV)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Diabetes mellitus</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Chemotherapy medications</td>
<td></td>
</tr>
<tr>
<td>Low blood glucose</td>
<td>Too much insulin</td>
<td>-administer dextrose</td>
</tr>
<tr>
<td></td>
<td>Abrupt withdrawal of PN</td>
<td>-monitor glucose</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-taper withdrawal of PN</td>
</tr>
<tr>
<td>High serum calcium</td>
<td>Acute or chronic kidney disease</td>
<td>-use isotonic saline IVs</td>
</tr>
<tr>
<td></td>
<td>Bone cancer</td>
<td>-evaluate vitamin D</td>
</tr>
<tr>
<td></td>
<td>Excessive vitamin D</td>
<td>-increase weight bearing</td>
</tr>
<tr>
<td></td>
<td>Prolonged bedrest</td>
<td>-a product of Calcium (mg/L) x Phosphorous (mM/L) that is</td>
</tr>
</tbody>
</table>
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<table>
<thead>
<tr>
<th>Condition</th>
<th>Causes</th>
<th>Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stress</td>
<td>Sarcoidosis, Milk-alkali syndrome</td>
<td>greater than 150 is incompatible in PN</td>
</tr>
<tr>
<td>Low serum calcium</td>
<td>Low albumin, Blood transfusions cause calcium to bind to citrate</td>
<td>-supplement calcium, -evaluate calcium with albumin and ionized calcium</td>
</tr>
<tr>
<td>High serum magnesium</td>
<td>Acute or chronic kidney disease, Excessive magnesium content</td>
<td>-decrease magnesium, -monitor for trends</td>
</tr>
<tr>
<td>Low serum magnesium</td>
<td>Diuretics, chemotherapy, or other drugs, Alcoholism, Refeeding syndrome, Diarrhea, Diabetic ketoacidosis</td>
<td>-decrease the rate of infusion, -supplement magnesium, -monitor for trends, -monitor drug nutrient interactions</td>
</tr>
<tr>
<td>High serum phosphorus</td>
<td>Acute or chronic kidney disease, Excessive phosphorus content, Low serum calcium</td>
<td>-decrease phosphorus content, -use phosphate binders, -monitor for trends</td>
</tr>
<tr>
<td>Low serum phosphorus</td>
<td>Refeeding syndrome, Alcoholism, Parathyroidism, Insulin therapy, Vitamin D deficiency, Gastrointestinal tract losses, Antacids</td>
<td>-decrease the rate of infusion, -monitor phosphorus, -replace phosphorous, -monitor drug nutrient interactions</td>
</tr>
<tr>
<td>Metabolic bone disease</td>
<td>Excessive protein, Inadequate calcium intake, Chronic acidosis, Cycling schedule, High serum phosphorus, Low serum calcium</td>
<td>-provide adequate calcium and phosphorus, -avoid acidosis, -avoid excessive amino acid (protein) content</td>
</tr>
<tr>
<td>Elevated triglycerides</td>
<td>Lipids infused at more than 4 milligrams/kilogram/minute, Multiorgan failure, Drugs that alter fat metabolism</td>
<td>-decrease lipid volume, -lengthen infusion time, -infuse glucose with lipids, -provide 60% or fewer calories from lipids, -monitor triglycerides, -monitor drug nutrient interactions</td>
</tr>
<tr>
<td>Air embolism</td>
<td>IV tubing disconnected, Injection cap off</td>
<td>-prevent further air intake</td>
</tr>
<tr>
<td>Blood in catheter</td>
<td>Injection cap not attached securely, Cracking of hub, Tear in line</td>
<td>-attach injection cap properly</td>
</tr>
<tr>
<td>Broken tubing inside hub</td>
<td>Crystallized glucose, Excessive twisting of tubing</td>
<td>-clamp catheter before the break, -avoid excessive pressure with hookup or disconnection</td>
</tr>
<tr>
<td>Catheter tear</td>
<td>Scissors, Not taking care when clamping, Pump fails to detect line obstruction</td>
<td>-gently handle catheter</td>
</tr>
<tr>
<td>Catheter clot -accidental disconnect, -unable to heparinize, -catheter damage</td>
<td>Solution not infusing, Solution not heparinized</td>
<td>-daily inspections, -use heparin as prescribed</td>
</tr>
</tbody>
</table>

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Section 3I: Nutrition Support

<table>
<thead>
<tr>
<th>Problem</th>
<th>Cause</th>
<th>Prevention or solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pump or power failure</td>
<td>Malfunction of pump</td>
<td>- regulate infusion by gravity</td>
</tr>
<tr>
<td>- pump broken, unable to start</td>
<td>Loss of power</td>
<td>- check pump following manufacturers recommendations</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- contact power company</td>
</tr>
</tbody>
</table>


Cross References

Section 3I: Tube Feeding

References


Section 3I: Nutrition Support


More Information

The Oley Foundation
214 Hun Memorial, A-28
Albany Medical Center
Albany, NY 12208
(800)-776-OLEY
www.oley.org
This organization serves long term users of enteral or parenteral nutrition support. It fosters support groups, provides information by phone and through a variety of media, and organizes annual conferences.

Tube Feeding

Background

Tube feeding provides nutrition directly to the stomach or the intestines using a flexible tube. The flexible tube's internal circumference is measured in French units. One French is approximately 1/3 millimeter. Nasal and jejunostomy tubes are 8-12 French and gastrostomy tubes are 14-24 French. Placement of catheters or tubes not intended for use as enteral feeding devices, such as urinary or GI drainage tubes, which usually are without an external anchoring device, should be avoided.

Enteral nutrition is a term that refers to either tube feeding or the use of oral supplements to replace or augment oral food intake. Tube feeding is an option when the person has a functional gastrointestinal tract with sufficient length and absorptive capacity and the person cannot eat, will not eat, or cannot eat enough to meet their nutritional needs (American Society For Enteral and Parental Nutrition [ASPEN], 2009, p. 124). For critically ill patients who cannot consume an oral diet, enteral nutrition is recommended rather than parenteral nutrition because the incidence of infectious complications and costs are lower (Bourgault, Ipe, Weaver, Swartz, and O'Dea, 2007, p. 17).

Glossary

**American Society For Parenteral and Enteral Nutrition (ASPEN)** – a group of health professionals who diligently study existing literature, solicit expert opinion based on current knowledge and best practices to formulate enteral practice recommendations updated at least every five years.

**Aspiration** – the inhalation of material, such as nasopharyngeal secretions and bacteria, liquids, food, and gastric contents, into the airway. A risk factor is poor oral care.

**Enteral misconnection** – an inadvertent connection between an enteral feeding system and a non-enteral system, such as an intravascular catheter, peritoneal dialysis catheter, tracheostomy, etc. Reaffirmed in 2005, a voluntary standard for adapters and connectors used in the enteral system are to be incompatible with female luer lock rigid connectors.

Access routes for tube feedings that are commonly used are named for the place in the body where the tube is inserted and for the location of the tube’s outlet.

<table>
<thead>
<tr>
<th>Table 4H-1: Enteral Access Routes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Tube placement</strong></td>
</tr>
<tr>
<td>Nasogastric (NG)</td>
</tr>
<tr>
<td>- (nose to stomach)</td>
</tr>
<tr>
<td>Nasoenteric (ND or NJ)</td>
</tr>
<tr>
<td>- (nose to duodenum or jejunum)</td>
</tr>
<tr>
<td>Orogastric</td>
</tr>
<tr>
<td>- (mouth to stomach)</td>
</tr>
<tr>
<td>Oroenteric</td>
</tr>
<tr>
<td>- (mouth to intestine)</td>
</tr>
</tbody>
</table>
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<table>
<thead>
<tr>
<th>Tube placement</th>
<th>Intended Use</th>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
</table>
| Gastrojejunal (G-J tube)| Long term feeding especially in cases of: | - Bypasses stomach  
 - Less aspiration risk | - Increases probability of diarrhea  
 - Small bore tube, greater chance of clogging |
|                         | - May have double lumen with one tube draining stomach contents and the other for feeding. | | |
| Jejunostomy (J-tube)    | Long term feeding Same as G-J tube) | - Reduces risk that formula will back up into the esophagus | - Same as G-tube |
|                         | -(implanted through abdominal wall below stomach directly into jejunum. | | |

Note: Source ASPEN, 2009

Administration of enteral nutrition should be guided by the person's age, underlying disease, nutrition status and requirements, enteral access device, and condition of the gastrointestinal tract (ASPEN, 2009, p. 149). A combination of methods may be used.

**Bolus feedings** are formula delivered by gravity via a syringe over approximately 15 minutes. Feedings may be initiated with full-strength formula 3-8 times per day, with increases of 60-120 ml every 8-12 hours as tolerated up to the goal volume. The bolus (or the amount given at one feeding) is usually 250 to 400 milliliters. The method is not recommended for intestinal feedings.

**Intermittent feedings** are a specific quantity of formula delivered via a feeding bag over 30-60 minutes with an enteral feeding pump or by gravity drip. They are often used for people who are not critically ill, such as those in long-term care facilities, in home care, or in rehabilitation facilities.

**Pump-assisted feedings** are delivered per enteral feeding pump. They are generally required for small-bowel feedings and preferred for gastric feedings in critically ill patients, as the slower administration rate of continuous feedings often enhances tolerance (ASPEN, 2009, p. 151). Enteral feeding pumps should deliver the prescribed volume within 10% accuracy for adults and within 5% for pediatrics. Feeding pumps should be calibrated periodically to assure accuracy.

- **Continuous feedings** deliver formula at a preset rate over 24 hours or an ordered volume per 24 hours. Frequently formulas are initiated at full strength at 10-40 mL per hour and advanced to the goal rate in increments of 10-20 mL per hour every 8-12 hours as tolerated. For stable, adult patients, feeding can be started at goal rates. (ASPEN, 2009, p. 151). This method is recommended for the critically ill because there is less chance of diarrhea, gastric distension, and aspiration.

- **Cyclic feedings** also use a pump but are given for a shorter time (8 to 16 hours) at a faster rate. They are often used as overnight feedings to promote better oral food intake during the day.
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Commercial tube feeding formulas are grouped into categories based on nutritional content. Differing kinds and amounts of ingredients result in varying nutrient content and nutrient density as well as osmolality. The osmolality of a formula may contribute to some types of tube feeding intolerance since hyperosmolar solutions empty from the stomach more slowly than isotonic ones.

**Glossary**

**Closed enteral system** is considered ready to administer as prepared in a closed enteral container or bag, pre-filled with sterile, liquid formula by the manufacturer.

**Hang Time** is the length of time an enteral formula is considered safe for delivery to the person beginning with the time the formula has either been reconstituted, warmed, decanted, or has had the original package seal broken. Recommended hang times for sterile formula in an open system in an institution is <8 hours and at home <12 hours. Recommended hang time for a sterile formula in a closed system is 24-48 hours per manufacturer’s guidelines. (ASPEN, 2009, p.138)

**Hypertonic** or **hyperosmolar** refers to a solution with osmolality higher than that of our blood. Formulas for oral intake or tube feeding may have osmolality up to about 700 mOsm/kg water.

**Isotonic** refers to a solution with osmolality similar to our blood or about 300 mOsm/kg water.

**Open enteral system** is a system in the clinician/person is required to decant formula into the enteral container or bag.

**Osmolality** is the measure of the oncotic pressure exerted by the concentration of particles in a solution. Formulas with 1.5 calories/mL or more, those that are partially hydrolyzed, and those for oral use have higher osmolality (ADA, 2000, pp. 593-594).

**Water** When additional water is necessary to meet fluid requirements, it is administered intermittently as flushes throughout the day.

- **Distilled** water has been vaporized and recondensed but is not necessarily free of suspended matter and should not be used with medication administration.

- **Purified** or sterile, solute-free water is free of any chemical or microbial contaminants. It should be used when administering medications as minerals in tap water may interact with crushed medication and reduce bioavailability.

- **Tap** or bottled water may be adequate for hydration of immuno-competent persons. It is municipal or locally owned potable water that meets the Environmental Protection Agency's National Primary Drinking Water regulations. (ASPEN, 2009, p133, 149, and 156)

Commercial tube feeding formulas are made by many companies who develop and market therapeutically equivalent products. These products are classified by the U.S. Food and Drug Administration (FDA) as medical foods and are not regulated as either conventional foods or as medications. They are designed to meet energy, protein, fat, and carbohydrate needs in a given volume, with micronutrients provided proportionately. They range in caloric density between 1 and 2 calories per milliliter.
There are a few formulas that can be considered unique and these are for specialized metabolic conditions. It makes economic sense to develop a formulary designed for the needs of each institution's population and purchase fewer products in larger amounts.

**Polymeric formulas** use ingredients that require normal digestion and absorption. Most do not contain lactose or gluten. Characteristics that vary include protein content, caloric density, fiber and residue content, and the osmolality.

**Partially hydrolyzed formulas** (also called defined or elemental) have ingredients that are already partially digested in order to facilitate absorption. As a result they may have higher osmolality than polymeric formulas.

**Disease-specific formulas** have been developed partly in response to clinical nutrition research, but also as a means for companies to compete in the marketplace. They are usually more expensive than conventional formulas, however most lack rigorous scientific evidence to support their claims at this time.

**Administration Considerations (ASPEN, 2009)**

No part of the delivery system, including the formula itself, should come into contact with hands, skin, clothing or any other non-disinfected surface.

Use of disposable gloves is recommended in the administration of enteral nutrition.

Formula decanted from a screw cap is preferable instead of a flip top.

Wipe down can/bottle lids with isopropyl alcohol, allow them to dry, and pour them into containers that can be sealed and clearly labeled with hang time not to exceed 8 hours or 4 hours for a neonate.

Feedings should be given at room temperature.

Elevate the backrest (head of bed) to a minimum of 30°, and preferably to 45°, unless a medical contraindication exists.

A feeding pump with a drip chamber prevents retrograde contamination of the enteral formula from the feeding tube.

When making a reconnection, trace lines back to their origins and ensure they are secure. Identify and confirm the Enteral Nutrition label.

Sterile, liquid enteral formulas should be used in preference to powdered, reconstituted formulas whenever possible.

Store unopened, commercially-available liquid enteral formulas under controlled (dark, dry, cool) conditions.

Maintain a rapid enteral feeding formula inventory turnover well within the product' expiration date.

**Medication practices**

- Do not add medication directly to an enteral feeding formula.
- Avoid mixing together medications intended for administration through an enteral feeding tube.
- Liquid dosage forms should be used when available and if appropriate. Only immediate-release solid dosage forms may be substituted. Grind simple compressed tablets to a fine powder and mix with sterile water.
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- Prior to administering medication, stop the feeding and flush the tube with at least 15 mL water. Use oral syringe to administer medication. Flush the tube with 15 mL water between each medication.

**Objectives**

The medical nutrition therapy objectives with tube feeding are to maintain or improve nutrition status, maintain normal hydration status, assist in transition to oral feeding when possible, and prevent or correct any physical, mechanical, or metabolic complications.

**Nutrition Care**

**Nutrition Assessment**

Determine current nutrition status, which will likely depend on the underlying condition(s) that lead to the necessity for tube feeding. Review the medical and surgical history for factors that would influence tube feeding decisions such as aspiration risk, gastrointestinal function, metabolic abnormalities and expected outcomes.

Persons at high risk for refeeding syndrome have depleted minerals and electrolytes that should be replaced prior to initiating feeding. Refeeding syndrome is potentially lethal for malnourished persons. Assess the medication list for drugs that may affect tolerance of the feedings. Some may result in diarrhea, such as antibiotics, liquid medications flavored with sorbitol, and hyperosmolar products such as potassium salts. Others may cause constipation, such as pain relievers that reduce bowel motility. Identify potential food-drug interactions.

With the Speech Language Pathologist, assess ability to consume food and fluids orally and the adequacy of current intake.

Discuss the person's beliefs and feelings concerning tube feeding as well as those of family members. Review admission Advance Directives.

With the help of the Interdisciplinary Team, determine the type of tube feeding access that is present or planned.

Review the daily activities of people who are mobile to select the optimal method of administration.

**Nutrition Intervention**

Select a formula appropriate for the person's nutrition needs, access route, and method of administration.

Provide liquid vitamin and mineral supplements if the total volume of formula (plus any oral intake) is not enough to meet the DRIs.

Provide a source of fiber for long-term tube feedings, unless this is contraindicated. Some formulas do not provide fiber, which may be acceptable over the short term or for some conditions.
Determine the amount of additional fluid needed each day. Commercial formulas contain 70 to 85% water. Due to their concentration, these formulas alone do not usually provide adequate fluid. Fluid needs can be met through supplemental water flushes used to maintain tube patency or to administer medication through the tube, or sometimes by oral intake, if this is feasible. Avoid routine use of diluted formula, since dilution introduces a risk of contamination.

Start the tube feedings only after placement of the tube outlet is confirmed by x-ray. At the time of radiography, the feeding tube should be marked with indelible ink at the exit site from the lip or naris.

With continuous feedings, begin at full strength, but not at the goal rate. Begin feedings at 10-40 mL per hour and increase in rate by 10 to 20 mL per hour every 8 to 12 hours, especially if feeding goes directly into the intestine. For stable, adult patients, feeding can be started at goal rates.

Standardize (ASPEN, 2009, p.126) the Enteral Nutrition Order to include:
- patient identifiers – name, date of birth, weight, location, medical record number,
- formula – clearly identify either by generic name (isotonic‖ or standard‖ or -1.5 calorie per mL‖ or specific product name.
- modular products used to enhance the protein, fat or fiber should be specified including amount and frequency to be given,
- enteral access delivery site/device (eg. jejunal port of G-J tube), and
- administration method (bolus, gravity, or continuous) and rate (per 24 hours or cyclic).

Order protocols may indicate advancement and ancillary orders (water flushes, head of bed elevation, monitoring laboratory parameters).

Provide education for those who will be cared for at home, which should include:
- caring for the tube and ostomy site,
- maintaining aspiration precautions,
- providing the name and source of the formula, the administration times, and volumes or rates,
- reviewing food safety and sanitation practices,
- administering the feedings and operating pumps,
- administering medicine through the tube, and
- assessing, preventing, and treating tube feeding complications.
**Nutrition Monitoring**

Evaluate how well the tube feeding is tolerated by reviewing any signs or symptoms of discomfort, nausea or vomiting, alteration of bowel function, and abdominal distension.

Evaluate how well the formula meets the person's nutritional needs by determining kcalories provided per kilograms body weight, grams of protein per kilograms body weight, and milliliters of free water per kilograms body weight.

Track changes in weight and other anthropometric measures. Observe for physical signs and symptoms of malnutrition or dehydration.

Monitor lab values. The parameters and frequency will depend on the person's condition (critical, acute stable, long-term stable).

Refer to Table 4H-2 for solutions to potential tube feeding problems.

Adjust the volume, timing, or method of administering the feedings to support resumption of oral feeding when the person's condition allows.

<table>
<thead>
<tr>
<th>Problem</th>
<th>Cause</th>
<th>Prevention or solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constipation</td>
<td>Inadequate fluid or fiber</td>
<td>-provide adequate fluid</td>
</tr>
<tr>
<td></td>
<td>Inactivity</td>
<td>-use a formula with fiber or a bulking agent</td>
</tr>
<tr>
<td></td>
<td>Medication side effect</td>
<td>-if possible, encourage walking and moving</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-use stool softeners or laxatives</td>
</tr>
<tr>
<td>Dehydration</td>
<td>Inadequate fluid</td>
<td>-administer more water</td>
</tr>
<tr>
<td></td>
<td>Calorie-dense formula</td>
<td>-administer more water</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diarrhea</td>
<td>Delivery method</td>
<td>-use continuous infusion</td>
</tr>
<tr>
<td></td>
<td>-bolus feeding</td>
<td>-decrease volume</td>
</tr>
<tr>
<td></td>
<td>-volume overload</td>
<td>-decrease rate</td>
</tr>
<tr>
<td></td>
<td>-rapid administration</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Inadequate fiber</td>
<td>-use formula with fiber</td>
</tr>
<tr>
<td></td>
<td>Contaminated formula</td>
<td>-use closed system for feeding</td>
</tr>
<tr>
<td></td>
<td>(bacterial overgrowth)</td>
<td>-use aseptic technique to administer formula and medications</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-do not add new formula to old formula</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-replace tubing/container every 24 hours</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-refrigerate unused portion of formula</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-culture stool for pathogens</td>
</tr>
<tr>
<td></td>
<td>Drug therapy</td>
<td>-administer antidiarrheal drugs</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-provide probiotics with antibiotic drugs</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-avoid medications with sorbitol</td>
</tr>
<tr>
<td></td>
<td>Fecal impaction</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>-remove impaction</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-provide adequate fluid</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-use formula with fiber or a bulking agent</td>
</tr>
<tr>
<td></td>
<td>Hyperosmolar formula</td>
<td>-start at a low rate and advance gradually</td>
</tr>
<tr>
<td>Problem</td>
<td>Cause</td>
<td>Prevention or Solution</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>------------------------------------</td>
<td>------------------------------------------------------------</td>
</tr>
<tr>
<td>High blood glucose</td>
<td>Insulin resistance</td>
<td>- reduce infusion rate or stop feeding until blood sugar control is established</td>
</tr>
<tr>
<td></td>
<td>Inadequate insulin</td>
<td>- adjust insulin type, dose, and/or timing</td>
</tr>
<tr>
<td></td>
<td>Overfeeding</td>
<td>- use oral diabetes drugs if appropriate</td>
</tr>
<tr>
<td></td>
<td>High carbohydrate feeding</td>
<td>- re-evaluate the feeding goal</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- use a formula with less carbohydrate</td>
</tr>
<tr>
<td>High gastric residual</td>
<td>Delayed gastric emptying</td>
<td>- hold feeding 2 hours and check again</td>
</tr>
<tr>
<td>(&gt; 250 mL)</td>
<td></td>
<td>- consider promotility drugs (ie. metoclopramide or cisapride)</td>
</tr>
<tr>
<td></td>
<td>Feeding tube position</td>
<td>- reposition person</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- radiograph for placement</td>
</tr>
<tr>
<td></td>
<td>Hyperglycemia</td>
<td>- see High blood sugar treatments.</td>
</tr>
<tr>
<td>Low blood glucose</td>
<td>Stopping infusion abruptly</td>
<td>- maintain feeding rate and volume</td>
</tr>
<tr>
<td>Low serum sodium</td>
<td>Overhydration</td>
<td>- restrict fluid or use a calorie dense formula</td>
</tr>
<tr>
<td>(hyponatremia)</td>
<td></td>
<td>- replace sodium</td>
</tr>
<tr>
<td>Nausea, Vomiting, Gastric</td>
<td>Rapid administration</td>
<td>- decrease rate</td>
</tr>
<tr>
<td>Reflux (GERD)</td>
<td>Delayed gastric emptying</td>
<td>- change administration method</td>
</tr>
<tr>
<td></td>
<td>Body Positioning</td>
<td>- decrease rate</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- use promotility drugs</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- change to an intestinal feeding route</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- use formula that is isotonic and lower in fat</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- use medication to treat GERD</td>
</tr>
<tr>
<td>Skin or site irritation</td>
<td>Poorly fitting tube</td>
<td>- have the person lie on the right side to promote passage of formula through the pylorus</td>
</tr>
<tr>
<td></td>
<td>- too small for tract</td>
<td>- elevate the head of the bed 45 degrees during and after feeding administration.</td>
</tr>
<tr>
<td></td>
<td>- button stem too long</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- internal bumper not snug</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tube tugging at exit site</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- strain at the site from activity</td>
<td></td>
</tr>
<tr>
<td></td>
<td>or friction</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- external bolster migrates into</td>
<td></td>
</tr>
<tr>
<td></td>
<td>stomata site</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- check tube size and length</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- check tube for migration</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- use medication for infection</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- use tape or holders to secure the external tube</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- use specially designed undergarments for active people</td>
</tr>
<tr>
<td>Problem</td>
<td>Cause</td>
<td>Prevention or Solution</td>
</tr>
<tr>
<td>---------</td>
<td>-------</td>
<td>------------------------</td>
</tr>
</tbody>
</table>
| Tube obstruction, blockage or clogging | Improper administration of medication | - do not add medications to the formula  
- flush the tube with at least 15 mL sterile water before and after each medication  
- give one drug at a time  
- crush solids completely and mix with 30 mL water; dilute liquids with 30 mL water  
- do not give bulking agents via small bore tubes  
- use solution of Viokase (Axcan Pharma, Quebec) plus sodium bicarbonate per physician direction |
| | Inadequate flushing | - irrigate the tube at least once a day when not in use or when formula is stopped  
- irrigate 3 to 4 times a day with 30 to 50 mL water during use  
- flush with water every 4 hours during continuous feeding  
- flush the tube so that formula and medications do not contact each other inside the tube  
- water flushes are superior to cranberry juice; no evidence that carbonated beverages unclog tubes better than water |
| | Administration rate too low | - change the delivery method to increase the infusion rate |
| Weight gain | Slow: Excessive calories | - re-evaluate the feeding goal |
| | Fast: Excessive fluid | - re-evaluate fluid needs or tolerance |


References


Section 3I: Nutrition Support


More Information

The Oley Foundation
214 Hun Memorial, A-28
Albany Medical Center
Albany, NY 12208
(800) 776-OLEY
www.oley.org
This organization serves long-term users of enteral or parenteral nutrition support. It fosters support groups, provides information by phone and through a variety of media, and organizes annual conference.

Nestle Nutrition http://www.nestle-nutrition.com/

Ross Nutritionals http://www.ross.co
Section 3J: Obesity

**Obesity**

**Background**

Obesity is the fastest growing chronic disease in the United States. In the past 10 years, it has become an epidemic. In 2007, an estimated 68 percent of the U.S. population was considered overweight or obese according to the Centers for Disease Control and Prevention (CDCP, 2010). The causes of the obesity epidemic are complex. Individual behavior such as food and activity choices and other environmental factors explain 40 to 60 percent of the causes of obesity. Genetic factors explain the other 40 to 60 percent. Because the causes are complex, obesity treatments work best if they are multi-dimensional (Cummings, Parham, & Strain, 2002, p. 1146; Kushner, 2004).

Obesity can result in a variety of medical, psychological, social, and financial problems. Additionally, obesity and the degree of obesity also impose an increasing burden on the health care system. According to a recently published study, the higher the Body Mass Index (BMI), the higher the healthcare costs. This means that a person with a BMI of 40 or more has costs that are double those of people with normal weight (Andreyeva, Sturm, & Ringel, 2004, pp. 1936-1943).

Other risk factors, such as smoking, and other conditions, such as high blood pressure, diabetes, and cardiovascular disease make the treatment of obesity even more complex. A family history of these chronic diseases along with an above normal BMI increase the need for a person to have intensive treatment to prevent the development of these chronic diseases.

**Objectives**

The medical objective is to prevent or treat obesity and related chronic diseases. The medical nutrition therapy objectives are

- to reduce weight over at least six months,
- to maintain weight loss,
- to preserve lean muscle mass while losing excess fat tissue, and
- to reduce obesity promoting environmental factors.

**Nutrition Care**

**Nutrition Assessment**

Identify conditions that would contraindicate a weight loss program. These include pregnancy, lactation, uncontrolled psychiatric illness such as anorexia nervosa or bulimia nervosa, binge eating disorder, anxiety disorders, or clinical depression (Cummings et al., 2002, pp. 1147-1148; Biesemeier, 2004).

Assess medication contraindications for weight loss. These include long-term use of antihistamines, corticosteroids, and types of antidepressants classified as monoamine oxidase (MAO) inhibitors and selective serotonin reuptake inhibitors (SSRIs). Buproprion is the only antidepressant that does not cause weight gain with long term use.
Section 3J: Obesity

Do not recommend herbal remedies (Cummings et al., 2002, p. 1151; Nonas, 2004).

Assess the person's overall health status (National Heart, Lung, and Blood Institute [NHLBI], 2000) and risk factors such as smoking, diabetes, high blood pressure, and cardiovascular disease. Provide appropriate nutrition therapy for these conditions before focusing on weight management.

Evaluate the person's degree of overweight or obesity using BMI and waist circumference.

Assess the person's readiness to change and ability to commit to lifelong behavior change. Factors that indicate the person is ready include being motivated, having a support system, being ready to make exercise a top priority, and having identified potential barriers (NHLBI, 2000).

Calculate the person’s calorie needs. Use of indirect calorimetry is ideal, but equipment is often unavailable. Debate continues over which are the most appropriate equations to use for overweight and obese people. The following equations were developed for this population.

*The Dietary Reference Intake Equations*

The Macronutrient Panel of the Institute of Medicine recommends the following equations for estimating total energy expenditure (TEE) for normal and overweight or obese adults (Institute of Medicine, 2002, p. 70). These two formulas express TEE in calories per day.

Men aged 19 years and older

\[
\text{\text{Men aged 19 years and older}} = 864 - (9.72 \times \text{age in yr}) + \text{PA} \times (14.2 \times \text{wt in kg} + 503 \times \text{ht in m})
\]

Where \( \text{PA} \) is the physical activity coefficient:

\[
\begin{align*}
\text{PA} &= 1.00 \text{ if physical activity level is sedentary} \\
\text{PA} &= 1.12 \text{ if physical activity level is low active} \\
\text{PA} &= 1.27 \text{ if physical activity level is active} \\
\text{PA} &= 1.54 \text{ if physical activity level is very active}
\end{align*}
\]

Women aged 19 years and older

\[
\text{\text{Women aged 19 years and older}} = 387 - (7.31 \times \text{age in yr}) + \text{PA} \times (10.9 \times \text{wt in kg} + 660.7 \times \text{ht in m})
\]

Where \( \text{PA} \) is the physical activity coefficient:

\[
\begin{align*}
\text{PA} &= 1.00 \text{ if physical activity level is sedentary} \\
\text{PA} &= 1.14 \text{ if physical activity level is low active} \\
\text{PA} &= 1.27 \text{ if physical activity level is active} \\
\text{PA} &= 1.45 \text{ if physical activity level is very active}
\end{align*}
\]
These are common formulas for calculating resting energy expenditure (REE) (Mifflin, St. Jeor, Hill, Scott, Daugherty, & Koh, 1990). These formulas express REE in calories per day.

Men = 10 x wt in kg + 6.25 x ht in cm – 5 x age in yr + 5

Women = 10 x wt in kg + 6.25 x ht in cm – 5 x age in yr – 161

Evaluate both healthy and unhealthy environmental factors as described by Kushner (2004)

**Healthy environmental factors**: the person
- selects more healthy foods
- monitors portions sizes
- cooks more
- eats only when hungry

**Unhealthy environmental factors**: the person
- shops more at convenience stores
- has less healthy food available
- selects food from vending machines
- eats out more
- selects value meals
- eats large portions
- tends to cook less
- makes more use of technological advances
- uses more motorized transportation
- uses more elevators and escalators
- has low physical activity
- watches more television
- plays more video games
- is more subject to time pressures

**Nutrition Intervention**

From the beginning, prepare for multiple contacts with the person in your care. The American Dietetic Association’s Weight Management Protocol recommends six sessions with a registered dietitian (Israel, 1997). Nutrition intervention is many-sided and focuses on lifestyle changes. It should include the following.

Develop a reduced calorie meal plan with the person. Formulas and meal replacements may also be used.
Educate concerning food composition, portions, label reading, food preparation, and appropriate food choices.
Promote optimal nutrient intake and minimize nutrient deficiencies.
Educate about behavior modification techniques.
- Provide suggestions for overcoming barriers to weight loss.
Section 3J: Obesity

- Assist in setting achievable goals for behavior change. Effective goals are specific, attainable, and forgiving (NHLBI, 2000).
- Support use of self-monitoring, developing rewards, and eliminating environmentally-cued eating.

Encourage appropriate and regular physical activity.

- Advise the person to accumulate at least 30 minutes of moderate-intensity activity daily (U.S. Department of Health and Human Services, 1996).
- Recommend a goal of 60 to 90 minutes of activity daily for weight maintenance (NHLBI, 2000).

**Nutrition Monitoring**

Encourage keeping food and exercise records.

- Assist with goal setting. A modest weight loss of 5 to 10 percent significantly improves obesity-related health conditions.
- Refer to appropriate adjunctive treatment (psychotherapy, physician, exercise physiologist, etc.) if indicated. Physicians should closely monitor individuals consuming a Very Low Calorie Diet (200 to 800 calories per day) to avoid complications.
- Prevent additional weight gain if weight loss or loss of body fat is unachievable.
- Consider weight loss medications if the person has not lost one pound per week after six months. These drugs may be used for individuals with a BMI greater than or equal to 30 (or with a BMI greater than or equal to 27 with co-morbidities.)
  - Phentermine is approved for short-term (less than 12 weeks) weight management.
  - Sibutramine and Orlistat are the only FDA approved drugs for long-term (greater than 12 weeks) weight management.
- Bariatric surgery may be considered as an option if BMI is greater than or equal to 40 (or greater than or equal to 35 with co-morbidities).

- Educate the person about the National Weight Control Registry’s Cardinal Behaviors of Successful Long-Term Weight Management.
  - Engage in self-monitoring of diet and weight.
    - Diet: Record daily food intake. Limit certain foods or food quantities.
    - Weight: Check body weight at least once per week.
  - Maintain a low-calorie, low-fat diet. The total energy intake should be 1300 to 1400 calories per day with 20 to 25 percent of the calories from fat.
  - Eat breakfast every day.
  - Engage in regular physical activity. Aim to burn 2500 to 3000 calories per week in physical activity, e.g., walk four miles every day.

Provide periodic follow-up by one or more members of the therapeutic team for as long as possible.
Section 3J: Obesity

Cross References

Section 3J: Bariatric Surgery
Section 4A: Calorie Controlled Diet

References


Section 3J: Obesity


More Information


Section 3J: Obesity

Bariatric Surgery

Background

Surgical treatment for severe obesity began in 1952 with Dr. Viktor Henriksson of Sweden reporting success in reducing obesity by removing much of the small bowel (Kral, 2006; Henriksson, 1952). This procedure evolved into the jejunal-ileal (JI) bypass, in which much of the small intestine was bypassed so that few nutrients were absorbed. However, due to serious complications from chronic malabsorption, the JI bypass was abandoned in the late 1970s (Deitel & Shikora, 2002). In the late 1960s, Dr. Edward Mason and his colleagues developed a procedure in which the stomach was reduced to a small pouch, capable of holding only a few ounces (American Society for Bariatric Surgery, (n. d.). This procedure is the foundation of stomach surgery today.

Bariatric surgery can be considered for people defined as morbidly obese (Class III obesity with a BMI of 40 or more) or seriously obese (Class II obesity with a BMI of 35 to 39.9) who have coexisting medical conditions such as diabetes, hypertension, cardiovascular disease, sleep apnea, or pulmonary hypertension (Deitel & Shikora, 2002; Mattar & Rogula, 2006; Schlösser & Ikramuddin, 2006).

Glossary

(Obesity Help, Inc., 2005)

Bariatric pertains to weight. Bariatric surgery may be performed by bariatric surgeons. Bariatric physicians are usually internists who specialize in non-surgical weight management. Together they are called **bariatricians**.

**Morbid obesity** is when a person's BMI is over 40. This is generally equivalent to having 100 or more pounds to lose.

The bariatric surgery available today is classified by the goal of the surgery. The two types are

- gastric reduction (gastric restrictive) procedures:
  - vertical-banded gastroplasty (GP),
  - gastric bypass (Roux-en-Y gastroenterostomy) (RGB), and
  - laparoscopic silicone gastric banding (commonly called the lap-band),

- malabsorptive procedures:
  - biliopancreatic bypass with or without duodenal switch.

Gastric reduction procedures decrease the size of the stomach pouch, so people can eat only small amounts. Malabsorptive procedures reduce the stomach to a lesser extent, and in addition, a large part of the intestine is bypassed, reducing the digestion of food and absorption of nutrients. Both types of procedures can be done either "open" or laparoscopically. The most common procedures today are the RGB and the lap-band.

Any surgery carries with it risk, but bariatric surgery carries the added risks of advanced obesity and other health conditions that affect healing and quality of life. Two excellent reviews of the surgical procedures, and the risks and complications associated with them, are cited in the references to this section (American Society for Bariatric Surgery, 2001; Deitel & Shikora, 2002).
Biliopancreatic diversion is a complicated gastric bypass operation. The stomach is reduced to a 6-ounce pouch that is connected to the last segment of the small intestine. The parts of the small intestine responsible for most of the digestion and absorption of nutrients are bypassed. This procedure can result in significant weight loss, but it is restricted to only a few very heavy people, because of the high risk for nutrient deficiencies.

Gastric banding (lap band) uses a band of special material around the upper end of the stomach, creating a small pouch and a narrow passage into the larger remainder of the stomach. This is one of the most common bariatric surgeries done today.

Laparoscopic refers to surgery performed with a laparoscope, a thin fiber-optic scope introduced into a body cavity through 4 or 5 small incisions. This procedure results in a shorter recovery time and a shorter hospital stay compared to an open surgery, in which a large incision is made and the abdomen exposed.

Roux-en-Y gastric bypass (RGB) is the other common bariatric surgery done today. In this procedure, a small 1 to 1 1/2 ounce stomach pouch is created with the top part of the stomach, causing restricted food intake. Next, a Y-shaped section of the small intestine is attached to this pouch so that food can bypass the duodenum as well as the first part of the jejunum. As a result, the person who has this procedure has both a restricted ability to eat and a decrease in absorption of nutrients. People with this procedure must take supplemental vitamins and minerals for the remainder of their lives.

Gastric sleeve is a relatively new procedure often performed for individuals who are superobese with BMI > 50 kg/m². This is an initial procedure that removes ~60% of the stomach. After the individual has had some weight loss, a second surgery such as Roux-en-Y gastric bypass or biliopancreatic diversion (BPD) is performed.

Excess weight loss reaches a maximum between 18 to 24 months after surgery. Five years after surgery, many studies have shown that excess weight loss is 50 to 60 percent, with about 50 percent excess weight staying off up to 10 years (American Society for Bariatric Surgery, 2001; Blankenship & Wolfe, 2006; Buchwald, Avidor, Braunwald, Jensen, Pories, Fahrbach, & Schoelles, 2004).

Glossary
(Obesity Help, Inc., 2005)

Dumping syndrome occurs when food empties too rapidly from the stomach into the small intestine. This mass of food is too concentrated, pulling water into the intestine and pushing the food though quickly. Symptoms include nausea, weakness, sweating, and diarrhea. Some people later experience very low blood glucose (hypoglycemia), which occurs when overeating sweets.

Objectives

The medical objectives for bariatric surgery are to reduce excess weight by 60 to 70 percent,
Section 3J: Obesity

improve eating behavior,
reduce the severity of co-existing health conditions,
improve self-esteem, and
improve quality of life.

The nutrition objectives for bariatric surgery are to
provide an eating pattern that promotes healthy continued weight loss,
provide guidance to prevent dehydration, protein malnutrition, and vitamin
and mineral deficiencies,
prevent complications associated with poor food choices or food habits, and
promote exercise.

Nutrition Care

Nutrition Assessment (pre-operative)

Assess past and present medical history, focusing on significant health conditions associated with morbid obesity. Such conditions include, but are not limited to diabetes, reactive hypoglycemia, hypertension, cardiovascular disease, high cholesterol or triglycerides, sleep apnea, osteoarthritis, gastroesophageal reflux disease (GERD), and depression (as documented by medical history or a psychologist/psychiatrist) (ADA, 2010).

Review the person's weight history and that of immediate family members. Document years of obesity and the degree of obesity. Use either the Hamwi equation or a BMI of 24 as a guide to determine ideal body weight (Blankenship & Wolfe, 2006).

Review the person's weight goal, and compare it to how much can be lost, that is 60 to 70 percent of excess weight (Blankenship & Wolfe, 2006; Buchwald et al., 2004). If the weight goal is unrealistically low, discuss a more manageable goal, which could be changed at a future date.

Evaluate laboratory data related to associated health conditions, as well as those for iron status (hemoglobin, hematocrit, serum iron). Using either food frequency or typical 24-hour intake, identify the eating habits that are conducive to, and those that are contrary to, healthy eating for weight loss. Focus on

- likes and dislikes,
- food aversions,
- intermeal timing,
- allergies (especially to egg and milk),
- lactose intolerance,
- consumption of alcohol, caffeine, sodas, concentrated sweets, and spicy foods,
- use of chewing gum, and
- fluid intake.
Document areas for improvement, and identify those behaviors that may become a problem later. For example, if the person eats sweets often, this behavior may result in slower weight loss or in dumping syndrome due to the high concentration of sweets. Assess the dose and frequency of medications, and of vitamin/mineral and herbal supplements. Consult with the physician or pharmacist about the availability of these medications in liquid or chewable form, or if they can be crushed for use in the post-operative and diet transition period. Discuss with the physician and patient any potential nutrient-drug interactions and negative side effects that may occur associated with surgery, for example, stopping use of vitamin E supplements before surgery due to the anticoagulant effects, or the decreased absorption of drugs due to limited intestinal absorptive area. Determine readiness for the surgery. Find out if the patient has the realistic expectations of life-long dietary, exercise, and lifestyle changes necessary to lose weight and maintain weight loss. Discuss the degree of support from family and friends for the person's choice for surgery and their availability for helping with immediate post-op care.

**Nutrition Intervention (pre-operative)**

Provide practical information about the physiological changes associated with both the small pouch (1 to 1 1/2 ounces for RYGB and the lap-band) and its small pouch outlet. Topics to include are
- diet transition from fluids to regular food,
- chewing food thoroughly,
- separating liquids from solids at meals,
- intolerance to certain foods,
- need for small meals,
- intake of adequate protein, and
- if appropriate, the reduced absorptive area of the intestine.

Initiate dietary changes to prepare the patient for surgery. Following are some food behaviors that help make a smooth transition to the post-operative diet.
- Eat breakfast and at least two more meals per day. Stop snacking, or do so only once per day.
- Eat small portions, being careful to include protein in every meal and snack.
- Stop eating meals out, and start preparing meals at home.
- Chew foods thoroughly. Do not swallow until the food is the consistency of applesauce. Eat slowly.
- Choose lean protein sources and low fat foods.
- Drink two cups of skim milk per day. If milk is not tolerated, use a milk substitute.
Section 3J: Obesity

- Experiment with protein shakes and protein meal bars to see which ones taste good.
- Limit sweets (candy, ice cream, desserts) to no more than 2 to 3 times per week.
- Add fruits and/or vegetables to each meal and snack.
- Practice separating fluids from solids. Do not drink 30 minutes before or after a meal or snack.
- Reduce caffeinated beverages to one or none per day.
- Reduce carbonated beverages (soda pop) to 12 ounces or less per day.
- Increase water consumption to 64 ounces per day. Keep a water bottle available at all times and sip throughout the day.
- Eliminate alcoholic beverages.
- If not already doing so, take a daily vitamin and mineral supplement.

Create a list of recommended foods to purchase before surgery. See Table 3D-1 below.

<table>
<thead>
<tr>
<th>Dairy</th>
<th>Meat and Protein Foods</th>
</tr>
</thead>
<tbody>
<tr>
<td>-skim or 1% milk</td>
<td>-white chicken or turkey (canned or fresh)</td>
</tr>
<tr>
<td>-low fat cottage or ricotta cheese</td>
<td>-canned tuna or salmon (in water)</td>
</tr>
<tr>
<td>-low fat American cheese (melts well)</td>
<td>-baby food meats (ham, turkey, chicken, beef)</td>
</tr>
<tr>
<td>-light or plain yogurt (using sugar sub)</td>
<td>-canned stew, bean soup</td>
</tr>
<tr>
<td></td>
<td>-canned rehydrated peas, beans, and lentils</td>
</tr>
<tr>
<td>Soy</td>
<td>Fruits and Vegetables</td>
</tr>
<tr>
<td>(especially with dairy intolerance)</td>
<td>-canned, frozen, or baby food vegetables</td>
</tr>
<tr>
<td>-light tofu</td>
<td>-canned fruit (in juice or water, not in syrup)</td>
</tr>
<tr>
<td>-soy cheese</td>
<td>-baby food fruits (without added sugar)</td>
</tr>
<tr>
<td>-fortified light (or low-fat) soy milk</td>
<td></td>
</tr>
<tr>
<td>Starches</td>
<td>Protein Supplements</td>
</tr>
<tr>
<td>-potatoes (instant, fresh)</td>
<td>-dry skim milk powder</td>
</tr>
<tr>
<td>-sweet potatoes</td>
<td>-no-sugar-added Carnation Instant Breakfast</td>
</tr>
<tr>
<td>-squash</td>
<td>-protein powders with less than 5 to 8 grams carbohydrate per serving</td>
</tr>
<tr>
<td>-soup</td>
<td></td>
</tr>
<tr>
<td>Fluids</td>
<td>Sweets (also count as fluids)</td>
</tr>
<tr>
<td>-broth or bouillon (for blending meats, beans, vegetables)</td>
<td>-sugar-free soda (let go flat, consider no-caffeine)</td>
</tr>
<tr>
<td>-vegetable juices, such as V-8</td>
<td>-Crystal Light, Wyler’s Light, sugar-free Kool-Aid</td>
</tr>
<tr>
<td>-fruit juice (100% juice)</td>
<td>-Diet Snapple or Diet Nestea</td>
</tr>
<tr>
<td>-coffee or tea (0 to 1 with caffeine a day)</td>
<td>-sugar-free Popsicles or gelatin</td>
</tr>
<tr>
<td>-water</td>
<td></td>
</tr>
</tbody>
</table>

Discuss the need for chewable or liquid vitamin/mineral supplements after surgery (Blankenship & Wolfe, 2006). The types of supplements and their frequency will vary with the type of bariatric surgery. (See Table 3D-2.) People who have had RGB or the biliopancreatic bypass must take more supplements than those with the GP or the lap band
surgeries and be more diligent about taking them due to the malabsorption of nutrients with their procedures.
Devise exercise and walking plans to use before surgery. Stress that any strength gains (especially in the shoulders and legs) will shorten recuperation from the procedure.
Encourage attendance at group meetings of future and past bariatric surgery clients to enhance awareness and provide a sense of closeness.

**Nutrition Monitoring (pre-operative)**
Continue pre-op monitoring on second or third visits. Include a family member or close friend who will be helping the person through recuperation.
Review the post-operative diet and supplements, along with the transition to solid food.
Review previously noted areas for improvement in the diet.
Reassess readiness for surgery and the lifestyle changes that will come about after surgery.

### Table 3D-2: Regimen of supplements after bariatric surgery

<table>
<thead>
<tr>
<th>Type of Supplement</th>
<th>When on liquid or blended food</th>
<th>When on solid food</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multivitamin and mineral</td>
<td>-Take 1 to 2 children’s or 1 adult’s chewable (some children’s chewables meet adult needs).</td>
<td>-Take 1 adult multivitamin and mineral supplement with iron.*</td>
</tr>
<tr>
<td>Calcium</td>
<td>-Take 3 extra strength Tums or the generic equivalent. -Split so the maximum dose is 600 mg calcium or less. -DO NOT TAKE IRON AT THE SAME TIME.</td>
<td>-Take a 600 mg dose of calcium citrate twice a day. -DO NOT TAKE IRON AT THE SAME TIME.</td>
</tr>
<tr>
<td>Iron</td>
<td>-Take 50 mg ferrous sulfate daily. -Can be found in liquid form.</td>
<td>-Take 50 mg ferrous sulfate daily. -Take with vitamin C or orange juice.</td>
</tr>
<tr>
<td>Vitamin B₁₂</td>
<td>-Take a 1000 mcg tablet sublingually (under the tongue) every other day or 500 mcg every day.</td>
<td>-Take a 1000 mcg tablet sublingually once a week.</td>
</tr>
</tbody>
</table>

**Nutrition Assessment (initial post-operative)**
An inpatient dietitian should assess the person during hospitalization.
Evaluate and document compliance to the prescribed diet and supplements.
Obtain current weight and document weight changes.
Evaluate for signs of dehydration (dry cotton mouth, dark urine) or dumping syndrome (diarrhea, cramping, hypoglycemia).

**Nutrition Intervention (initial post-operative)**

The diet progression should follow this path
- one to two days NPO,
- a period of ice chips and sips of water, and then
- a clear liquid diet that is low in sugar and high in protein.

Instruct patients to drink slowly, and to remove the meal after 20 minutes.

Set aside some liquids for a snack between meals. Patients should try to drink nourishing fluids six times per day.

Discuss the transition to the next phase of the diet. See Table 3D-3 below.

Reinforce the goals of adequate protein and fluids; review ways to meet goals.

Discuss plans to start an exercise program.

**Nutrition Monitoring (initial post-operative)**

Arrange for a follow-up visit with the outpatient dietitian a few weeks after surgery.

Review the current diet, as well as steps to transition to the next phase.

Assess for presence of vomiting, nausea, or dumping syndrome. Plan and document interventions to correct these conditions.

If the person is noncompliant with her/his diet, such as eating solid foods too soon, or not taking supplements as prescribed, discuss the consequences with the person, and bring this to the physician’s attention. Document any noncompliance.

If chronic nausea or vomiting is present without diet noncompliance, discuss the situation with the physician. The person may have food intolerances (lactose) or allergies (dairy, soy, or egg) that were previously unnoticed. If the problem is associated with slow stomach emptying, the physician may recommend metoclopramide to increase stomach contractions.

**Table 3D-3: Progression of the diet after bariatric surgery**

<table>
<thead>
<tr>
<th>Phase</th>
<th>Duration</th>
<th>Type of diet</th>
<th>Diet principles</th>
</tr>
</thead>
</table>
| Phase 1 | 4 to 6 weeks | Use blended and pureed foods. | - Eat 5 to 6 times per day with protein at least 4 times per day.  
- Stop eating after 20 minutes.  
- Drink fluids between (not with) meals.  
- Aim for 48 to 64 oz fluid daily. |

<table>
<thead>
<tr>
<th>Food group</th>
<th>Servings per day</th>
<th>Serving size</th>
</tr>
</thead>
</table>
| Protein | 6 | -1/4 cup meat  
-2/3 cup milk |
### Section 3J: Obesity

<table>
<thead>
<tr>
<th>Vegetable</th>
<th>2</th>
<th>-1/4 cup</th>
<th>-Aim for 60 gm protein daily.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fruit</td>
<td>2</td>
<td>-1/4 to 1/2 cup</td>
<td></td>
</tr>
<tr>
<td>Starch</td>
<td>2</td>
<td>-1/4 to 1/2 cup</td>
<td></td>
</tr>
<tr>
<td>Fat</td>
<td>3</td>
<td>-1 tsp to 1 Tbs</td>
<td></td>
</tr>
</tbody>
</table>

#### Phase 2
2-3 weeks

Progress to solid food.

<table>
<thead>
<tr>
<th>Food group</th>
<th>Servings per day</th>
<th>Serving size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Milk</td>
<td>2</td>
<td>-2/3 cup</td>
</tr>
<tr>
<td>Meat or beans</td>
<td>4</td>
<td>-1/4 cup</td>
</tr>
<tr>
<td>Vegetable</td>
<td>2</td>
<td>-1/4 cup</td>
</tr>
<tr>
<td>Fruit</td>
<td>2</td>
<td>-1/4 to 1/2 cup</td>
</tr>
<tr>
<td>Starch</td>
<td>2</td>
<td>-1/4 to 1/2 cup</td>
</tr>
<tr>
<td>Fat</td>
<td>3</td>
<td>-1 tsp to 1 Tbs</td>
</tr>
</tbody>
</table>

- Continue mostly blended foods.
- Introduce soft foods one at a time, only one new food per meal or snack. Chew thoroughly, to the texture of blended food, before swallowing.
- Drink fluids between (not with) meals.
- Aim for 64 oz fluid daily.
- Aim for 60 gm protein daily.

#### Phase 3
Lifetime

- Use solid food.
- Aim for a goal of 1200 to 1500 calories per day.
- Include exercise.

- Continue to introduce new foods, chewing thoroughly.
- Drink fluids between (not with) meals.
- Aim for 64 oz fluid or more per day.
- Aim for 60 to 80 gm protein per day.

For Lap-band procedure

<table>
<thead>
<tr>
<th>Phase</th>
<th>Duration</th>
<th>Type of diet</th>
<th>Diet principles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phase 1</td>
<td>2 to 3 weeks</td>
<td>Use a liquid diet focusing on high protein beverages.</td>
<td>- Consume 3 meals per day; stop meal after 20 minutes. - Drink fluids between (not with) meals. - Aim for 48 to 64 ounces of fluid per day. - Aim for 60 gm protein daily.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Food group</th>
<th>Servings per day</th>
<th>Serving size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protein</td>
<td>6</td>
<td>-1/4 cup meat; -2/3 cup milk</td>
</tr>
<tr>
<td>Vegetable</td>
<td>2</td>
<td>-1/4 cup</td>
</tr>
<tr>
<td>Fruit</td>
<td>2</td>
<td>-1/4 to 1/2 cup</td>
</tr>
</tbody>
</table>

- Eat 3 meals per day with protein at every meal. Stop eating after 20 minutes.
- Drink fluids between (not with) meals.
- Aim for 64 ounces fluid daily.
- Aim for 60 gm protein daily.
Section 3J: Obesity

<table>
<thead>
<tr>
<th></th>
<th>Starch</th>
<th>2</th>
<th>-1/4 to 1/2 cup</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fat</td>
<td>3</td>
<td>-1 tsp to 1 Tbs</td>
<td></td>
</tr>
</tbody>
</table>

Phase 2
- 1-2 weeks
- Progress to solid foods.
- Introduce solid foods one at a time, only one new food per meal. Chew thoroughly, to the texture of blended food before swallowing.
- Drink fluids between (not with) meals.
- Aim for 64 ounces fluid daily.
- Aim for 60 gm protein daily.

Phase 3
- Lifetime
- Use solid food.
- Maintain a goal of 1200 to 1500 calories per day in 3 meals with no snacks.
- Include exercise.
- Continue to introduce new foods, chewing thoroughly.
- Drink fluids between (not with) meals.
- Aim for 64 ounces fluid or more per day.
- Aim for 60 to 80 gm protein per day.

*Note that the type of diet and length of each phase varies with the type of surgical procedure. This is the dietary progression to follow after hospital discharge.

Nutrition Assessment (long-term post operative)

At a minimum, patients should be seen again at six to eight weeks and then at six months after surgery. Thereafter, schedule annual visits. Obtain current weight. Calculate the change in BMI, and the rate of weight loss.

Review laboratory data, especially those that reflect iron status (hemoglobin, hematocrit, serum iron) and protein status (albumin, transferrin, prealbumin). If available, review changes in blood sugars and lipids.

Using food frequency or 24-hour intake, assess diet for calories, protein, fluids, and variety. Frequency of meals should be noted as well as hours between meals. Meals should be no more than four to five hours apart.

Assure adequate daily fluid (64 ounces) and protein (60-80 gm) intake (Blankenship & Wolfe, 2006; Deitel & Shikora, 2002).

Review exercise habits and compliance.

Document compliance with supplementation.

Document problems with dehydration, nausea, vomiting, diarrhea (dumping syndrome), food intolerance, or constipation.
Nutrition Intervention (long-term post operative)
Discuss progress toward total weight loss goal. If weight loss is too slow or too quick, review methods to correct the problem.
The general goal for continued weight loss is 1200 to 1500 calories daily with
○ 60 to 80 gm protein (22 to 26 percent calories from protein),
○ 35 to 45 gm fat (22 to 28 percent calories from fat), and
○ 150 to 180 gm carbohydrate (50 percent calories from carbohydrate)
Assist the person with correcting dietary noncompliance or overcoming problems such as
○ hair loss,
○ gastrointestinal problems,
○ inadequate social support, and
○ eating sweets or other inappropriate foods.
Commercial supplements of protein shakes and meal bars may be a life-long necessity to assure adequate protein intake.
Discuss the exercise program. If exercise is not being maintained, share opportunities in the community to enhance activity. Some fitness facilities, especially YMCAs, have special programs just for bariatric surgery patients.

Nutrition Monitoring (long-term post operative)
Continue to monitor weight loss, which tapers significantly after 1 to 1 1/2 years (Blankenship & Wolfe, 2006; Deitel & Shikora, 2002). Stress this limitation, and work closely with the person to establish good eating habits early. Weight regain is possible and can start after just one year.
Lifelong follow-up is necessary, at decreasing intervals. Social and psychological support are very important and can be achieved through bariatric surgery support groups and maintaining contact with the bariatric team.
Reassess the need for a multivitamin and mineral supplement with iron after weight is stabilized and dietary habits are established. Most multivitamin and mineral supplements contain 18 mg iron. Consider switching to a low or no iron supplement if
○ the patient is a man or postmenopausal woman (who need only 8 mg daily),
○ iron status is acceptable, and/or
○ iron intake (from heme iron or iron fortified protein shakes or meal replacements) is adequate.

Cross References
Section 3C: Diabetes
Section 3F: Cardiovascular Disease
Section 3J: Obesity

Section 3F: High Blood Pressure
Section 3H: Anemia
Section 3J: Obesity
Section 4A: Calorie Controlled Diet
Section 4C: Consistency Modification

References


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Section 3J: Obesity


More Information

American Dietetic Association
This is a Web-based publication available by subscription at www.nutritioncaremanual.org

American Society for Bariatric Surgery
http://www.asbs.org/
This is an organization of bariatric surgeons and allied health professionals concerned with advancing the art and science of bariatric surgery. See also The Story of Surgery for Obesity., A. MacGregor (Ed.) (1999/2002) http://www.asbs.org/html/story/chapter1.html

G. D. Foster & C. A. Nonas (Eds.)

H. J. Sugerman & N. T. Nguyen (Eds.)
New York: Taylor and Francis.

Obesity Help, Inc.
http://www.obesityhelp.com/morbidobesity/
This site offers resources for professionals and for people who have had, or who are considering having, bariatric surgery. Provides a locator for both physicians and bariatric centers. Provides a monthly newsletter for professionals.
Dementia

Background

Dementia is a term that refers to a group of symptoms caused by changes in brain function. Dementia symptoms include:
- asking the same questions repeatedly,
- becoming lost in familiar places,
- being unable to follow directions,
- getting disoriented about time, people, and places, and
- neglecting personal safety, hygiene, and nutrition.

Dementia develops at different rates in different people. People with Alzheimer's disease live an average of 8-10 years but may live as long as 20 years (Alzheimer's Disease Education and Referral Center, [ADEAR], 2010).

Dementia is caused by many conditions. Alzheimer's disease and multi-infarct or vascular dementia are the most common forms in older people. These types of dementia cannot be cured. They may overlap. The physician makes a probable diagnosis based on the symptom history and clinical evaluation. A definite diagnosis cannot be made until an autopsy is performed after death (Campellone, 2009).

Glossary

**Alzheimer's disease** is a dementia in which abnormal proteins and fibrous tangles collect in the brain and there is loss of nerve cells in the part of the brain controlling memory and thinking. The cause is unknown. Changes are gradual and progressive.

**Multi-infarct dementia (vascular dementia)** results from a series of small strokes or changes in the brain's blood supply that leads to the death of brain tissue. The location in the brain where this happens determines the seriousness of the problem and the symptoms. When another stroke occurs, new symptoms begin suddenly. People may improve or be stable for long periods. People with high blood pressure, high lipid levels and diabetes are most likely to develop this form of dementia (ADEAR, 2010).

Alzheimer's disease is described in 3 stages. Each has its own nutritional challenges. In early or mild Alzheimer's disease people have a shorter attention span, and are mildly forgetful and confused. They may have mood swings and be hostile and angry when frustrated or tired. They have trouble learning new things. They may forget to eat, eat only one kind of food, or eat constantly. They may also become depressed.

In intermediate or moderate Alzheimer's disease, behavioral problems become more obvious. People may be suspicious, have delusions or hallucinate. Judgment and coordination become increasingly impaired. Energy needs may increase by 600 calories per day because of increased agitation combined with the increased wandering and pacing. People may forget to chew and swallow. They may not be able to tell foods from non-foods such as paper or plants.

In late or severe stages of the disease, appetite loss and forgetting to eat lead to weight loss and undernutrition. People are dependent on others to feed them. They lose the ability to speak understandably. They lose the ability to walk alone or even hold their
Section 3K: Dementia & Nervous System Disorders

heads up. They are incontinent. Skin breakdown is a risk. Choking and dysphagia may become problems (Alzheimer's Association, 2010; ADEAR, 2010).

Objectives

The medical nutrition therapy objectives are
to maintain nutrition status, and
to promote independent feeding for as long as possible.

Nutrition Care

Nutrition Assessment

Review behavioral changes related to the degree of dementia, ability to plan and prepare meals, ability to self-feed, eating and weight history. Interview family members and caregivers since the person may not have an accurate memory of recent events.

Nutrition Intervention

Create a dining environment to promote good intake.
- Minimize noise and distractions.
- Use solid, contrasting colors for carpeting and furniture.
- Simplify table settings.
- Seat the person in the same place at each mealtime.
- Seat the person in a position where stimulation is minimal.
- Simplify food service.
  - Offer finger foods like sandwiches, hamburgers, cheese, vegetable sticks, and fruit segments. These foods are easy to eat and encourage clients to eat independently.
  - If necessary, place the food in the person's hand and provide verbal cues to eat.
  - Avoid foods that are difficult or complicated to eat.
  - Provide foods with a variety of temperatures, textures, colors and flavors.
  - Offer a limited variety of foods at each meal. Serve multiple small meals and healthful snacks.
  - Serve cooked foods hot, but not so hot that people may burn themselves.
  - Cut food into small pieces or serve easily chewed food.
  - Use adaptive utensils to assist with self-feeding such as straws or cups with lids to make drinking easier.
- Use effective communication techniques.
  - Make eye contact when communicating.
  - Speak slowly and calmly in a normal, pleasant voice.
  - Use verbal prompts during the meal, but keep the message simple. Give instructions one step at a time. For example, instead of saying, “Eat some potatoes,” give instructions like this:
Section 3K: Dementia & Nervous System Disorders

1. –Pick up the fork.‖
2. –Put some potatoes on the fork.‖
3. –Put the potatoes in your mouth.‖
4. –Chew.‖
5. –Swallow.‖
○ Keep your words simple.
○ Offer limited choice. –Would you like some coffee?‖

Maintain good oral hygiene.

**Nutrition Monitoring**
Monitor the person's intake, activity, weight, hydration status, skin condition, swallowing ability and changes in cognitive and functional level.

**Cross References**

- Section 4A: High Calorie Diet
- Section 4C: Dysphagia Diets
- Section 4C: Finger Foods Diet
- Section 4H: High Protein Diet

**References**


**More Information**

Alzheimer's Association National Office
225 N. Michigan Ave., Fl. 17
Chicago, IL 60601(800) 272-3900
[http://www.alz.org/overview.asp](http://www.alz.org/overview.asp)
Eating Disorders

Background

Eating disorders are psychological disorders characterized by the serious disturbance of eating behavior. These disorders include anorexia nervosa (AN), bulimia nervosa (BN), eating disorder, not otherwise specified (EDNOS), and binge eating disorder (BED).

Eating disorders affect seven to ten million women and one million men in America across all segments of the population (National Association of Anorexia Nervosa and Associated Eating Disorders, 2008). Eating disorders are extreme expressions of a variety of attempts to control food and weight issues. Eating disorders are complex, multidimensional disorders that involve socio-cultural, psychological, medical, and nutritional factors. They can also reflect developmental and family issues.

Eating disorder treatment is frequently long term and requires a multi-disciplinary team with members specializing in these conditions. Outpatient therapy is typically the first choice of intervention. If not successful, or if medical complications are too severe, inpatient hospital, residential or a variety of other alternatives are recommended.

Nutrition therapy for eating disorders is only one element needed to help people with these conditions develop healthy lifestyles. Treatment teams may include psychologists, physicians, psychiatrists, dentists, therapists, and registered dietitians, all who are trained in the treatment of eating disorders. Medications used to aid in treatment of eating disorders are more effective when combined with cognitive-behavioral therapy. Furthermore, psychological treatment is most effective when the brain is well nourished (Woolsey, 2002, p. 6).

Anorexia Nervosa (ICD-9 Code 307.1)

Incidence of anorexia nervosa is around eight per 100,000 persons per year (Hoek, 1996). Many of the nutritional and physiological complications are similar to those of starvation or malnutrition. Anorexia nervosa can cause harmful and potentially life-threatening medical complications. Complications include amenorrhea, estrogen deficiency, electrolyte imbalances, osteoporosis, abnormal thermoregulation, anemia, dehydration, red blood cell dysfunction, encephalopathy, disruption in renal and gastric functioning, cardiac abnormalities, postural hypotension/dizziness upon standing/fainting episodes,
anxiety, and depression (American Dietetic Association [ADA], Anorexia Nervosa Overview, 2010).

Several complications, such as disturbance in bone development, failure to reach peak bone density, and possible development of osteoporosis, may be irreversible. The most common cause of death for patients with anorexia is suicide, followed by cardiac complications (ADA, Anorexia Nervosa Overview, 2010).

According to the Diagnostic and Statistical Manual of Psychiatric Disorders (DSM) (American Psychiatric Association [APA], 2000), diagnostic criteria for anorexia nervosa include:
- refusal to maintain body weight at or above minimally normal weight for age and height or failure to make expected weight gain during period of growth, leading to body weight less than 85% of that expected,
- intense fear of gaining weight or becoming fat, even though under weight,
- disturbance in the way in which one’s body weight or shape is experienced, undue influence of body weight or shape on self-evaluation, or denial of the seriousness of the current low body weight,
- absence of at least three consecutive menstrual cycles in postmenarcheal females.

There are two types of anorexia nervosa. Restricting type includes persons not regularly engaging in binge-eating or purging behavior such as self-induced vomiting or misuse of laxatives, diuretics, or enemas. Binge-eating/Purging type includes persons regularly engaging in binge-eating or purging behaviors such as those named previously (APA, 2000).

**Bulimia Nervosa (ICD-9 Code 307.51)**

Bulimia nervosa is an eating disorder characterized by episodes of excessive eating (bingeing) followed by compensatory behavior for weight control (purging) through methods such as vomiting, laxative use, diet pills, diuretics, excessive exercise, or fasting (ADA, Bulimia Overview, 2010). Purging methods are not necessarily effective in preventing weight gain, so patients may present at normal or above-normal weight. The root of the bulimic cycle is an abnormally low self-esteem coupled with a variety of possible psychiatric or psychosocial issues. Fear of being unacceptable is acted out in the form of fear of weight gain where perceived fundamental flaws translate into dissatisfaction with body (ADA, Bulimia Overview, 2010).

Bulimia nervosa occurs more often in women than in men with prevalence rates reported as one to five percent in adolescents and highest among female college students. Actual rates may be higher as there is a great deal of shame and secrecy with this condition and therefore, many of those affected may not report bulimic behavior (ADA, Bulimia Disease Process, 2010).

According to the DSM (APA, 2000), diagnostic criteria include:
- recurrent episodes of binge eating characterized by both eating an amount of food definitely larger than most people would eat during a similar period of time in similar circumstances and a sense of lack of control over eating during the episode,
recurrent inappropriate compensatory behavior in order to prevent weight gain such as self-induced vomiting, misuse of laxatives, diuretics, enemas, or other medications, fasting, or excessive exercise, the binge eating and inappropriate compensatory behaviors both occur, on average, at least twice a week for three months, self-evaluation is unduly influenced by body shape and weight, the disturbance does not occur exclusively during episodes of anorexia nervosa. There are two types of bulimia nervosa. Purging type includes persons regularly engaging in self-induced vomiting or misuse of laxatives, diuretics or enemas. Nonpurging type includes persons who use other inappropriate compensatory behaviors such as fasting or excessive exercise (APA, 2000).

**Eating Disorder Not Otherwise Specified (ICD-9 Code 307.50)**

This diagnosis is used for persons who do not meet the specific criteria for any specific eating disorder. Eating disorder not otherwise specified (EDNOS) represents the most common eating disorder diagnosis in specialized treatment settings and accounts for three-quarters of all community cases of eating disorders (Machado, Machado, Goncalves, & Hoek, 2007) Examples may include
- females who meet all the criteria for anorexia nervosa except have regular menses,
- patients who meet all criteria for anorexia nervosa except, despite significant weight loss, current weight is in normal range,
- patients who meet all criteria for bulimia nervosa except the binge eating and compensatory behavior occurs less frequently than twice a week or for a duration of less than three months,
- patients of normal body weight who use inappropriate compensatory behaviors after eating small amounts of food,
- patients who repeatedly chew and spit out, but not swallow food, and binge-eating disorder of recurrent episodes of binge eating without regular use of inappropriate compensatory behaviors of bulimia nervosa (APA, 2000),

**Binge Eating Disorder**

Binge eating disorder is included in the DSM (APA, 2000) as an eating disorder not otherwise specified. It is also included in the DSM Appendix B, which is used to list diagnostic categories that were not included in the current edition but may be included in future editions should adequate data be available to warrant a separate diagnostic category. Binge eating disorder is often associated with obesity and the concomitant nutritional and medical complications. It is characterized by recurrent episodes of binge eating in the absence of any compensatory behaviors characteristic of bulimia nervosa (ADA, Binge Eating Disorder Disease Process, 2010).

Prevalence of binge eating disorder is two to three percent of the adult population and eight percent of the obese adult population. Binge eating disorder is not uncommon in men and the average age at presentation for medical care is 30 to 50 years, although
the condition may have been present for many years (ADA, Binge Eating Disorder Overview, 2010).

According to the DSM (APA, 2000), research criteria for binge eating disorder include
recurrent binging episodes characterized by eating an amount of food definitely larger than most people would eat in similar circumstances and a similar amount of time accompanied by a lack of control over eating,
binge eating episodes are associated with three or more of the following
- eating much more rapidly than normal,
- eating until feeling uncomfortably full,
- eating large amounts of foods when not feeling physically hungry,
- eating alone because of being embarrassed of how much is eaten,
- feeling disgusted with oneself, depressed, or very guilty after overeating,
marked distress regarding binge eating,
binge eating occurs at least two days per week for six months, and/or
binge eating is not associated with regular use of compensatory behaviors (APA, 2000).

Objectives
Nutrition therapy for eating disorders is most successful when combined with psychological counseling and medical supervision. Cognitive behavior therapy is frequently used for psychological counseling, but many other methods are available and have demonstrated success. The Registered Dietitian may provide nutrition education, meal planning, and assist the patient in awareness of hunger cues. Focus should be on self-acceptance, positive self-esteem, and caring for self to improve patient adherence to health-focused outcome. It is important that the Registered Dietitian have a strong background in counseling and/or psychology and experience in working with patients with eating disorders.
Goals of nutrition therapy for eating disorders may include the following as they are appropriate to individual patients
- weight gain, if necessary, and return of the patient's body to a nourished and stable state,
- discussion of myths and beliefs relating to disordered eating habits,
- reconnecting the patient with reason to eat,
- addressing ritualistic behaviors related to food,
- establishing regular meal and snack times and spacing,
- planning reasonable menus,
- addressing gastrointestinal complaints or constipation,
- reconnecting the patient with pleasurable and social aspects of eating and food,
- resuming normal menstruation in females,
- teaching hunger and satiety cues, and
- adequate fluid intake.
Nutrition Care

*Nutrition Assessment*

Establish rapport early in the first interaction with the patient. Some patients may not be seeking help willingly, and it is thus important to establish a relationship with them in order to obtain accurate information. Asking why the patient is seeking help or how you can be of help may assist in starting dialogue and determining the motivation for the session. Use the Prochaska & DeClemente (1994) stages of behavior change to gain insight into the patient's motivation to change.

Use the technique of motivational interviewing (Miller & Rollick, 1991) to assist in establishing mutually agreeable goals. The person's values will help them focus on improving their health for reasons important to them. Use these values to reinforce behaviors associated with recovery.

Identify support systems including family, friends, and other members of the treatment team.

Determine food and eating history including
- current eating habits,
- family eating habits and patterns,
- past diets and changes in eating patterns,
- classification of food as safe or unsafe,
- binge and purge experience,
- restriction or binge triggers,
- physical activity habits and experience,
- past experience with eating disorder treatment,
- when weight focus or body dissatisfaction began, and
- fluid intake including caffeinated beverages, non-caloric beverages, and ice.

Determine anthropometrics and weight history including
- height,
- weight using blind weighing with patient's back to the scale and not sharing weight with patient until determination of how the information will influence their behaviors and thoughts, and
- weight history including highest and lowest weights and respective dates and/or time periods.

Determine use of prescription and over-the-counter medications or herbs including laxatives, diuretics, and appetite suppressants, vitamin and mineral supplements, caffeine, social drugs, and alcohol. Determine medical history, psychological history, gastrointestinal complaints, and review lab work to identify medical complications and vitamin or mineral deficiencies.
**Nutrition Intervention**

Determine calorie needs using an estimate of 130% measured or predicted resting energy expenditure (REE) using the Mifflin-St.Jeor equation with current weight as a starting place. Keep in mind predictor equations may not be accurate as REE increases dramatically during refeeding, but can provide a starting place.

- Men: \[ \text{REE (kcal/day)} = 10 \times \text{Wt (kg)} + 6.25 \times \text{Ht (cm)} - 5 \times \text{Age (years)} + 5, \]
- Women: \[ \text{REE (kcal/day)} = 10 \times \text{Wt (kg)} + 6.25 \times \text{Ht (cm)} - 5 \times \text{Age (years)} - 161 \]

(ADA, Weight Management Calculations for Nutrition Assessment, 2010).

If necessary, add energy gradually by 100 to 200 kcal increments keeping in mind energy needs will increase throughout the course of refeeding, sometimes to 5,000 kcal and above. Goal includes weight gain of one to two pounds per week until reaching goal weight (ADA, Anorexia Nervosa Nutrition Prescription, 2010).

Recommended goal weight can be established three to five pounds above weight where menses is resumed (ADA, Anorexia Nervosa Goals, 2010).

Assist patient in creating meal plan or menus with the following macronutrient composition

- 50 to 55 percent carbohydrate or four to five grams per kilogram recommended body weight,
- 25 to 30 percent fat, and
- 15 to 20 percent protein or 0.8 to 1.2 grams per kilogram recommended body weight (ADA, Anorexia Nervosa Nutrition Prescription & Bulimia Nutrition Prescription, 2010).

Plan meals and snacks using regular foods as opposed to sugar-free and fat-free foods as accepted by the patient. Meal plans based on exchange system can be helpful in establishing regular meal patterns and common language between the Registered Dietitian and patient. However, for some patients, these plans can become ritualistic and restrictive inhibiting recovery.

Use regular foods as much as possible unless nutrition supplements are needed to reach caloric intake goals.

Discuss pre-planning meals and scheduling eating times.

Discuss developing awareness of body signals of hunger and satiety. Instruct patient in keeping daily food records to work toward goals. Discontinue if patient becomes “perfectionistic” with record keeping.

Add “unsafe” foods slowly as patient is ready.

Advise journaling of emotions and thoughts regarding eating and foods.

Provide physical activity recommendations with physician approval.
Tube feeding may be necessary in cases where the patient cannot for physical or psychological reasons consume adequate energy by mouth.
Educate on normal weight fluctuations.
Assist patient in developing strategies to delay or overcome eating disorder behaviors. These may include
- misuse of foods such as calorie-free beverages or chewing gum to suppress appetite,
- scheduling activities to make eating inconvenient, if not impossible,
- eating only small portions of food and stopping eating when still hungry,
- avoiding once loved food because it is not healthy,
- spending extended time selecting food,
- delaying eating in an effort to avoid eating completely,
- fear of fat in food and on body,
- eating food based on calorie content rather than taste and enjoyment,
- avoiding eating with others, and
- using athletic performance as rationale for low body weight.

**Nutrition Monitoring**

Nutrition monitoring should be individualized based on severity of malnutrition and complications. In an inpatient setting, nutrition assessment and reassessment may occur two to three times per week. For out-patient settings, weekly or biweekly sessions may be appropriate for medically stable patients. Nutrition counseling should not be discontinued when healthy weight or cessation of purging has occurred. It should continue until eating behaviors are normalized and maintained. Nutrition counseling for a year or more is often indicated to prevent relapse. Nutrition counseling should be evaluated individually and regularly in consultation with the treatment team and patient (ADA, Bulimia Nutrition Monitoring & Evaluation, 2010).

In patients who are underweight and malnourished, monitoring for refeeding syndrome is important in the beginning stages of refeeding. Complications of refeeding can be seen in the cardiovascular system, neurologically, and in hematological values. The following should be assessed:
- hypophosphatemia (monitor phosphate levels daily during first week of refeeding),
- sudden drops in potassium and magnesium,
- glucose intolerance,
- hypokalemia,
- gastrointestinal dysfunction,
- cardiac arrhythmias, and
- congestive heart failure (ADA, Anorexia Nervosa Refeeding Syndrome, 2010).

Monitor and discuss refeeding side effects with patients including
water retention,  
constipation (address food choices and hydration using laxatives and stool  
softeners only under medical supervision),  
feelings of fullness and slow digestion, and  
food restriction.  
Monitor progress toward goals and modify goals as needed. Assist patients in  
developing a healthy relationship with food providing energy, good health, disease  
prevention, mental clarity, and enjoyment.

References

from www.nutritioncaremanual.org

American Psychiatric Association. (2000). Diagnostic and Statistical Manual of  
Association.


prevalence of eating disorders not otherwise specified. International Journal of  
Eating Disorders. 3, 212-217.


Facts About Eating Disorders. Retrieved May 28, 2010 from  
www.anad.org/getInformation/abouteatingdisorders

Morrow and Company.


Further Information Sources

Academy for Eating Disorders  
www.aedweb.org

Anorexia and Related Eating Disorders  
www.anred.org
Section 3K: Dementia & Nervous System Disorders

Eating Disorder Publications and Education  
www.bulimia.com

Eating Disorder Task Force of Indiana  
www.edtfi.org

International Association of Eating Disorder Professionals  
www.iaedp.com
National Association of Anorexia Nervosa and Associated Disorders  
www.anad.org

National Eating Disorder Association  
www.nationaleatingdisorders.org

Eating Disorders Shared Awareness – Canada  
Mirror-Mirror  
www.mirror-mirror.org
Section 4A: Calorie Control

Calorie Controlled Diet

Use
This diet may be prescribed for management of obesity, metabolic syndrome, and impaired glucose tolerance.

Adequacy
This diet is nutritionally adequate when
- calorie levels are 1200 calories or above,
- 50 to 60 percent of calories are from carbohydrate,
- 10 to 20 percent of calories are from protein, and
- 20 to 30 percent of calories are from fat.

Provide multivitamin and mineral supplements when the calorie level or meal plan does not permit adequate intake of essential micronutrients from food.

Diet Principles
- Reduce calories by 500 to 1,000 per day from person's usual intake.
- Appropriate daily calorie ranges are 1200 to 1600 for men and active women, and 1000 to 1200 for sedentary women.
- Use a meal plan that provides guidance about both portion sizes and number of portions per day from all food groups. (See Table 2A-1: USDA Food Guide by calorie levels.) The Exchange Lists for Diabetes developed jointly by the American Diabetes Association and the American Dietetic Association (2008), have been commonly used to plan calorie-controlled diets. The lists are found at the end of this section. (Table 4A-1)
- Food preparation should include foods low in sugar, sodium, saturated fat, and total fat.
- Provide adequate protein based on the DRIs for age. Adequate amounts of protein-rich foods help to maintain muscle mass and to prevent hunger sensations between meals.
- Include at least 10 to 11 grams of fat in at least one meal daily to maintain gall bladder function.
- Provide 130 or more grams of carbohydrate daily (Food and Nutrition Board, 2002, p. 6-19).
- Increased fiber intake helps to keep the person satisfied between meals. Fiber also helps with cholesterol and blood glucose control. Encourage whole fruits and vegetables and whole grains.
- Encourage low-fat or nonfat dairy products to be consistent with the U.S. Dietary Guidelines.
- Ensure adequate fluid intake. Fluid needs vary by individual and activity levels.
- Commercial weight loss formulas are generally used for Very Low Calorie Diets (VLCD) that provide 400 to 800 calories per day. Formulas often contain more
Section 4A: Calorie Control

complete nutrition than prepackaged bars or meals marketed for weight control (Foster & Nonas, 2004). VLCDs should only be used for people who have a BMI of 30 or more. Formulas make it easy to control calories, so this may explain why some people have initial weight loss success with them.

Suggested Meal Plan

Meal plans should be individualized. The goal for planning meals is to distribute calories and nutrients evenly through the day. A sample of a 1200-calorie meal plan follows.

<table>
<thead>
<tr>
<th>Breakfast</th>
<th>Lunch</th>
<th>Dinner</th>
</tr>
</thead>
<tbody>
<tr>
<td>- 1 1/2 cups wheat flakes cereal</td>
<td>Chef salad made with</td>
<td>- 3 ounces grilled center-cut pork chop</td>
</tr>
<tr>
<td>- 1/2 banana</td>
<td>- 1 cup lettuce and cucumber</td>
<td>- 1/2 cup mashed potato made without fat</td>
</tr>
<tr>
<td>- 1 cup 1% low-fat milk</td>
<td>- 1 ounce turkey</td>
<td>- 1/2 cup corn</td>
</tr>
<tr>
<td>- 1 cup nonfat flavored yogurt</td>
<td>- 1 ounce low-fat cheese</td>
<td>- 1/2 cup beets</td>
</tr>
<tr>
<td></td>
<td>- 1/2 cup sliced carrots</td>
<td>- 1 cup cauliflower</td>
</tr>
<tr>
<td></td>
<td>- 1 dined tomato</td>
<td>- 1 Tbs low-fat margarine</td>
</tr>
<tr>
<td></td>
<td>- 10 small green olives</td>
<td>- 1/2 cup unsweetened applesauce</td>
</tr>
<tr>
<td></td>
<td>- 2 Tbs low-fat salad dressing</td>
<td></td>
</tr>
<tr>
<td>- water or non-caloric beverage</td>
<td>- water or non-caloric beverage</td>
<td>- water or non-caloric beverage</td>
</tr>
</tbody>
</table>

Table 4 A-1: Calorie content and sources of standard portions

<table>
<thead>
<tr>
<th>Exchange Group</th>
<th>Carbohydrate grams</th>
<th>Protein grams</th>
<th>Fat grams</th>
<th>Calories</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Carbohydrate Groups</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Starch</td>
<td>15</td>
<td>3</td>
<td>0-1</td>
<td>80</td>
</tr>
<tr>
<td>Fruit</td>
<td>15</td>
<td>---</td>
<td>---</td>
<td>60</td>
</tr>
<tr>
<td>Milk</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fat-Free</td>
<td>12</td>
<td>8</td>
<td>0-3</td>
<td>90</td>
</tr>
<tr>
<td>Reduced-Fat</td>
<td>12</td>
<td>8</td>
<td>5</td>
<td>120</td>
</tr>
<tr>
<td>Whole</td>
<td>12</td>
<td>8</td>
<td>8</td>
<td>150</td>
</tr>
<tr>
<td>Other Carbohydrates</td>
<td>15</td>
<td>Varies</td>
<td>Varies</td>
<td>Varies</td>
</tr>
<tr>
<td><strong>Meat and Meat Substitute Group</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Very Lean</td>
<td>---</td>
<td>7</td>
<td>0-1</td>
<td>35</td>
</tr>
<tr>
<td>Lean</td>
<td>---</td>
<td>7</td>
<td>3</td>
<td>55</td>
</tr>
<tr>
<td>Medium Fat</td>
<td>---</td>
<td>7</td>
<td>5</td>
<td>75</td>
</tr>
<tr>
<td>High Fat</td>
<td>---</td>
<td>7</td>
<td>8</td>
<td>100</td>
</tr>
<tr>
<td>Fat Group</td>
<td>---</td>
<td>---</td>
<td>5</td>
<td>45</td>
</tr>
</tbody>
</table>

Starch List

Bread

<table>
<thead>
<tr>
<th>Bread</th>
<th>1/4 (1 oz)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bagel, 4 ounce</td>
<td>1/4 (1 oz)</td>
</tr>
<tr>
<td>Bread, reduced-calorie</td>
<td>2 slices (1 1/2 oz)</td>
</tr>
<tr>
<td>Bread, white, whole-wheat, pumpernickel, rye</td>
<td>1 slice (1 oz)</td>
</tr>
</tbody>
</table>
## Section 4A: Calorie Control

<table>
<thead>
<tr>
<th>Item</th>
<th>Serving Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>English muffin</td>
<td>1/2</td>
</tr>
<tr>
<td>Hot dog or hamburger bun</td>
<td>1/2 (1 oz)</td>
</tr>
<tr>
<td>Naan, 8 x 2 inch</td>
<td>1/4</td>
</tr>
<tr>
<td>Pancake, 4 inch across, 1/4 inch thick</td>
<td>1</td>
</tr>
<tr>
<td>Pita, 6 inch across</td>
<td>1/2</td>
</tr>
<tr>
<td>Raisin bread, unfrosted</td>
<td>1 slice (1 oz)</td>
</tr>
<tr>
<td>Roll, plain, small</td>
<td>1 (1 oz)</td>
</tr>
<tr>
<td>Tortilla, corn, 6 inch across</td>
<td>1</td>
</tr>
<tr>
<td>Tortilla, flour, 6 inch across</td>
<td>1</td>
</tr>
<tr>
<td>Waffle, 4 1/2 inch across, reduced-fat</td>
<td>1</td>
</tr>
</tbody>
</table>

### Cereals and Grains

<table>
<thead>
<tr>
<th>Item</th>
<th>Serving Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bran cereals</td>
<td>1/2 cup</td>
</tr>
<tr>
<td>Bulgur</td>
<td>1/2 cup</td>
</tr>
<tr>
<td>Cereals, cooked</td>
<td>1/2 cup</td>
</tr>
<tr>
<td>Cereals, unsweetened, ready-to-eat</td>
<td>3/4 cup</td>
</tr>
<tr>
<td>Cornmeal (dry)</td>
<td>3 Tbs</td>
</tr>
<tr>
<td>Couscous</td>
<td>1/3 cup</td>
</tr>
<tr>
<td>Flour (dry)</td>
<td>3 Tbs</td>
</tr>
<tr>
<td>Granola, low-fat</td>
<td>1/4 cup</td>
</tr>
<tr>
<td>Grape-Nuts</td>
<td>1/4 cup</td>
</tr>
<tr>
<td>Grits</td>
<td>1/2 cup</td>
</tr>
<tr>
<td>Kasha</td>
<td>1/2 cup</td>
</tr>
<tr>
<td>Millet</td>
<td>1/3 cup</td>
</tr>
<tr>
<td>Muesli</td>
<td>1/4 cup</td>
</tr>
<tr>
<td>Oats</td>
<td>1/2 cup</td>
</tr>
<tr>
<td>Pasta</td>
<td>1/3 cup</td>
</tr>
<tr>
<td>Puffed cereal</td>
<td>1 1/2 cups</td>
</tr>
<tr>
<td>Rice, white or brown</td>
<td>1/3 cup</td>
</tr>
<tr>
<td>Shredded Wheat</td>
<td>1/2 cup</td>
</tr>
<tr>
<td>Sugar-frosted cereal</td>
<td>1/2 cup</td>
</tr>
<tr>
<td>Wheat germ</td>
<td>3 Tbs</td>
</tr>
</tbody>
</table>

### Starchy Vegetables

<table>
<thead>
<tr>
<th>Item</th>
<th>Serving Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baked beans</td>
<td>1/3 cup</td>
</tr>
<tr>
<td>Corn</td>
<td>1/2 cup</td>
</tr>
<tr>
<td>Corn on cob, large</td>
<td>1/2 cob, 5 oz</td>
</tr>
<tr>
<td>Mixed vegetables with corn, peas, or pasta</td>
<td>1 cup</td>
</tr>
<tr>
<td>Peas, green</td>
<td>1/2 cup</td>
</tr>
<tr>
<td>Plantain</td>
<td>1/2 cup</td>
</tr>
<tr>
<td>Potato, boiled</td>
<td>1/2 cup or 1/2 medium (3 oz)</td>
</tr>
<tr>
<td>Potato, baked with skin</td>
<td>1/4 large (3 oz)</td>
</tr>
<tr>
<td>Potato, mashed</td>
<td>1/2 cup</td>
</tr>
<tr>
<td>Squash, winter (acorn, butternut, pumpkin)</td>
<td>1 cup</td>
</tr>
<tr>
<td>Yam, sweet potato, plain</td>
<td>1/2 cup</td>
</tr>
</tbody>
</table>
Section 4A: Calorie Control

Crackers and Snacks

<table>
<thead>
<tr>
<th>Snack</th>
<th>Calories</th>
</tr>
</thead>
<tbody>
<tr>
<td>Animal crackers</td>
<td>8</td>
</tr>
<tr>
<td>Graham cracker, 2 1/2 inch square</td>
<td>3</td>
</tr>
<tr>
<td>Matzoh</td>
<td>3/4 oz</td>
</tr>
<tr>
<td>Melba toast</td>
<td>4 slices</td>
</tr>
<tr>
<td>Oyster crackers</td>
<td>24</td>
</tr>
<tr>
<td>Popcorn (popped, no fat added, or low-fat microwave)</td>
<td>3 cups</td>
</tr>
<tr>
<td>Pretzels</td>
<td>3/4 oz</td>
</tr>
<tr>
<td>Rice cakes, 4 inch across</td>
<td>2</td>
</tr>
<tr>
<td>Saltine-type crackers</td>
<td>6</td>
</tr>
<tr>
<td>Snack chips, fat-free or baked (tortilla or potato)</td>
<td>15 to 20 (3/4 oz)</td>
</tr>
<tr>
<td>Whole-wheat crackers, no fat added</td>
<td>2 to 5 (3/4 oz)</td>
</tr>
</tbody>
</table>

Beans, Peas, and Lentils

(count as 1 starch exchange plus 1 very lean meat exchange)

<table>
<thead>
<tr>
<th>Food</th>
<th>Serving Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beans and Peas (garbanzo, pinto, kidney, white, split, black-eyed)</td>
<td>1/2 cup</td>
</tr>
<tr>
<td>Lima beans</td>
<td>2/3 cup</td>
</tr>
<tr>
<td>Lentils</td>
<td>1/2 cup</td>
</tr>
<tr>
<td>Miso</td>
<td>3 Tbs</td>
</tr>
</tbody>
</table>

Starchy Foods Prepared with Fat

(count as 1 starch exchange plus 1 fat exchange)

<table>
<thead>
<tr>
<th>Food</th>
<th>Serving Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biscuit, 2 1/2 inch across</td>
<td>1</td>
</tr>
<tr>
<td>Chow mein noodles</td>
<td>1/2 cup</td>
</tr>
<tr>
<td>Corn bread, 2 inch cube</td>
<td>1 (2 oz)</td>
</tr>
<tr>
<td>Crackers, round butter type</td>
<td>6</td>
</tr>
<tr>
<td>Croutons</td>
<td>1 cup</td>
</tr>
<tr>
<td>French-fried potatoes (oven baked)</td>
<td>1 cup (2 oz)</td>
</tr>
<tr>
<td>Granola</td>
<td>1/2 cup</td>
</tr>
<tr>
<td>Hummus</td>
<td>1/3 cup</td>
</tr>
<tr>
<td>Muffin, 5 ounce</td>
<td>1/5 (1 oz)</td>
</tr>
<tr>
<td>Popcorn, microwave</td>
<td>3 cups</td>
</tr>
<tr>
<td>Sandwich crackers, cheese or peanut butter filling</td>
<td>3</td>
</tr>
<tr>
<td>Snack chips (potato, tortilla)</td>
<td>9 to 13 (3/4 oz)</td>
</tr>
<tr>
<td>Stuffing, bread (prepared)</td>
<td>1/3 cup</td>
</tr>
<tr>
<td>Taco shell, 6 inch across</td>
<td>2</td>
</tr>
<tr>
<td>Waffle, 4 inch square or across</td>
<td>1</td>
</tr>
<tr>
<td>Whole-wheat crackers, fat added</td>
<td>4 to 6 (1 oz)</td>
</tr>
</tbody>
</table>

Fruit List

The weight includes skin, core, seeds, and rind.

<table>
<thead>
<tr>
<th>Fruit</th>
<th>Serving Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apple, unpeeled, small</td>
<td>1 (4 oz)</td>
</tr>
<tr>
<td>Applesauce, unsweetened</td>
<td>1/2 cup</td>
</tr>
<tr>
<td>Apples, dried</td>
<td>4 rings</td>
</tr>
<tr>
<td>Apricots, fresh</td>
<td>4 whole (5 1/2 oz)</td>
</tr>
</tbody>
</table>
### Section 4A: Calorie Control

<table>
<thead>
<tr>
<th>Item</th>
<th>Serving Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apricots, canned</td>
<td>1/2 cup</td>
</tr>
<tr>
<td>Banana, small</td>
<td>1 (4 oz)</td>
</tr>
<tr>
<td>Blackberries</td>
<td>3/4 cup</td>
</tr>
<tr>
<td>Blueberries</td>
<td>3/4 cup</td>
</tr>
<tr>
<td>Cantaloupe, small</td>
<td>1/3 melon (11 oz) or 1 cup cubes</td>
</tr>
<tr>
<td>Cherries, sweet fresh</td>
<td>12 (3 oz)</td>
</tr>
<tr>
<td>Cherries, sweet, canned</td>
<td>1/2 cup</td>
</tr>
<tr>
<td>Dates</td>
<td>3</td>
</tr>
<tr>
<td>Figs, fresh</td>
<td>1 1/2 large or 2 medium (3 1/2 oz)</td>
</tr>
<tr>
<td>Figs, dried</td>
<td>1 1/2</td>
</tr>
<tr>
<td>Fruit cocktail</td>
<td>1/2 cup</td>
</tr>
<tr>
<td>Grapefruit sections, canned</td>
<td>3/4 cup</td>
</tr>
<tr>
<td>Grapes, small</td>
<td>17 (3 oz)</td>
</tr>
<tr>
<td>Honeydew melon</td>
<td>1 slice (10 oz) or 1 cup cubes</td>
</tr>
<tr>
<td>Kiwi</td>
<td>1 (3 1/2 oz)</td>
</tr>
<tr>
<td>Mandarin oranges, canned</td>
<td>3/4 cup</td>
</tr>
<tr>
<td>Nectarine, small</td>
<td>1 (5 oz)</td>
</tr>
<tr>
<td>Orange, small</td>
<td>1 (6 1/2 oz)</td>
</tr>
<tr>
<td>Papaya</td>
<td>1/2 fruit (8 oz) or 1 cup cubes</td>
</tr>
<tr>
<td>Peach, medium, fresh</td>
<td>1 (4 oz)</td>
</tr>
<tr>
<td>Peaches, canned</td>
<td>1/2 cup</td>
</tr>
<tr>
<td>Pear, large, fresh</td>
<td>1/2 (4 oz)</td>
</tr>
<tr>
<td>Pears, canned</td>
<td>1/2 cup</td>
</tr>
<tr>
<td>Pineapple, fresh</td>
<td>3/4 cup</td>
</tr>
<tr>
<td>Pineapple, canned</td>
<td>1/2 cup</td>
</tr>
<tr>
<td>Plums, small</td>
<td>2 (5 oz)</td>
</tr>
<tr>
<td>Plums, canned</td>
<td>1/2 cup</td>
</tr>
<tr>
<td>Plums, dried (prunes)</td>
<td>3</td>
</tr>
<tr>
<td>Raisins</td>
<td>2 Tbs</td>
</tr>
<tr>
<td>Raspberries</td>
<td>1 cup</td>
</tr>
<tr>
<td>Strawberries</td>
<td>1 1/4 cup whole berries</td>
</tr>
<tr>
<td>Tangerines, small</td>
<td>2 (8 oz)</td>
</tr>
<tr>
<td>Watermelon</td>
<td>1 slice (13 1/2 oz) or 1 1/4 cup cubes</td>
</tr>
</tbody>
</table>

### Fruit Juice, Unsweetened

<table>
<thead>
<tr>
<th>Item</th>
<th>Serving Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apple juice/cider</td>
<td>1/2 cup</td>
</tr>
<tr>
<td>Cranberry juice cocktail</td>
<td>1/3 cup</td>
</tr>
<tr>
<td>Cranberry juice cocktail, reduced-calorie</td>
<td>1 cup</td>
</tr>
<tr>
<td>Fruit juice blends, 100% juice</td>
<td>1/3 cup</td>
</tr>
<tr>
<td>Grape juice</td>
<td>1/3 cup</td>
</tr>
<tr>
<td>Grapefruit juice</td>
<td>1/2 cup</td>
</tr>
<tr>
<td>Orange juice</td>
<td>1/2 cup</td>
</tr>
</tbody>
</table>
Section 4A: Calorie Control

<table>
<thead>
<tr>
<th>Pineapple juice</th>
<th>1/2 cup</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prune juice</td>
<td>1/3 cup</td>
</tr>
</tbody>
</table>

**Milk List**

**Fat-free and Low-fat Milk**

<table>
<thead>
<tr>
<th>Milk Type</th>
<th>Serving Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fat-free milk</td>
<td>1 cup</td>
</tr>
<tr>
<td>1/2% milk</td>
<td>1 cup</td>
</tr>
<tr>
<td>1% milk</td>
<td>1 cup</td>
</tr>
<tr>
<td>Buttermilk, low-fat or fat free</td>
<td>1 cup</td>
</tr>
<tr>
<td>Evaporated fat-free milk</td>
<td>1/2 cup</td>
</tr>
<tr>
<td>Fat-free dry milk</td>
<td>1/3 cup dry</td>
</tr>
<tr>
<td>Soy milk, low-fat or fat free</td>
<td>1 cup</td>
</tr>
<tr>
<td>Yogurt, fat-free, flavored, sweetened with nonnutritive sweetener and fructose</td>
<td>2/3 cup (6 oz)</td>
</tr>
<tr>
<td>Yogurt, plain, fat-free</td>
<td>2/3 cup (6 oz)</td>
</tr>
</tbody>
</table>

**Reduced Fat**

<table>
<thead>
<tr>
<th>Milk Type</th>
<th>Serving Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>2% milk</td>
<td>1 cup</td>
</tr>
<tr>
<td>Soy milk</td>
<td>1 cup</td>
</tr>
<tr>
<td>Sweet acidophilus milk</td>
<td>1 cup</td>
</tr>
<tr>
<td>Yogurt, plain, low-fat</td>
<td>3/4 cup</td>
</tr>
</tbody>
</table>

**Whole Milk**

<table>
<thead>
<tr>
<th>Milk Type</th>
<th>Serving Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Whole milk</td>
<td>1 cup</td>
</tr>
<tr>
<td>Evaporated whole milk</td>
<td>1/2 cup</td>
</tr>
<tr>
<td>Goat’s milk</td>
<td>1 cup</td>
</tr>
<tr>
<td>Kefir</td>
<td>1 cup</td>
</tr>
<tr>
<td>Yogurt, plain (made from whole milk)</td>
<td>3/4 cup</td>
</tr>
</tbody>
</table>

**Sweets, Desserts, and Other Carbohydrates List**

<table>
<thead>
<tr>
<th>Food</th>
<th>Serving Size</th>
<th>Exchanges per Serving</th>
</tr>
</thead>
<tbody>
<tr>
<td>Angel food cake, unfrosted</td>
<td>1/12 cake (2 oz)</td>
<td>2 carbohydrates</td>
</tr>
<tr>
<td>Brownie, small, unfrosted</td>
<td>2-inch square (1 oz)</td>
<td>1 carbohydrate, 1 fat</td>
</tr>
<tr>
<td>Cake, unfrosted</td>
<td>2-inch square (1 oz)</td>
<td>1 carbohydrate, 1 fat</td>
</tr>
<tr>
<td>Cake, frosted</td>
<td>2-inch square (1 oz)</td>
<td>2 carbohydrates, 1 fat</td>
</tr>
<tr>
<td>Cookie or sandwich cookie with crème filling</td>
<td>2 small (2/3 oz)</td>
<td>1 carbohydrate, 1 fat</td>
</tr>
<tr>
<td>Cookies, sugar-free</td>
<td>3 small or 1 large (3/4-1 oz)</td>
<td>1 carbohydrate, 1 to 2 fats</td>
</tr>
<tr>
<td>Cranberry sauce, jellied</td>
<td>1/4 cup</td>
<td>1 1/2 carbohydrates</td>
</tr>
<tr>
<td>Cupcake, frosted</td>
<td>1 small (2 oz)</td>
<td>2 carbohydrates, 1 fat</td>
</tr>
<tr>
<td>Doughnut, plain cake</td>
<td>1 medium (1 1/2 oz)</td>
<td>1 1/2 carbohydrates, 2 fats</td>
</tr>
</tbody>
</table>
## Section 4A: Calorie Control

<table>
<thead>
<tr>
<th>Item</th>
<th>Serving Size</th>
<th>Carbohydrates</th>
<th>Fats</th>
</tr>
</thead>
<tbody>
<tr>
<td>Doughnut, glazed</td>
<td>3 3/4 inch across (2 oz)</td>
<td>2 carbohydrates, 2 fats</td>
<td></td>
</tr>
<tr>
<td>Energy, sport, or breakfast bar</td>
<td>1 bar (1 1/3 oz)</td>
<td>1 1/2 carbohydrates, 0 to 1 fat</td>
<td></td>
</tr>
<tr>
<td>Energy, sport, or breakfast bar</td>
<td>1 bar (2 oz)</td>
<td>2 carbohydrates, 1 fat</td>
<td></td>
</tr>
<tr>
<td>Fruit cobbler</td>
<td>1/2 cup (3 1/2 oz)</td>
<td>3 carbohydrates, 1 fat</td>
<td></td>
</tr>
<tr>
<td>Fruit juice bars, frozen, 100% juice</td>
<td>1 bar (3 oz)</td>
<td>1 carbohydrate</td>
<td></td>
</tr>
<tr>
<td>Fruit snacks, chewy (pureed fruit concentrate)</td>
<td>1 roll (3/4 oz)</td>
<td>1 carbohydrate</td>
<td></td>
</tr>
<tr>
<td>Fruit spreads, 100% fruit</td>
<td>1 1/2 Tbs</td>
<td>1 carbohydrate</td>
<td></td>
</tr>
<tr>
<td>Gelatin, regular</td>
<td>1/2 cup</td>
<td>1 carbohydrate</td>
<td></td>
</tr>
<tr>
<td>Gingersnaps</td>
<td>3</td>
<td>1 carbohydrate</td>
<td></td>
</tr>
<tr>
<td>Granola or snack bar, regular or low-fat</td>
<td>1 bar (1 oz)</td>
<td>1 1/2 carbohydrates</td>
<td></td>
</tr>
<tr>
<td>Honey</td>
<td>1 Tbs</td>
<td>1 carbohydrate</td>
<td></td>
</tr>
<tr>
<td>Ice cream</td>
<td>1/2 cup</td>
<td>1 carbohydrate, 2 fats</td>
<td></td>
</tr>
<tr>
<td>Ice cream, light</td>
<td>1/2 cup</td>
<td>1 carbohydrate, 1 fat</td>
<td></td>
</tr>
<tr>
<td>Ice cream, low-fat</td>
<td>1/2 cup</td>
<td>1 1/2 carbohydrates</td>
<td></td>
</tr>
<tr>
<td>Ice cream, fat-free, no sugar added</td>
<td>1/2 cup</td>
<td>1 carbohydrate</td>
<td></td>
</tr>
<tr>
<td>Jam or jelly, regular</td>
<td>1 Tbs</td>
<td>1 carbohydrate</td>
<td></td>
</tr>
<tr>
<td>Milk, chocolate, whole</td>
<td>1 cup</td>
<td>2 carbohydrates, 1 fat</td>
<td></td>
</tr>
<tr>
<td>Pie, fruit, 2 crusts</td>
<td>1/6 of 8-inch pie, commercially prepared</td>
<td>3 carbohydrates, 2 fats</td>
<td></td>
</tr>
<tr>
<td>Pie, pumpkin or custard</td>
<td>1/8 of 8-inch pie, commercially prepared</td>
<td>2 carbohydrates, 2 fats</td>
<td></td>
</tr>
<tr>
<td>Pudding, regular (made with reduced-fat milk)</td>
<td>1/2 cup</td>
<td>2 carbohydrates</td>
<td></td>
</tr>
<tr>
<td>Pudding, sugar-free or sugar-free and fat-free (made with fat-free milk)</td>
<td>1/2 cup</td>
<td>1 carbohydrate</td>
<td></td>
</tr>
<tr>
<td>Reduced-calorie milk replacement (shake)</td>
<td>1 can (10-11 oz)</td>
<td>1 1/2 carbohydrates, 0 to 1 fat</td>
<td></td>
</tr>
<tr>
<td>Rice milk, low-fat or fat free, plain</td>
<td>1 cup</td>
<td>1 carbohydrate</td>
<td></td>
</tr>
<tr>
<td>Salad dressing, fat free</td>
<td>1/4 cup</td>
<td>1 carbohydrate</td>
<td></td>
</tr>
<tr>
<td>Sherbet, sorbet</td>
<td>1/2 cup</td>
<td>2 carbohydrates</td>
<td></td>
</tr>
<tr>
<td>Spaghetti sauce or pasta sauce, canned</td>
<td>1/2 cup</td>
<td>1 carbohydrate, 1 fat</td>
<td></td>
</tr>
<tr>
<td>Sports drinks</td>
<td>1 cup (8 oz)</td>
<td>1 carbohydrate</td>
<td></td>
</tr>
<tr>
<td>Sugar</td>
<td>1 Tbs</td>
<td>1 carbohydrate</td>
<td></td>
</tr>
<tr>
<td>Sweet roll or Danish pastry</td>
<td>1 (2 1/2 oz)</td>
<td>2 1/2 carbohydrates, 2 fats</td>
<td></td>
</tr>
<tr>
<td>Syrup, light</td>
<td>2 Tbs</td>
<td>1 carbohydrate</td>
<td></td>
</tr>
<tr>
<td>Syrup, regular</td>
<td>1 Tbs</td>
<td>1 carbohydrate</td>
<td></td>
</tr>
<tr>
<td>Syrup, regular</td>
<td>1/2 cup</td>
<td>4 carbohydrates</td>
<td></td>
</tr>
</tbody>
</table>
Section 4A: Calorie Control

<table>
<thead>
<tr>
<th></th>
<th>Carbohydrate</th>
<th>Fat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vanilla wafers</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>Yogurt, frozen</td>
<td>1/2 cup</td>
<td>1</td>
</tr>
<tr>
<td>Yogurt, frozen, fat-free</td>
<td>1/3 cup</td>
<td></td>
</tr>
<tr>
<td>Yogurt, low-fat with fruit</td>
<td>1 cup</td>
<td>3</td>
</tr>
</tbody>
</table>

**Nonstarchy Vegetable List**
One vegetable portion is 1/2 cup cooked or 1 cup raw.

- Artichoke
- Artichoke hearts
- Asparagus
- Beans (green, wax, Italian)
- Bean sprouts
- Beets
- Broccoli
- Brussels sprouts
- Cabbage
- Carrots
- Cauliflower
- Celery
- Cucumber
- Eggplant
- Green onions or scallions
- Greens (collard, kale, mustard, turnip)
- Kohlrabi
- Leeks
- Mixed vegetables (without corn, peas or pasta)
- Mushrooms
- Okra
- Onions
- Pea pods
- Peppers (all varieties)
- Radishes
- Salad greens (endive, escarole, lettuce, romaine, spinach)
- Sauerkraut
- Spinach
- Summer squash
- Tomato
- Tomatoes, canned
- Tomato sauce
- Tomato/vegetable juice
- Turnips

Water chestnuts
Watercress
Zucchini

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Section 4A: Calorie Control

**Meat and Meat Substitutes List**

In general, one meat exchange is

- 1 ounce of meat, fish, poultry or cheese
- 1/2 cup cooked dried beans, peas, or lentils

<table>
<thead>
<tr>
<th>Very Lean Meat and Meat Substitutes</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Poultry:</strong> chicken or turkey (white meat, no skin) or Cornish hen (no skin)</td>
<td>1 oz</td>
</tr>
<tr>
<td><strong>Fish:</strong> fresh or frozen cod, flounder, haddock, halibut, trout, lox (smoked salmon), tuna (fresh or canned in water)</td>
<td>1 oz</td>
</tr>
<tr>
<td><strong>Shellfish:</strong> clams, crab, lobster, scallops, shrimp, imitation shellfish</td>
<td>1 oz</td>
</tr>
<tr>
<td><strong>Game:</strong> duck or pheasant (no skin), venison, buffalo, ostrich</td>
<td>1 oz</td>
</tr>
<tr>
<td><strong>Cheese with 1 gram of fat or less per ounce:</strong> Fat-free or low-fat cottage cheese Fat-free cheese</td>
<td>1/4 cup 1 oz</td>
</tr>
<tr>
<td><strong>Other:</strong> Processed sandwich meats with 1 gram of fat or less per ounce, such as deli thin, shaved meats, chipped beef, or turkey ham Egg whites Egg substitutes, plain Hot dogs with 1 gram of fat or less per ounce Kidney (high in cholesterol) Sausage with 1 gram of fat or less per ounce</td>
<td>1 oz 2 each 1/4 cup 1 oz 1 oz</td>
</tr>
</tbody>
</table>

Count as one meat and one starch exchange

| Beans, peas, lentils (cooked) | 1/2 cup |

<table>
<thead>
<tr>
<th>Lean Meat and Meat Substitutes</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Beef:</strong> USDA Select or Choice grades of lean beef trimmed of fat, such as round sirloin and flank steak; tenderloin; roast (rib, chuck, rump); steak (T-bone, porterhouse, cubed) ground round</td>
<td>1 oz</td>
</tr>
<tr>
<td><strong>Pork:</strong> lean pork, such as fresh ham; canned, cured, or boiled ham; Canadian bacon; tenderloin, center loin chop</td>
<td>1 oz</td>
</tr>
<tr>
<td><strong>Lamb:</strong> roast, chop, or leg</td>
<td>1 oz</td>
</tr>
<tr>
<td><strong>Veal:</strong> lean chop, roast</td>
<td>1 oz</td>
</tr>
<tr>
<td><strong>Poultry:</strong> chicken, turkey (dark meat, no skin), chicken (white meat, with skin), domestic duck or goose (well-drained of fat, no skin)</td>
<td>1 oz</td>
</tr>
<tr>
<td><strong>Fish:</strong> Herring, creamed or smoked Oysters Salmon (fresh or canned), catfish Sardines (canned) Tuna (canned in oil, drained)</td>
<td>1 oz 6 medium 1 oz 2 medium 1 oz</td>
</tr>
</tbody>
</table>
### Section 4A: Calorie Control

#### Game:
- Goose (no skin), rabbit

<table>
<thead>
<tr>
<th>Cheese:</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 grams of fat or less per ounce:</td>
</tr>
<tr>
<td>4% to 5% fat cottage cheese</td>
</tr>
<tr>
<td>Grated Parmesan</td>
</tr>
<tr>
<td>1 oz</td>
</tr>
<tr>
<td>1 oz</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Other:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Processed sandwich meats with 3 grams of fat or less per ounce, such as turkey pastrami or kielbasa</td>
</tr>
<tr>
<td>Hot dogs with 3 grams of fat or less per ounce</td>
</tr>
<tr>
<td>Liver, heart (high in cholesterol)</td>
</tr>
<tr>
<td>1 oz</td>
</tr>
<tr>
<td>1 oz</td>
</tr>
</tbody>
</table>

#### Medium Fat Meat and Meat Substitutes

- **Beef:** Most beef products fall into this category (ground beef, meatloaf, corned beef, short ribs, prime grades of meat trimmed of fat, such as prime rib)
- **Pork:** Top loin, chop, Boston butt, cutlet
- **Lamb:** Rib roast, ground
- **Veal:** Cutlet (ground or cubed, unbreaded)
- **Poultry:** Chicken (dark meat, with skin), ground turkey or ground chicken, fried chicken (with skin)
- **Fish:** Any fried fish product

<table>
<thead>
<tr>
<th>Cheese:</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 grams of fat or less per ounce:</td>
</tr>
<tr>
<td>Feta or Mozzarella</td>
</tr>
<tr>
<td>Ricotta</td>
</tr>
<tr>
<td>1 oz</td>
</tr>
<tr>
<td>1 oz</td>
</tr>
<tr>
<td>1/4 cup (2 oz)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Other:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Egg (high in cholesterol, limit to 3 per week)</td>
</tr>
<tr>
<td>Sausage with 5 grams of fat or less per ounce</td>
</tr>
<tr>
<td>Tempeh</td>
</tr>
<tr>
<td>Tofu</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>1 oz</td>
</tr>
<tr>
<td>1/4 cup</td>
</tr>
<tr>
<td>4 oz or 1/2 cup</td>
</tr>
</tbody>
</table>

#### High Fat Meat and Meat Substitutes

- **Pork:** Spareribs, ground pork, pork sausage
- **Cheese:** All regular cheeses, such as American, cheddar, Monterey Jack, Swiss

<table>
<thead>
<tr>
<th>Cheese:</th>
</tr>
</thead>
<tbody>
<tr>
<td>All regular cheeses, such as American, cheddar, Monterey Jack, Swiss</td>
</tr>
<tr>
<td>1 oz</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Other:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Processed sandwich meats with 6 grams of fat or more per ounce, such as bologna, pimento loaf, salami</td>
</tr>
<tr>
<td>Sausage, such as bratwurst, Italian, knockwurst, Polish, smoked</td>
</tr>
<tr>
<td>Hot dog (turkey or chicken)</td>
</tr>
<tr>
<td>Bacon</td>
</tr>
<tr>
<td>Peanut butter (contains unsaturated fat)</td>
</tr>
<tr>
<td>1 oz</td>
</tr>
<tr>
<td>1 oz</td>
</tr>
<tr>
<td>1 oz (10/lb)</td>
</tr>
<tr>
<td>3 slices (20/lb)</td>
</tr>
<tr>
<td>1 Tbs</td>
</tr>
</tbody>
</table>

Count as one meat exchange plus 1 fat exchange

<table>
<thead>
<tr>
<th>Hot dog (beef, pork, or combination)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (10/lb)</td>
</tr>
</tbody>
</table>
### Fat List

#### Monounsaturated Fats

<table>
<thead>
<tr>
<th>Item</th>
<th>Calories</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avocado, medium</td>
<td>2 Tbs (1 oz)</td>
</tr>
<tr>
<td>Oil (canola, olive, peanut)</td>
<td>1 tsp</td>
</tr>
<tr>
<td>Olives:</td>
<td></td>
</tr>
<tr>
<td>Ripe (black)</td>
<td>8 large</td>
</tr>
<tr>
<td>Green, stuffed</td>
<td>10 large</td>
</tr>
<tr>
<td>Nuts:</td>
<td></td>
</tr>
<tr>
<td>Almonds, cashews</td>
<td>6 nuts</td>
</tr>
<tr>
<td>Mixed (50% peanuts)</td>
<td>6 nuts</td>
</tr>
<tr>
<td>Peanuts</td>
<td>10 nuts</td>
</tr>
<tr>
<td>Pecans</td>
<td>4 halves</td>
</tr>
<tr>
<td>Peanut butter, smooth or crunchy</td>
<td>1/2 Tbs</td>
</tr>
<tr>
<td>Sesame seeds</td>
<td>1 Tbs</td>
</tr>
<tr>
<td>Tahini or sesame paste</td>
<td>2 tsp</td>
</tr>
</tbody>
</table>

#### Polyunsaturated Fats

<table>
<thead>
<tr>
<th>Item</th>
<th>Calories</th>
</tr>
</thead>
<tbody>
<tr>
<td>Margarine: stick, tub, or squeeze</td>
<td>1 tsp</td>
</tr>
<tr>
<td>lower fat spread (30% to 50% vegetable oil)</td>
<td>1 Tbs</td>
</tr>
<tr>
<td>Mayonnaise:</td>
<td></td>
</tr>
<tr>
<td>Regular</td>
<td>1 tsp</td>
</tr>
<tr>
<td>Reduced-fat</td>
<td>1 Tbs</td>
</tr>
<tr>
<td>Nuts: walnuts, English</td>
<td>4 halves</td>
</tr>
<tr>
<td>Oil (corn, safflower, soybean)</td>
<td>1 tsp</td>
</tr>
<tr>
<td>Salad dressing:</td>
<td></td>
</tr>
<tr>
<td>Regular</td>
<td>1 Tbs</td>
</tr>
<tr>
<td>Reduced-fat</td>
<td>2 Tbs</td>
</tr>
<tr>
<td>Miracle Whip Salad Dressing:</td>
<td></td>
</tr>
<tr>
<td>Regular</td>
<td>2 tsp</td>
</tr>
<tr>
<td>Reduced-fat</td>
<td>1 Tbs</td>
</tr>
<tr>
<td>Seeds: pumpkin, sunflower</td>
<td>1 Tbs</td>
</tr>
</tbody>
</table>

#### Saturated Fats

<table>
<thead>
<tr>
<th>Item</th>
<th>Calories</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bacon, cooked</td>
<td>1 slice (20/lb)</td>
</tr>
<tr>
<td>Bacon grease</td>
<td>1 tsp</td>
</tr>
<tr>
<td>Butter:</td>
<td></td>
</tr>
<tr>
<td>Stick</td>
<td>1 tsp</td>
</tr>
<tr>
<td>Whipped</td>
<td>2 tsp</td>
</tr>
<tr>
<td>Reduced-fat</td>
<td>1 Tbs</td>
</tr>
<tr>
<td>Chitterlings, boiled</td>
<td>2 Tbs (1/2 oz)</td>
</tr>
<tr>
<td>Coconut, sweetened, shredded</td>
<td>2 Tbs</td>
</tr>
<tr>
<td>Coconut milk</td>
<td>1 Tbs</td>
</tr>
<tr>
<td>Cream, half and half</td>
<td>2 Tbs</td>
</tr>
<tr>
<td>Cream cheese:</td>
<td></td>
</tr>
<tr>
<td>Regular</td>
<td>1 Tbs (1/2 oz)</td>
</tr>
<tr>
<td>Reduced-fat</td>
<td>1 1/2 Tbs (3/4 oz)</td>
</tr>
</tbody>
</table>
Section 4A: Calorie Control

<table>
<thead>
<tr>
<th>Fatback or salt pork</th>
<th>1 x 1 x 1/4 inch eaten with cooked vegetables; 2 x 1 x 1/2-inch for seasoning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shortening or lard</td>
<td>1 tsp</td>
</tr>
<tr>
<td>Sour cream:</td>
<td></td>
</tr>
<tr>
<td>Regular</td>
<td>2 Tbs</td>
</tr>
<tr>
<td>Reduced-fat</td>
<td>3 Tbs</td>
</tr>
</tbody>
</table>

**Free Foods List**
A free food is any food or drink that contains
- less than 20 calories or
- 0 to 5 grams of carbohydrate per serving.
Foods with a serving size listed should be limited to 3 servings per day.

<table>
<thead>
<tr>
<th>Fat-Free or Reduced-Fat Foods</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Cream cheese, fat-free</td>
<td>1 Tbs (1/2 oz)</td>
</tr>
<tr>
<td>Creamers, non-dairy, liquid</td>
<td>1 Tbs</td>
</tr>
<tr>
<td>Creamers, non-dairy, powdered</td>
<td>2 tsp</td>
</tr>
<tr>
<td>Mayonnaise, fat-free</td>
<td>1 Tbs</td>
</tr>
<tr>
<td>Mayonnaise, reduced-fat</td>
<td>1 tsp</td>
</tr>
<tr>
<td>Margarine spread, fat-free</td>
<td>1 Tbs</td>
</tr>
<tr>
<td>Margarine spread, reduced-fat</td>
<td>1 tsp</td>
</tr>
<tr>
<td>Miracle Whip, fat-free</td>
<td>1 Tbs</td>
</tr>
<tr>
<td>Miracle Whip, reduced-fat</td>
<td>1 tsp</td>
</tr>
<tr>
<td>Non-stick cooking spray</td>
<td></td>
</tr>
<tr>
<td>Salad dressing, fat-free or low-fat</td>
<td>1 Tbs</td>
</tr>
<tr>
<td>Salad dressing, fat-free, Italian</td>
<td>2 Tbs</td>
</tr>
<tr>
<td>Sour cream, fat-free, reduced-fat</td>
<td>1 Tbs</td>
</tr>
<tr>
<td>Whipped topping, regular</td>
<td>1 Tbs</td>
</tr>
<tr>
<td>Whipped topping, light or fat-free</td>
<td>2 Tbs</td>
</tr>
</tbody>
</table>

**Sugar-Free Foods**

| Candy, hard, sugar-free      | 1 candy                                                                                 |
| Gelatin dessert, sugar-free |                                                                                          |
| Gelatin, unflavored         |                                                                                          |
| Gum, sugar-free              |                                                                                          |
| Jam or jelly, light         | 2 tsp                                                                                   |
| Sugar substitutes: (Equal (aspartame), Splenda (sucralose), Sprinkle Sweet (saccharin), Sweet One (acesulfame K), Sweet-10 (saccharin), Sugar Twin (saccharin), and Sweet ‘N Low (saccharin) are all FDA approved and safe to use |
| Syrup, sugar-free            | 2 Tbs                                                                                    |

**Drinks**

| Bouillon, broth, consommé   |                                                                                          |
| Bouillon or broth, low-sodium |                                                                                         |
| Carbonated or mineral water |                                                                                          |
Section 4A: Calorie Control

| Club soda |  |
| Cocoa powder, unsweetened | 1 Tbs |
| Coffee |  |
| Diet soft drinks, sugar-free |  |
| Drink mixes, sugar-free |  |
| Tea |  |
| Tonic water, sugar-free |  |

### Condiments

<table>
<thead>
<tr>
<th>Item</th>
<th>Serving Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Catsup</td>
<td>1 Tbs</td>
</tr>
<tr>
<td>Horseradish</td>
<td></td>
</tr>
<tr>
<td>Lemon juice</td>
<td></td>
</tr>
<tr>
<td>Lime juice</td>
<td></td>
</tr>
<tr>
<td>Mustard</td>
<td></td>
</tr>
<tr>
<td>Pickle relish</td>
<td>1 Tbs</td>
</tr>
<tr>
<td>Pickles, dill</td>
<td>1 1/2 medium</td>
</tr>
<tr>
<td>Pickles, sweet (bread and butter)</td>
<td>2 slices</td>
</tr>
<tr>
<td>Pickles, sweet (gherkin)</td>
<td>3/4 oz</td>
</tr>
<tr>
<td>Salsa</td>
<td>1/4 cup</td>
</tr>
<tr>
<td>Soy sauce, regular or light</td>
<td>1 Tbs</td>
</tr>
<tr>
<td>Taco sauce</td>
<td>1 Tbs</td>
</tr>
<tr>
<td>Vinegar</td>
<td></td>
</tr>
<tr>
<td>Yogurt</td>
<td>2 Tbs</td>
</tr>
</tbody>
</table>

### Seasonings

<table>
<thead>
<tr>
<th>Item</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Flavoring extracts</td>
<td></td>
</tr>
<tr>
<td>Garlic</td>
<td></td>
</tr>
<tr>
<td>Herbs, fresh or dried</td>
<td></td>
</tr>
<tr>
<td>Pimento</td>
<td></td>
</tr>
<tr>
<td>Spices</td>
<td></td>
</tr>
<tr>
<td>Tabasco or hot pepper sauce</td>
<td></td>
</tr>
<tr>
<td>Wine, used in cooking</td>
<td></td>
</tr>
<tr>
<td>Worcestershire sauce</td>
<td></td>
</tr>
</tbody>
</table>

### Combination Foods List

Many foods are mixtures of ingredients from several food groups. This list gives the exchanges for many common combination foods.

<table>
<thead>
<tr>
<th>Food</th>
<th>Serving Size</th>
<th>Exchanges per Serving</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Entrees</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tuna noodle casserole, lasagna, spaghetti with meatballs, chili with beans, macaroni and cheese</td>
<td>1 cup (8 oz)</td>
<td>2 carbohydrates 2 medium fat meats</td>
</tr>
<tr>
<td>Chow mein (without noodles or rice)</td>
<td>2 cups (16 oz)</td>
<td>1 carbohydrate 2 lean meats</td>
</tr>
<tr>
<td>Tuna or chicken salad</td>
<td>1/2 cup (3 1/2 oz)</td>
<td>1/2 carbohydrate 2 lean meats, 1 fat</td>
</tr>
</tbody>
</table>

**Frozen meals/entrees** |  |  |
<table>
<thead>
<tr>
<th>Frozen dinner-type meal</th>
<th>14 to 17 oz</th>
<th>3 carbohydrates 3 medium fat meats 3 fats</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meatless burger, soy based</td>
<td>3 oz</td>
<td>1/2 carbohydrate 2 lean meats</td>
</tr>
<tr>
<td>Meatless burger, starch and vegetable based</td>
<td>3 oz</td>
<td>1 carbohydrate 1 lean meat</td>
</tr>
<tr>
<td>Pizza, cheese, thin crust</td>
<td>1/4 of 12-inch (6 oz)</td>
<td>2 carbohydrates 2 medium fat meats 1 fat</td>
</tr>
<tr>
<td>Pizza, meat topping, thin crust</td>
<td>1/4 of 12-inch (6 oz)</td>
<td>2 carbohydrates 2 medium fat meats 2 fats</td>
</tr>
<tr>
<td>Pot pie</td>
<td>1 (7 oz)</td>
<td>2 1/2 carbohydrates 2 medium fat meats 2 fats</td>
</tr>
<tr>
<td>Entrée or meal with less than 340 calories</td>
<td>8 to 11 oz</td>
<td>2 to 3 carbohydrates 1 to 2 lean meats</td>
</tr>
</tbody>
</table>

**Soup**

| Bean soup | 1 cup (8 oz) | 1 carbohydrate 1 very lean meat |
| Cream soup (made with water) | 1 cup (8 oz) | 1 carbohydrate, 1 fat |
| Instant soup | 6 oz prepared | 1 carbohydrate |
| Instant with beans/lentils | 8 oz prepared | 2 1/2 carbohydrates 1 very lean meat |
| Split pea soup (made with water) | 1/2 cup (4 oz) | 1 carbohydrate |
| Tomato soup (made with water) | 1 cup (8 oz) | 1 carbohydrate |
| Vegetable beef, chicken noodle, or other broth-type soup | 1 cup (8 oz) | 1 carbohydrate |


**Cross References**

Section 2A: USDA Food Guide  
Section 3J: Obesity  
Section 4B: Carbohydrate Controlled Diet  
Section 4D: Fat Control  
Section 4E: High Fiber Diet

**References**

Section 4A: Calorie Control


High Calorie Diet

Use

The high calorie diet is a regular diet with larger amounts of calorie dense foods. It is used for people who can tolerate oral feedings and who have increased calorie needs or poor intake. Conditions for which the diet may be indicated include:
- cancer,
- HIV infection or AIDS,
- chronic gastrointestinal problems,
- burns,
- wounds,
- trauma,
- renal disease,
- protein-calorie malnutrition,
- cystic fibrosis,
- failure to thrive,
- athetoid cerebral palsy, and
- in preparation for planned surgery.

Adequacy

This diet is adequate in all nutrients as long as it includes all food groups and a variety of foods. The actual calories provided depends on individual nutrition goals, which should be based on nutrition assessment.

Diet Principles

High calorie food sources include those that are high in fat such as:
- oil,
- margarine,
- butter,
- cream,
- gravy,
- mayonnaise,
- salad dressing,
- avocado,
- coconut,
- nuts and seeds.

The diet often exceeds 30 percent of total calories from fat.
With diseases where fat is not digested and absorbed normally, a special fat product called MCT oil may be used instead. The amount to use must be determined individually. MCT oil is an ingredient in some nutrition formulas.
Concentrated sugar sources are also an appealing form of calories:
Section 4A: Calorie Control

- dried fruit,
- syrup or honey, and sugar.

Any type of seasoning, condiment, or flavor enhancer that increases the appeal of food will help improve intake. Refer to Table 4A-1 for a list of ideas that can be used specifically for adding calories to food.

Table 4A-1: High calorie food guidelines

<table>
<thead>
<tr>
<th>Foods</th>
<th>Serving Tips</th>
<th>Lower Fat Alternatives</th>
<th>High Protein Choices</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beverages, milk, milkshake, eggnog</td>
<td>-Use whole milk, cream, half &amp; half cream, nondairy creamer. Mix them into other beverages, such as coffee or tea.</td>
<td>-Nonfat or 1% low fat milk.</td>
<td>-Milk, milkshakes, eggnog, and most nutrition drinks are high in protein.</td>
</tr>
<tr>
<td></td>
<td>-Serve with whipped cream.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-Serve milkshakes, eggnog, and nutrition drinks.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-Use fruit juices and nectars.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-Serve regular soft drinks.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Breads, cereals, and grains</td>
<td>-Add additional oil, butter, or margarine as ingredients or as a topping. Add cheese, nuts, seeds, or dried fruit.</td>
<td>-Use nonfat milk or evaporated skim milk in cooked cereal.</td>
<td>-Milk, cheese and other milk products, nuts, and seeds are high protein.</td>
</tr>
<tr>
<td></td>
<td>-Use whole milk or evaporated milk in cooked cereals.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Meats, poultry, and fish</td>
<td>-Serve fried foods. Enhance with high calorie butter or cream sauces and gravies.</td>
<td>-Use lean cuts of meat, skinless white meat poultry, and fish or shellfish.</td>
<td>-These foods are all high in protein</td>
</tr>
<tr>
<td></td>
<td>-Choose high fat cuts of meat and leave the skin on poultry.</td>
<td>-Avoid high fat meats such as ribs, bacon, or sausage.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-Serve canned fish packed in oil.</td>
<td>-Bake or grill, do not fry.</td>
<td></td>
</tr>
<tr>
<td>Cheese and cottage cheese</td>
<td>Add cheese as a topping or ingredient to meats, casseroles, vegetables, salads, soups, potatoes, eggs, and sauces.</td>
<td>-Use nonfat or low fat forms.</td>
<td>-These milk products are all high in protein.</td>
</tr>
<tr>
<td></td>
<td>-Serve cheese on sandwiches, biscuits, crackers, or tortillas.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-Serve with fruit or apple pie.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-Add cottage cheese to casseroles, gelatin and other salads, egg or pasta dishes.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eggs</td>
<td>Vegetables</td>
<td>Fruit</td>
<td>Soups</td>
</tr>
<tr>
<td>---------------------</td>
<td>----------------------------------------------</td>
<td>--------------------------------------------</td>
<td>--------------------------------------------</td>
</tr>
</tbody>
</table>
| **-Prepare eggs with extra margarine, butter, cream, cream cheese, cheese, or bacon fat. Add extra eggs to pancakes, muffins, and other baked goods.**  
**-Add chopped hard cooked eggs to salads, vegetables, casseroles, and sandwich spreads.**  
**-Serve egg based desserts, such as custard or flan.**  
**-Never serve raw, unpasteurized eggs.** | **-Serve fried or topped with butter, margarine, cream sauce, bacon fat, or gravy.**  
**-Add cheese, nuts, seeds, or dried fruit.**  
**-Make mashed potatoes with cream or half & half.**  
**-Serve salads with mayonnaise or salad dressing. Raw vegetables may be served with sour cream based dips.** | **-Serve canned fruit packed in heavy syrup and dried fruit.**  
**-Serve with whipped cream, sour cream, nut butter, coconut, chocolate, honey, or granola toppings.**  
**-Serve in salad with gelatin, marshmallows, nuts, or cream cheese.**  
**-Use fruit in desserts, such as pie, cobblers, or crisps.** | **-Serve cream soups, those with cheese or high fat meat, or those made from cooked dried beans, peas, or lentils.** | **-Use high fat snack crackers or chips served with bean or cream based dips.**  
**-Serve mixtures of nuts, seeds, grains, cereal, crackers, and dried fruit.** | **-Use egg white or egg substitute.** | **-Use sweet sauces or glazes and added sugar or marshmallow rather than high fat toppings.** | **-Serve soups made with cooked beans, peas, or lentils, with little or no fat added.** | **-Use reduced fat crackers and chips and nonfat ingredients for dips.** | **-Dips may be fortified with cheese, tofu, seafood, meat, or poultry.** |
|                    |                                              |                                            |                                            |                                            | -Eggs are high in protein.                | -Cooked dried beans, peas, and lentils are higher in protein. | -Fruit is not high in fat, except for coconut and avocado. | -Fruit is not high in protein. | |

| 294 |
Section 4A: Calorie Control

<table>
<thead>
<tr>
<th>Foods</th>
<th>Serving Tips</th>
<th>Lower Fat Alternatives</th>
<th>High Protein Choices</th>
</tr>
</thead>
</table>
| Desserts| -Serve ice cream, sherbet, pudding, mousse, frosted cake, pie, cookies, bars, and candies.  
-Replace milk or water with cream, sour cream, or cream cheese.  
-Serve with whipped cream.  
-In recipes, replace milk or water with cream, sour cream, or cream cheese.  
-Serve with whipped cream. | -Use nonfat ice cream or sherbet, pudding made with nonfat milk, angel food and sponge cake, vanilla wafers, hard or soft sugar candies.  
-Use desserts made with evaporated or condensed milk or extra milk powder.  
-Use those made with nuts, nut butters, and tofu.  
-Use desserts made with evaporated or condensed milk or extra milk powder.  
-Use those made with nuts, nut butters, and tofu. | -Use desserts made with evaporated or condensed milk or extra milk powder.  
-Use desserts made with evaporated or condensed milk or extra milk powder.  
-Use those made with nuts, nut butters, and tofu. |
| Condiments | -Add margarine, butter, peanut or other nut butters, salad dressing, mayonnaise, sour cream, and both plain and flavored cream cheese.  
-Add sugar, honey, syrup, jelly, jam, or preserves to glaze meats or vegetables. | -Rely on reduced fat and sweet condiments to enhance food appeal.  
-Nut butters and nuts are higher in protein.  
-Nut butters and nuts are higher in protein. | -Rely on reduced fat and sweet condiments to enhance food appeal.  
-Nut butters and nuts are higher in protein.  
-Nut butters and nuts are higher in protein. |
| Yogurt  | -Use whole milk fruited or flavored yogurt. Add cultured yogurt to fruit or gelatin salads.  
-Freeze to make a frozen pop.  
-Serve as a tangy dessert or snack.  
-Blend into a smoothie or milkshake.  
-Add margarine, butter, peanut or other nut butters, salad dressing, mayonnaise, sour cream, and both plain and flavored cream cheese.  
-Add sugar, honey, syrup, jelly, jam, or preserves to glaze meats or vegetables. | -Use nonfat or low fat yogurt.  
-Use nonfat or low fat yogurt.  
-Use nonfat or low fat yogurt.  
-Use nonfat or low fat yogurt. | -Use nonfat or low fat yogurt.  
-Use nonfat or low fat yogurt.  
-Use nonfat or low fat yogurt.  
-Use nonfat or low fat yogurt. |

- Provide small, frequent meals and snacks of calorie rich foods to optimize intake. For example, many facilities use supplemental nutrition drinks to administer medications several times throughout the day.
- In some cases, the high calorie diet is not tolerated well due to increased fat intake. Signs of intolerance may include steatorrhea, diarrhea, vomiting, nausea, and increased cholesterol or triglyceride levels. Table 4A-1 indicates lower fat alternatives.
- Encourage consumption of fluids that provide additional calories rather than low calorie beverages or plain water.
- Use ingredients that are high calorie to fortify lower calorie foods without increasing the volume of food. This is very helpful for people who feel full quickly when eating.
Section 4A: Calorie Control

- Table 4A-2 provides a list of commercially made calorie supplements. These often have little flavor since people often tire of sweet flavors, or, due to disease, experience sweetness as unpleasant.
- Some nutrition drinks are very high in calories. They provide a source of protein and other micronutrients, but they do not always provide complete nutrition. Refer to Table 4A-3 for examples.

Table 4A-2: Calorie supplements

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Form</th>
<th>Calorie Content</th>
<th>Manufacturer’s Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>MCT oil</td>
<td>liquid</td>
<td>7.7 per mL</td>
<td>Nestle Nutrition</td>
</tr>
<tr>
<td>Resource Benecalorie</td>
<td>liquid</td>
<td>7 per mL</td>
<td>Nestle Nutrition</td>
</tr>
<tr>
<td>Polycose</td>
<td>powder</td>
<td>8 per level tsp (2 gm)</td>
<td>Abbott Nutrition</td>
</tr>
<tr>
<td>Polycose</td>
<td>liquid</td>
<td>2 per mL</td>
<td>Abbott Nutrition</td>
</tr>
</tbody>
</table>

Note. ¹ This product is also a source of protein (7 gm per 1.5 oz serving).


Table 4A-3: High calorie supplemental nutrition drinks

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Form</th>
<th>Calorie Content</th>
<th>Manufacturer’s Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resource 2.0</td>
<td>liquid</td>
<td>475 per 8 fl oz</td>
<td>Nestle Nutrition</td>
</tr>
<tr>
<td>MedPass 2.0</td>
<td>liquid</td>
<td>480 per 8 fl oz</td>
<td>Hormel HealthLabs</td>
</tr>
<tr>
<td>Scandishake, regular</td>
<td>powder</td>
<td>440 calories per packet</td>
<td>Axcan Pharma, Inc.</td>
</tr>
<tr>
<td>Scandishake, lactose-free</td>
<td>powder</td>
<td>430 calories per packet</td>
<td>Axcan Pharma, Inc.</td>
</tr>
<tr>
<td>TwoCal HN</td>
<td>liquid</td>
<td>475 per 8 fl oz</td>
<td>Abbott Nutrition</td>
</tr>
</tbody>
</table>


Recipes

Homemade Milkshake = 380 calories, 11 grams protein
1 cup whole milk
1/2 cup ice cream
2 Tbs chocolate or strawberry sundae syrup
Mix all ingredients together.

Fruit Smoothie = 270 calories, 8 grams protein
1 cup whole milk
1 cup frozen fruit
1 cup orange juice
Blend all ingredients in a blender or food processor until smooth.

Variations: Substitute heavy cream for milk = 950 calories, 5 grams protein
Section 4A: Calorie Control

Substitute half & half for milk = 440 calories, 5 grams protein

*Carnation Instant Breakfast Shake* = 500 calories, 17 grams protein
1 packet vanilla or chocolate Carnation Instant Breakfast (or store brand)
1 cup whole milk
1/2 cup vanilla ice cream
2 Tbs chocolate syrup
Mix all ingredients together. Section 4A: Calorie Control

*Boost Plus or Ensure Plus Chocolate Shake* = 580 calories, 17 grams protein
1-8 oz can vanilla or chocolate Boost Plus or Ensure Plus
1/2 cup vanilla or chocolate ice cream
2 Tbs chocolate syrup
Blend all ingredients in a blender or food processor.
Variations: Add 2 Tbs smooth peanut butter = 768 calories, 25 grams protein

*Boost Plus or Ensure Plus Fruit Smoothie* = 500 calories, 14 grams protein
1-8 oz can vanilla Boost Plus or Ensure Plus
1 cup frozen strawberries or blueberries
1/2 to 3/4 cup orange juice (or other 100% juice)
Blend all ingredients together in a blender or food processor.

*Boost Plus or Ensure Plus Sherbet Shake* = 490 calories, 15 grams protein
8 oz can vanilla Boost Plus or Ensure Plus
1/2 cup sherbet (any flavor)
Mix ingredients together.

Cross References

Section 4H: High Protein Diet

References

Axcan-Pharma, Inc. [www.axcan.com/scandishake_us.php](http://www.axcan.com/scandishake_us.php)

Hormel HealthLabs, Inc. [www.hormelhealthlabs.com](http://www.hormelhealthlabs.com)


Abbott Nutrition [http://www.abbotnutrition.com](http://www.abbotnutrition.com)
Carbohydrate Controlled Diet

Use

A carbohydrate controlled diet is appropriate for people with all types of diabetes. The total amount of carbohydrate served in meals or snacks is emphasized over the food source or type of carbohydrate (American Dietetic Association [ADA], 2010).

Adequacy

Diabetic meal planning using carbohydrate counting is adequate in all nutrients if a variety of foods are eaten with the recommended number of servings.

Diet Principles

Measure carbohydrate served either in grams or with portioned servings that provide about 15 grams each. Meal planning based on carbohydrate intake will vary, depending on:
- type of diabetes,
- diabetes medications used, and
- each person's learning ability as well as readiness to learn.

Select one of these four commonly used methods (ADA, 2001):
- **Consistent (or constant) carbohydrate** is a method for people who manage their diabetes by diet alone, or by diet and some oral diabetes medications. It is important to provide the same amount of carbohydrate at the same time each day.
- **Consistent carbohydrate for medication adjustment in Type 2 diabetes** is for people who manage their diabetes with diet and with either a combination of oral medications and insulin, or with mixed insulin. Their meal plan provides the same amount of carbohydrate at the same time each day, but the amount may be increased or decreased depending on blood glucose levels.
- **Carbohydrate counting for basal/bolus insulin** therapy is a method that allows people to adjust bolus insulin doses based on amount of carbohydrate eaten at a particular meal or snack. This method would be used for people using an insulin pump or taking multiple daily injections of insulin.
- **Exchange lists for diabetes or weight management** provides a highly structured plan for eating that controls intake of fat and protein, as well as types of carbohydrates. It is described in section 4A.

Provide carbohydrate from whole grains, fruits, vegetables, and low fat milk or yogurt in a healthy eating plan.

Plan at least 3 meals per day. Space meals about 4 to 5 hours apart. Some conditions, such as gestational diabetes, require more meals or snacks with less carbohydrate at each one.

Distribute carbohydrates throughout the day.
Section 4B: Carbohydrate Control

- Most women need about 3 to 4 carbohydrate servings (45 to 60 grams) at each of 3 meals.
- Most men need about 4 to 5 carbohydrate servings (60 to 75 grams) at each of 3 meals.

Refer to Table 4B-1 for a list of carbohydrate rich foods that are counted as 15 gram servings.

Determine the grams of carbohydrate in food by reading the food label, analyzing the nutrients in a recipe, or referring to a published resource listing the grams of carbohydrate.

### Table 4B-1: Carbohydrate servings from different food groups

<table>
<thead>
<tr>
<th>Food Group</th>
<th>Carbohydrate servings (15 grams each)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grains, Breads, Cereals</td>
<td>-1 oz bread (1 slice bread, 1/4 large bagel, 6” tortilla)</td>
</tr>
<tr>
<td></td>
<td>-1/2 cup cooked dried beans</td>
</tr>
<tr>
<td></td>
<td>-1/3 cup pasta or rice</td>
</tr>
<tr>
<td></td>
<td>-1 cup soup</td>
</tr>
<tr>
<td></td>
<td>-3/4 cup cold cereal</td>
</tr>
<tr>
<td></td>
<td>-1/2 cup cooked cereal</td>
</tr>
<tr>
<td>Milk and Yogurt</td>
<td>-1 cup milk</td>
</tr>
<tr>
<td></td>
<td>-2/3 cup (6 fl oz) yogurt unsweetened or sweetened with noncaloric sweetener</td>
</tr>
<tr>
<td>Fruits</td>
<td>-1 small fresh fruit</td>
</tr>
<tr>
<td></td>
<td>-1/2 cup fruit</td>
</tr>
<tr>
<td></td>
<td>-1 cup melon or berries</td>
</tr>
<tr>
<td></td>
<td>-1/2 cup fruit juice</td>
</tr>
<tr>
<td></td>
<td>-1/4 cup dried fruit</td>
</tr>
<tr>
<td>Vegetables</td>
<td>-1/2 cup potato, peas, or corn</td>
</tr>
<tr>
<td></td>
<td>-3 cups raw vegetables</td>
</tr>
<tr>
<td></td>
<td>-1 1/2 cups cooked nonstarchy* vegetables</td>
</tr>
<tr>
<td></td>
<td>(*Smaller portions of nonstarchy vegetables are not counted as carbohydrate servings.)</td>
</tr>
<tr>
<td>Sweets and Snack Foods</td>
<td>-3/4 oz snack food (pretzels, chips)</td>
</tr>
<tr>
<td></td>
<td>-4 to 6 crackers</td>
</tr>
<tr>
<td></td>
<td>-1 oz sweet snack (2 small sandwich cookies, 5 vanilla wafers)</td>
</tr>
<tr>
<td></td>
<td>-1 Tbs sugar or honey</td>
</tr>
<tr>
<td></td>
<td>-1/2 cup ice cream</td>
</tr>
</tbody>
</table>

Note. ¹Source: Ready, set, start counting: How to use carbohydrate counting to keep your blood glucose healthy, p. 3, by B. O’Connell & S. Wang. Copyright 2003 by the Diabetes Care and Education Dietetic Practice Group of the American Dietetic Association

### References

Section 4B: Carbohydrate Control


More Information

American Association of Diabetes Educators
100 West Monroe Street, Suite 400
Chicago IL 60603-1901
(312) 424-2426
www.adanet.org

American Diabetes Association
1701 North Beauregard Street
Alexandria, VA 22311
(800) DIABETES or (800) 342-2383
www.diabetes.org

American Dietetic Association
Evidence Analysis Library: Diseases and conditions: Adult diabetes 1 and 2 evidence analysis project
www.eatright.org

International Diabetes Center
www.icdpublishing.com

National Diabetes Information Clearinghouse
www.diabetes.niddk.nih.gov
Section 4C Consistency Modification

Clear Liquid Diet

Use

The clear liquid diet primarily supplies fluid and energy in a form that requires minimal digestion. Individuals may be placed on the diets due to acute illness, such as vomiting, diarrhea, pre-operative, post-operative or prior to surgery or exams of the lower digestive tract. The diet should be used only for a short-time (24-48 hours). Individuals on clear liquids for more than 2-3 days should be assessed by the Registered Dietitian (RD).

Adequacy

The clear liquid diet does not meet the RDAs for most nutrients. All items are clear liquids or become clear liquid at room temperature.

Diet Principles

Use sugar and clear liquid supplements for additional calories and protein. Sugar substitutes (sugar free gelatin or beverages) are not recommended for individuals with diabetes, due to the decreased caloric level of the diet. Individuals with diabetes require a minimum of 200 gram of carbohydrate daily on a clear liquid diet.

Three balanced meal plus two-three between meal snacks should be included in the meal plan.

Surgeries of the mouth, jaw and esophagus may require additional modifications. Straws, red or highly acidic foods, and foods that cannot be spoon-fed (such as frozen pops, gelatin, or candy) may not be allowed.

Some test diets specify no red or purple colored foods or no caffeine. Fruit juices and other concentrated simple sugar solutions may worsen osmotic diarrhea.

<table>
<thead>
<tr>
<th>Foods Allowed</th>
<th>Foods Not Allowed</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Beverages:</strong> Clear juices(no pulp), clear liquid supplements, coffee, tea, water, soft drinks</td>
<td>Milk, milk products, cream, milkshakes,</td>
</tr>
<tr>
<td><strong>Soup:</strong> Broth or flavored bouillon, high protein broth</td>
<td>All other types</td>
</tr>
<tr>
<td><strong>Desserts/other items</strong> Ices, flavored or unflavored gelatin, high protein gelatin, popsicles, sugar, sweeteners, flavor extracts, hard candy</td>
<td>All other items</td>
</tr>
</tbody>
</table>
Sample Menu for a Clear Liquid Diet

Breakfast
1 cup cranberry juice
1 cup clear liquid supplement
1/2 cup gelatin dessert
6 oz tea or coffee
1 tsp sugar

Mid-morning snack
1/2 cup high protein gelatin dessert or 1 cup clear liquid supplement

Lunch
8 oz broth
1 cup apple juice
6 oz carbonated soft drink or beverage of choice
1/2 cup fruit-flavored ice, or 6 oz tea, or coffee, or bev. of choice
1 tsp sugar

Mid-afternoon
1 frozen popsicle or
1 c clear liquid supplement

Dinner
8 oz broth
1 cup strained orange juice
6 oz carbonated soft drink
1/2 cup gelatin dessert
6 oz tea or coffee
1 tsp sugar

Bedtime
1 cup clear liquid supplement
**Full Liquid Diet**

**Use**

A full liquid diet provides liquids and semi-solid foods that become liquid at room temperature. It is used for individuals on a temporary basis (usually < 5 days) who cannot tolerate solid foods, such as people who have had surgery or injury of their mouth, face or jaw. In some facilities it is used instead of the more restrictive clear liquid diet after surgery or acute infections of the digestive tract.

**Adequacy**

It takes planning to meet 100% of the RDA's on a Full Liquid Diet due to the inadequacy of some items such as fiber. Commercial supplements should be considered, when an individual needs to remain on a Full Liquid for an extended period of time.

**Diet Principles**

People who must remain on this diet for many weeks, and do not select a variety of foods, should use a vitamin and mineral supplement.

Plan meals and snacks to provide a variety of temperatures, colors, and flavors at each feeding since the texture will become monotonous over time.

Provide three balanced meal plus two-three between meal snacks

<table>
<thead>
<tr>
<th>Foods Allowed</th>
<th>Foods Not Allowed</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Beverages:</strong></td>
<td>None unless they contain pieces of fruit, nuts, or seeds.</td>
</tr>
<tr>
<td>All fruit &amp; vegetable juices, milk, milk products, commercial clear &amp; full liquid supplements, coffee, tea, soft drinks.</td>
<td></td>
</tr>
<tr>
<td><strong>Bread/Grains:</strong></td>
<td>All other items</td>
</tr>
<tr>
<td>Cream of rice, Cream of wheat</td>
<td></td>
</tr>
<tr>
<td><strong>Soups:</strong></td>
<td>All other soups</td>
</tr>
<tr>
<td>Broth or flavored bouillon, strained cream soups</td>
<td></td>
</tr>
<tr>
<td><strong>Desserts/other items:</strong></td>
<td>Products with nuts, seeds, coconut, chunks of fruit, marmalade</td>
</tr>
<tr>
<td>Plain yogurt, plain puddings, custard, ice cream, sherbet, ices, popsicles, sugar, honey, sugar substitutes, plain jelly,</td>
<td></td>
</tr>
</tbody>
</table>

**Sample Menu for a General Liquid Diet**

**Breakfast**

1 cup fortified cream of wheat cereal  
1 tsp margarine  
sugar  
1 cup milk, whole  
1 cup juice, cranberry  
3/4 cup coffee with creamer and sugar
Section 4C Consistency Modification

Mid-morning
1/2 cup custard

Lunch
1 cup tomato soup made with milk
1 cup ice cream or sherbet
1 cup apple juice
Coffee, tea or beverage of choice
Sugar,
Mid-afternoon
1/2 cup vanilla pudding
1/2 cup peach nectar or 1 cup commercial supplement

Dinner
1 cup strained cream soup
1 cup milkshake(homemade) or commercial supplement
½ cup plain pudding
sugar
Coffee, tea or choice of beverage

Bedtime
1 cup milkshake or commercial supplement
Section 4C Consistency Modification

Mechanical or Dental Soft Diet

Use

The mechanical soft or dental soft diet is for individuals who have difficulty chewing regular textured foods, perhaps due to ill fitting dentures or worn teeth. The speech language pathologist (SLP) may evaluate the individual to determine if the diet is appropriate. This diet may not appropriate for individuals being treated for dysphagia. The regular menu is followed and foods are altered to the highest consistency the individual can tolerate.

Adequacy

Diet should be planned to meet 100% of the RDS/AI. Generally plan three-balanced meals plus snacks between meals to achieve individual's requirements.

Diet Principles:

Use a variety of foods
Monitor diet to make certain foods offered are moist, easy to chew and swallow
Alter all foods to the highest consistency the individual can tolerate

<table>
<thead>
<tr>
<th>Food Allowed</th>
<th>Foods Not Allowed</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Meat or Protein Items:</strong> Tender meat, fish, eggs chop, shred, or grind moisten with gravy, broth, or sauce,</td>
<td>Dry tough meats, whole pieces of meat, bacon slices, peanut butter or cheese by itself, hot dogs</td>
</tr>
<tr>
<td><strong>Milk/Dairy:</strong> Regular milk, buttermilk, plain yogurt, sour cream, plain cream cheese, milkshakes, ice cream, sherbet,</td>
<td>Milk products with nuts, coconut, or chunks of fruit</td>
</tr>
<tr>
<td><strong>Fruits:</strong> Bananas, soft, peeled fruit such as peaches, berries, nectarines, kiwi, or melon chopped, cooked, tender, chopped or shredded, fruit juice</td>
<td>Pineapple, difficult to chew fresh fruit such as grapes, apples, etc., dried fruit</td>
</tr>
<tr>
<td><strong>Bread/Grains:</strong> Easy to chew breads, toast, crackers, graham crackers, cooked pasta or rice, hot cereal, dry cereal moistened with milk</td>
<td>Dry, tough or crusty bread, Dry cereals such as bran cereal, granola or any with seeds or nuts, if not tolerated</td>
</tr>
<tr>
<td><strong>Vegetables:</strong> Cooked, tender, chopped, or shredded, vegetable juice</td>
<td>Potato skins, whole or large pieces, whole kernel corn, raw vegetables (except shredded lettuce)</td>
</tr>
<tr>
<td><strong>Desserts/Sweets:</strong> Soft, easy to chew items such as cake, soft cookies, cheese cake, cream or fruit pies</td>
<td>Cakes or cookies with nuts, coconut, seeds, large chunks of tough fruit, popcorn, hard candy (caramels)</td>
</tr>
</tbody>
</table>
Sample Meal for Mechanical Soft (Dental) Diet

**Breakfast:**
- ¾ c Orange Juice
- 1 cup Oatmeal
- 1 soft Scrambled Egg
- 1 Toast/Margarine/Jelly
- 1 cup of Milk
- Beverage of choice
- Sugar, salt, pepper

**Lunch:**
- 3oz. chopped or ground Roast Beef / gravy
- 1/2cup Mashed Potatoes
- 1/2cup Buttered steamed carrots
- 1/2cup Shredded Lettuce / dressing
- 1 pat margarine
- 1 slice bread
- 1 slice cheese cake/chocolate sauce
- 1 cup milk

**Dinner:**
- 6 oz. Cream of Tomato Soup / saltines
- 1 Chicken Salad sandwich on whole what bread
- 1/2cup chilled canned peaches
- 1/2c ice cream
- 1 cup Milk
- Beverage of choice
- Sugar, Salt, pepper

**Bedtime Snack:**
- .2c juice of choice
- 2 soft cookies
Dysphagia Diets

Diet Principles

The National Dysphagia Diet provides overall guidelines for managing dysphagia. However, each healthcare facility should address concerns in the context of the organization's abilities and needs. Three levels of solid foods as defined by the National Dysphagia Task Force are Dysphagia Pureed, Dysphagia Mechanically Altered, and Dysphagia Advanced plus four levels of fluids Thin, Nectar-like, Honey-like, Spoon-thick. (National Dysphagia Task Force 2002). It is recommended that solid foods and fluids be ordered separately so ability to consume a complete meal is maximized for the individual. The Speech Language Pathologist (SLP) is responsible for evaluating and treating an individual with dysphagia. The registered dietitian (RD) and dietetic technician, registered (DTR) work with the SLP to ensure the meals/beverages served meet the nutritional requirements and are accepted by the individual. When appropriate, diet should be advanced to the highest level that is safe for the individual.

When using a thickener the acceptability of the end product varies according to type of liquid, thickener brand, product density desired, and time between mixing and consuming the beverage. Many facilities choose to purchase products that are pre-thickened to defined levels. Often the cost of these products is off-set by the individual's increased consumption and satisfaction with the beverages. Individuals who receive thickened liquids are at risk for dehydration when they refuse the beverages based on taste and palate feel.

The four levels of liquids

1. Thin
   All beverages are acceptable.
2. Nectar-like
   The beverage coats and drips off a spoon similar to unset gelatin.
3. Honey-like
   The liquid is thicker than nectar-like and flows off a spoon in a ribbon just like actual honey.
4. Spoon-thick (also called pudding thick)
   Liquid stays on the spoon in a soft mass and plops off the spoon like pudding.

Foods that melt at body temperature, such as ice cream, need to be classified according to their melted consistency.

Adequacy

Diet should be planned to meet 100% of the RDIS/AI. Generally plan three-balanced meals plus snacks between meals to achieve individual's requirements.
Section 4C Consistency Modification

The following are recommendations from the 2010 American Dietetic Association Nutrition Care Manual and National Dysphagia Diet Task Force (2002).

**Level 1: Pureed**

It is important to follow the therapeutic recommendations of the physician, registered dietitian, and/or speech-language pathologist. Guidelines for the number of servings of each food group recommended within the MyPyramid are also important to maintenance of optimal health.

Foods are totally pureed. No coarse textures or lumps of any sort are allowed. Fluid consistency is ordered separately from the meal plan and may be thin, nectar-thick, honey-like, or spoon-thick. Beverages should be very smooth, but at the liquid consistency designated by the nutrition prescription.

Breads must be pureed or pre-gelled, slurried through the entire product thickness. Cereals are to be homogenous and "pudding-like" (e.g., cream of wheat or rice, farina). Avoid oatmeal.

Desserts should be smooth, like custard or yogurt. No coarse or textured desserts. Fats are generally smooth, so there really is not much adjustment for the level 1 pureed diet.

Fruits must be pureed or well-mashed without pulp, seeds, or skins and juices thickened to the prescribed consistency.

Meats and meat substitutes must be of very smooth consistency or pureed. No peanut butter unless part of a pureed recipe that would be easy to swallow.

Mashed potatoes and pureed pasta are the main components of the potatoes and starches food group. These should be served with gravy, sauce, or extra butter/margarine to ensure it is moist and not sticky.

Soups should be strained to ensure no chunks or lumps with smooth consistency or pureed to appropriate fluid consistency. Because soup is a fluid, it is important to have it thickened using the fluid recommendations for the individual patient.

Vegetables are pureed and vegetable juices thickened to the prescribed consistency.

Honey, ketchup, and smoothly ground spices may be used.

Smooth jellies and very soft, smooth candies may be included.

Because texture is so homogenous at this phase, the flavorings or garnishing touches of syrup or sauce that are added are important to maximize palatability, eye appeal, and enjoyment of the food.

**Level 2: Mechanically Altered**

Foods are soft-textured and moist so that they may easily form a bolus.

When providing this level of mechanically altered food, it is important to follow the therapeutic recommendations of the physician, registered dietitian, and/or speech-language pathologist. Guidelines for the number of servings of each food group recommended within the MyPyramid are also key to maintenance of optimal health.
Section 4C Consistency Modification

Fluid consistency is ordered separately in the nutrition prescription and maybe thin, nectar-thick, honey-like, or spoon-thick. Beverages may have suspended pulp or bits of texture, but at liquid consistency specified by the nutrition prescription. Breads need to be slurried/pre-gelled through entire thickness, but soft, well-moistened pancakes are allowed. Cooked cereals may have a little texture and some dry, but well-moistened cereals are allowed. Dry or coarse whole grain cereals are still not allowed. Any cereal with flaxseed, coconut, dried fruit, nuts, or other seeds must be avoided. Desserts at this level may include most canned fruits, moist cobblers, and moist soft cookies. Most fats are allowed. Exceptions are those with chunky additives. Soft canned or cooked fruits, soft banana, and fruit juices with a small amount of pulp at the prescribed consistency may be consumed. No fruits with skin or seeds. Moist-ground or minced, tender-cooked meat with no larger than 1/4" pieces, well-cooked pasta casseroles, cottage cheese, and tofu are allowed. Avoid peanut butter, sandwiches, and pizza. Moist, well-cooked potatoes, noodles, and dumplings are allowed. Continue to avoid rice or casseroles with rice. Almost all soups with less than 1/2" chunks of easy-to-chew meat or vegetables are allowed. Soft, well-cooked vegetables with less than 1/2" pieces are allowed with the exception of corn, peas, and specific fibrous varieties. Vegetables should mash easily with a fork. Salsa and sauces may include small, soft, tender chunks. Other miscellaneous smooth jellies and jams without seeds are allowed.

Level 3: Advanced

Foods are nearly normal textures, yet exclude crunchy, sticky, or very hard foods. There is a need for food items to be bite-sized and moist. When providing this advanced dysphagia level, it is important to follow the therapeutic recommendations of the physician, registered dietitian, and/or speech-language pathologist. Guidelines for the number of servings of each food group recommended within MyPyramid are also key to maintenance of optimal health. Fluid consistency is ordered separately from the nutrition therapy and may be thin, nectar-thick, honey-like, or spoon-thick. All beverages are allowed as long as they meet the prescribed liquid consistency. All moist breads are allowed. No tough, crusty breads. Moist cereals may be consumed. Only very coarse or dry grains need to be avoided. Most desserts are allowed, except those that are dry; chewy; or have nuts, seeds, coconut, pineapple, or dried fruit. All fats are allowed except those with chunky additives. Fruits should be soft, peeled, and without seeds.
Section 4C Consistency Modification

Meats that are moist and tender or casseroles with small chunks of meat are allowed. Only dry meats and fish, chunky peanut butter, and yogurt with nuts or coconut should be avoided.

Moist potatoes, rice, and moist stuffing are allowed. Potato skins, crisp-fried potatoes, and dry stuffing are to be avoided.

All soups are allowed except those with tough meats or vegetables.

Most cooked, tender vegetables are allowed except corn and vegetables that are rubbery when cooked; may add shredded lettuce.

In the miscellaneous category, the only foods to be avoided are nuts, seeds, coconut, and chewy candies.

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### Table 4C-2: National dysphagia diet comparison.

<table>
<thead>
<tr>
<th>Food Group</th>
<th>Dysphagia Puree NDD Level 1</th>
<th>Dysphagia Mechanically Altered NDD Level 2</th>
<th>Dysphagia Advanced NDD Level 3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Beverages</strong></td>
<td>Smooth mixtures only. May need to be thickened.</td>
<td>All that are smooth or with only a minimum amount of texture. May need to be thickened.</td>
<td>Any beverages. May need to be thickened.</td>
</tr>
<tr>
<td>Allowed</td>
<td>Smooth mixtures only. May need to be thickened.</td>
<td>All that are smooth or with only a minimum amount of texture. May need to be thickened.</td>
<td>Any beverages. May need to be thickened.</td>
</tr>
<tr>
<td>Not Allowed</td>
<td>Lumps, chunks, seeds, or pulp.</td>
<td>Any with large pieces.</td>
<td>None.</td>
</tr>
<tr>
<td><strong>Breads &amp; Grains</strong></td>
<td>Bread products must be a puree or a pre-gelled slurry. Smooth cooked cereals. Pureed pasta, grains or rice that has a smooth consistency.</td>
<td>Level 1 foods. Bread products must be a puree or a pre-gelled slurry. Soft pancakes soaked in syrup or sauce. Cooked cereals with texture, such as oats; or with unprocessed wheat bran. Ready-to-eat cereals slightly moistened. Well-cooked pasta in a sauce.</td>
<td>Moist, tender bread products. Use spreads to moisten well. All cooked or well-moistened ready-to-eat cereals. All tender pasta, rice and grain products. Moist bread dressing.</td>
</tr>
<tr>
<td>Allowed</td>
<td>Bread products must be a puree or a pre-gelled slurry. Smooth cooked cereals. Pureed pasta, grains or rice that has a smooth consistency.</td>
<td>Level 1 foods. Bread products must be a puree or a pre-gelled slurry. Soft pancakes soaked in syrup or sauce. Cooked cereals with texture, such as oats; or with unprocessed wheat bran. Ready-to-eat cereals slightly moistened. Well-cooked pasta in a sauce.</td>
<td>Moist, tender bread products. Use spreads to moisten well. All cooked or well-moistened ready-to-eat cereals. All tender pasta, rice and grain products. Moist bread dressing.</td>
</tr>
<tr>
<td>Not Allowed</td>
<td>All other bread, cereals, rice, grain, or pasta products.</td>
<td>All other bread, cereals, rice, grain, or pasta products. All cereals with a coarse texture, seeds, nuts, or dried fruit.</td>
<td>Dry bread, toast, or crackers. Tough or crusty bread or bagels. Coarse cereal. Dry, tough pasta, rice or dressing.</td>
</tr>
<tr>
<td><strong>Desserts &amp; Sweets</strong></td>
<td>Smooth pudding, custard, pureed desserts or soufflés. All types of sweeteners. Jelly.</td>
<td>Level 1 foods. Soft fruit pies, bottom crust only; or crisps and cobblers. Moistened baked goods, soaked in a complementary liquid. Jams or preserves without seeds.</td>
<td>Level 1 or 2 foods. Moist, tender baked goods.</td>
</tr>
<tr>
<td>Allowed</td>
<td>Smooth pudding, custard, pureed desserts or soufflés. All types of sweeteners. Jelly.</td>
<td>Level 1 foods. Soft fruit pies, bottom crust only; or crisps and cobblers. Moistened baked goods, soaked in a complementary liquid. Jams or preserves without seeds.</td>
<td>Level 1 or 2 foods. Moist, tender baked goods.</td>
</tr>
<tr>
<td>Not Allowed</td>
<td>Ices or frozen fruit bars, gelatin, baked goods, or textured pudding. Fruit preserves or jam.</td>
<td>Dry or chewy baked goods, any with nuts, seeds, coconut, pineapple, or dried fruit. Sticky or chewy candy.</td>
<td>Dry cakes, hard cookies, or chewy candy or baked goods; any with nuts, seeds, coconut, pineapple or dried fruit.</td>
</tr>
<tr>
<td><strong>Fruits &amp; Juices</strong></td>
<td>Pureed fruit. Fruit juice without pulp.</td>
<td>Level 1 foods. Soft canned or cooked fruit without seeds or skins. Ripe bananas. Fruit juices with some pulp.</td>
<td>Level 1 or 2 foods. Soft, peeled fresh fruit (peach, melon) Berries with small seeds.</td>
</tr>
<tr>
<td>Allowed</td>
<td>Pureed fruit. Fruit juice without pulp.</td>
<td>Level 1 foods. Soft canned or cooked fruit without seeds or skins. Ripe bananas. Fruit juices with some pulp.</td>
<td>Level 1 or 2 foods. Soft, peeled fresh fruit (peach, melon) Berries with small seeds.</td>
</tr>
<tr>
<td>Not Allowed</td>
<td>Whole fruit.</td>
<td>All other fruit. All pineapple.</td>
<td>Hard-to-chew fresh fruit (apples, pears), stringy, high-pulp fruits (pineapple, mango), and dried fruit.</td>
</tr>
<tr>
<td><strong>Meat &amp; Meat Substitutes</strong></td>
<td><strong>Allowed</strong></td>
<td><strong>Not Allowed</strong></td>
<td></td>
</tr>
<tr>
<td>----------------------------</td>
<td>-------------</td>
<td>-----------------</td>
<td></td>
</tr>
<tr>
<td>Smooth, pureed meats, poultry, fish, eggs, or legumes; smooth soufflés; softened tofu; pureed cottage cheese, ricotta cheese or smooth yogurt. Cheese or nut butter pureed into other foods.</td>
<td>Level 1 foods. Moist, ground or tender cooked meat, poultry or fish, served with a gravy or sauce. Tender cooked eggs. Souffles or custard pie or quiche. Well-cooked pasta with meat sauce or in a casserole such as tuna casserole or macaroni and cheese. Tuna or egg salad without large chunks of vegetable. Well-cooked, moist, mashed legumes. Cottage cheese or grated cheese. Sandwiches with pre-gelled bread slurry or pureed bread.</td>
<td>Level 1 or 2 foods. Thin-sliced, tender or ground meat or poultry. Moist fish. All forms of eggs. Fruited yogurt. Casseroles with pasta, rice and small chunks of meat, poultry or fish. Smooth nut butter. Soft cheese slices or cubes.</td>
<td></td>
</tr>
<tr>
<td>Whole or ground forms of meat, poultry, or fish. Legumes, eggs, cheese or cottage cheese that are not pureed. Fruited yogurt.</td>
<td>Dry, tough or rubbery meat, poultry, fish or eggs; casseroles with rice or chunks; cheese slices or cubes; nut butters; regular bread; or pizza.</td>
<td>Tough, dry meats, poultry or fish. Chunky nut butters or nuts. Pizza or sandwiches made with hard, crusty bread.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Soups</strong></th>
<th><strong>Allowed</strong></th>
<th><strong>Not Allowed</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Pureed or strained soup. Soup may need to be thickened to meet liquid orders.</td>
<td>Level 1 foods. Soups with tender meats, poultry, fish and vegetables. Pieces need to be less than 1/2 inch.</td>
<td>Level 1 or 2 foods. Strained corn or clam chowder. Any made with tender pieces that are smaller than 1 inch.</td>
</tr>
<tr>
<td>Soups with chunks or lumps.</td>
<td>Soups with large chunks, rice, corn or peas.</td>
<td>Unstrained corn or clam chowder.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Vegetables</strong></th>
<th><strong>Allowed</strong></th>
<th><strong>Not Allowed</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Smooth, pureed vegetables. Tomato paste or seedless sauce. Mashed potatoes with gravy or butter, or other sauce.</td>
<td>Level 1 foods. Soft, well-cooked vegetables in 1/2 inch pieces or less. They should be easily mashed with a fork.</td>
<td>Level 1 or 2 foods. All cooked, tender vegetables. Shredded lettuce. Tender, fried potatoes.</td>
</tr>
<tr>
<td>Vegetables with chunks, lumps, seeds or pulp.</td>
<td>Peas, corn, broccoli, cabbage, Brussels sprouts, asparagus or other fibrous vegetables. Potato skins or fried potatoes.</td>
<td>Corn. Non-tender or rubbery cooked vegetables. All other raw vegetables. Potato skins; crisp/tough potatoes.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Other Foods</strong></th>
<th><strong>Allowed</strong></th>
<th><strong>Not Allowed</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Smooth sauces or condiments. Salt and finely ground pepper, herbs and spices</td>
<td>Level 1 foods. Sauces with chunks less than 1/2 inch.</td>
<td>Level 1 or 2 foods. All types of seasonings and condiments.</td>
</tr>
</tbody>
</table>

Section 4C Consistency Modification

**Finger Foods Diet**

**Use**

This diet is used for people whose intake is improved when they can feed themselves most easily using few utensils such as toddlers or adults with dementia. It may also be used with people who cannot sit up to eat due to a physical restriction.

**Adequacy**

This diet is adequate in all nutrients since the only modification is in the shape and size of food pieces.

**Diet Principles**

People who prefer this kind of diet may also eat better with smaller, more frequent feedings.

Provide a balanced diet with food selections that meet the U. S. Food Guide. Choose or alter foods so the size and shape make them easy to pick up with the fingers.

<table>
<thead>
<tr>
<th>Beverages</th>
<th>Breads &amp; Grains</th>
</tr>
</thead>
<tbody>
<tr>
<td>Any; serve in a mug with a lid</td>
<td>Breadsticks</td>
</tr>
<tr>
<td></td>
<td>Crackers</td>
</tr>
<tr>
<td></td>
<td>Pretzels*</td>
</tr>
<tr>
<td></td>
<td>Peanut butter or cheese-filled crackers</td>
</tr>
<tr>
<td></td>
<td>Biscuits</td>
</tr>
<tr>
<td></td>
<td>Cereal bars or breakfast tarts*</td>
</tr>
<tr>
<td></td>
<td>Muffins</td>
</tr>
<tr>
<td></td>
<td>Pancakes</td>
</tr>
<tr>
<td></td>
<td>Pita bread</td>
</tr>
<tr>
<td></td>
<td>Rolls</td>
</tr>
<tr>
<td></td>
<td>Mini bagels*</td>
</tr>
<tr>
<td></td>
<td>Mini-Danish pastries</td>
</tr>
</tbody>
</table>

*If the person can bite and chew.*

<table>
<thead>
<tr>
<th>Fruits &amp; Juices</th>
<th>Meats &amp; Meat Substitutes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bananas</td>
<td>Cheese sticks, string cheese</td>
</tr>
<tr>
<td>Pieces of cut-up fresh fruit, (e.g. apple, pears, peaches, plum halves, pineapple chunks, orange sections, strawberries)</td>
<td>Cheese cubes or slices</td>
</tr>
<tr>
<td>Melon slices</td>
<td>Chicken fingers or nuggets</td>
</tr>
<tr>
<td>Dried fruit</td>
<td>Fish sticks or nuggets</td>
</tr>
<tr>
<td>Frozen juice bars</td>
<td>Hot dogs (split)</td>
</tr>
<tr>
<td>Juices (serve in a mug with a lid)</td>
<td>Corn dogs</td>
</tr>
<tr>
<td>Grapes, halved</td>
<td></td>
</tr>
</tbody>
</table>
Section 4C Consistency Modification

Lunch meats
Meat (boneless, bite-size pieces)*
Meatloaf
Cocktail shrimp
Sausage patties or links
Hard-boiled eggs
Deviled eggs
Omelets
Custard pie or quiche

Soups
Soup, blended or strained, in a mug

Vegetables
French fries
Potato wedges
Whole green beans
Steamed broccoli or cauliflower
flowerettes
Corn on the cob*

Cherry tomatoes cut in half
Cucumber slices
Baby carrots*
Breaded, fried vegetable sticks
Onion rings
Stuffed or breaded mushrooms

Combination foods
French toast
Sandwiches (sliced into quarters or fingers) filled with peanut butter, deli meats, cheese or meat salads*
Pizza with a variety of toppings*
Mini hamburgers on mini buns
Ravioli or tortellini (can serve with tomato sauce or cream sauce for dipping)
Eggrolls*
Quesadillas*

Sample Menu for a Finger Foods Diet

Breakfast
2 French toast sticks
1 Tbs. syrup
1 sausage link
1 orange, sectioned
1 cup milk, in a mug
3/4 cup coffee with creamer and sugar (in a mug)

Mid-morning
1 pudding pop

Lunch
3 ounces meatloaf pieces
1 Tbs. ketchup
1/2 cup cooked baby carrots
1 tsp. margarine
1/2 cup herbed potato wedges
1/2 cup cranberry juice, in a mug

Mid-afternoon
1 peanut butter and jelly sandwich, quartered
1/2 cup grape juice, in a mug

Dinner
3 fish sticks
1 Tbs. tartar sauce
1/2 cup whole green beans
1 biscuit
2 tsp. margarine
1 cup milk, in a mug

Bedtime
1 oz. cheese cubed
1 apple, sliced
1 oz. pretzels
Section 4C: Consistency Modification

3/4 cup iced tea with sugar, in a mug

References


More Information


**Cholesterol Control Diet**

**Use**

This diet is used to manage abnormal blood cholesterol levels, which in turn may contribute to the buildup of plaque in the lining of blood vessels, resulting in heart attacks, strokes, and poor circulation in the legs, feet, and other parts of the body.

**Adequacy**

There are no nutrition deficiencies associated with this diet.

**Diet Principles**

- Limit foods that contain saturated fat and trans fat, which are usually solid at room temperature.
- Limit saturated fat from animal foods.
  - Control portion sizes. Limit portions to 5 ounces lean meat or skinless poultry per day.
  - Purchase lean, low fat, or nonfat foods.
  - Remove visible fat from meat and poultry before or during cooking.
  - Use cooking methods that reduce the fat content, such as broiling, baking, grilling, or stewing.
- Use more unsaturated, healthful sources of fat, which are usually liquid or semi-solid at room temperature.
- Serve fish 3 times per week or more. Include other sources of omega-3 fats such as ground flaxseed and walnuts.
- Use recipes that do not call for large amounts of high fat ingredients.
- Plan menus with more whole grains, fruits, and vegetables to increase fiber intake.
  - Make at least half of the bread, cereal, and grain servings whole grain every day.
  - Provide 2 to 4 fruit servings and 2 to 6 vegetable servings each day depending on total calorie needs. (Refer to Table 2A-1.)
  - Provide sources of viscous or soluble fiber (listed in Table 4D-1) with a daily target of 10 to 25 grams.

The following guide is based on information from *An Eating Guide for Healthy Americans* (American Heart Association, 2005).
Section 4D: Fat Control

**Beverages**

**Allowed:**
- 1 percent fat, 1/2 percent fat, or nonfat milk
- soy or rice beverages
- non-dairy creamers made with allowed fats
- fat free creamers
- fat free or reduced fat hot chocolate
- coffee, cereal beverages
- tea or herb tea
- carbonated and non-carbonated soft drinks

**Not Allowed:**
- 2 percent or whole milk
- half and half creamer
- nondairy creamers made with coconut oil or other saturated fat

**Breads & Grains**

**Allowed:**
- breads, rolls, English muffins, or bagels with 1 gram of fat or less per ounce
- pasta with vegetable or tomato sauces or healthful oils
- rice, wild rice, barley, bulgur, buckwheat, or couscous
- ready-to-eat breakfast cereal
- cooked breakfast cereal without added fat

**Not Allowed:**
- specialty breads, muffins, croissants, pastries, or donuts with more than 1 gram of fat per ounce
- fried bread, deep-fried French toast
- pasta with high fat cheese or cream sauces
- fried rice
- pie crust made with hard fats

**Fruits & Juices**

**Allowed:**
- all fresh or canned fruit and fruit juice
- all fruit cooked and served without added fat

**Not Allowed:**
- fruit served with high fat creams or sauces
- fruit desserts that are fried or have high fat ingredients

**Desserts & Sweets**

**Allowed:**
- desserts that feature whole grain, vegetable, or fruit ingredients
- pudding or custard made with low fat or nonfat milk and egg substitute
- low fat or nonfat yogurt or soy yogurt
- fruit sorbet or sherbet, reduced fat or fat free ice cream,
- soy or rice based frozen desserts, frozen fruit flavored bars
- cakes, bars, or cookies with only 1 to 2 grams of saturated fat per serving
- pie crust made with healthful vegetable oils
- sugar, low calorie sweeteners, jelly or jam, syrup, honey, apple butter
- candy made without fat
Section 4D: Fat Control

Not Allowed:  -desserts made with whole milk, sweet or sour cream, cream cheese, butter, or egg yolks  
-regular and premium ice cream  
-whole milk yogurt  
-pie crust made with solid shortening or lard  
-cookies or candies made with solid shortening or butter  
-sweets made with cocoa butter or coconut

Meat & Meat Substitutes
Allowed:  -85 percent or more lean beef or pork cuts  
-skinless chicken or turkey  
-fresh, unbreaded frozen, water-pack canned fish, or shellfish  
-cooked dried peas and beans, without added animal fats  
-peanuts, tree nuts, seeds, and nut butters  
-soy meat products, tofu, tempeh, and similar vegan protein sources  
-unlimited egg white or egg substitute; 2 to 4 egg yolks per person per week  
-low fat or fat free cottage cheese  
-hard cheese with 5 grams of fat or less per ounce
Not Allowed:  -deep-fried meat, poultry, or fish  
-sausage and bacon  
-high fat cuts of meat  
-medium or high fat lunch meats or frankfurters with 5 grams of fat or more per ounce  
-cheese with more than 5 grams of fat per ounce

Soups
Allowed:  -soups made with de-fatted broth or low fat or nonfat milk  
-soups that feature vegetables, cooked dried beans or peas, and whole grains
Not Allowed:  -soups made with whole milk or cream  
-soups made with high fat meats, poultry, or cheese

Vegetables
Allowed:  -all vegetables prepared with allowed ingredients and cooking methods  
-vegetables that are high fiber  
-all vegetable juices (though these are low fiber)
Not Allowed:  -vegetables with high fat sauces  
-deep fried vegetables

Other Foods
Allowed:  -vegetable oils including soy, corn, canola, olive, peanut, safflower, sunflower  
-soft or lite margarine made with allowed oils and without trans fat  
-small amounts of mayonnaise, or oil-based salad dressing  
-reduced fat or fat free salad dressings
Section 4D: Fat Control

- cocoa powder
- fat free condiments
- crackers, chips, or popcorn with less than 2 grams of fat per serving

Not Allowed: - fat from animal sources such as butter, cream, lard, bacon fat, or drippings from meat or poultry
- solid margarine or shortening with trans fat
- coconut, coconut oil, palm kernel oil, and cocoa butter
- crackers, chips, or popcorn with more than 2 grams of fat per serving

Table 4D-1: Sources of soluble fiber

<table>
<thead>
<tr>
<th>Food Source</th>
<th>Soluble fiber (grams)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cereal (1/2 cup cooked)</td>
<td></td>
</tr>
<tr>
<td>- barley</td>
<td>1</td>
</tr>
<tr>
<td>- oatbran</td>
<td>1</td>
</tr>
<tr>
<td>- oatmeal</td>
<td>1</td>
</tr>
<tr>
<td>Seeds (1 Tbs ground)</td>
<td></td>
</tr>
<tr>
<td>- psyllium seed</td>
<td>5</td>
</tr>
<tr>
<td>Fruit (1 medium fruit)</td>
<td></td>
</tr>
<tr>
<td>- apple</td>
<td>1</td>
</tr>
<tr>
<td>- banana</td>
<td>1</td>
</tr>
<tr>
<td>- blackberries (1/2 cup)</td>
<td>1</td>
</tr>
<tr>
<td>- citrus fruit</td>
<td>2</td>
</tr>
<tr>
<td>- peaches</td>
<td>1</td>
</tr>
<tr>
<td>- pears</td>
<td>2</td>
</tr>
<tr>
<td>- plums</td>
<td>1</td>
</tr>
<tr>
<td>- prunes (1/4 cup)</td>
<td>1.5</td>
</tr>
<tr>
<td>Legumes (1/2 cup cooked)</td>
<td></td>
</tr>
<tr>
<td>Beans</td>
<td></td>
</tr>
<tr>
<td>- black beans</td>
<td>2</td>
</tr>
<tr>
<td>- kidney beans</td>
<td>3</td>
</tr>
<tr>
<td>- lima beans</td>
<td>3.5</td>
</tr>
<tr>
<td>- navy beans</td>
<td>2</td>
</tr>
<tr>
<td>- northern beans</td>
<td>1.5</td>
</tr>
<tr>
<td>- pinto beans</td>
<td>2</td>
</tr>
<tr>
<td>- yellow, green, and orange</td>
<td>1</td>
</tr>
<tr>
<td>- black-eyed peas</td>
<td>1</td>
</tr>
<tr>
<td>- chickpeas</td>
<td>1</td>
</tr>
<tr>
<td>Lentils</td>
<td></td>
</tr>
<tr>
<td>Peas</td>
<td></td>
</tr>
<tr>
<td>-broccoli</td>
<td>1</td>
</tr>
<tr>
<td>-Brussels sprouts</td>
<td>3</td>
</tr>
<tr>
<td>-carrots</td>
<td>1</td>
</tr>
</tbody>
</table>

Note. Source: National Heart, Lung, and Blood Institute, 2005.

Cross References

Section 3F: Cardiovascular Disease
Section 4D: Triglyceride Control Diet

References

Section 4D: Fat Control


**More Information**

Section 4D: Fat Control

Triglyceride Control Diet

Use

This diet is used to lower high blood triglyceride levels. High levels of these fats, like high cholesterol levels, are risk factors for cardiovascular disease.

Adequacy

There are no nutrition deficiencies associated with this diet.

Diet Principles

Weight loss and increased physical activity are two important ways to lower triglycerides.
Limit calories from sugars, alcohol, saturated fat, and trans fats.
Serve fish 3 times per week or more. Include ground flaxseed in cereal or baked goods and/or walnuts daily since these are sources of omega-3 fats.
The guidelines listed for the Cholesterol Control Diet are appropriate for managing triglycerides as long as sugars are limited (AHA, 2005).
  o Use beverages sweetened with low calorie sweeteners.
  o Limit use of fruit juices by serving fruit instead.
  o Serve sugar-free jelly, jam, preserves, and syrups.
  o Prepare desserts that are low in sugar and fat, such as those which feature whole grains, fruit, and vegetables.
  o Use candy, gelatin, pudding, and similar sweets that are sweetened with low calorie sweeteners.

Cross References

Section 3F: Cardiovascular Disease
Section 3J: Obesity
Section 4A: Calorie Controlled Diet
Section 4D: Cholesterol Control Diet

References

Low Fat Diet

Use

The USDA’s Dietary Guidelines recommend limiting dietary fat to 20 to 35 percent of calories to maintain health. However, some conditions require even stricter control of fat. The low fat diet is used to treat conditions such as (American Dietetic Association (ADA), 2000, p. 697)
  - gall bladder disease,
  - fatty liver,
  - diarrhea,
  - delayed stomach emptying (gastroparesis), or
  - diseases of the pancreas or small intestine in which fat malabsorption occurs.
It is helpful to distinguish this diet from the diet that is used to manage cholesterol levels in heart disease. These diets have much in common, but the low fat diet is usually defined in terms of grams of total fat, rather than percent fat, not concerned with types or proportions of fat in foods, and not intended to control dietary cholesterol.

Adequacy

Based on RDAs, this diet is adequate in all nutrients except vitamin E. The meal plans provided below contain some fats as sources of essential fatty acids. A physician may prescribe vitamin or mineral supplements for people with prolonged fat malabsorption (ADA, 2000, p. 702).

Diet Principles

Use an exchange group method, such as the calorie controlled diet, for a convenient way to plan a low fat diet.
  - Limit servings from the Meat & Meat Substitutes Group and the Fat Group, as shown in Table 4D-2.
  - All other foods should have less than 1 gram of fat per serving.

<table>
<thead>
<tr>
<th>Table 4D-2: Guidelines for different degrees of fat restriction</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Daily Fat Restriction</strong></td>
</tr>
<tr>
<td>--------------------------</td>
</tr>
<tr>
<td>50 grams or less</td>
</tr>
<tr>
<td>30 grams or less</td>
</tr>
<tr>
<td>25 grams or less</td>
</tr>
</tbody>
</table>

Use recipes and food preparation methods that do not add fat to the diet. Prepare foods by baking, roasting, broiling, grilling, steaming, or poaching, or serve foods raw. Trim visible fat from meats, remove poultry skin, and skim fat off cooking liquid.
In some conditions, medium chain triglyceride (MCT) oil may be substituted for other food fats because MCT is digested and absorbed by a different route (ADA, 2000, p. 701).

**Beverages**

**Allowed:**
- any skim or nonfat milk or milk products
- any nonfat soy or rice milk
- coffee, tea, or herb tea
- cocoa made with skim milk or fat-free hot chocolate
- fat-free creamers
- carbonated and non-carbonated soft drinks

**Not Allowed:**
- whole or 2% low fat milk
- drinks made with cream, whole, or 2% milk, or ice cream
- regular non dairy creamers

**Breads & Grains**

**Allowed:**
- cooked or ready-to-serve breakfast cereal
- whole grain or enriched sandwich bread, rolls, or buns, bagels, or English muffins
- muffins, pancakes, or French toast made without fat
- steamed or boiled rice, pasta, or noodles
- pretzels, soda crackers, rice cakes, or air popped popcorn

**Not Allowed:**
- granola cereal or cereal with nuts
- breads made with egg, cheese, or added fat
- biscuits, sweet rolls, doughnuts, waffles, or fritters
- regular pancakes and French toast
- snack crackers, chips, and popcorn prepared with fat
- packaged rice, pasta, noodle, or stuffing mixes
- fried rice

**Fruits & Juices**

**Allowed:**
- any fruits or fruit juices

**Not Allowed:**
- fruit baked into high fat desserts

**Desserts & Sweets**

**Allowed:**
- fat-free frozen desserts
- angel food or other fat-free cakes
- pudding made with skim milk
- fat-free yogurt
- cookies, vanilla wafers, or graham crackers with 1 gram fat or less per serving
- gelatin desserts plain or with added fruit or other fat-free ingredients
- hard candy, jelly beans, marshmallows, or any candy without fat
- syrup, jelly, jam, preserves, marmalade, apple butter
- sugar or artificial sweeteners

**Not Allowed:**
- regular ice cream or frozen yogurt
- regular pastries, cookies, cakes, or pies
Section 4D: Fat Control

- pudding or mousse made with whole or 2% milk, cream, or whipped topping
- yogurt made with whole or reduced fat milk
- gelatin desserts with regular cheese, cream cheese, sour cream, or whipped topping
- chocolate candy or candy with nuts
- honey butter

**Meat & Meat Substitutes**

**Allowed:**
- Use the daily servings allowed from Table 4D-2
- any fat-free cheese, ricotta cheese, cottage cheese
- poultry without the skin
- trimmed lean beef or veal; USDA choice or good grades; cuts of round, sirloin, flank, and tenderloin; ground round or sirloin; rib, chuck or rump roasts
- trimmed lean pork cuts, tenderloin, center loin, or Canadian bacon
- ham, fresh, canned, cured, or boiled
- lamb chop, leg, or roast
- fish, fresh, frozen, canned in water
- lunch meats, hot dogs, or sausage with 3 grams of fat or less per ounce
- eggs or egg substitute prepared without added fat
- cooked dried beans, peas, or lentils without added fat
- tofu, tempeh, seitan, fat-free soy sausage and other soy-based meat alternatives

**Limit:**
- low fat cottage cheese or ricotta cheese to 1/4 cup per day
- part skim mozzarella or other cheese with 4 to 5 grams fat per ounce to 1 ounce per day
- low fat cheese with 1 to 3 grams fat per ounce to 3 ounces per day

**Not Allowed:**
- whole milk or reduced fat cheese with 6 or more grams of fat per ounce
- pot pies
- fried poultry, poultry skin, turkey bacon, or ground turkey
- fried, fatty, or heavily marbled beef; USDA Prime grades; ribs, ground beef, and corned beef
- pork ribs, pork steaks, hamhocks, salt pork, fatback
- breaded and/or fried fish or fish canned in oil
- lunch meat, hot dogs, or sausage with more than 3 grams fat per ounce
- eggs prepared with added butter, margarine, or oil

**Soups**

**Allowed:**
- fat-free broth or bouillon
- soups made with fat-free broth, skim milk, or evaporated skim milk
- fat-free canned soups
Section 4D: Fat Control

Not Allowed:  
- soups made with cream, half-and-half, whole, or 2% milk  
- soups with added cheese, butter, margarine, oils, or meat fat  
- soups made with stock containing meat fat

Vegetables
Allowed:  
- any vegetables, raw, steamed, boiled, or baked without added fat  
- any vegetable juices
Not Allowed:  
- vegetables that are fried or batter-dipped  
- vegetables served with butter or cheese sauces or dips

Other Foods
Allowed:  
- any fat-free margarine  
- any fat-free cream cheese or sour cream  
- fat-free butter flavorings  
- fat-free whipped topping  
- fat-free salad dressing or mayonnaise
Limit:  
- Use the daily servings allowed from Table 4D-2  
- 1 tsp butter, regular margarine, vegetable oil, mayonnaise  
- 1 tsp shortening, bacon grease, or lard  
- 2 tsp reduced fat margarine, whipped butter, peanut butter, tahini, or other nut or seed butters  
- 1 Tbs regular salad dressing or cream cheese, or reduced fat mayonnaise  
- 1 Tbs dry-roasted or raw sesame or sunflower seeds  
- 2 Tbs reduced fat salad dressing or light cream cheese  
- 2 Tbs regular sour cream or half-and-half cream  
- 2 Tbs avocado or shredded coconut  
- 3 Tbs reduced fat sour cream  
- 1 strip pork bacon or 2 strips turkey bacon  
- 8 black olives or 10 large stuffed olives  
- dry-roasted or raw nuts: 18 pistachios, 20 small peanuts or 10 large peanuts, 6 almonds or cashews, or 4 pecan or walnut halves
Not Allowed:  
- exceeding the daily serving allowance of fat sources

Sample Menu for a Low Fat (30 Gram) Diet

**Breakfast**
1 medium orange  
1/4 cup egg substitute cooked with 1 tsp oil  
1 English muffin, toasted  
2 tsp jelly  
3/4 cup wheat cereal flakes  
1 cup skim milk  
6 oz coffee or hot tea

**Lunch**
1 sliced turkey sandwich:  
2 oz turkey, 2 slices bread,  
2 tsp reduced fat mayonnaise  
1 cup mixed green salad  
1 Tbs fat-free salad dressing  
1/2 cup apricots halves  
6 oz coffee or tea
Section 4D: Fat Control

Dinner
2 oz grilled pork center-loin
1/2 cup baked sweet potato
1/2 cup broccoli with lemon
1 dinner roll
2 tsp reduced fat margarine
1 cup skim milk
6 oz coffee or tea
1 slice angel food cake

Bedtime
4 oz fat-free ice cream,
1/2 banana,
1 oz fat-free caramel topping

Cross References

Section 4G: Vitamin E Rich Foods

References


More Information

High Fiber Diet

Use

Use this diet to increase stool bulk and frequency. This diet is also useful for normalizing serum cholesterol, reducing the rise in blood glucose after meals, and reducing the need for insulin in diabetics. Additionally, this diet is used to both prevent and treat disease. Conditions that benefit from a high fiber diet include (American Dietetic Association [ADA], 2010)

- diverticulosis,
- constipation,
- inflammatory bowel disease,
- irritable bowel syndrome,
- diabetes mellitus, and
- high cholesterol.

Nutrition experts classify fiber according to the physiological effect that the fiber has in the human body. For example, some fiber that dissolves in water is highly viscous and helps to lower cholesterol levels, but this is not true of all water-soluble fiber.

Glossary

**Dietary fiber** refers to the edible, non-digestible carbohydrates and lignin naturally found in food. Dietary fiber has many classifications, and as a whole, it does not have a specific physiological effect. Examples of food sources are oatmeal, sweet potatoes, and pinto beans.

**Functional fiber** consists of isolated, extracted, or synthetic fiber that always has a beneficial physiological effect. Examples are oat bran and pectin.

**Total fiber** is dietary fiber plus functional fiber. Functional fiber is present in small amounts compared to dietary fiber.

(Food & Nutrition Board, [FNB], 2002, p. 2)

A high fiber diet should not be used in some conditions (ADA, 2010), including the following:

- autonomic neuropathy,
- gastroparesis,
- postgastrectomy,
- intestinal pseudo-obstruction,
- intestinal strictures, and
- acute bowel inflammation.

Adequacy

A high fiber diet is adequate in all nutrients since it is a normal or general diet with an emphasis on foods with high fiber content. Specific types of fiber are known to impair or enhance absorption of other nutrients.
Section 4E: Fiber Control

Diet Principles

People in the United States usually eat about 14 to 15 grams of fiber daily (Marlett, McBurney, & Slavin, 2002, p. 994). This intake is below the dietary reference intakes (DRI). Fiber should be gradually increased to recommended amounts to prevent cramping, bloating and passing gas. The DRI for total fiber varies by age and gender. (See Table 4E-1.) The DRI for older adults is lower due to decreased calorie needs.

<table>
<thead>
<tr>
<th></th>
<th>Male (grams per day)</th>
<th>Female (grams per day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adults less than 51 years old</td>
<td>38</td>
<td>25</td>
</tr>
<tr>
<td>Adults 51 years and older</td>
<td>30</td>
<td>21</td>
</tr>
<tr>
<td>Children 2 years old and older</td>
<td>Age plus 5 grams</td>
<td>Age plus 5 grams</td>
</tr>
</tbody>
</table>

Note. 

Table 4E-1: Dietary Reference Intake for Fiber

Food groups that are good fiber sources include

- fruits,
- vegetables,
- legumes, and
- whole grain breads and cereals.

Refer to Table 4E-2 for the fiber content of common foods.

Adequate fluid intake is very important with a high fiber diet. Each day, at least 8 cups of fluid should be consumed. For heavier people, or those whose environment is hot, dry, or windy, fluid intake may need to be much higher.

To promote normal bowel movements in cases of constipation, use a diet with a mixture of fiber sources, legumes, and whole grain or high fiber grain products.

To prevent and manage diverticular disease, use a mixed high fiber diet. Foods with small seeds or husks that may cause inflammation are often eliminated when diverticula already exist.

To reduce cholesterol levels, the National Cholesterol Education Program recommends 10 to 25 grams of viscous fiber each day (National Institutes of Health, 2001, p. 2). Viscous fiber is found in a mixed fiber diet but especially in foods such as apples, citrus fruit, cooked dried beans and other legumes, barley, and oats. It is also found in functional fiber sources, such as oat bran, rice hulls, and psyllium husks.

High fiber foods are a better source of fiber than commercial fiber supplements because they provide other nutrients and are often less expensive. Supplements, however, may be needed for people who have poor food intake. There are greater health risks from use of fiber supplements than high fiber foods when inadequate fluids are taken with them (Beyers, 2000, p. 669).
Table 4E-2: Fiber content of common foods\(^2\)

<table>
<thead>
<tr>
<th>High Fiber</th>
<th>Medium Fiber</th>
<th>Low Fiber</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 or more grams</td>
<td>2 to 4 grams</td>
<td>less than 2 grams</td>
</tr>
</tbody>
</table>

**Vegetables**
- dried beans, peas, or legumes, cooked, 1/2 cup
- green peas, fresh, frozen, or canned, 1/2 cup
- lima beans, 1/2 cup
- popcorn, air-popped, 3 cups
- snow peas, 10 pods
- Swiss chard, cooked, 1 cup
- broccoli, fresh, frozen, 1 cup
- Brussels sprouts, 1/2 cup
- carrots, raw, 1/2 cup
- collards, cooked, 1/2 cup
- corn, fresh, cooked, 1/2 cup
- eggplant, 1/2 cup
- okra, cooked, 1/2 cup
- parsnips, 1/2 cup
- potato, baked, with skin, half
- spinach, raw, 1 1/2 cups
- spinach, cooked, 1/2 cup
- sweet potato, with skin, half
- sweet potato, baked, no skin, 1/2 cup
- turnip, raw, 1/2 cup
- vegetables, mixed, 1/2 cup
- winter squash, baked, 1/2 cup

**Fruits**
- apple, with skin, 1 medium
- blackberries, 1/2 cup
- blueberries, 1 cup
- kiwi fruit, 2 medium
- loganberries, 1 cup
- prunes, dried, 5
- prunes, stewed, 1/2 cup
- apple, no skin, 1 medium
- banana, 1 medium
- cherries, raw, 1 cup
- dates, whole, 1/4 cup
- mango, 1 medium
- orange, 1 small
- orange sections, 1/2 cup
- pear, 1 medium
- pears, canned, 1 cup
- raspberries, fresh, 1/2 cup
- raisins, 2 Tbs
- rhubarb, cooked, 1/2 cup
- strawberries, 1 cup
- tangerines, canned, 1/2 cup
- tangerine, raw, 1 medium
- applesauce, 1/2 cup
- apricots, canned, 3 halves
- cantaloupe, 1/4
- cantaloupe, pieces, 1 cup
- cherries, canned, 1/2 cup
- fruit cocktail, canned, 1/2 cup - grapes, 1 cup
- grapefruit sections, 1/2 cup
- honeydew melon, pieces, 1 cup
- mandarin oranges, canned, 1/2 cup
- peaches, canned, 1/2 cup
- peaches, raw, 1 medium
- pineapple, raw, diced, 1 cup
- purple plums, canned, 1/2 cup
- tropical fruit salad, canned, 1/2 cup
- watermelon, pieces, 1 cup

**Juices**
- Juice Plus Fiber, 1/2 cup
- prune juice, 1 cup
- apple, cranberry, grape, grapefruit, orange, pineapple, 1 cup
- fruit nectar, 1 cup
- tomato juice, 1 cup
- vegetable juice, 1 cup

\(^2\) Fiber content is often expressed as grams per serving of food.
## Section 4E: Fiber Control

<table>
<thead>
<tr>
<th>High Fiber</th>
<th>Medium Fiber</th>
<th>Low Fiber</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 or more grams</td>
<td>2 to 4 grams</td>
<td>less than 2 grams</td>
</tr>
</tbody>
</table>

### Nuts and Seeds
- almonds, 1 ounce
- soybeans, roasted, 2 Tbs
- peanut butter, smooth or crunchy, 2 Tbs
- peanuts (15), 1 oz
- sesame seeds, whole, dried, 2 Tbs
- sunflower seeds, with kernels, 2 Tbs
- coconut, 2 Tbs
- walnuts, 2 Tbs

### Meat Alternatives
- Garden Burger, 1 patty
- Harvest Burger, 1 patty
- Boca breakfast links, 2
- Boca Italian sausage, 1
- Near East falafel mix, 1/4 cup
- Boca classic original burger, 1 patty
- Morningstar Farms burger, 1 patty
- Loma Linda chicken mix, 1/3 cup

### Breads
- bran muffin, 1 small
- pumpernickel, 1 slice
- rye bread, 1 slice
- whole wheat, 1 slice
- whole wheat bagel, half
- whole wheat matzo, 1
- bagel, plain, half
- baking powder biscuit, 1 small
- soft bread stick, 1
- English muffin, half
- sandwich bun, half
- matzo (6”), 1
- melba toast, 4
- plain dinner roll, 1 small
- white/cracked wheat bread, 1 slice

### Ready To Eat Cereals
- All Bran, 1/3 cup
- Bran Buds, 1/3 cup
- Corn Bran, 1/2 cup
- Fiber One, 1/3 cup
- Grape Nuts, 1/2 cup
- 100% Bran, 1/3 cup
- Uncle Sam Cereal, 1 cup
- 40% Bran Flakes, 1/2 cup
- Cheerios, 1 cup
- Complete Oat Bran Flakes, 3/4 cup
- Grape Nuts flakes, 1/2 cup
- Puffed wheat, 1/2 cup
- Shredded Wheat, 1 biscuit
- Shredded Wheat, bite size, 1/3 cup
- Golden Grahams, 3/4 cup
- Rice Krispies, 2/3 cup
- Special K, 1 cup

### Cooked Cereals
- oat bran cereal, 1 cup
- whole wheat cereal, 1 cup
- multigrain cereal, 1 cup
- oatmeal, 1 cup
- Cream of Wheat, 1 cup

### Grains
- barley, cooked 1/2 cup
- bran, natural, 1 Tbs
- brown rice, cooked, 1/2 cup
- bulgur, kasha, dry, 2 Tbs
- wheat germ, 1 Tbs
- white rice, cooked, 1/2 cup
- wild rice, cooked, 1/2 cup

### Pasta
- whole wheat pasta, 1/2 cup
- macaroni, noodles, or spaghetti, cooked, 1/2 cup
Section 4E: Fiber Control

<table>
<thead>
<tr>
<th></th>
<th>High Fiber</th>
<th>Medium Fiber</th>
<th>Low Fiber</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5 or more grams</td>
<td>2 to 4 grams</td>
<td>less than 2 grams</td>
</tr>
<tr>
<td>Cookies/Crackers</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- rye crackers, 1 triple</td>
<td></td>
<td></td>
<td>- saltine crackers, 6</td>
</tr>
<tr>
<td></td>
<td>- Wheat Thins, 16</td>
<td></td>
<td>- corn or potato chips, 1 oz</td>
</tr>
<tr>
<td></td>
<td>- oat cakes, 2</td>
<td></td>
<td>- Wheatworth crackers, 5</td>
</tr>
<tr>
<td></td>
<td>- Triscuits, 3</td>
<td></td>
<td>- Wasa wheat crackers, 3</td>
</tr>
<tr>
<td></td>
<td>- whole wheat pretzels, 1 oz</td>
<td></td>
<td>- Sunshine Krispy whole wheat crackers, 5</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Wheatables, 12</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- graham crackers, 4 squares</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- melba toast, 4</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- oatmeal cookie, 1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- snack crackers, 10</td>
</tr>
</tbody>
</table>


Sample Menu for a High Fiber Diet

**Breakfast**
- 1 medium orange
- 2/3 cup bran cereal
- 2 Tbs raisins
- 2 scrambled eggs
- 2 slices whole-wheat toast
- 2 tsp jelly
- 2 tsp margarine
- 1 cup skim milk
- 6 oz coffee or tea

**Mid-afternoon**
- 1 cup fresh fruit cup

**Lunch**
- 2 oz chicken patty
- 1 hamburger bun
- 1 tsp mustard or catsup
- 1/2 cup coleslaw
- 2 oatmeal raisin cookies
- 1 cup skim milk
- 6 oz coffee or tea

**Dinner**
- 1/2 cup tomato juice
- 3 oz baked fish
- 1/2 cup brown rice
- 1/2 cup green peas
- 1 cup tossed salad
- 1 Tbs ranch salad dressing
- 1 whole wheat dinner roll
- 2 tsp margarine

**Bedtime**
- 1 cup skim milk
- 6 oz coffee or tea
- 1 apple

Cross References
- Section 1B: Adult Nutrition Requirements, Fluids
- Section 2A: USDA Food Guide
- Section 3D: Constipation
- Section 3D: Diverticular Disease
- Section 4D: Cholesterol Control Diet
- Section 4G: DASH Eating Plan
Section 4E: Fiber Control

References


Section 4E: Fiber Control

**Low Fiber Diet**

**Use**

According to the current DRI (Food and Nutrition Board, 2002), a low fiber diet ranges from 10 to 17 grams of fiber per day. This diet is used to treat digestive problems such as

- Crohn's disease,
- ulcerative colitis,
- radiation therapy to the pelvis and lower bowel,
- preparation for a colonoscopy,
- the acute phase of diverticular disease,
- intestinal strictures (i.e., narrowing of the small intestine),
- diarrhea, and
- gastroparesis or delayed gastric emptying.

This diet may also be used to reduce fecal volume or during transition to a general (or regular) diet either pre- or post-operatively (American Dietetic Association, 2010).

**Adequacy**

A well-planned low fiber diet can adequately meet all nutrient needs as established by the DRI/RDA. While short-term use of low fiber diets may not be detrimental, long-term use could result in deficiencies of some nutrients or in increased disease risk. Inadequate intake of fruits, vegetables, and whole grains may result in deficiencies of antioxidant vitamins A, C, E, and folic acid (Mahan & Escott-Stump, 2004, pp. 728-730; Whitney, Cataldo, & Rolfes, 2002, pp. 124-128).

**Diet Principles**

Serve cooked or canned vegetables or vegetable juices. Avoid those with skins, hulls, or seeds, or those that are overly mature or fibrous.

Serve fruits that have been cooked or canned and only those without skins or seeds.

Do not serve vegetables or fruits that are gas-forming.

Use only refined breads, cereals, and grains.

Avoid foods that do not digest well, even if they are not fiber sources, such as tough meat, gristle, or sausage casings.

If a low residue diet is also prescribed, limit milk to 2 cups per day. Limit cheese and cottage cheese as well.
The following guidelines are compiled from several sources (Mahan & Escott-Stump, 2004, pp. 1238-1239; Mayo Clinic Staff, 2005; University of Pittsburgh Medical Center, 2003).

**Beverages**

Allowed:  
- milk, soy milk  
- carbonated & non-carbonated beverages  
- coffee  
- tea  
- broth  

Not Allowed:  
- high fiber enteral products  
- high fiber meal replacements

**Breads & Grains**

Allowed:  
- enriched white bread, rolls, bagels, pancakes, waffles, biscuits, or pastries  
- white rice  
- puffed rice, white rice cakes  
- non-wheat crackers  
- refined plain pasta or cereals with no more than 1 gram fiber per serving  
- white tortilla  
- grits, farina, cream of rice, or cream of wheat

Not Allowed:  
- whole grain or rye breads  
- oat bran  
- all bran products  
- whole-wheat products  
- whole grain or bran cereals  
- whole grain pasta  
- oatmeal, oat bran  
- rolled oats  
- brown or wild rice  
- granola products  
- cornbread  
- graham crackers

**Fruits & Juices**

Allowed:  
- fruit juice with little or no pulp  
- canned or cooked fruits without skins, seeds, or membranes  
- fresh banana  
- ripe, soft cantaloupe or honeydew melon  
- orange or grapefruit sections (without membranes)  
- applesauce

Not Allowed:  
- fruit with skins, seeds, or membranes  
- oranges and grapefruit (with membranes)  
- berries  
- coconut
- dried fruits
- figs
- kiwi
- raw pears
- pineapple
- plums or prunes
- prune juice
- raisins
- unstrained, blenderized high fiber fruits
- fruit juice with pulp

*Desserts & Sweets*

**Allowed:**
- plain or flavored yogurt
- pastries made with allowed fruits
- ice cream without berries
- cookies and cakes made with white flour
- sherbet
- ice pops
- pudding
- gelatin
- custard
- jelly
- plain hard candy
- marshmallows
- syrup, molasses, sugar

**Not Allowed:**
- dessert items containing berries, nuts, seeds, fruit skins, oats, wheat, bran, granola, brown or wild rice, chunky peanut butter, or dried fruits
- yogurt containing seeds or fruit peels
- jam, marmalade, and preserves
- popcorn

*Meat & Meat Substitutes*

**Allowed:**
- any tender cooked meat, poultry, or fish
- organ meats
- eggs
- cheese without nuts or seeds
- smooth peanut butter (up to 2 Tbs)
- tofu
- soy-based meat substitutes

**Not Allowed:**
- tough, fibrous meats with gristle
- sausage with seeds or casings
- luncheon meats or cheese with seeds
- baked beans
- cooked dried beans, peas, or lentils
- nuts, peanuts, seeds, or soy nuts
- chunky peanut butter
Section 4E: Fiber Control

**Soups**
Allowed: - boullion
- broth or cream soups made with allowed ingredients
Not Allowed: - soups with ingredients listed as not allowed

**Vegetables**
Allowed: - cooked or canned vegetables without skins, hulls, or seeds
- beets
- carrots
- green or wax beans
- mushrooms
- tomato products without skin or seeds
- white potato without skin
- vegetable juice without pulp

Not Allowed: - raw vegetables
- artichoke hearts
- broccoli
- Brussels sprouts
- cabbage
- cauliflower
- corn
- green leafy vegetables (except pureed)
- lettuce
- mature, fibrous vegetables
- okra
- pickles or olives
- rhubarb
- sauerkraut
- sweet potatoes
- white potatoes with skin
- winter squash

**Other Foods**
Allowed: - oils
- margarine
- butter
- salad dressings without seeds
- mayonnaise
- plain gravies

Not Allowed: - flax seed
- miso
- tempeh
- bacon
Sample Menu for a Low Fiber Diet

Breakfast
1/2 cup orange juice, low or no pulp
1 scrambled egg
2 3-inch pancakes
2 Tbs syrup
1 cup skim milk
6 oz coffee or hot tea
1 tsp sugar

Lunch
1 cup tomato soup
2 oz grilled chicken breast
1/2 cup sliced carrots
1 slice white bread
2 tsp margarine
6 oz coffee or tea
1 tsp sugar

Mid-afternoon
5 Ritz crackers
1 Tbs smooth peanut butter
1/2 cup sweetened applesauce

Dinner
3 oz broiled salmon
1/2 cup seasoned mashed potatoes
1/2 cup green beans
1 white dinner roll
2 tsp margarine
1/2 cup ripe cantaloupe pieces
1 cup skim milk
6 oz coffee or tea
1 tsp sugar

Bedtime
1/2 cup rice pudding (no raisins)

References


Corn Allergy Diet

Use

This diet is used for people who are allergic to corn. True corn allergy is rare but can be severe. This diet may be used also for people also have non-allergic intolerance to corn.

Adequacy

Corn is a very common ingredient in processed foods. By limiting use of processed foods a nutritionally adequate diet can be planned.

Diet Principles

Corn is common in our foods as a fresh vegetable or as a grain. In processed foods it is found as corn syrup, cornstarch, and corn oil.

Ingredient Terms To Know

The following terms usually indicate the presence of corn in a product (Melina, V., Stepaniak, J., & Aronson, D, 2004):

- baking powder
- caramel
- caramel coloring
- corn
- corn alcohol
- corn flour
- corn oil
- corn sweetener
- corn syrup
- corn syrup solids
- cornmeal
- cornstarch
- dextrates
- dextrin
- dextrose
- food starch
- fructose
- golden syrup
- grits
- high-fructose corn syrup
- hominy
- hydrolyzed corn protein
- invert sugar or invert syrup
- lactic acid
- maize
- malt
- malt extract
- malt syrup
- maltodextrin
- modified food starch
- monosodium glutamate (MSG)
- starch
- syrup
- treacle
- vanilla extract
- vegetable gum
- vegetable oil
- vegetable starch
- xanthan gum
Foods that always or sometimes contain corn (Melina, Stepaniak, & Aronson, 2004)

- alcoholic beverages (ale, beer, gin, whiskey)
- artificial sweeteners (such as Equal®)
- baked beans
- baked goods
- barbecue sauce
- biscuits and biscuit mix
- bleached flour
- blended sugar
- bread
- cake and cake mix
- candied fruit
- candy
- caramels
- soft drinks
- carob
- cereals
- cheese (imitation and nondairy)
- coffee creamers or whiteners
- condiments
- confectioners or powdered sugar
- cookies
- corn chips
- corn flakes
- custard
- doughnuts
- frozen desserts
- graham crackers
- gravy
- grits
- hominy
- iced tea (canned or bottled)
- instant coffee
- iodized salt
- jam
- jelly
- juice drinks (canned or bottled)
- ketchup
- maize
- margarine
- nachos
- nondairy creamers
- pancake syrup
- pancakes and pancake mix
- peanut butter (commercial sweetened)
- pickle relish
- pickles, sweet
- pie fillings
- polenta
- puddings
- salad dressing
- sauces (thickened, clear, Asian-style)
- sherbet
- soda
- soup
- spaghettis sauce
- succotash
- syrup
- tortillas
- vanilla flavoring
- vegetable shortening
- vegetables, mixed
- vinegar (distilled white)
- waffles
- yogurt (dairy or so)

References

Section 4F Food Allergy & Intolerance

**More Information**

American Academy of Allergy, Asthma, and Immunology  
611 East Wells Street  
Milwaukee, WI 53202  
[http://www.aaaai.org](http://www.aaaai.org)

Food Allergy and Anaphylaxis Network  
11781 Lee Jackson Highway, Suite 160  
Fairfax VA 22033-3309  
(800) 929-4040  
[http://www.foodallergy.org](http://www.foodallergy.org)
Egg Allergy Diet

Use

This diet may also be called an egg-free diet. It is used for people who have an allergy or intolerance to eggs.

Adequacy

There are many alternative protein sources so the egg-free diet need not be inadequate in protein. Eggs have many functions (such as leavening, emulsifying, binding or coating) as ingredients in other foods. Egg-free alternatives are available for bread and other baked goods (Barnes Koerner & Munoz-Furlong, 1998, pp.34-36).

Diet Principles

Avoid eggs from all types of animals.
Avoid foods that have ingredients and food additives derived from eggs.

Ingredient Terms To Know
Avoid foods with these ingredients on an egg-free diet (Koerner, C.B. & Munoz-Furlong, A., 1998)

- albumin, albumen
- egg (dried, powdered, solids, white, yolk)
- egg substitute
- eggnog
- globulin
- livetin
- lysozyme
- mayonnaise
- meringue
- ovalbumin
- ovomucin
- ovomucoid
- ovovitellin

Simplesse® surimi

The following terms may indicate the presence of egg:

- flavoring (natural or artificial)
- lecithin
- macaroni
- marzipan
- marshmallow
- nougat
- pasta
References


More Information

American Academy of Allergy, Asthma, and Immunology
611 East Wells Street
Milwaukee, WI 53202
[http://www.aaaaai.org](http://www.aaaaai.org)
Fish Allergy Diet

Use

This diet is used for people who are allergic to any type of fish. It is not appropriate for those with shellfish allergy.

Adequacy

There is no nutrition deficiency associated with this diet.

Diet Principles

Avoid all species of fish when there is an allergy to any of them, since they contain similar allergens.
Shellfish, which are crustaceans or mollusks, are not restricted on this diet.

Ingredient Terms To Know
Avoid all types of fish. Some, but not all types are listed below (Barnes Koerner & Munoz-Furlong, 1998).

- anchovy
- barracuda
- bass
- bluefish
- bonito
- bullhead
- butterfish
- carp
- catfish
- caviar
- cod
- crappie
- croaker
- drum
- eel
- flounder
- grayling
- grouper
- haddock
- hake
- halibut
- harvest fish
- herring
- mackerel
- mahimahi
- mullet
- perch
- pickerel
- Pollack
- pompano
- porgy
- red snapper
- rockfish
- roughy
- salmon
- sardines
- scrod
- sea trout
- shad
- shark
- smelt
- sole
- sturgeon
- sunfish
- swordfish
- tilapia
- trout
- tuna
- whiting
Avoid foods with any of these ingredients (Barnes Koerner & Munoz-Furlong, 1998, p.40).

- Caesar salad or Caesar salad dressing (has anchovy)
- caviar or roe (fish eggs)
- crab cakes made with imitation crab
- imitation crab, lobster, or scallops
- surimi (processed fish used to make imitation seafood)
- Worcestershire sauce (has anchovy)

References


More Information

American Academy of Allergy, Asthma, and Immunology
611 East Wells Street
Milwaukee, WI 53202
[http://www.aaaai.org](http://www.aaaai.org)

Food Allergy and Anaphylaxis Network
11781 Lee Jackson Highway, Suite 160
Fairfax VA 22033-3309
(800) 929-4040
[http://www.foodallergy.org](http://www.foodallergy.org)
Section 4F Food Allergy & Intolerance

**Latex Allergy Diet**

**Use**

This diet may be used for people who have an allergy to natural rubber latex. This allergy can cause allergic reactions to foods as well. When latex allergy is severe, it can be a life-threatening problem. Food services should avoid using rubber latex gloves in food preparation to protect both the workers themselves and their latex-sensitive customers from exposure to latex.

**Adequacy**

This diet is not associated with any nutrition deficiencies.

**Diet Principles**

There are many allergens in natural rubber latex. Similar allergens occur in a variety of unrelated foods. Some of the foods that may have cross reactivity include (Perkins, 2000, pp. 1382-1383):

- avocado
- banana
- buckwheat
- chestnut
- kiwi fruit
- mango
- papain
- peaches
- potato
- tomato

**References**

Milk Allergy Diet

Use

This diet is used for people who are allergic to milk. It may also be called a milk-free diet since it excludes milk, milk products, and food additives derived from milk.

Adequacy

This diet may not provide adequate calcium unless calcium-fortified foods or milk alternatives are included. Fortified soymilk may be used unless the person also has a soy allergy.

Diet Principles

Avoid all milk and milk products. These include:
  - milk
  - cheese
  - cream
  - yogurt
  - butter
  - most margarine.

Avoid foods made with milk or milk products. These may include:
  - a variety of baked goods
  - frozen desserts
  - creamed foods
  - cream soups.

Foods may be legally labeled “nondairy” but still contain additives derived from milk (Barnes Koerner & Munoz-Furlong, 1998, pp.31-33). Examples include:
  - coffee creamers
  - whipped toppings
  - imitation cheese
  - soft ice creams
  - other frozen desserts.

Ingredient Terms To Know

Avoid foods with these ingredients on a milk-free diet (Koerner, C.B. & Munoz-Furlong, A., 1998).
  - artificial butter flavor
  - butter, butter fat, butter oil
  - buttermilk
  - casein (casein hydrolysate)
  - caseinates (listed as ammonium, calcium, magnesium, potassium or sodium caseinates)
  - cheese
  - cottage cheese
Section 4F Food Allergy & Intolerance

cream
curds
custard
ghee
half & half
hydrolysates (listed as casein, milk protein, protein, whey or whey protein hydrolysate)
lactalbumin, lactalbumin phosphate
lactoferrin
lactoglobulin
lactose
lactulose
milk (condensed, derivative, dry, evaporated, low-fat, malted, milkfat, non-fat, powder, protein, skinned, solids, whole, and goat's or other animals' milk)
nougat
pudding
rennet casein
sour cream, sour cream solids
sour milk solids
whey (in all forms)
yogurt

The following terms may indicate presence of milk (Koerner, C.B. & Munoz-Furlong, A., 1998)

flavorings including caramel, Bavarian cream, coconut cream, brown sugar, butter and natural flavorings
chocolate
high protein flour
lactic acid started culture
lunch meat, hot dogs, sausages
margarine
non-dairy products
Simplesse

Cross References

Appendix 5B: Infant Feedings and Formulas

References


Peanut Allergy Diet

Use

This diet may also be called a peanut-free diet. It is used for people with allergies to peanuts. Since the allergic response to this allergy can be very serious the diet excludes peanuts, ingredients derived from peanuts, and, foods or ingredients that may be cross-contaminated with peanuts. Food services must take precautions to prevent cross-contamination during food preparation as well.

Adequacy

No nutrition deficiencies are associated with this diet.

Diet Principles

Peanuts come from a type of plant called a legume. They grow underground, unlike tree nuts. People allergic to peanuts are not likely to be allergic to most other legumes like beans, peas, and lentils.

A peanut allergy is not the same as a tree nut allergy. However, people with peanut allergy should avoid shelled tree nuts and sunflower seeds because of the risk of cross-contamination since they are often processed in the same facility. Watch out for artificial nuts that are often de-flavored peanuts with other nut flavoring added.

Peanuts are used often in African, Chinese, Indian, Indonesian, Thai, and Vietnamese cooking (Food Allergy & Anaphylaxis Network, 2009).

Ingredient Terms To Know

Avoid foods with these ingredients on a peanut-free diet.

- artificial nuts
- beer nuts
- cold pressed, expelled, or extruded peanut oil
- goobers
- ground nuts
- mandelonas (peanuts soaked in almond flavoring)
- mixed nuts
- monkey nuts
- Nu-Nuts flavored nuts
- nutmeats
- nut pieces
- peanut
- peanut butter
- peanut flour

The following foods may indicate the presence of peanut:

- baked goods (pastries, cookies, etc.)
candy (including chocolate candy)
chili
chocolate
egg rolls
enchilada sauce
marzipan
nougat

References


More Information

American Academy of Allergy, Asthma, and Immunology
611 East Wells Street
Milwaukee, WI 53202
http://www.aaaai.org

Food Allergy and Anaphylaxis Network
11781 Lee Jackson Highway, Suite 160
Fairfax VA 22033-3309
(800) 929-4040
http://www.foodallergy.org
Shellfish Allergy Diet

Use
This diet is used for people who are allergic to shellfish.

Adequacy
There are no nutrition deficiencies associated with this diet.

Diet Principles
Avoid all species of shellfish when there is an allergy to any of them, since they contain similar allergens. A fish allergy is not related to shellfish allergy.

Ingredient Terms To Know
Avoid the following foods on a shellfish allergy diet:
- abalone
- clams
- cockles
- crab
- crawfish, crayfish
- fish stock
- imitation shellfish (may have natural shellfish flavoring)
- lobster
- mollusks
- mussels
- octopus
- oysters, snails (escargot)
- prawns
- quahog
- scallops, shrimp
- squid (calamari)
- surimi (processed fish used to make imitation seafood)

These foods may indicate the presence of shellfish protein:
- bouillabaisse
- cuttlefish ink
- fish stock
- flavorings (artificial or natural)
- seafood flavoring (such as crab or clam extract)

References
Soy Allergy Diet

Use

This diet is used for people who are allergic to soybean protein. Sometimes soy oil and soy lecithin are not restricted (Barnes Koerner & Munoz-Furlong, 1998, pp.37-38). In this manual they are restricted to prevent allergic reactions in highly sensitive people.

Adequacy

Soybean allergy is most common in infants and young children. It is often outgrown by age 3. It is rare in adults. While soy is present in a wide variety of processed foods, a nutritionally adequate diet can be prepared using less processed items.

Alternatives to those allergic to dairy and soy milk are rice milk, almond milk, or other nut milks (Melina, Stepaniak, & Aronson, 2004, p.88). Alternative infant formulas are hypoallergenic types such as Nutramigen or Alimentum.

Diet Principles

Soybeans may be eaten in the fresh, green form, or as dried beans. They are the source of many ingredients in processed foods. These ingredients may function as protein sources, fat sources, emulsifiers, or texturizers.

Ingredient Terms To Know

Avoid foods with these ingredients on a soy-allergy diet (Melina, Stepaniak & Aronson, 2004):

- edamame
- hydrolyzed soy protein
- miso
- natto
- shoyu sauce
- soy (albumin, flour, grits, nuts, milk or sprouts)
- soya
- soybean (curd, granules)
- soy protein (concentrate, isolate)
- soy sauce
- soybean (granules, curd)
- Tamari
- tempeh
- textured vegetable protein (TVP)
- tofu

The following ingredients may indicate the presence of soy:

- flavorings artificial or natural
- guar gum
gum arabic
hydrolyzed plant protein
hydrolyzed vegetable protein
monosodium glutamate (MSG)
protein extender
vegetable broth, gum, starch or flavorings
vitamin E

Foods that may have soy protein (Melina, Stepaniak & Aronson, 2004, p. 87):

- baby foods
- bakery goods (cakes, cookies, pies, desserts
- bouillon cubes or paste
- bread, especially high-protein
- breakfast cereal, muesli
- butter substitutes
- candy
- nondairy cheese
- Chinese food
- crackers
- energy and health drinks
- gravy mix
- ice cream, nondairy frozen desserts
- infant formula
- margarine
- meat alternatives
- meal replacers, liquid or powdered
- salad dressing
- sauces (Worcestershire, sweet and sour, hoisin, teriyaki)
- seasoned salt
- shortening
- snack, energy or sports bars
- soup, canned or dried mix
- soy pasta

References


Tree Nut Allergy Diet

Use

This diet is used for people with an allergy to any type of tree nut. It is also called a tree nut-free diet. Since the allergic reaction in nut allergies can be life threatening, people are advised to avoid all types of tree nuts. The risk of cross-contamination between nut varieties is high. Cross-contamination is also a problem in candy manufacturing.

Adequacy

There is no nutrition deficiency associated with this diet.

Diet Principles

Tree nuts and products made with them are eliminated in a tree nut-free diet. Many processed foods contain tree nuts including expected sources like baked goods but in unexpected foods as well. Artificial nuts are often peanuts with flavoring from other nuts. Natural almond extract may have some almond protein that produces allergic reaction (Barnes Koerner & Munoz-Furlong, 1998, p.38).

Some foods with the word ‘nut’ in the name are safe to eat such as:
- coconut
- nutmeg
- water chestnuts.

Ingredient Terms To Know

Avoid foods with any of these ingredients on a tree nut-free diet. (Melina, Stepaniak & Aronson, 2004)

- almonds
- artificial nuts
- Brazil nuts
- caponata
- cashews
- chestnuts
- filberts (hazelnuts)
- gianduja (a creamy mixture of chocolate and chopped nuts used in candy)
- hickory nuts
- macadamia nuts
- marzipan or almond paste
- Mashuga Nuts (an Asian pecan)
- nan-gai nuts
- natural wintergreen extract (for filbert or hazelnut allergy)
- nougat
- nut butters(such as almond or cashew)
- nut extracts (both natural and artificial)
- nut meal
- nutmeat
- nut oil
- nut paste (such as almond paste)
- nut pieces
- pecans
- pesto
Section 4F Food Allergy & Intolerance

pine nuts (Indian nuts, pignoli, pinon, pyony, pignolia or pignon nuts)  pistachios
walnuts (black or English)

These processed foods may contain nuts or have a high risk of being cross-contaminated with nuts (Oh & Kennedy, 2005, pp. 65-67).

- cakes and pastries (especially carrot cake, pumpkin cake, spice cake, fruit cake)
- candy
- nut flavored cappuccino, coffee or coffee creamers
- cereals
- chili
- cookies
- dips
- egg rolls
- frangipane (custard with almond flavor)
- fried foods (may have been exposed to nuts)
- gravy
- ice cream
- liqueur (amaretto or Frangelico)
- mortadella (smoked sausage with pistachios)
- nut rolls
- praline
- salads and salad dressing
- spaghetti sauce
- Worcestershire sauce (may contain walnuts)

References


Wheat Allergy Diet

Use

This diet is used for people who are allergic to wheat. It is also called a wheat-free diet. Wheat allergy and celiac disease are not the same. Refer to the Gluten-Free Diet for treating celiac disease.

Adequacy

Alternative grains are available to provide the carbohydrate, fiber, iron and B-vitamins found in wheat.

Diet Principles

Avoid wheat and products made with wheat-derived ingredients.

Ingredient Terms To Know (The Food Allergy & Anaphylaxis Network, 2004)
Avoid foods with any of these ingredients on a wheat-free diet:
- bran
- bread crumbs
- bulgur
- cereal extract
- couscous
- cracker meal
- durum, durum meal
- farina
- flour (all-purpose, bleached, bread, cake, durum, enriched, graham, high-gluten, high-protein, instant, pastry, self-rising, soft wheat, steel ground, stone ground, whole wheat, unbleached, unenriched)
- gluten
- kamut
- macaroni
- matzoh or matso
- pasta
- seitan
- semolina
- spelt
- triticale
- vital gluten
- wheat (bran, cracked, germ, gluten, malt, starch)
- wheat grass
- whole wheat berries

The following foods may contain wheat:
- flavorings (artificial or natural)
Section 4F Food Allergy & Intolerance

hydrolyzed protein
soy sauce
starch (gelatinized starch, modified starch, modified food starch, vegetable starch, wheat starch)
surimi (processed fish used to make imitation seafood)

Cross References

Section 4F: Gluten Free Diet

References

Section 4F Food Allergy & Intolerance

Citrus Fruit Intolerance Diet

Use

This diet is used for people with food intolerance to citrus fruits.

Adequacy

Citrus fruits are a significant source of vitamin C so alternative sources must be included in the diet.

Diet Principles

Avoid citron, grapefruit, kumquat, lemon, lime, orange, tangelo, tangerine.
Avoid juices, fruit drinks or punch made with citrus fruits.
Avoid baked goods made with candied fruit (such as fruit cake), fruit peel or zest, or citrus juices.
Avoid preserves such as marmalade.
Avoid sauces, salad dressings, or marinades made with citrus juices.

Cross Reference

Section 4G: Vitamin C Rich Foods

References

Gluten-Free Diet

Use

This diet is used to treat two conditions arising from gluten intolerance: celiac disease, a digestive tract condition, and, dermatitis herpetiformis, a chronic skin condition. Diet therapy is the only treatment for celiac disease at this time. However, this diet should not be started until a diagnosis is confirmed, or else an incorrect diagnosis may be made (Case, 2001, p. 7).

Adequacy

Heavy reliance on refined, unenriched, gluten-free products may result in inadequate intakes of B-vitamins, iron, and fiber (American Dietetic Association [ADA], 2010). The digestive tract will take months or years to recover fully, so people may need vitamin and mineral supplements for a time.

Diet Principles

This diet restricts
○ wheat (wheat varieties termed durum, semolina, kamut, spelt),
○ rye,
○ barley, and
○ triticale (a hybrid of wheat and rye).
These grains may be present in both ingredients and food additives. Even tiny amounts must be avoided.
Oats should also be eliminated because they are frequently contaminated with grains that have gluten.
Avoid contaminating food with these grains during processing, storing, preparing, and serving.
Substitute gluten-free grains and starches to make baked goods and pasta, or purchase ready-made gluten-free grain products. The following foods are allowed:
○ amaranth
○ arrowroot
○ beans
○ buckwheat
○ corn
○ garfava
○ millet
○ nut flour
○ potato
○ quinoa
○ rice
○ sorghum
○ soy
○ tapioca
○ teff or tef
Read food labels carefully to identify ingredients that are not allowed. If the label is not clear, do not serve the food to an individual on the gluten-free diet. Some manufacturers provide toll-free customer service phone lines, and they can often provide clarification. The following common additives are gluten-

- acetic acid
- adipic acid
- annatto
- ascorbic acid
- aspartame
- benzoic acid
- beta carotene
- BHA, BHR
- biotin
- calcium chloride
- calcium disodium EDTA
- calcium pantothenate
- calcium phosphate
- carboxymethyl cellulose
- caramel color (made from corn in North America)
- carrageenan
- citric acid
- corn sweetener
- corn syrup solids
- demineralized whey
- dextrimaltose
- dextrin
- dextrose
- diocytlo sodium sulfo succinate
- ethyl maltol folic acid, folacin
- fructose
- fumaric acid
- gelatin
- glucose
- glutamic acid
- gums: acacia, algin, Arabic, carob bean, cellulose, guar, locust bean, methylcellulose, tragacanth, xanthan
- invert sugar
- lactic acid
- lactose
- lecithin
- levulose
- magnesium hydroxide
- malic acid
- maltodextrin
- maltol
- mannitol
- microcrystalline cellulose
- molasses
- monosodium glutamate (made in the U.S.)
- niacin, niacinamide
- papain
- pectin
- polyglycerol
- polysorbate 60 and 80
- potassium citrate
- potassium iodide
- propylene glycol
- propyl gallate
- pyridoxine hydrochloride
- psyllium
- riboflavin
- sodium acid pyrophosphate
- sodium ascorbate
- sodium benzoate
- sodium caseinate
- sodium citrate
- sodium hexametaphosphate
- sodium metabisulfite
- sodium nitrate
- sodium silicoaluminate
- sodium sulfite
- sorbitol
- stearic acid
- sucralose
- sucrose: white or brown sugar
- sulfo succinate
- tartaric acid
- tartrazine
- thiamine hydrochloride
- titanium dioxide
- tricalcium phosphate
- vanilla (alcohol free)
Use the following food lists to plan a gluten-free diet (ADA, 2000, pp. 182-183; Case, 2001, pp. 22-24; National Institute of Diabetes and Digestive and Kidney Diseases, 2005).

### Beverages
**Allowed:**
- milk and milk products made without gluten additives
- carbonated soft drinks
- unflavored brewed or instant coffee or brewed tea
- distilled alcoholic beverages (gin, rum, vodka, whiskey), wine (from the U.S.), and liqueurs
- chocolate drinks made from cocoa powder

**Not Allowed:**
- malted milk or other malted beverages
- instant tea mixes, some fruit flavored drinks
- cereal beverages
- ale, beer, or lager
- chocolate drink mixes

### Breads & Grains
**Allowed:**
- homemade or commercial bread made with allowed ingredients
- hot cereals made from corn, hominy, soy, rice, buckwheat, millet, or quinoa
- cold cereals such as puffed corn, rice, or millet, or flakes made from allowed grains
- rice, rice noodles, or unflavored rice cakes
- pasta made with gluten-free grains
- gluten-free crackers, unflavored snack chips, or popped corn

**Not Allowed:**
- any baked goods made with wheat, wheat starch, wheat germ, wheat bran, kamut, spelt, einkorn, rye, triticale, barley, malt, oats, or oat bran
- cereals containing malt or malt flavoring
- bulgur, farina, couscous, or products made with semolina, durum, or graham flour

### Fruits & Juices
**Allowed:**
- all fresh, frozen, or canned fruits and juices

**Not Allowed:**
- any that may have gluten additives, such as pie filling

### Desserts & Sweets
**Allowed:**
- granulated white or brown sugar, honey, or aspartame
- jam, jelly, preserves, or marmalade
- corn syrup, maple syrup, or molasses
- hard candy, plain chocolate, marshmallows, or meringue
- coconut
- gelatin or frozen desserts made from allowed ingredients
- cakes, cookies, or pies made with allowed ingredients
- custard or pudding made with allowed thickeners

Not Allowed:  
- licorice candy
- baked desserts with gluten additives or grains
- wafer, waffle, or sugar type ice cream cones
- pudding or custard made with gluten containing thickeners

**Meat & Meat Substitutes**

Allowed:  
- meat, poultry, fish, shellfish, eggs, or cheese processed without gluten additives
- unprocessed dried beans, chickpeas, lentils, or peas
- nuts, peanuts, or peanut butter, and seeds without additives
- tofu

Not Allowed:  
- any meats, lunch meat, hot dogs, sausages, or bacon that are processed with grains, stabilizers, or fillers that are not allowed
- any that are served with breading, gravy, or sauce that is not gluten-free
- imitation meat or fish with gluten additives
- egg substitute or dried eggs with gluten additives
- self-basting poultry with hydrolyzed vegetable or plant protein
- canned fish or meat with hydrolyzed vegetable or plant protein

**Soups**

Allowed:  
- homemade broth
- bouillon made from gluten-free base or cubes
- any made with allowed ingredients

Not Allowed:  
- canned, dried, or frozen soups made with ingredients that are not allowed
- soup bases and bouillon cubes that have hydrolyzed vegetable or plant protein

**Vegetables**

Allowed:  
- all plain fresh, frozen, or canned vegetables made with allowed ingredients

Not Allowed:  
- batter dipped or breaded vegetables
- commercially fried vegetables (cross-contamination risk)
- canned baked beans
- any served with sauces containing gluten

**Other Foods**

Allowed:  
- vegetable oil, margarine, butter, lard, shortening, or cream
- homemade salad dressings made with allowed ingredients
- catsup, mustard, or mustard flour
- soy sauce made without wheat
- pure spices and herbs

Not Allowed:  
- non-dairy cream substitutes
- salad dressings and condiments made with gluten additives
-soy sauce made with wheat
-malt vinegar or Worcestershire sauce made with it

Cross References

Section 3E: Celiac Disease

References


More Information

Quick Start Guide for Celiac Disease, downloadable files from The Gluten Intolerance Group of North America (GIG)
15110 10th Avenue SW, Suite A
Seattle, WA 98166-1820
Phone: (206) 246-6652
www.gluten.net
Low Lactose Diet

Use

This diet is used for people who are unable to fully digest lactose, the natural sugar in milk and milk products. People with mild intolerance to lactose can tolerate small amounts of lactose. In the case of severe lactose intolerance the person may need to restrict lactose to very low levels.

Adequacy

This diet may not be adequate in calcium unless other calcium rich alternatives or supplements are used. It may also be deficient in Vitamin D and riboflavin.

Diet Principles

Tolerance to lactose varies from one person to another. Intolerance often improves over time by slowly increasing lactose intake. Most people can tolerate up to 6 grams of lactose at a time if it is eaten with a meal. Eventually they may tolerate up to 12 grams per day (Escott-Stump, 2005, p 304).

Use Table 4F-1 to plan the low lactose diet. Begin the diet using only the moderate, low, and very low lactose foods. When symptoms are relieved, advance the diet by adding one food with 5-6 grams of lactose per serving per meal. Those who are very sensitive to lactose will need to read ingredient labels on processed foods to identify less obvious sources of lactose in foods such as:
- processed breakfast cereal,
- bread and baked goods,
- pancake, cookie, or biscuit mixes,
- breaded or battered meat, poultry, fish or vegetables,
- egg substitute,
- lunch meats,
- candies such as chocolate and caramel, and
- snack foods.

Serve lactose-containing foods in small portions with solid foods. This will slow down movement of food through the digestive tract allowing more time for digestion of lactose.

Replace regular cow’s milk with calcium fortified milk alternates such as soy milk or rice milk.

Table 4F-1 Lactose content of some foods (Pennington & Douglass, 2005, pp. 28-29, pp. 365-372).

<table>
<thead>
<tr>
<th>Product</th>
<th>Portion</th>
<th>Lactose (grams)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>High lactose foods</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Condensed milk</td>
<td>1/2 cup</td>
<td>15</td>
</tr>
<tr>
<td>Dry milk powder</td>
<td>1/4 cup</td>
<td>15</td>
</tr>
<tr>
<td>Milkshake</td>
<td>10 oz</td>
<td>14</td>
</tr>
<tr>
<td>Evaporated milk</td>
<td>1/2 cup</td>
<td>12</td>
</tr>
</tbody>
</table>
Section 4F: Food Allergy & Intolerance

<table>
<thead>
<tr>
<th>Food Item</th>
<th>Serving Size</th>
<th>Lactose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Milk (whole, low fat, non fat, or chocolate)</td>
<td>1 cup</td>
<td>11</td>
</tr>
<tr>
<td>Whey fluid</td>
<td>1 cup</td>
<td>11</td>
</tr>
<tr>
<td>Buttermilk</td>
<td>1 cup</td>
<td>10</td>
</tr>
<tr>
<td>Ice milk</td>
<td>1/2 cup</td>
<td>9</td>
</tr>
<tr>
<td>Yogurt, plain</td>
<td>1 cup</td>
<td>8</td>
</tr>
<tr>
<td>Acidophilus milk</td>
<td>1 cup</td>
<td>6</td>
</tr>
<tr>
<td>Cooked cereal made with milk</td>
<td>1/2 cup</td>
<td>6</td>
</tr>
<tr>
<td>Ice cream or pudding made with milk</td>
<td>1/2 cup</td>
<td>6</td>
</tr>
<tr>
<td>Cream soup made with milk</td>
<td>3/4 cup</td>
<td>5</td>
</tr>
<tr>
<td>Half &amp; half</td>
<td>1/2 cup</td>
<td>5</td>
</tr>
<tr>
<td>Yogurt, flavored</td>
<td>1 cup</td>
<td>5</td>
</tr>
</tbody>
</table>

**Moderate lactose foods**

<table>
<thead>
<tr>
<th>Food Item</th>
<th>Serving Size</th>
<th>Lactose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cottage cheese, creamed</td>
<td>1/2 cup</td>
<td>3</td>
</tr>
<tr>
<td>Heavy cream</td>
<td>1/2 cup</td>
<td>3</td>
</tr>
</tbody>
</table>

**Low lactose foods include**

<table>
<thead>
<tr>
<th>Food Item</th>
<th>Serving Size</th>
<th>Lactose</th>
</tr>
</thead>
<tbody>
<tr>
<td>American processed cheese</td>
<td>1 oz</td>
<td>2</td>
</tr>
<tr>
<td>Chocolate syrup or chocolate icing</td>
<td>2 Tbs</td>
<td>2</td>
</tr>
<tr>
<td>Cottage cheese, uncreamed, or curds</td>
<td>1/2 cup</td>
<td>2</td>
</tr>
<tr>
<td>Milk chocolate candy</td>
<td>1 oz</td>
<td>2</td>
</tr>
<tr>
<td>Ricotta cheese</td>
<td>1/2 cup</td>
<td>2</td>
</tr>
<tr>
<td>Sherbet</td>
<td>1/2 cup</td>
<td>2</td>
</tr>
<tr>
<td>Sour cream</td>
<td>2 Tbs</td>
<td>1</td>
</tr>
</tbody>
</table>

**Very low lactose foods**

<table>
<thead>
<tr>
<th>Food Item</th>
<th>Serving Size</th>
<th>Lactose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Other aged, hard cheese</td>
<td>1 oz</td>
<td>&lt; 1</td>
</tr>
<tr>
<td>Cream cheese</td>
<td>1 oz</td>
<td>&lt; 1</td>
</tr>
<tr>
<td>Lactaid 100 or Dairy Ease</td>
<td>1 cup</td>
<td>&lt; 1</td>
</tr>
<tr>
<td>Butter or margarine</td>
<td>1 tsp</td>
<td>trace</td>
</tr>
</tbody>
</table>

References


More Information


National Digestive Diseases Information Clearinghouse
Monosodium Glutamate (MSG) Intolerance Diet

Use

This diet is used for people who have intolerance to monosodium glutamate. This sensitivity often causes a headache.

Adequacy

No nutrition deficiencies are associated with this diet.

Diet Principles

MSG is a flavor enhancer that is often used in Asian foods. The food intolerance is often called “Chinese restaurant syndrome” for this reason. MSG is used in other types of cuisine as well. It is widely used in packaged foods and is available as flavor enhancers such as Accent or Zest. Listing on food labels is voluntary. These ingredient terms indicate MSG may be used in the food;

- hydrolyzed protein
- hydrolyzed vegetable protein
- hydrolyzed plant protein
- glutamic acid
- flavoring
- kombu extract

References

Strawberry Intolerance Diet

Use

This diet is used for people with food intolerance to strawberries.

Adequacy

No nutrition deficiencies are associated with this diet.

Diet Principles

Avoid fresh or frozen strawberries.
Avoid strawberry jelly, jams, preserves, and syrups.
Avoid fruit juices, fruit drinks, or punch made with strawberries.
Avoid frozen desserts, yogurt, fruit snacks, or candy with natural strawberry ingredients.

References

Section 4F: Food Allergy & Intolerance

Sulfite Intolerance Diet

Use

This diet is used for people who have intolerance to sulfites which may occur naturally in food or may be food additives.

Adequacy

No nutrition deficiencies are associated with this diet.

Diet Principles

Sulfites are sulfur-based food additives used as preservatives, dough conditioners, bleaching agents and stabilizing agents. Sulfites are found in a variety of raw, cooked and processed foods. These include:
- baked goods
- fruit, dried, glacéed, or pre-cut fresh
- guacamole
- jam, jelly and preserves
- molasses and syrup
- pickled foods
- potatoes, canned, dried, frozen, or pre-cut fresh
- raisins
- rice or potato mixes
- salad dressing
- shrimp
- soup
- vegetables, canned, dried, or pre-cut fresh

Sulfites are used in beverages such as:
- beer
- wine
- hard cider
- fruit and vegetable juices
- instant tea and coffee.

Ingredient Terms To Know

The following 6 terms used on food labels indicate sulfites are present (Melina, Stepaniak, & Aronson, 2004, p.41 and p.99):
- sulfur dioxide
- sodium sulfite
- sodium bisulfite
- potassium bisulfite
- sodium metabisulfite
- potassium metabisulfite
Section 4F: Food Allergy & Intolerance

References


More Information

American Academy of Allergy, Asthma, and Immunology
611 East Wells Street
Milwaukee, WI 53202
http://www.aaaai.org
Tartrazine Intolerance Diet

Use

This diet is used for people with intolerance to tartrazine, which is another name for FD&C Yellow #5. This intolerance causes serious breathing problems in some people with asthma who are sensitive to aspirin.

Adequacy

No nutrition deficiencies are associated with this diet.

Diet Principles

Read labels carefully. Food color may be listed as an ingredient without naming the specific agent used. Processed foods that are shades of yellow, orange, red, or green often have tartrazine. Contact the manufacturer to find out which food dyes have been used.

Foods that may contain tartrazine include the following (Perkins, 1990, pp. 269-272).

- Breakfast cereal with artificial colors, pastries, doughnuts, bread, muffins, biscuits, and baking mixes
- Flavored milk such as chocolate or strawberry, instant breakfast drinks, milkshakes, yogurt, frozen desserts, pudding and custard, and colored cheese
- Bologna, salami, frankfurters, sausage, ham, bacon, pork, meatloaf, barbecued meat, frozen breaded fish products, packaged entrée mixes, macaroni and cheese mix, and egg substitute
- Pickles, packaged vegetable mixes
- Soft drinks, fruit drinks, and powdered drink mixes
- Ices cream, sherbet, ices, gelatin, cakes, cookies, dessert mixes, pies and pie crust, pudding and custard, mint flavored items, chocolate syrup, flavored topping and frosting, candies, fruit snacks.
- Almonds, salad dressing, olives, mayonnaise, avocados, margarine, butter, and cooking fats
- Mint or wintergreen flavored items, soy sauce, snack crackers and chips, mustard, catsup, and chili sauce

References

Tomato Intolerance

Use

This diet is used for people with a food intolerance to tomatoes.

Adequacy

No nutrition deficiencies are associated with this diet.

Diet Principles

Avoid tomatoes and tomato products including canned, dried or fresh.
Avoid condiments that may contain tomatoes including catsup, barbecue sauce and salad dressings.
Check ingredient lists of foods such as soups, stews, and vegetable dishes where tomatoes are frequently used.

References


More Information

American Academy of Allergy, Asthma, and Immunology
611 East Wells Street
Milwaukee WI 53202
http://www.aaaai.org

Food Allergy & Anaphylaxis Network
11781 Lee Jackson Highway, Suite 160
Fairfax VA 22033-3309
1-800-929-4040
Section 4G: Micronutrients

**Calcium Rich Foods**

The Adequate Intake (AI) for calcium varies with age and state of pregnancy or lactation (Food and Nutrition Board [FNB], 1997, p. 94, 99, 105, 109, 111, 115, 117, 121, 127).

<table>
<thead>
<tr>
<th>Adequate Intake (AI)</th>
<th>milligrams per day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infants 0 through 6 months</td>
<td>210</td>
</tr>
<tr>
<td>Infants 7 through 12 months</td>
<td>270</td>
</tr>
<tr>
<td>Children ages 1 through 3</td>
<td>500</td>
</tr>
<tr>
<td>Children ages 4 through 8</td>
<td>800</td>
</tr>
<tr>
<td>Children ages 9 through 18</td>
<td>1300</td>
</tr>
<tr>
<td>Adults age 19 through 50</td>
<td>1000</td>
</tr>
<tr>
<td>Adults ages 51 and older</td>
<td>1200</td>
</tr>
<tr>
<td>Pregnancy and lactation</td>
<td>1300</td>
</tr>
<tr>
<td>Women ages 14 through 18</td>
<td>1000</td>
</tr>
<tr>
<td>Women ages 19 through 50</td>
<td>1000</td>
</tr>
</tbody>
</table>

The AIs were established by taking into account many variables including calcium absorption. In part, calcium absorption depends on the amount of calcium intake. With lower intake, a larger percentage of calcium is absorbed compared to high calcium intake (FNB, 1997, p. 72). Absorption of calcium also varies over the lifespan with the highest percent absorption in infancy and early puberty. It gradually decreases after middle adulthood (FNB, 1997, p.73).

Calcium absorption from most foods and supplements is very similar. The oxalic acid or phytic acid in some foods inhibits absorption of calcium. These foods include:
- oxalic acid: spinach, rhubarb, sweet potatoes, beans;
- phytic acid: unleavened bread, raw beans, seeds, nuts and grains, and soy isolates (FNB, 1997, p.73).

In 1994 about 73 percent of calcium in the U. S. food supply came from milk products, 9 percent from fruits and vegetables, and 5 percent from grains. Grains are usually not a rich source of calcium, but their contribution is significant because of the quantity consumed (FNB, 1997, pp. 81-82).

The National Health and Nutrition Examination Survey 1999-2000 reported mean calcium intakes were 1,081 and 793 mg/day for boys and girls ages 12-19 years, respectively; 1,025 and 797 mg/day for men and women 20-39 years; and 797 and 660 mg/day for men and women ≥60 years. Overall, females are less likely than males to get recommended intakes of calcium from food (National Institute of Health: Office of Dietary Supplements, 2010)

**Foods with 20% or more of the AI for adults ages 19 to 50 (1000 milligrams)**

**Cereals**
- 1 oz fortified ready-to-eat cereal
- 1 packet fortified instant oatmeal

**Fish & Shellfish**
- 3 oz sardines, canned in oil, drained
- 3 oz pink salmon canned, with bones
Section 4G: Micronutrients

3 oz ocean perch, Atlantic, cooked
3 oz blue crab, canned
3 oz clams, canned
3 oz rainbow trout, farmed, cooked

Vegetables
1/2 cup collards, cooked from frozen
1/2 cup spinach, cooked from frozen
1/2 cup green soybeans, cooked
1/2 cup cooked turnip greens, cooked from frozen
1/2 cup cowpeas, cooked
1/2 cup white beans, canned
1/2 cup cooked kale, cooked from frozen
1/2 cup okra, cooked from frozen
1/2 cup mature soybeans, cooked
1/2 cup beet greens, cooked from fresh
1/2 cup Chinese cabbage, cooked from fresh
1/2 cup dandelion greens, cooked from fresh

Milk & Milk Products
1 cup cow's milk, plain or flavored, non-fat, low-fat, or whole milk
6 oz yogurt, plain or flavored, non-fat, low-fat, or whole milk
1 oz cheese, cheddar, part-skim mozzarella, muenster, provolone, romano, or Swiss
1 1/2 oz cheese, bleu, feta, or whole milk mozzarella
1/2 cup part-skim ricotta cheese

Other
1 Tbs blackstrap molasses
1/2 cup firm tofu prepared with calcium sulfate
1 cup calcium-fortified soy beverage

(Department of Health and Human Services & United States Department of Agriculture, 2005).

Cross References

Section 4G: DASH Diet
Section 4J: Vegetarian Diets

References

Section 4G: Micronutrients


Section 4G: Micronutrients

**DASH Eating Plan**

**Use**

The Dietary Approaches to Stop Hypertension (DASH) Eating Plan was developed by the National Heart, Lung, and Blood Institute (NHLBI) to help control hypertension. It can also be prescribed to manage weight and to lower cholesterol. In combination with a reduced sodium intake, the DASH plan yields the greatest benefit to lowering high blood pressure. The DASH Eating Plan is recommended by the American Heart Association, by the USDA’s Dietary Guidelines, and is featured in the U.S. High Blood Pressure Guidelines.

**Adequacy**

The DASH Eating Plan is a nutritionally sensible and well-balanced approach to eating. Depending on the individual's food choices, it is adequate in all nutrients according to the Recommended Dietary Allowances.

**Diet Principles**

The DASH plan focuses on potassium, magnesium, calcium, and fiber. It is high in fruits, vegetables, and low fat dairy foods, making it
- low in sodium,
- high in potassium, magnesium, and calcium, and
- low in saturated fat and cholesterol.

The eating plan also includes whole grains, poultry, fish, and nuts, while decreasing red meat, fats, sweets, sugared beverages, and salt.

The greatest blood pressure lowering benefits are achieved with the DASH plan and a 1500 milligram sodium intake.

Use the DASH guidelines in Table 4G-1 and below for planning menus. Refer to Table 4G-2 for serving guidelines for a variety of calorie levels.

**Beverages**

Allowed:  
- milk, fat-free or low-fat
- unsweetened fruit and vegetable juices
- any sugar-free, fat-free beverage

Limited:  
- sugar containing beverages

**Breads & Grains**

Allowed:  
- whole-wheat bread, bagels, muffins, buns, pita bread, English muffins
- whole grain rice, pasta, cereals, grits, oatmeal
- pretzels, popcorn, whole grain crackers
- low salt or salt free recommended
Section 4G: Micronutrients

**Dairy Foods**
- Allowed: - fat-free or low-fat dairy products
  - milk, yogurt, low sodium cheese
  - frozen yogurt or ice cream with no-added-sugar or regular types within the Desserts/Sweets guidelines
- Limited: - buttermilk and cheese because of higher sodium content

**Desserts & Sweets**
- Limited: - 0 to 2 servings per day, based on calorie level,
  - 1 Tbs sugar, maple syrup, jelly, or jam
  - 1/2 oz jelly beans or 3 pieces hard candy
  - 1 cup sugar-containing beverages
  - 1/2 cup gelatin or sherbet

**Fruits & Juices**
- Allowed: - all fruit and fruit juice without added sugar
  - higher potassium fruit, such as apricots, bananas, dates, oranges, grapefruit, mangoes, melons, peaches, prunes, raisins, tangerines
  - other fruit such as apples, cherries, grapes, pineapple, strawberries

**Fats & Oils**
- Allowed: - 2 to 3 servings per day
  - soft margarine
  - low-fat mayonnaise or light salad dressing
  - vegetable oil, such as olive, corn, canola, safflower, peanut, sunflower, sesame, or soy
- Not Allowed: - butter or stick margarine
  - regular mayonnaise, or salad dressings containing cheese, cream, or sour cream
  - solid shortening, lard, salt pork, meat or bacon drippings
  - sour or sweet cream, half and half creamer, cream cheese
  - coconut oil or palm oil
  - gravies and cream sauces
  - nondairy creamers & whipped toppings unless made with allowed ingredients

**Meat & Meat Substitutes**
- Allowed: - lean meats, poultry, fish (cook without fat, trim visible fat, remove skin from poultry)
  - tofu and low fat soy products
- Not Allowed: - fried meat, fish, poultry
  - heavily marbled and fatty meats, such as sausages, bacon,
  - bologna and other luncheon meats, hot dogs
  - regular ground beef or hamburger
  - spareribs, fatty corned beef
  - goose, duck, or poultry skin
**Section 4G: Micronutrients**

**Nuts, Seeds, & Dried Beans**
- Allowed: almonds, filberts, mixed nuts, peanuts, walnuts
- sunflower seeds
- dried beans and peas and lentils
- low-salt or salt-free recommended

**Soups**
- Allowed: made with fat-free milk, broth, consommé, or bouillon
- made with other allowed ingredients
- low salt, low fat canned soups
- Not Allowed: regular canned or dried soups

**Vegetables**
- Allowed: all vegetables and vegetable juices
- higher potassium vegetables such as tomatoes, potatoes, carrots, winter squash, broccoli, turnip greens, collards, kale, spinach, lima beans, sweet potatoes
- tomato juice and vegetable juice
- low salt or salt free recommended

**Other Foods**
- Limit: pickles, mustard, catsup (high in sodium)

**Sample Menu for the DASH Eating Plan**

The following sample menu is based on 2000 calories per day.

**Breakfast**
- 1 medium orange
- 2/3 cup shredded wheat cereal
- 1 slice whole-wheat toast
- 1 tsp jelly
- 1 cup yogurt, fat-free, no sugar added
- 1 cup skim milk
- 6 oz coffee or hot tea

**Lunch**
- 3 oz chicken salad
- (made with low-fat mayonnaise)
- 2 slices whole-wheat bread
- 1 cup fresh cucumbers and tomato chunks
- 2 Tbs fat-free ranch dressing,
- 1/2 cup peaches, juice pack
- 6 oz coffee, tea or diet soft drink

**Dinner**
- 3 oz roast beef, eye of round
- 1 cup unsalted green beans seasoned with herbs, and no fat
- 1 small baked potato
- 2 Tbs fat-free sour cream,
- 1 Tbs chopped scallions,
- 1 small whole-wheat dinner roll
- 1 tsp soft margarine
- 1 small apple
- 1 cup skim milk
- 6 oz coffee, tea or diet soft drink

**Bedtime**
- 1/3 cup almonds, unsalted, and
- 1/4 cup raisins
- 1 cup orange juice
Table 4G-1: Food selection guide for the DASH diet (based on 2000 calories per day)¹

<table>
<thead>
<tr>
<th>Food Group</th>
<th>Serving Size</th>
<th>Food Examples</th>
<th>Significance to DASH Eating Plan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grains and grain products</td>
<td>-1 slice bread</td>
<td>-whole-wheat bread, English muffin, pita bread, bagels, whole grain crackers</td>
<td>major sources of energy &amp; fiber</td>
</tr>
<tr>
<td></td>
<td>-1/2 cup dry cereal</td>
<td>-cereals</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-1/2 cup cooked rice, pasta,</td>
<td>-grits, oatmeal</td>
<td></td>
</tr>
<tr>
<td></td>
<td>or cereal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vegetables</td>
<td>-1 cup raw, leafy vegetable</td>
<td>-tomatoes, potatoes, carrots, peas, squash, broccoli, turnip greens, collards,</td>
<td>rich sources of potassium, magnesium, &amp; fiber</td>
</tr>
<tr>
<td></td>
<td>-1/2 cup cooked vegetable</td>
<td>kale, spinach, artichokes, beans, sweet potatoes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-3/4 cup vegetable juice</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fruits</td>
<td>-3/4 cup fruit juice</td>
<td>-orange juice</td>
<td>important sources of potassium, magnesium, &amp; fiber</td>
</tr>
<tr>
<td></td>
<td>-1 medium fruit</td>
<td>-apricots, bananas, dates, grapes, oranges, tangerines, strawberries, mangoes,</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-1/2 cup cut-up fresh, frozen,</td>
<td>melons, peaches, pineapple</td>
<td></td>
</tr>
<tr>
<td></td>
<td>or canned fruit</td>
<td>-prunes, or raisins</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-1/4 cup dried fruit</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low-fat or non-fat dairy foods</td>
<td>-1 cup milk</td>
<td>-fat-free or 1% milk</td>
<td>major sources of calcium &amp; protein</td>
</tr>
<tr>
<td></td>
<td>-1 cup yogurt</td>
<td>-fat-free or low-fat buttermilk</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-1.5 oz cheese</td>
<td>-nonfat or low-fat yogurt</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>-part-skim or nonfat mozzarella cheese</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>-nonfat cheese.</td>
<td></td>
</tr>
<tr>
<td>Meats, poultry, &amp; fish</td>
<td>-3 oz cooked meats, poultry,</td>
<td>-lean meats; trim away visible fats; broil, roast, or boil, instead of frying</td>
<td>rich sources of protein &amp; magnesium</td>
</tr>
<tr>
<td></td>
<td>or fish</td>
<td>-remove skin from poultry.</td>
<td></td>
</tr>
<tr>
<td>Nuts, seeds and legumes</td>
<td>-1.5 oz or 1/3 cup nuts</td>
<td>-almonds, filberts, mixed nuts, peanuts, walnuts</td>
<td>rich sources of energy protein, magnesium, potassium,</td>
</tr>
<tr>
<td></td>
<td>-0.5 oz or 2 Tbs seeds</td>
<td>-sunflower or sesame seeds</td>
<td>&amp; fiber</td>
</tr>
<tr>
<td></td>
<td>-1/2 cup cooked legumes</td>
<td>-kidney beans, pinto beans, lentils, split peas</td>
<td></td>
</tr>
</tbody>
</table>

Note. ¹Source: NHLBI, 2003, p. 5.

Fat servings. Limit added fat to 2-3 servings per day. One serving = 1 tsp soft margarine, butter, mayonnaise, or vegetable oil; 1 Tbs low-fat mayonnaise or salad dressing; 2 Tbs light salad dressing.

Sweets servings. Limit added sweets to less than 1 per day or 5 per week. One serving = 1 Tbs maple syrup, sugar, jelly, or jam; 1/2 cup gelatin or sherbet, 1/2 oz jelly beans, 1 cup soft or fruit drink, 3 pieces hard candy.

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Table 4G-2: DASH Eating Plan for various calorie levels²

<table>
<thead>
<tr>
<th>Food Group</th>
<th>1600 calories</th>
<th>2000 calories</th>
<th>3100 calories</th>
</tr>
</thead>
<tbody>
<tr>
<td>grains and grain products</td>
<td>6</td>
<td>10 to 11</td>
<td>12 to 13</td>
</tr>
<tr>
<td>vegetables</td>
<td>3 to 4</td>
<td>5 to 6</td>
<td>6</td>
</tr>
<tr>
<td>fruit</td>
<td>4</td>
<td>5 to 6</td>
<td>6</td>
</tr>
<tr>
<td>low-fat or nonfat dairy</td>
<td>2 to 3</td>
<td>3 to 4</td>
<td>4</td>
</tr>
<tr>
<td>meats, poultry, fish</td>
<td>1 to 2</td>
<td>2 to 3</td>
<td>3</td>
</tr>
<tr>
<td>nuts, seeds, legumes</td>
<td>0 to 1 (3 to 4 per week)</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>desserts and sweets</td>
<td>0</td>
<td>0 to 1 (5 per week)</td>
<td>2</td>
</tr>
<tr>
<td>fats and oils</td>
<td>2 to 3</td>
<td>2 to 3</td>
<td>2 to 3</td>
</tr>
</tbody>
</table>


Cross References

Section 4D: Cholesterol Control Diet
Section 4G: Calcium Rich Foods
Section 4G: Potassium Rich Foods
Section 4G: Sodium Controlled Diet

References


More Information

American Heart Association
www.americanheartassociation.com

National Heart, Lung, and Blood Institute
Health Information Center
www.nhlbi.nih.gov

Your guide to lowering high blood pressure
www.nhlbi.nih.gov/hbp/index.html

Reduce salt and sodium in your diet
www.nhlbi.nih.gov/hbp/prevent/sodium/sodium.htm
Section 4G: Micronutrients

Folate & Folic Acid Rich Foods

The RDA for adult men and women for folate is 400 micrograms of dietary folate equivalents. Prior to fortification of cereal grains with folic acid in 1998, the median intake of folate from food was about 250 micrograms per day in the United States (FNB, 1998, pp. 196-197). Medical conditions that increase folate requirements or result in increased loss of folate include:

- pregnancy and lactation
- alcohol abuse
- malabsorption
- dialysis
- liver disease
- certain anemias

Medications that interfere with folate utilization in the body include:

- anticonvulsant medications (such as dilantin, phenytoin and primidone)
- metformin
- sulfasalazine (used to control inflammation associated with Crohn's disease and ulcerative colitis)
- triamterene (a diuretic)
- methotrexate (used for cancer and other diseases such as rheumatoid arthritis)
- barbiturates

(National Institute of Health: Office of Dietary Supplements, 2010)

Foods with 100% of the RDA:
3/4 cup ready-to-eat breakfast cereal fortified with 100% of the RDA
3.5 ounces chicken liver

Foods with at least 50% of the RDA:
3/4 cup ready-to-eat breakfast cereal fortified with 50% of the RDA
3.5 ounces braised beef liver
3/4 cup cooked chickpeas
3/4 cup cooked lentils

Foods with at least 25% of the RDA:
3/4 cup ready-to-eat breakfast cereal with 25% of the RDA
2 ounces pasta
1/2 cup cooked black-eyed peas, navy, northern, pinto, black, kidney beans
1 cup cooked split peas
1/2 cup cooked spinach
1/2 cup cooked okra
1/2 cup cooked asparagus
1/3 cup toasted wheat germ
1/2 cup cream of wheat cereal, cooked

Foods with at least 15% of the RDA:
1/2 cup turnip or collard greens, cooked
1 cup corn
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1 cup spinach, raw
1/2 cup green peas
1/2 cup cooked Brussels sprouts or chopped broccoli
1 cup orange juice
2 Tbs ground flax seed
1/2 cup enriched egg noodles, cooked

**Foods with at least 10% of the RDA:**
1/2 cup white rice, enriched, cooked
1 ounce peanuts, dry roasted
1 medium fresh orange
1/3 medium avocado
3/4 cup romaine lettuce, shredded
1 cup tomato or V-8 juice
(Pennington & Douglass, 2005).

**References**


Section 4G: Micronutrients

Iron Rich Foods

Use

This diet is for people who may not be eating enough iron rich foods. It is also for those who may not be able to absorb enough iron from the food they eat. People who may be at risk include older infants and toddlers, teenage girls, women of childbearing age, pregnant women, and people with kidney disease and GI disorders.

Adequacy

This diet is planned to meet or exceed the Recommended Dietary Allowance for iron. See Table 3H-1 for RDAs for iron, based on age and gender, and pregnancy or lactation status. Careful planning is needed when people do not eat meat, fish, or poultry.

Diet Principles

With all meals and snacks, provide good sources of iron, such as those listed in Table 4G-3.

Table 4G-3: Sources of dietary iron

<table>
<thead>
<tr>
<th>Low Sources</th>
<th>Good Sources</th>
<th>High Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 0.9 mg per serving</td>
<td>1.8 to 3.4 mg per serving</td>
<td>3.6 mg or more per serving</td>
</tr>
<tr>
<td>1/2 cup green beans, cooked</td>
<td>1/2 cup dried beans, cooked</td>
<td>1/2 cup baked beans with pork &amp; tomato sauce</td>
</tr>
<tr>
<td>1/2 cup broccoli, cooked</td>
<td>3 oz beef, lean</td>
<td>1 cup Cheerios</td>
</tr>
<tr>
<td>1/2 cup Brussels sprouts, cooked</td>
<td>3 oz beef, round</td>
<td>1 cup Total Raisin Bran</td>
</tr>
<tr>
<td>1 slice bread, white, whole wheat, or rye</td>
<td>1 chicken liver, cooked</td>
<td>1/2 cup All-Bran original</td>
</tr>
<tr>
<td>1/2 cup cabbage, raw</td>
<td>3 oz salmon, pink, canned with bone &amp; liquid</td>
<td>1 cup Kellogg’s Corn Flakes</td>
</tr>
<tr>
<td>1/2 cup cauliflower, cooked</td>
<td>3 oz lamb, shoulder, arm, cooked</td>
<td>3/4 cup Frosted Flakes</td>
</tr>
<tr>
<td>1/2 chicken breast, cooked</td>
<td>1/2 cup lima beans, cooked</td>
<td>1 cup Cream of Wheat, iron fortified, cooked</td>
</tr>
<tr>
<td>1 oz pecans or peanuts</td>
<td>1 oz cashew nuts, roasted in oil, salted</td>
<td>3 oz clams, canned, drained</td>
</tr>
<tr>
<td>3 oz pork, fresh, loin chop,</td>
<td>1 potato, baked, with skin</td>
<td>3 oz oyster, cooked, fried</td>
</tr>
<tr>
<td>1 packet raisins, seedless</td>
<td>1 cup prune juice, canned</td>
<td>1/2 cup spinach, cooked</td>
</tr>
<tr>
<td></td>
<td>3 oz turkey, cooked</td>
<td></td>
</tr>
</tbody>
</table>

For foods not listed, refer to the U.S. Department of Agriculture's Nutrient Database Web site: http://www.nal.usda.gov/fnic/cgi-bin/nut_search.pl

There are two forms of dietary iron. Heme iron is found in meat, fish, clams and oysters, and poultry.
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Nonheme iron is found in plant foods such as beans (especially lima and navy), lentils, nuts and seeds, dried fruits, dark green leafy vegetables, whole grain, fortified, or enriched breads and cereals, and molasses. Provide foods that enhance iron absorption in all meals and snacks. These are
- heme iron foods, and
- vitamin C rich foods. (See the section, Vitamin C Rich Foods)

Some foods contain compounds that inhibit iron absorption. Combine them with heme iron foods and vitamin C foods to offset this effect. Some examples are
- foods high in oxalic acid, such as spinach, beet greens, Swiss chard, berries, rhubarb, sweet potato, and chocolate,
- foods high in phytate, such as dark green leafy vegetables, whole grains, beans, and lentils,
- the food preservative EDTA,
- egg yolks, and
- soybeans.

Tea and coffee contain tannins that inhibit iron absorption. Serve tea and coffee 2 hours before or after meals and snacks. Do not serve them with meals. Do not serve tea or coffee to high-risk children or teens. Limit foods that are high in calories, but low in vitamins and minerals, such as many snack foods. Vegetarians who exclude all animal foods may need twice as much nonheme iron foods as people who eat heme iron sources. Also, provide them with a vitamin C rich food or beverage with all meals and snacks.

Cross References

Section 3H: Iron Deficiency Anemia
Section 4G: Vitamin C Rich Foods
Section 4J: Vegetarian Diets

References


More Information

Potassium Rich Foods

The Adequate Intake (AI) for potassium is 4.7 grams. There are conditions in which a diet with less potassium than the AI should be used. High intakes of potassium can pose a serious risk for people with these conditions ((Food and Nutrition Board [FNB], 2004, p 245).

- type 1 diabetes,
- chronic kidney disease (GFR less than 40),
- end-stage kidney disease,
- severe heart failure, and
- adrenal insufficiency.

There is increased risk with some classes of drugs, for example, angiotensin converting enzyme (ACE) inhibitors and angiotensin receptor blockers (ARBs).

The best food sources of potassium are leafy green vegetables, fruit from vines, and root vegetables (FNB, 2004, pp. 244-245). These vegetables and fruits contain components, called bicarbonate precursors, which act along with potassium to promote health. Potassium chloride salt substitutes do not contain them. High protein foods such as meat or milk and some cereal products contain more acidic components instead.

**Foods with 13 to 15% of the AI:**
- 1/2 cup white beans, canned
- 1/2 cup cooked beet greens
- 1 sweet potato, baked (5 oz)
- 1 potato, baked, flesh (5.5 oz)
- 1/4 cup tomato paste

**Foods with 10 to 12% of the AI:**
- 1/2 cup lima beans, cooked
- 1/2 tomato puree
- 1/2 cup green soybeans, cooked
- 1/2 cooked winter squash
- 3/4 cup carrot juice
- 8 oz yogurt, plain, low-fat or non-fat
- 3 oz clams, canned
- 3 oz cooked halibut or yellowfin tuna

**Foods with 7 to 9% of the AI:**
- 1/2 cup cooked kidney beans
- 1/2 cup cooked lentils
- 1/2 cup cooked dried soybeans
- 1/2 cup cooked split peas
- 1/2 cup cooked spinach
- 1/2 cup tomato sauce
- 1 medium banana
- 1/4 cup dried apricots or peaches, uncooked
- 1/4 medium cantaloupe
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1/8 medium honeydew melon
1/2 cup prunes, stewed
3/4 cup orange juice
3/4 cup prune juice
8 oz yogurt, plain, whole milk
1 cup buttermilk, low fat
1 cup milk, 1%, 2% or non-fat
3 oz cooked cod, rainbow trout, or rockfish
3 oz cooked pork loin

(Department of Health and Human Services & United States Department of Agriculture, 2005).

References


Sodium Controlled Diets

Use

Dietary sodium restriction is used to prevent and treat high blood pressure, cardiovascular disease, congestive heart failure, kidney disease, and some liver diseases. In addition, the effectiveness of some drugs is increased with sodium restriction. Lower drug dosages reduce the risk of undesirable side effects.

The current recommendation for adults in the United States is to limit daily sodium intake to 2.3 grams (Food and Nutrition Board [FNB], 2004, p. 271). Not long ago, this level was considered a therapeutic restriction. Most people consume more than the recommended upper limit. The sources of dietary sodium in an unrestricted diet are (FNB, 2004, p. 319)

- 77 percent from processed and prepared foods,
- 12 percent from natural sources,
- 6 percent added while eating, and
- 5 percent added during cooking.

Most people have learned to prefer the taste of foods that are high in sodium, but, given time to adjust, they can learn to prefer less sodium. In the case of advanced disease, however, oral intake may be so poor that it limits total sodium intake even on an unrestricted diet. For a debilitated or malnourished person, optimizing oral intake should take priority over dietary sodium restriction.

Sodium controlled diets may be prescribed in terms of milligrams, grams, or milliequivalents of sodium. They are also prescribed in less precise terms as —low sodium,‖ —low salt,‖ —no added salt,‖ or —no salt packet.‖ Whatever naming convention is used, the terms should be defined in specific units of sodium.

Use of potassium chloride salt substitutes or light salts with potassium chloride should be prescribed by the physician. The high potassium content can be dangerous in kidney failure cases, with some drugs that cause potassium retention, or with potassium chloride supplements.

Glossary

- **Salt** is a crystalline product that is mostly sodium chloride. It is obtained from sea water, underground rock salt deposits, or natural brine.
- **Salt substitute** is defined by the food codes as potassium chloride. Sometimes salt-free herb and spice seasoning mixtures are called —salt substitutes.‖
- **Light or lite salt** is a reduced sodium salt mixture.

Adequacy

A sodium restricted diet that meets the Adequate Intake (AI) for sodium can be adequate in all nutrients according to the Food and Nutrition Board (2004, p. 308). The AI for sodium (FNB, 2004, pp. 304, 307, 308, 310, 316) is set at

- 0.12 grams for infants 0 to 6 months,
- 0.37 grams for infants 7 to 12 months,
- 1 gram for children ages 1 to 3 years,
Section 4G: Micronutrients

1.2 grams for children ages 4 to 8 years,
1.5 grams for children ages 9 to 18 years,
1.5 grams for women during pregnancy and lactation,
1.5 grams for adults ages 19 to 50 years,
1.3 grams for adults ages 51 to 70 years, and
1.2 grams for adults ages 71 or more.

Diet Principles

Table salt is 40 percent sodium and 60 percent chloride. A teaspoon of table salt has 6 grams of salt but only 2.4 grams of sodium.

The National Heart, Lung, and Blood Institute (NHLBI) (2003, p. 8) offers several tips to plan a sodium controlled diet:

○ Buy foods that are less processed by food manufacturers.
  - Limit use of "instant" or flavored mixes.
  - Limit regular canned soups or broths, regular soup or gravy bases, and regular dried soup mixes.
  - Limit pickled foods or those packed in brine or preserved by salting.

○ Buy fresh poultry, fish, and meat. Avoid canned, cured, or sodium "enhanced" raw products.

○ Rinse canned foods, such as tuna, with tap water to remove some sodium.

○ Choose convenience entrees and side dishes that have less sodium.

○ Buy low-sodium, reduced-sodium, or no-salt-added versions of foods when possible.

○ Buy fresh, plain frozen, or no-salt-added canned vegetables.

○ Cook foods without adding extra salt or salty seasonings.

○ Use herbs, spices, and salt-free flavorings to season foods.

○ Choose foods labeled with terms found in Table 4G-4. Wholesale foods do not use these labeling terms, so sodium information must come from the salesperson.

Table 4G-4: Sodium labeling terms used on retail foods

<table>
<thead>
<tr>
<th>Food label term</th>
<th>What it means:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sodium free or salt free</td>
<td>Less than 5 mg per serving</td>
</tr>
<tr>
<td>Very low sodium</td>
<td>35 mg or less sodium per serving</td>
</tr>
<tr>
<td>Low sodium</td>
<td>140 mg or less sodium per serving</td>
</tr>
<tr>
<td>Low sodium meal</td>
<td>140 mg or less sodium per 3 1/2 oz (100 g)</td>
</tr>
<tr>
<td>Reduced (or less) sodium</td>
<td>At least 25% less sodium than the regular version</td>
</tr>
<tr>
<td>Light in sodium</td>
<td>50% less sodium than the regular version</td>
</tr>
<tr>
<td>Unsalted or no-salt-added</td>
<td>No salt added to the product during processing, and none of the ingredients contain a significant amount of sodium.</td>
</tr>
</tbody>
</table>

Note. ³Source: NHLBI, 2003, p. 10.

Salt substitutes and light salts contain varying amounts of potassium or sodium. (Refer to Table 4G-5.) Potassium chloride tastes bitter or metallic to many people, particularly when added during cooking. It is best to use these
salt alternatives at the table. Food manufacturers are researching ways to mask the unpleasant flavor of salt substitute.

### Table 4G-5: Comparison of salt substitutes and light salts

<table>
<thead>
<tr>
<th>Brand</th>
<th>Weight (grams)</th>
<th>Potassium (mg per 1/4 tsp)</th>
<th>Sodium (mg per 1/4 tsp)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adolph’s Unseasoned Salt Substitute</td>
<td>1.2</td>
<td>550</td>
<td>0</td>
</tr>
<tr>
<td>Adolph’s Seasoned Salt Substitute</td>
<td>1.1</td>
<td>400</td>
<td>0</td>
</tr>
<tr>
<td>Morton’s Seasoned Salt Substitute</td>
<td>1.1</td>
<td>475</td>
<td>0</td>
</tr>
<tr>
<td>Morton’s Unseasoned Salt Substitute</td>
<td>1.2</td>
<td>610</td>
<td>0</td>
</tr>
<tr>
<td>NoSalt</td>
<td>1.3</td>
<td>650</td>
<td>0</td>
</tr>
<tr>
<td>Nu-Salt</td>
<td>1.5</td>
<td>795</td>
<td>0</td>
</tr>
<tr>
<td>Morton’s Lite Salt Mixture</td>
<td>1.4</td>
<td>350</td>
<td>290</td>
</tr>
<tr>
<td>Papa Dash Lite Salt</td>
<td>0.5</td>
<td>0</td>
<td>85</td>
</tr>
</tbody>
</table>

Note. "Source: Manufacturers’ information.

Include in the diet restriction the regular use of nonfood sources of sodium. These include some antacid, seltzer-containing medicines, and chewing tobacco (ADA, 2000, p. 771).

### 4 Gram Sodium Diet

#### Beverages
- Allowed: -all
- Limit: -regular vegetable or tomato juice, up to 1 cup per day

#### Breads & Grains
- Allowed: -bread, bagels, muffins
  - pasta, rice, or other grains, or bread stuffing, homemade, without added salt
  - breakfast cereal
- Not Allowed: -commercial mixes for pasta, rice, or other grains, or bread stuffing

#### Fruits & Juices
- Allowed: -all

#### Desserts & Sweets
- Allowed: -all

#### Meat & Meat Substitutes
- Allowed: -all except those listed as not allowed
  - canned fish that has been rinsed with water
- Not Allowed: -canned, cured, koshered, pickled, salted, or smoked meat, poultry, or fish
  - processed cheese, cheese spreads, or cheese sauce
  - salted nuts, peanuts, or sunflower seeds
4 Gram Sodium Diet continued

**Soups**
- **Allowed:** reduced sodium or homemade soups
- **Limit:** regular canned or dried soup, up to once a week

**Vegetables**
- **Allowed:** all except those listed as not allowed
- vegetables pickled without salt
- **Not Allowed:** commercial mixes for potato dishes
- sauerkraut
- vegetables pickled in brine

**Other Foods**
- **Allowed:** all except those listed as not allowed
- **Limit:** salted snack foods, up to 1 oz per day
- salad dressings with more than 300 mg of sodium per serving, up to 1 Tbs per day
- **Not Allowed:** salt of all types including sea salt, rock salt, kosher salt, or canning salt
- seasonings made with salt, such as celery salt, garlic salt, onion salt, or seasoned salt mixtures
- soy sauce, miso, teriyaki sauce, monosodium glutamate
- snack dips made with dried soup mix or processed cheese

3 Gram Sodium Diet

**Beverages**
- **Allowed:** all
- **Limit:** buttermilk, up to 1 cup per day
- regular vegetable or tomato juice, up to 1/2 cup per day

**Breads & Grains**
- **Allowed:** breads, rolls, bagels, muffins, crackers without salted tops
- pasta, rice, or other grains, or bread stuffing, homemade, without added salt
- most breakfast cereal
- **Not Allowed:** breads, rolls, bagels, or crackers with salted tops
- instant flavored hot cereal
- commercial mixes for pasta, rice, or other grains, or bread stuffing

**Fruits & Juices**
- **Allowed:** all

**Desserts & Sweets**
- **Allowed:** all

**Meat & Meat Substitutes**
- **Allowed:** all except those listed as not allowed
- canned fish that has been rinsed with water
- low sodium cheese
3 Gram Sodium Diet continued

Limit: no more than 2 oz regular cheese, ricotta, or cream cheese per day

Not Allowed:
- canned, cured, koshered, pickled, salted, or smoked meat, poultry, or fish
- processed cheese, cheese spreads, or cheese sauce
- salted nuts, peanuts, or sunflower seeds
- pickled eggs
- frozen dinners with 600 mg or more of sodium
- canned baked beans
- frozen breaded meat, poultry, fish, or meat substitutes

Soups

Allowed:
- reduced sodium or homemade soups made without added salt or high salt ingredients

Not Allowed:
- regular canned or dried soup, broth, or bouillon

Vegetables

Allowed:
- all except those listed as not allowed
- vegetables pickled without salt

Not Allowed:
- commercial mixes for potato dishes
- sauerkraut
- vegetables pickled in brine; olives
- vegetables seasoned with ham, bacon, or salt pork

Other Foods

Allowed:
- all except those listed as not allowed
- unsalted varieties of snacks, like pretzels, popcorn, potato, or corn chips
- low sodium varieties of condiments, such as catsup, mustard, or commercial salad dressing
- oil and vinegar dressing, or homemade salad dressing

Limit:
- salted snack foods, up to 1 oz per day
- low sodium soy sauce, up to 1 tsp per day
- catsup or mustard, up to 1 Tbs per day
- salsa, up to 2 Tbs per day
- commercial salad dressing with 140 to 300 mg of sodium per serving, up to 1 Tbs per day

Not Allowed:
- salt of all types, including sea salt, rock salt, kosher salt, or canning salt
- seasonings made with salt, such as celery salt, garlic salt, onion salt, or seasoned salt mixtures
- soy sauce, miso, teriyaki sauce, monosodium glutamate
- snack dips made with dried soup mix or processed cheese
- meat tenderizers
Section 4G: Micronutrients

2 Gram Sodium Diet

Beverages
Allowed: -all except those listed as not allowed
- low sodium soft drinks
Limit: - milk, up to 2 cups per day
- buttermilk, up to 1 cup per week
- regular vegetable or tomato juice, up to 1/2 cup per day
Not Allowed: - regular soft drinks or sports drinks

Breads & Grains
Allowed: - breads, rolls, bagels, muffins, and crackers without salted tops
- pasta, rice, or other grains, or bread stuffing, homemade, without added salt
- most breakfast cereal
- low sodium or homemade bread crumbs or cracker crumbs
Not Allowed: - breads, rolls, bagels, or crackers with salted tops
- instant flavored hot cereal or cooked cereal with added salt
- commercial mixes for pasta, rice, or other grains, or bread stuffing
- commercial bread or cracker crumbs
- self-rising flours, and biscuit, pancake, or cornbread mixes

Fruits & Juices
Allowed: - all

Desserts & Sweets
Allowed: - all except those listed as not allowed
Not Allowed: - instant pudding mixes
- cake or quick bread mixes

Meat & Meat Substitutes
Allowed: - all except those listed as not allowed
- canned fish that has been rinsed with water
- low sodium cheese, low sodium ricotta or cottage cheese
- canned legumes (beans or peas), drained and rinsed
- low sodium peanut butter or other nut butters
- frozen dinners with less than 500 mg of sodium
Not Allowed: - canned, cured, koshered, pickled, salted, or smoked meat, poultry, or fish
- processed cheese, cheese spreads, or cheese sauce
- salted nuts, peanuts, or sunflower seeds
- pickled eggs
- frozen dinners with 500 mg or more of sodium
- frozen breaded meat, poultry, fish, or meat substitutes
- canned baked beans
Section 4G: Micronutrients

2 Gram Sodium Diet continued

**Soups**

Allowed: -low sodium or homemade soups made without added salt or high salt ingredients
Not Allowed: -regular canned or dried soup, broth, or bouillon

**Vegetables**

Allowed: -all except those listed as not allowed
-vegetables pickled without salt
-no-salt-added or low sodium canned vegetables
Not Allowed: -commercial mixes for potato dishes
-sauerkraut
-vegetables pickled in brine; olives
-vegetables seasoned with ham, bacon, or salt pork
-regular canned vegetables
-frozen vegetables in sauces

**Other Foods**

Allowed: -all except those listed as not allowed
-unsalted varieties of snacks like pretzels, popcorn, potato, or corn chips
-low sodium varieties of condiments, such as catsup, mustard, or commercial salad dressing
-oil and vinegar dressing, or other homemade salad dressing
-low sodium gravy bases or homemade gravy
Limit: -low sodium soy sauce, up to 1 tsp per day
-salsa, up to 2 Tbs per day
Not Allowed: -salt of all types, including sea salt, rock salt, kosher salt, or canning salt
-seasonings made with salt, such as celery salt, garlic salt, onion salt, or seasoned salt mixtures
-soy sauce, miso, teriyaki sauce, monosodium glutamate, Worcestershire sauce, steak sauce, or most flavored vinegars
-regular commercial salad dressings
-snack dips made with dried soup mix or processed cheese
-meat tenderizers
-regular condiments, like catsup and mustard
-canned gravy or those made from regular gravy bases
## Sample Menu for a 4 Gram Sodium Diet

### Breakfast
- 1/2 cup orange sections
- 1 pkt instant maple-nut oatmeal
- 1 scrambled egg
- 1 bran muffin
- 1 tsp margarine
- 1 tsp jelly
- 1/2 cup tomato juice
- 1 cup milk
- 6 oz coffee or hot tea

### Lunch
- 1 sliced turkey sandwich, made with
  - 2 oz unsalted turkey, 2 slices bread,
  - 1 Tbs mayonnaise, lettuce and tomato
- 1 cup mixed green salad
- 1 Tbs French salad dressing
- 1/2 cup instant pudding
- 6 oz coffee, tea, or soft drink

### Dinner
- 2 oz baked pork chop
- 1 dinner roll
- 1 Tbs margarine
- 1/2 cup canned green beans
- 1/2 cup baked sweet potato
- 1/8 slice apple pie
- 1 cup milk
- 6 oz coffee, tea, or soft drink

### Bedtime
- 1 oz cheddar cheese
- 6 salted soda crackers
- 1 cup buttermilk

## Sample Meal Plan for a 3 Gram Sodium Diet

### Breakfast
- 1/2 cup orange sections
- 3/4 cup cereal flakes
- 1 scrambled egg
- 1/2 English muffin, toasted
- 1 tsp margarine
- 1 tsp jelly
- 1/2 cup tomato juice
- 1 cup milk
- 6 oz coffee or hot tea

### Lunch
- 1 sliced turkey sandwich, made with
  - 2 oz unsalted turkey, 2 slices bread,
  - 1 Tbs mayonnaise, lettuce and tomato
- 1 cup mixed green salad
- 1 Tbs oil & vinegar salad dressing
- 1/2 cup apricot halves
- 6 oz coffee, tea, or soft drink

### Dinner
- 2 oz baked pork chop
- 1 dinner roll
- 2 tsp margarine
- 1/2 cup steamed broccoli
  - with lemon juice
- 1/2 cup baked sweet potato
- 1/8 slice apple pie
- 1 cup milk
- 6 oz coffee, tea, or soft drink

### Bedtime
- 1 oz cheddar cheese
- 6 unsalted soda crackers
- 1 cup milk

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Sample Menu for a 2 Gram Sodium Diet

**Breakfast**
- 1/2 cup orange sections
- 3/4 cup cereal flakes
- 1 scrambled egg
- 1/2 English muffin, toasted
- 1 tsp margarine
- 1 tsp jelly
- 1/2 cup low sodium tomato juice
- 1 cup milk
- 6 oz coffee or hot tea

**Dinner**
- 2 oz baked pork chop
- 1 dinner roll
- 2 tsp margarine
- 1/2 cup steamed broccoli with lemon juice
- 1/2 cup baked sweet potato
- 1 baked apple
- 1 cup milk
- 6 oz coffee, tea, or low sodium soft drink

**Lunch**
- 1 sliced turkey sandwich, made with
- 2 oz unsalted turkey, 2 slices bread,
- 1 Tbs mayonnaise, lettuce and tomato
- 1 cup mixed green salad
- 1 Tbs oil & vinegar salad dressing
- 1/2 cup apricot halves
- 6 oz coffee, tea, or low sodium soft drink

**Bedtime**
- 1 oz low sodium cheddar cheese
- 6 low sodium crackers
- 1 cup cranberry juice

Cross References

Section 4G: DASH Eating Plan

References


Section 4G: Micronutrients

**More Information**

National Heart, Lung, and Blood Institute
Health Information Center
www.nhlbi.nih.gov

*Cut down on salt and sodium*
(Part of a booklet series for improving cardiovascular health in Latino families)
http://www.nhlbi.nih.gov/health/public/heart/other/sp_salt.htm

*Reduce salt and sodium in your diet*
(From the on-line NHLBI publication, *Your guide to lowering high blood pressure*)
www.nhlbi.nih.gov/hbp/prevent/sodium/sodium.htm

*Spice up your life! Eat less salt and sodium*
(Part of a booklet series for improving cardiovascular health in African Americans)
Vitamin A Rich Foods

The daily adult RDA is 900 micrograms of retinol activity equivalents (RAE) for men and 700 for women.

Preformed vitamin A is found in many foods from animal sources. Provitamin A carotenoids are found in darkly colored fruits and vegetables. There have been some recent changes in calculating equivalents for some forms of carotene (Food and Nutrition Board [FNB], 2000, p. 82).

**Food sources providing 100% or more of the RDA for adult men.**
3 oz organ meats, cooked
3/4 cup carrot juice
1 medium sweet potato, baked, boiled or canned
1/2 cup pumpkin, canned

**Food sources providing 50% to 100% of the RDA for adult men.**
1/2 cup carrots, cooked from fresh
1/2 cup spinach, cooked from frozen
1/2 cup collards, cooked from frozen
1/2 cup kale, cooked from frozen
1 slice pumpkin pie
1/2 cup mixed vegetables, canned

**Food sources providing 20% to 50% of the RDA for adult men.**
1/2 cup turnip greens, cooked from frozen
1 packet instant cooked cereal, fortified
1 oz ready-to-eat cereals, fortified
1 small raw carrot
1/2 cup beet greens, cooked
1/2 cup winter squash, cooked
1/2 cup dandelion greens, cooked
1/4 medium cantaloupe
1/2 cup cooked mustard greens
3 oz herring, pickled
1/2 cup red sweet pepper, cooked
1/2 cup Chinese cabbage, cooked

**Food sources providing 15% to 20% of the RDA for adult men.**
1 cup milk, with added vitamin A
1/4 cup tomato paste

(Department of Health and Human Services & United States Department of Agriculture. 2005; Pennington & Douglass, 2005).
References


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Vitamin C Rich Foods

The daily adult RDA for vitamin C for men is 90 milligrams and for women 75 milligrams. For smokers add 35 milligrams per day to that requirement (FNB, 2000, p. 95). The estimated median daily dietary intake of adults in the United States is 102 milligrams.

Foods with 100% or more of the RDA for adult men:
- 1/2 cup guava, raw
- 1/2 cup black currants, raw
- 1/2 cup red or yellow sweet pepper, raw
- 1/2 cup red sweet pepper, cooked

Foods with 75% to 100% of the RDA for adult men:
- 1 medium kiwi, raw
- 1 medium orange, raw
- 3/4 cup orange juice

Foods with 50% to 75% of the RDA for adult men:
- 3/4 cup vegetable juice cocktail
- 1/2 cup sweet green bell pepper, cooked or raw
- 3/4 cup grapefruit juice
- 1/2 medium red or pink grapefruit, raw
- 1/4 medium papaya, raw
- 1/2 cup strawberries, raw or frozen unsweetened
- 1/2 cup Brussels sprouts, cooked
- 1/2 cup kohlrabi, cooked
- 1/4 medium cantaloupe

Foods with 20% to 50% of the RDA for adult men:
- 3/4 cup tomato juice
- 1/2 cup broccoli, cooked or raw
- 1/2 cup edible pod or snow peas, cooked
- 1/2 cup sweet potato, canned
- 1/2 cup cauliflower, cooked
- 1/2 cup cooked kale
- 1/2 cup pineapple, raw
- 1/2 cup mango
- 1/2 cup mandarin oranges, canned in juice
- 1 (4 1/2-inch) banana pepper, raw

(Department of Health and Human Services & United States Department of Agriculture. 2005; Pennington & Douglass, 2005).
Section 4G: Micronutrients

References


Vitamin E Rich Foods

The daily adult RDA for vitamin E is 15 milligrams alpha-tocopherol. Data from the CFSII suggest that adults aged 31 to 50 in the United States do not consume the RDA for vitamin E from food routinely. Many adults use vitamin E supplements as well and this contributes significantly to meeting the RDA (Food and Nutrition Board [FNB], 2000, pp. 244-245). People who are on diets low in fat are particularly at risk for inadequate intake of vitamin E.

The primary food sources are vegetable oils. There is no evidence of adverse effects of consuming vitamin E found in foods though there is for synthetic vitamin E supplements.

Foods with 10% or more of the RDA for vitamin E per serving:
Cereals
1 oz fortified ready-to-eat cereals
2 Tbs wheat germ, toasted, plain

Fish
3 oz sardine, Atlantic, in oil, drained
3 oz blue crab, cooked/canned
3 oz herring, Atlantic, pickled

Nuts & Seeds
1 oz sunflower seeds
1 oz almonds
1 oz hazelnuts or filberts
1 oz mixed nuts
1 oz pine nuts
1 oz peanuts
1 oz Brazil nuts
2 Tbs peanut butter

Oils
1 Tbs sunflower oil, high linoleic
1 Tbs cottonseed oil
1 Tbs safflower oil, high oleic
1 Tbs canola oil
1 Tbs peanut oil
1 Tbs corn oil
1 Tbs olive oil

Vegetables
1/2 cup turnip greens, frozen, cooked
1/4 cup tomato paste
1/2 cup tomato puree or tomato sauce
1/2 raw avocado
1/2 cup cooked spinach
1/2 cup cooked dandelion greens

(Department of Health and Human Services & United States Department of Agriculture, 2005).
Section 4G: Micronutrients

References


High Protein Diet

Use

The high protein diet is a regular diet with larger amounts of protein rich foods. It is often used in combination with a high calorie diet. It is used for people who can tolerate oral feedings, but who have

- increased protein needs,
- reduced retention,
- increased protein losses, or
- poor intake.

Conditions for which the diet may be indicated include cancer, HIV infection or AIDS, burns, wounds, trauma, protein-calorie malnutrition, failure to thrive, and in preparation for planned surgery.

The diet can be instituted as needed and continued until nutritional status or oral intake has improved.

Adequacy

This diet is adequate in all nutrients as long as it includes all food groups and a variety of foods. The actual amount of protein provided depends on individual nutrition goals, which should be based on nutrition assessment.

Diet Principles

Nutrient dense, high protein food sources include

- dairy milk or soy milk,
- dairy or soy milk products, such as yogurt and cheese,
- beef, pork, lamb
- poultry,
- fish and shellfish,
- peanuts or soy nuts, peanut butter, or soy butter,
- soy meat analogs, tofu, or tempeh,
- cooked dried beans, peas, or lentils, and
- eggs, particularly egg whites.

Use a variety of foods, flavors, textures, and tactics to prevent taste fatigue and improve compliance. (See Table 4H-1.)

Provide small, frequent meals and snacks of protein rich foods to optimize intake. For example, many facilities use supplemental nutrition drinks to
Section 4H: Protein Control

administer medications several times throughout the day.

Use protein rich ingredients to improve the protein content of foods without adding to the volume of food. This is a good tactic when people feel full quickly when eating.

In some cases, the high protein diet is not tolerated well due to increased fat intake. Signs of intolerance may include steatorrhea, diarrhea, vomiting, nausea, and increased cholesterol or triglyceride levels. Table 4H-1 indicates lower fat alternatives.

Table 4H-1: High protein food guidelines

<table>
<thead>
<tr>
<th>Foods</th>
<th>Serving Tips</th>
<th>Lower Fat Alternatives</th>
<th>High Calorie</th>
</tr>
</thead>
</table>
| Beverages, milk, milkshake, eggnog | -Add 2 to 4 Tbs dry milk to 1 cup milk.  
- Stir extra milk powder into soup, cereal, batter, sauces or gravy, casseroles, or meatloaf.  
- Mix milk into other beverages, such as coffee or tea. | -Nonfat or 1% low fat milk.            | - Whole milk and cream is high in calories.                                |
| Breads, cereals, and grains     | - Add soy flour or dry milk to the mix before baking or cooking.  
- Use milk or evaporated milk in cooked cereals. | - Use nonfat milk or evaporated skim milk in cooked cereals. |                                                                            |
| Meats, poultry, and fish        | - Serve chopped or ground for people who do not chew well.  
- Add to soups, casseroles, side dishes, stuffing, dips, or spreads. | - Use lean cuts of meat, skinless white meat poultry, and fish or shellfish.  
- Avoid high fat meats, such as ribs, bacon, or sausage.  
- Bake or grill, do not fry. | - High fat meats and fried products are very high calorie. |
| Cheese, and cottage cheese      | - Add cheese as a topping or ingredient to meats, casseroles, vegetables, salads, soups, potatoes, eggs, and sauces.  
- Serve on sandwiches, biscuits, crackers, or tortillas.  
- Serve with fruit or apple pie.  
- Add cottage cheese to casseroles, gelatin and other salads, egg or pasta dishes. | - Use nonfat or low fat forms.        | - Regular cheese is very high calorie.                                    |
### Table 4H-1 continued

<table>
<thead>
<tr>
<th>Foods</th>
<th>Serving Tips</th>
<th>Lower Fat Alternatives</th>
<th>High Calorie</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Eggs</strong></td>
<td>-Serve French toast.</td>
<td>-Use egg white or egg substitute.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-Add extra eggs to pancakes, muffins, and other baked goods.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-Add chopped hard cooked eggs to salads, vegetables, casseroles, and sandwich spreads.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-Serve egg-based desserts, such as custard or flan.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Never serve raw, unpasteurized eggs.</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Peanuts or soy nuts and butters</td>
<td>-Use as a spread on breads, crackers, fruit, or vegetables.</td>
<td>-Soy nuts are lower in fat than peanuts.</td>
<td>-Peanut butter is very high in fat.</td>
</tr>
<tr>
<td></td>
<td>-Swirl into ice cream, yogurt, or hot cereal.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-Blend into milkshakes.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-Add nuts to casseroles, rice, pasta, or vegetable dishes, desserts, cereals, or salads.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-Avoid nuts if choking is a risk.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cooked dried beans, peas, and lentils</td>
<td>-Use as alternatives to ground or chopped meats.</td>
<td>-Use cooked beans, peas, or lentils with little or no fat added.</td>
<td>-These are nutrient dense. They are especially high calorie when cooked with added fats.</td>
</tr>
<tr>
<td></td>
<td>-Use in casseroles and soups.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-Serve as spreads or dips.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Soy products</td>
<td>-Add tofu to soups, salads, casseroles, desserts, milkshakes or smoothies, scrambled eggs, and sauces.</td>
<td>-Use tofu or tempeh with little or no added fat.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-Use soy meat analogs in the form of burgers, frankfurters, lunch meat, sausage, or bacon.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yogurt</td>
<td>-Add cultured yogurt to fruit or gelatin salads.</td>
<td>-Use nonfat or low fat yogurt.</td>
<td>-Whole milk and sweetened varieties are higher in calories.</td>
</tr>
<tr>
<td></td>
<td>-Freeze to make a frozen pop.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-Serve as a tangy dessert or snack.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-Blend into a smoothie or milkshake</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Use oral supplements when food intake is inadequate. These may be

- homemade supplements (see recipes in Section 4A: High Calorie Diet),
- commercially prepared mixes or ready-to-use drinks, bars, puddings, and soups (see Table 4H-2), or
- liquid or powdered protein sources (see Table 4H-3).
Section 4H: Protein Control

Table 4H-2: High protein supplemental nutrition drinks

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Form</th>
<th>Protein and Calorie Content per packet</th>
<th>Manufacturer's Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instant Breakfast Essentials</td>
<td>liquid</td>
<td>13 grams protein, 150 calories</td>
<td>Nestle Nutrition</td>
</tr>
<tr>
<td>Scandishake, regular</td>
<td>powder</td>
<td>6 grams protein, 440 calories</td>
<td>Axcan Pharma, Inc.</td>
</tr>
<tr>
<td>Scandishake, lactose-free</td>
<td>powder</td>
<td>8 grams protein, 430 calories</td>
<td>Axcan Pharma, Inc.</td>
</tr>
</tbody>
</table>


Table 4H-3: Protein supplements

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Form</th>
<th>Protein Content</th>
<th>Manufacturer’s Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pro-Stat</td>
<td>liquid</td>
<td>17 grams per 30 mL</td>
<td>Medical Nutrition USA</td>
</tr>
<tr>
<td>BeneProtein</td>
<td>powder</td>
<td>6 grams per 7 gram scoop</td>
<td>Nestle Nutrition</td>
</tr>
<tr>
<td>Nutra/Pro</td>
<td>powder</td>
<td>16 grams per packet</td>
<td>Nutra/Balance</td>
</tr>
</tbody>
</table>


Cross Reference

Section 4A: High Calorie Diet

References

Axcan-Pharma, Inc.
www.axcan.com/scandishake_us.php

Medical Nutrition U.S.A.
www.pro-stat.info/

Nestle Nutrition
http://www.nestle-nutrition.com/

Nutra/Balance
www.nutra-balance-products.com
Kidney Disease Diet

Use

People with kidney disease may need diets that are modified in protein, sodium, potassium, phosphorous, and fluid. The type of diet modification will depend on how well the kidneys work and the kind of treatment used. The diet should be individualized.

Protein intake is controlled, so the body's needs for building and repairing tissue are met without excess protein, which causes waste to build up in the blood. High protein foods can come from either animals or plants. People with kidney disease should get most of their protein from sources that produce as little waste as possible for the kidneys to filter.

The kidney disease diet must provide the correct amounts of sodium, potassium, and phosphorous because diseased kidneys cannot keep these minerals in balance with a regular diet.

Sodium and potassium are involved in vital body functions such as maintaining fluid balance, controlling blood pressure, sending nerve impulses, and stimulating muscle function. Too little or too much potassium is very dangerous since either can cause an irregular heartbeat that could be fatal. The kidney disease diet is planned with fewer high or moderate potassium foods and more foods that are low in potassium.

High sodium intake causes fluid to collect in the body, especially when the kidneys produce little urine. Too much fluid can cause breathing problems, high blood pressure, and heart failure. A fluid restriction may be prescribed to control fluid and sodium balance.

Phosphorous is involved in important body functions, such as transferring energy, and keeping bones strong. However, high levels of phosphorous in the blood cause bones to be weak, brittle, and painful. Phosphorous can also damage soft tissues, blood vessels, and the heart. High phosphorous foods must be limited in advanced stages of kidney disease.

Adequacy

The kidney disease diet is planned to provide adequate nutrients; however, people with advanced kidney disease often have a poor appetite, nausea, vomiting, weakness, taste changes, and confusion. As a result, inadequate intake places them at risk for malnutrition.
Section 4I: Kidney Disease Diet

People with chronic kidney disease who are not on dialysis are sometimes on a protein-restricted diet. These people may also need supplements of a few vitamins and minerals.

People on dialysis therapy need a special prescription supplement that replaces nutrients lost during dialysis, and limits nutrients that may build up to dangerous levels. These people should not use over-the-counter vitamin and mineral supplements.

Diet Principles

The best method for planning a kidney disease diet uses groups of foods that have similar kinds and amounts of nutrients. These food groups are called “Exchanges” since each portion listed can be exchanged for another on the list. No food groups need to be eliminated in order to plan a diet for kidney disease. Refer to Table 4I-1 for the approximate nutrient content of these meal planning groups.

Table 4I-1: Nutrient content of food groups for kidney disease diets

<table>
<thead>
<tr>
<th>Group</th>
<th>Calories</th>
<th>Protein gm</th>
<th>Carbohydrate Gm</th>
<th>Sodium mg</th>
<th>Potassium mg</th>
<th>Phosphorous mg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protein</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>50-100</td>
<td>6-8</td>
<td>0</td>
<td>20-150</td>
<td>50-150</td>
<td>50-100</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>200-500</td>
<td>250-450</td>
<td>100-300</td>
</tr>
<tr>
<td>Dairy</td>
<td>100-400</td>
<td>2-8</td>
<td>8</td>
<td>30-300</td>
<td>50-400</td>
<td>100-120</td>
</tr>
<tr>
<td>Vegetable</td>
<td>10-100</td>
<td>2-3</td>
<td>5-20</td>
<td>0-50</td>
<td></td>
<td>10-70</td>
</tr>
<tr>
<td>Low</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medium</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fruit</td>
<td>10-100</td>
<td>0-3</td>
<td>15</td>
<td>1-50</td>
<td></td>
<td>0-70</td>
</tr>
<tr>
<td>Low</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0-149</td>
<td></td>
</tr>
<tr>
<td>Medium</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>150-250</td>
<td></td>
</tr>
<tr>
<td>High</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>250-550</td>
<td></td>
</tr>
<tr>
<td>Bread &amp;</td>
<td>50-200</td>
<td>2-3</td>
<td>15</td>
<td>0-150</td>
<td>10-100</td>
<td>10-70</td>
</tr>
<tr>
<td>Grain</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Calorie</td>
<td>100-150</td>
<td>0-1</td>
<td>Varies</td>
<td>0-100</td>
<td>0-100</td>
<td>0-100</td>
</tr>
<tr>
<td>Flavoring</td>
<td>0-20</td>
<td></td>
<td>Varies</td>
<td>250-300</td>
<td>0-100</td>
<td>0-20</td>
</tr>
</tbody>
</table>


Refer to Table 3G-1, which lists the nutrient needs of adults with kidney disease based on the stage and type of therapy.

Protein needs depend on the person's health, body weight, and type of dialysis therapy. People on dialysis need more protein than people normally need. Limit added table salt (sodium chloride), both in cooking and at the table. Limit high sodium foods.

Potassium is found in most foods, except pure fats, oils, and concentrated carbohydrate sources. All meats, milk, milk products, fruits, and vegetables supply potassium to the diet.
Limit servings of fruits, vegetables, and juices to 4 to 6 half-cup servings daily to control the potassium of people receiving hemodialysis. People receiving peritoneal dialysis or taking medications that cause potassium loss often need additional potassium. When they cannot get enough by eating more food, their physician may prescribe potassium chloride supplements or salt substitutes.

Limit foods that naturally contain high phosphorus, such as dairy products, nuts, soy products, chocolate, and whole grains, when planning meals for people on dialysis or with advanced kidney disease. Foods containing phosphate additives can increase the phosphorus intake by as much as 1000mg/day and should also be limited. Phosphate additives are used widely in highly processed foods, such as restructured meats, spreadable cheeses, instant puddings and sauces, refrigerated bakery products, dark cola, and flavored waters, teas and fruit drinks.

Many people will need sources of extra calories. Those who also have diabetes need to choose sources of calories and plan their intake to keep blood glucose under control.

Kidney Disease Diet Exchange Lists

Protein Choices

This group lists the best protein sources for people with kidney disease. (Renal Dietetic Practice Group, 2002a, p. 5) Portion sizes at most meals will be 2, 3, 4 or more ounces per person.

- 1 oz beef, fish, lamb, pork, poultry, shellfish, veal, or wild game
- Egg servings equal to 1 oz:
  - 1 large egg
  - 1/4 cup egg substitute

The high protein foods listed in Table 4I-2 have more sodium, potassium, or phosphorus than other protein choices. Some people with kidney disease have trouble eating protein-rich foods. If necessary, these choices can be served to meet their protein needs.

<table>
<thead>
<tr>
<th>Food portion</th>
<th>High sodium</th>
<th>High Potassium</th>
<th>High phosphorus</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 slices bacon</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 sausage links or 2 sausage patties</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1/4 cup canned fish</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>1 oz cheese</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>1/4 cup cottage cheese</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 oz deli-style beef, ham, chicken, or</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>turkey</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1/2 cup cooked dried beans or peas</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>2 oz frankfurters, bratwurst, or Polish</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>sausage</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 oz lunch meats, bologna, liverwurst,</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>salami, etc.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Dairy Choices

Dairy products and foods made with them are especially high in phosphorus. Most people can choose one to two high-phosphorus foods a day from the dairy products listed here or from other food groups.

- 1/2 cup cow milk or soy milk
- 1/2 cup light cream or half-and-half
- 1/2 cup ice cream or ice milk
- 1/2 cup yogurt, plain or fruit flavored
- 1/4 cup sweetened condensed or evaporated milk
- 1 cup non-dairy milk substitute or Lo Pro milk
- 1/2 cup pudding or custard
- 1/2 cup milkshake
- 1 oz cheese
- 1 1/4 cup cottage cheese

(Renal Dietetic Practice Group, 2002a, p. 13)

### Fruit & Vegetable Choices

Fruit and vegetable choices are grouped by potassium content. Serving sizes are 1/2 cup unless otherwise noted. A moderate potassium diet may provide 1 high-potassium food, 2 medium-potassium foods, and 3 low-potassium foods each day.

#### Low Potassium (less than 150 milligrams)

<table>
<thead>
<tr>
<th>Fruits</th>
<th>Potassium (less than 150 milligrams)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 apple</td>
<td>cranberry juice cocktails</td>
</tr>
<tr>
<td>apple juice</td>
<td>fruit cocktail</td>
</tr>
<tr>
<td>applesauce</td>
<td>gooseberries</td>
</tr>
<tr>
<td>apricot nectar</td>
<td>grape juice</td>
</tr>
<tr>
<td>blackberries</td>
<td>1 lemon</td>
</tr>
<tr>
<td>blueberries</td>
<td>lemon juice</td>
</tr>
<tr>
<td>clementine</td>
<td>1 lime</td>
</tr>
<tr>
<td>clementine</td>
<td>lime juice</td>
</tr>
<tr>
<td>cranberries</td>
<td>papaya nectar</td>
</tr>
<tr>
<td>cranberry juice cocktails</td>
<td>peach (canned)</td>
</tr>
</tbody>
</table>
Section 4I: Kidney Disease Diet

Fruits
- peach nectar
- pear (canned)
- pineapple
- 1 plum
- raspberries
- strawberries
- 1 tangerine
- Watermelon

Vegetables
- alfalfa sprouts
- bamboo shoots (canned)
- bean sprouts
- beets (canned)
- cabbage
- carrots
- cauliflower
- corn
- cucumber
- endive
- eggplant
- green beans
- 1 cup lettuce (all types)
- mushrooms
- onions
- radishes
- summer squash
- water chestnuts (canned)
- watercress

(Medium Potassium (150 to 250 milligrams)

Fruits
- cherries
- 2 figs
- grapefruit
- grapefruit juice
- mango
- papaya
- peach (fresh)
- pear (fresh)
- rhubarb

Vegetables
- asparagus
- broccoli
- celery
- kale
- mixed vegetables
- peas
- peppers
- turnips
- zucchini

(Renal Dietetic Practice Group, 2002a, p. 9)
Section 4I: Kidney Disease Diet

*High Potassium (more than 250 milligrams)*

Fruits
- 3 apricots
- 1 small banana
- cantaloupe
- 1/4 cup dates
- honeydew melon
- kiwifruit
- nectarine
- 1 orange
- orange juice
- prune juice
- 5 prunes
- 2 Tbs raisins

Vegetables
- artichokes
- avocado
- bamboo shoots (fresh, raw)
- beets (fresh)
- Brussels sprouts
- chard
- greens (beet, collard, mustard, etc.)
- kohlrabi
- okra
- parsnips
- potatoes

*Warning!*

**Star fruit** should never be served to people with kidney disease. This fruit contains compounds which cannot be removed by diseased kidneys, and which are toxic to the nervous system.

Star fruit toxins can cause persistent hiccups, vomiting, disturbed consciousness, decreased muscle power, limb numbness, paresis, insomnia, paresthesias, seizures, and death (Neto, Abrao Cardeal da Costa, Garcia-Cairasco, Coutinho Netto,

(Renal Dietetic Practice Group, 2002a, p. 10)

*Bread & Grain Choices*

Most people can have 7 to 9 servings per day from these choices.

**Breads and Rolls**
- 1/2 small bagel
- 1 slice (or 1 oz) bread, all kinds
- 1/2 bun, hamburger or hot dog type
- 1 piece (or 2 oz) cornbread, homemade
- 1 small Danish pastry or sweet roll
Section 4I: Kidney Disease Diet

1 small dinner roll
1 small doughnut
1/2 English muffin
1/2 6-inch pita or pocket bread
1 6-inch tortilla, flour
1 small muffin, without nuts, bran, or whole-wheat flour
1 slice French toast, homemade

Cereals and Grains
1 cup (or 1 oz) low salt dry cereals (Corn Pops, Cocoa Puffs, Sugar Smacks, Fruity Pebbles, Puffed Wheat, Puffed Rice, etc.)
1/2 cup cooked cereals (Cream of Rice or Wheat, Farina, Malt-o-Meal, or grits)
1/2 cup pasta, cooked (noodles, macaroni, spaghetti, etc.)

Crackers and Snacks
4 2-inch crackers, unsalted
3 graham cracker squares
4 shortbread cookies
4 sugar wafers
10 vanilla wafers

(Renal Dietetic Practice Group, 2002a, p. 17-18)

Some grain foods have extra salt and phosphorus added to them. These are listed in Table 4I-3. Use the high phosphorous foods rarely. Replace them with lower phosphorous alternatives with similar taste, for example,
instead of a waffle or pancake ….. serve French toast;
instead of corn tortillas …………… serve flour tortillas;
instead of wheat or bran cereal …. serve corn or rice cereal.

Table 4I-3: Other bread and grain choices that are high in sodium or phosphorous

<table>
<thead>
<tr>
<th>Food portion</th>
<th>High sodium</th>
<th>High phosphorous</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 small biscuit or muffin</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>1/20 round cake (or 2&quot; x 2&quot; square)</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>3/4 cup dry cereal, most brands</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>1/8 fruit pie</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>1/2 cup oatmeal or granola</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>1 4-inch waffle or pancake</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>3/4 oz or 10 sticks pretzels</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>3 Ry Krisp crackers</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>4 sandwich cookies</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>2 6-inch corn tortillas</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>1/2 cup bran or whole wheat cereal</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

**Calorie Choices**

High calorie foods are often needed on a renal diet to help maintain body weight. These choices do not add significant amounts of the nutrients that must be limited.

- 1 Tbs butter
- 1 oz chewy fruit snacks and candies
- 1/4 cup cranberry sauce or relish
- 2 Tbs cream cheese
- 4 (or 1 oz) fruit chews
- 1 cup fruit drinks
- 2 fruit roll ups
- 8 gum drops
- 2 Tbs jam or jelly
- 15 jelly beans
- 1 Tbs regular margarine
- 2 Tbs marmalade
- 5 large marshmallows
- 1 1/2 Tbs mayonnaise
- 13 mints
- 1/2 large peppermint patty
- 1/2 cup non-dairy whipped topping
- 1 1/2 Tbs salad dressing
- 1/4 cup sour cream
- 2 Tbs sugar, brown or white
- 2 Tbs tartar sauce
- 1 Tbs vegetable oil
- 1/4 cup whipped cream
- (Renal Dietetic Practice Group, 2002a, p. 25)

**Flavor Choices**

The renal diet does not need to be salt free. This list includes higher salt choices that can be used to add flavor to foods. Limit to 1 to 2 flavoring choices each day.

- 1/4 tsp Accent flavor enhancer
- 2 Tbs barbecue sauce
- 1/3 cup bouillon or broth
- 2 Tbs catsup
- 1 1/2 Tbs chili sauce
- 1/8 large (or 1/2 oz) dill pickle
- 1 tsp light soy sauce
- 4 tsp mustard
- 3 medium olives
- 1/8 tsp salt
- 1/8 tsp seasoning salt (onion, garlic, etc.)
- 3/4 tsp soy sauce
- 1 1/2 Tbs steak sauce
- 2 1/2 Tbs sweet pickle relish
- 3 Tbs taco sauce
- 1 Tbs tamari sauce
- 1 1/4 tsp teriyaki sauce
- 1 Tbs Worcestershire sauce

(Renal Dietetic Practice Group, 2002a, p. 26)
**Fluid or Beverage Choices**

There are other beverage and fluid options in addition to fluids listed in other food groups. The following beverages may be used as desired within the daily fluid allowance (Renal Dietetic Practice Group, 2002a, p. 21).

- clear or fruit-flavored carbonated beverages (without phosphoric acid)
- ice
- lemonade
- limeade
- mineral water
- water

Foods that melt at room temperature also count as fluids, for example,

- gelatin
- juice bars
- Popsicles
- sherbet

Limit these beverages that contain moderate amounts of potassium and/or phosphorus.

- coffee
- coffee substitute (cereal-grain beverage)
- tea
- cola or pepper type carbonated beverages (with phosphoric acid)
- Cool Nestea and Hawaiian Punch

Avoid these liquids that are very high in sodium, potassium, and/or phosphorus.

- broth
- bouillon
- consommé
- low sodium broth or bouillon containing potassium chloride
- some thirst-quencher beverages
- most soups, canned or dry mix

There are several nutrition supplements designed for people with kidney disease. (See Table 4I-4.) They are lower in sodium, potassium, phosphorous, and fluid than regular supplements. The vitamin profile is also appropriate for kidney disease.

Regular calorie-dense supplements are options for people with kidney disease if blood levels of sodium, potassium, and phosphorous are monitored. (See Table 4I-5.) They are frequently used due to their lower cost and wider availability.

Table 4I-6 lists some of the protein supplements on the market. These are useful for people who only need additional protein or who are unable to tolerate the nutritionally complete supplements.
Table 4I-4: Specialized supplements for kidney disease

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Predialysis</th>
<th>On dialysis</th>
<th>Manufacturer's Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Magnacal Renal</td>
<td></td>
<td>X</td>
<td>Nestle Nutrition</td>
</tr>
<tr>
<td>Nepro</td>
<td></td>
<td>X</td>
<td>Ross Products</td>
</tr>
<tr>
<td>Novasource Renal</td>
<td></td>
<td>X</td>
<td>Novartis Nutrition</td>
</tr>
<tr>
<td>Re/Gen HP HC</td>
<td></td>
<td>X</td>
<td>Nutra/Balance</td>
</tr>
<tr>
<td>Re/Gen LP HC</td>
<td>X</td>
<td></td>
<td>Nutra/Balance</td>
</tr>
<tr>
<td>Renalcal</td>
<td>X</td>
<td></td>
<td>Nestle Nutrition</td>
</tr>
<tr>
<td>Suplena</td>
<td></td>
<td></td>
<td>Ross Products</td>
</tr>
</tbody>
</table>

Table 4I-5: Calorie dense supplement alternatives

<table>
<thead>
<tr>
<th>Product Name</th>
<th>1.5 kcal/mL</th>
<th>2 kcal/mL</th>
<th>Manufacturer's Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boost High Protein</td>
<td>X</td>
<td></td>
<td>Nestle Nutrition</td>
</tr>
<tr>
<td>Ensure High Protein</td>
<td></td>
<td>X</td>
<td>Ross Products</td>
</tr>
<tr>
<td>Nutren 1.5</td>
<td></td>
<td>X</td>
<td>Nestle Nutrition</td>
</tr>
<tr>
<td>Deliver 2.0</td>
<td></td>
<td>X</td>
<td>Nestle Nutrition</td>
</tr>
<tr>
<td>Magnacal</td>
<td></td>
<td>X</td>
<td>Nestle Nutrition</td>
</tr>
<tr>
<td>Nutren 2.0</td>
<td></td>
<td>X</td>
<td>Nestle Nutrition</td>
</tr>
<tr>
<td>TwoCal HN</td>
<td></td>
<td>X</td>
<td>Ross Products</td>
</tr>
</tbody>
</table>

Table 4I-6: Protein supplements

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Form</th>
<th>Protein Content</th>
<th>Manufacturer's Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pro-Stat</td>
<td>liquid</td>
<td>15 grams per 30 mL</td>
<td>Medical Nutrition</td>
</tr>
<tr>
<td>BeneProtein</td>
<td>powder</td>
<td>6 grams per 7 gram scoop</td>
<td>Novartis Nutrition</td>
</tr>
<tr>
<td>Nutra/Pro</td>
<td>powder</td>
<td>16 grams per packet</td>
<td>Nutra/Balance</td>
</tr>
<tr>
<td>Pro-Mod</td>
<td>liquid</td>
<td>10 g of protein per oz</td>
<td>Ross Products</td>
</tr>
</tbody>
</table>

Refer to Table 4I-7 for a summary of basic diet guidelines for use with residents of extended care facilities who receive hemodialysis.

Table 4I-7: Summary guide for residents of extended care facilities on hemodialysis

| Protein | -These residents need to eat enough protein. 
|---------|-----------------------------------------------|
|         | -Protein is lost during the hemodialysis treatments. 
|         | -Most of their protein will be meat, poultry, fish, eggs, or dairy foods. 
|         | -Some residents will need double meat portions on their trays. 
| Sodium  | -Avoid added table salt. 
|         | -Never use lite salt or salt substitute. 
|         | -Limit cured and processed meats or cheese. 
|         | -Limit salty convenience foods. 
|         | -Limit salty condiments and seasonings. 
| Potassium| -Limit or avoid fruits and vegetables on the high potassium list. 
|         | -Never use lite salt or salt substitute. 
|         | -Do not use high potassium juice to treat low blood glucose. 
|         | -Avoid chocolate, cocoa, molasses, nuts, and low sodium broth or soups. 
| Phosphorus| -Limit dairy products and foods made with them. 
|         | -Avoid chocolate, cocoa, nuts, seeds, caramels, and cooked dried beans/peas. 
| Fluids | -These residents usually must limit fluid to 4 to 8 cups a day. 
|         | -All beverages and soup count as fluids. |
Section 4I: Kidney Disease Diet

- Foods that melt at room temperature count as fluids.
- Remind residents about their fluid limit when they eat out or when foods are brought in to them.

**Snacks for non-diabetics**
- Cookies or cake without chocolate or cocoa; fruit or lemon pie; unsalted crackers, unsalted pretzels, or unsalted popcorn; breadsticks; candy without nuts or chocolate; or graham crackers spread with margarine, jelly, frosting, or marshmallow cream.
- Fluids: Popsicles, sherbet, gelatin, lemonade, Kool-Aid, clear or fruit flavored soft drinks, or cranberry juice.

**Snacks for diabetics**
- Vanilla wafers, animal crackers, or graham crackers; angel food cake; unsalted low fat crackers, unsalted pretzels, unsalted popcorn, or breadsticks.
- Fluids: sugar free soft drinks, sugar free Kool-Aid, sugar-free gelatin, sugar free candy, mints, or chewing gum.

**Sample Menus**

Meal plans vary widely to suit each person’s preferences. Table 4I-8 provides five sample meal plans for commonly ordered diets for kidney disease.

**Table 4I-8 : Sample meal plans for common kidney disease diet orders**

<table>
<thead>
<tr>
<th>Protein gm</th>
<th>Sodium mg</th>
<th>Potassium mg</th>
<th>Protein</th>
<th>Dairy</th>
<th>Bread &amp; Grains</th>
<th>Vegetables L</th>
<th>Vegetables M</th>
<th>Vegetables H</th>
<th>Fruits L</th>
<th>Fruits M</th>
<th>Fruits H</th>
<th>Calories</th>
<th>Flavoring</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>3000</td>
<td>3000</td>
<td>10</td>
<td>2</td>
<td>9</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>3+</td>
<td>2</td>
</tr>
<tr>
<td>80</td>
<td>3000</td>
<td>3000</td>
<td>7</td>
<td>2</td>
<td>8</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>4+</td>
<td>2</td>
</tr>
<tr>
<td>80</td>
<td>2000</td>
<td>2000</td>
<td>7</td>
<td>1-2</td>
<td>7</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>5+</td>
<td>1</td>
</tr>
<tr>
<td>60</td>
<td>3000</td>
<td>3000</td>
<td>5</td>
<td>1</td>
<td>7</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>4+</td>
<td>2</td>
</tr>
<tr>
<td>60</td>
<td>2000</td>
<td>2000</td>
<td>5</td>
<td>1</td>
<td>7</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>5+</td>
<td>1</td>
</tr>
</tbody>
</table>

L = Low potassium  M = Medium potassium  H = High potassium

**Sample Menu for Chronic Kidney Disease Stages I through IV**

50 to 60 grams protein, 2000 milligrams sodium, unrestricted potassium, and 800 milligrams phosphorus

<table>
<thead>
<tr>
<th>Breakfast</th>
<th>Lunch</th>
<th>Dinner</th>
</tr>
</thead>
<tbody>
<tr>
<td>-1 sliced turkey sandwich</td>
<td>2 oz turkey</td>
<td>-2 oz baked pork chop</td>
</tr>
<tr>
<td>1 scrambled egg</td>
<td>2 slices white toast</td>
<td>-1 dinner roll</td>
</tr>
<tr>
<td>2 tsp margarine</td>
<td>1 Tbs mayonnaise</td>
<td>-1 Tbs margarine</td>
</tr>
<tr>
<td>lettuce &amp; tomato slice</td>
<td>-1/2 cup steamed broccoli</td>
<td>-1/2 cup mixed green salad</td>
</tr>
<tr>
<td>-1/2 cup mixed green salad</td>
<td>-1/2 cup baked sweet potato</td>
<td></td>
</tr>
<tr>
<td>2 tsp jelly</td>
<td>-1 Tbs oil &amp; vinegar salad dressing</td>
<td></td>
</tr>
<tr>
<td>1/2 cup orange sections</td>
<td>-1/2 cup apricots halves</td>
<td>-1 baked apple</td>
</tr>
<tr>
<td>coffee or tea</td>
<td>-coffee, tea, or Sprite</td>
<td>-coffee or tea</td>
</tr>
</tbody>
</table>
Section 4I: Kidney Disease Diet

Sample Menu for Chronic Kidney Disease Stage V with Hemodialysis
80 grams protein, 2000 milligrams sodium, 3000 milligrams potassium, 1200 milligrams phosphorus, and 1200 to 1500 milliliter fluid restriction

<table>
<thead>
<tr>
<th>Breakfast</th>
<th>Lunch</th>
<th>Dinner</th>
</tr>
</thead>
<tbody>
<tr>
<td>- 1 sliced turkey sandwich</td>
<td>- 4 oz turkey</td>
<td>- 4 oz baked pork chop</td>
</tr>
<tr>
<td>2 scrambled eggs 2 oz turkey</td>
<td>2 slices white bread</td>
<td>- 1 dinner roll</td>
</tr>
<tr>
<td>2 tsp margarine</td>
<td>1 Tbs mayonnaise</td>
<td>- 1 Tbs margarine</td>
</tr>
<tr>
<td>- 1/2 cup mixed green salad</td>
<td>- 1/2 cup steamed broccoli</td>
<td>- 1/2 cup steamed white rice</td>
</tr>
<tr>
<td>2 tsp jelly</td>
<td>- 1 Tbs oil &amp; vinegar salad dressing</td>
<td></td>
</tr>
<tr>
<td>1/2 cup orange sections</td>
<td>- 15 grapes</td>
<td>- 1 baked apple</td>
</tr>
<tr>
<td>8 oz coffee or tea</td>
<td>- 8 oz coffee, tea, or Sprite</td>
<td>- 8 oz coffee, tea, or Sprite</td>
</tr>
</tbody>
</table>

If protein requirements are greater than 80 grams, consider adding nutrition supplements to meet needs.

Sample Menu for Chronic Kidney Disease Stage V with Peritoneal Dialysis
100 grams protein, 3000 milligrams sodium, unrestricted potassium, 1500 milligrams phosphorus

<table>
<thead>
<tr>
<th>Breakfast</th>
<th>Lunch</th>
<th>Dinner</th>
</tr>
</thead>
<tbody>
<tr>
<td>- 1 sliced turkey sandwich</td>
<td>- 4 oz turkey</td>
<td>- 5 oz baked pork chop</td>
</tr>
<tr>
<td>- 2 scrambled eggs</td>
<td>2 slices white bread</td>
<td>- 1 dinner roll</td>
</tr>
<tr>
<td>- 1 slice white toast</td>
<td>2 tsp mustard</td>
<td>- 1/2 cup steamed broccoli</td>
</tr>
<tr>
<td>- 1 tsp margarine</td>
<td>lettuce &amp; tomato slice</td>
<td>- 1/2 cup baked sweet potato</td>
</tr>
<tr>
<td>- 1 deviled egg</td>
<td>- 1/2 cup apricots halves</td>
<td>- 1 baked apple</td>
</tr>
<tr>
<td>- 1/2 cup orange sections</td>
<td>- coffee, tea, or Sprite</td>
<td>- coffee or tea</td>
</tr>
</tbody>
</table>

If protein requirements are greater than 100 grams, consider adding nutrition supplements to meet needs.

Cross References

Section 3G: Acute Kidney Failure
Section 3G: Chronic Kidney Disease (Stages I-IV)
Section 3G: End Stage Kidney Disease (Stage V)
Section 4G: Potassium Rich Foods
Section 4G: Sodium Controlled Diets

References

Section 4I: Kidney Disease Diet


More Information


Fluid Management

Use

Fluid restriction is ordered when the body's organs (such as the kidneys, heart, or liver) do not function well enough to prevent a fluid overload. Often it is used along with medications that remove excess fluid. It is sometimes used for people who habitually consume excessively large amounts of fluid.

Dietary fluid restriction is usually prescribed in liters or milliliters per day, but distributed into fluid allowances for each meal or nursing shift.

Adequacy

Some fluid restrictions limit fluid intake to the amount that is considered adequate intake in order to prevent excessive fluid intake. These do not pose a risk of not meeting nutrition needs.

In acute hospital situations, a fluid restriction may be prescribed for a short time that does not allow for adequate intake of nutrients such as calcium from milk.

Long-term fluid restriction is prescribed with hemodialysis along with other dietary restrictions and supplements to ensure that nutrition needs are met.

Diet Principles

Fluid restriction limits beverages and foods that are liquid at room temperature such as

- soft drinks
- fruit drinks
- juices
- coffee, tea, or herb tea
- milk, milkshakes, hot cocoa
- gelatin salads and desserts
- ice cream, sherbet or sorbet
- Popsicles or frozen juice bars
- soup or broth

Refer to Table 4I-9 for guidelines on the fluid content of foods whose fluid content is less than their volume.

<table>
<thead>
<tr>
<th>Table 4I-9: Fluid content of selected foods</th>
<th>Portion Size</th>
<th>Fluid Content (milliliters)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gelatin 1/2 cup</td>
<td>140</td>
<td></td>
</tr>
<tr>
<td>Sugar-free gelatin 1/2 cup</td>
<td>140</td>
<td></td>
</tr>
<tr>
<td>Sherbet 4 fl oz</td>
<td>60</td>
<td></td>
</tr>
<tr>
<td>Sugar-free sorbet 3 fl oz</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>Ice cream 4 fl oz</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>Frozen pop, twin size 2.5 fl oz</td>
<td>70</td>
<td></td>
</tr>
<tr>
<td>Soup 3/4 cup</td>
<td>170</td>
<td></td>
</tr>
<tr>
<td>Supplements with 1 calorie per ml 8 fl oz</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supplements with 1.5 calories per ml 8 fl oz</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supplements with 2 calories per ml 8 fl oz</td>
<td>170</td>
<td></td>
</tr>
</tbody>
</table>
Fluid restriction is usually accompanied by the discomfort of a dry mouth. Encourage taking small sips frequently rather than drinking larger amounts less often. Use of ice chips or small amounts of frozen fluids may be very soothing. Use of foods that are very dry or high in sodium should be avoided since they will increase thirst and discomfort. Fluid restriction does not limit moist or solid foods even if they have high water content. These foods are not included in fluid restriction:

- applesauce
- fruit
- vegetables
- pureed foods
- cooked cereals
- custard
- pudding
- cultured yogurt
- whipped topping
- catsup
- mustard
- mayonnaise
- salad dressing
- gravy
- sauces
- honey
- jelly
- syrup

Cross References

Section 4I: Kidney Disease Diet, Fluid or Beverage Choices

References

Vegetarian Diets

Use

Plant foods are the basis of vegetarian diets. These diets exclude some or all foods derived from animals such as meat, poultry, fish, or any foods that contain ingredients from these sources. The names of many vegetarian diets come from the animal foods they do include. For example, a lacto-vegetarian diet includes milk and milk products. An ovo-vegetarian diet includes eggs and egg ingredients. A lacto-ovo vegetarian diet includes both milk and eggs. A total vegetarian or vegan diet includes foods from plant sources only and excludes all foods of animal origin. As much as 40 percent of vegetarians are thought to be vegans (ADA, 2010).

Nutrition Adequacy

A vegetarian diet, like a diet that includes more animal foods, will meet all nutrient needs if a variety of foods are included. Vegan diets, and some vegetarian diets, require a vitamin B₁₂ supplement. The dose is 5 to 10 micrograms daily or 2000 micrograms weekly. Those vegans who do not get enough sun on their skin every day need a vitamin D supplement (Messina, Melina, & Mangels, 2003, p. 775).

Diet Principles

Figure 4J-1 is the graphic of the vegetarian guide in the form of a pyramid. It emphasizes the sources of calcium in each of the food groups (Messina, Melina, & Mangels, 2003, p. 773). Use the food guide, which is depicted in a table in Table 4J-1, to plan meals for adults. Table 4J-2 provides sample menus for a lacto-ovo vegetarian diet and a vegan diet. Use the servings listed in Table 4J-3 to plan meals for other stages in the life cycle.

This guide provides about 1400 to 1500 calories each day. Select more servings from any of the groups to provide additional calories as necessary. Use high quality protein sources when protein needs are higher, such as during wound healing. Instead of the meat, poultry, or fish in conventional menus, for vegetarian diets include animal protein such as egg albumin, milk, whey, or casein, and vegetable protein such as soy and seitan, a wheat gluten product used in Asian cooking (Collins, 2003, pp. 65-66). For vegan diets, include only the vegetable protein sources.

Include whole grains often, as they are a source of zinc. Use enriched, refined grains some of the time.

Include sweets or alcohol in moderation.

Provide eight or more servings each day from the calcium-rich foods. Each serving provides about 10 percent of adult daily requirements.

Include two servings each day of foods that have omega-3 fats.

Include three good sources of vitamin B-12 every day.
Section 4J: Vegetarian Diets

Servings of nuts and seeds may be used in place of fat servings (Messina, Melina, & Mangels, 2003, p. 772). Read ingredient lists to identify the addition of products derived from meat, poultry, or fish. For example, gelatin is made from animal bones or cartilage, and so, foods containing gelatin should not be included in either a vegetarian or vegan diet. Margarine often has milk solids added to it, which would not be appropriate for a vegan diet.

Figure 4J-1: The vegetarian food guide pyramid

### Table 4J-1: Vegetarian food guide

<table>
<thead>
<tr>
<th>Food Group</th>
<th>Foods to include</th>
</tr>
</thead>
</table>
| **Grains** | -1 slice bread  
-1/2 cup cooked grain, cereal, or pasta  
Calcium-rich foods  
-1 oz calcium-fortified ready-to-eat breakfast cereal  
Sources of Vitamin B<sub>12</sub>  
-1 oz B<sub>12</sub>-fortified ready-to-eat breakfast cereal |
| **Legumes, nuts, and protein-rich foods** | -1/2 cup cooked beans, peas, or lentils or 1/2 cup tofu  
-2 Tbs nut or seed butter  
-1/4 cup nuts  
-1 oz meat analog  
Calcium-rich foods  
-1/2 cup cow’s milk or yogurt  
-1/2 cup fortified soy milk or soy yogurt  
-3/4 oz cheese  
-1/2 cup tempeh or calcium-set tofu  
-1/4 cup almonds  
-2 Tbs almond butter or sesame tahini  
-1/2 cup cooked soy beans  
-1/4 cup soy nuts  
Sources of omega-3 fats  
-1 Tbs ground flaxseed  
-1/4 cup walnuts  
Sources of Vitamin B<sub>12</sub>  
-1/2 cup cow’s milk or yogurt  
-1 cup fortified soy milk or soy yogurt  
-1 egg  
-1 1/2 oz B<sub>12</sub>-fortified meat analog |
| **Vegetables** | -1/2 cup cooked vegetables or vegetable juice  
-1 cup raw vegetables  
Calcium-rich foods  
-1 cup cooked or 2 cups raw bok choy, broccoli, Chinese cabbage, collards, kale, mustard greens, or okra  
-1/2 cup calcium-fortified tomato juice |
| **Fruits** | -1 medium fruit  
-1/2 cup cut-up or cooked fruit or fruit juice  
-1/4 cup dried fruit  
Calcium-rich foods  
-5 figs  
-1/2 cup calcium-fortified fruit juice |
| **Fats** | -1 tsp oil, mayonnaise, or soft margarine  
Sources of omega-3 fats  
-1 tsp flaxseed oil  
-3 tsp canola or soy bean oil |

---

### Table 4J-2: Sample Menu

<table>
<thead>
<tr>
<th></th>
<th>Vegan</th>
<th>Lacto-Ovo Vegetarian</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Breakfast</strong></td>
<td>- 1 cup fortified soy milk,</td>
<td>- 1 cup nonfat cow's milk</td>
</tr>
<tr>
<td></td>
<td>1 cup Total breakfast cereal, and</td>
<td>- 1 slice rye bread toast</td>
</tr>
<tr>
<td></td>
<td>2 Tbs walnuts</td>
<td>- 1 tsp margarine</td>
</tr>
<tr>
<td></td>
<td>- 1 slice oatmeal bread toast</td>
<td>- 1 cup cooked cereal with</td>
</tr>
<tr>
<td></td>
<td>- 1 tsp canola oil</td>
<td>1 Tbs ground flaxseed and</td>
</tr>
<tr>
<td></td>
<td>- 1/2 cup scrambled tofu</td>
<td>1/2 cup sliced peaches</td>
</tr>
<tr>
<td></td>
<td>- 1/2 cup sliced peaches</td>
<td>- green tea</td>
</tr>
<tr>
<td></td>
<td>- green tea</td>
<td></td>
</tr>
<tr>
<td><strong>Lunch</strong></td>
<td>- 1 cup bean soup</td>
<td>- sandwich: 1 oz soy “turkey,”</td>
</tr>
<tr>
<td></td>
<td>- 1 cup steamed broccoli tossed with</td>
<td>3/4 oz cheese,</td>
</tr>
<tr>
<td></td>
<td>1 cup cooked pasta and</td>
<td>2 slices whole grain bread,</td>
</tr>
<tr>
<td></td>
<td>1 tsp canola oil</td>
<td>lettuce leaf, tomato slice and</td>
</tr>
<tr>
<td></td>
<td>- 1 cup mixed salad greens with</td>
<td>2 tsp mayonnaise</td>
</tr>
<tr>
<td></td>
<td>1/2 cup sliced strawberries and</td>
<td>- 1 cup vegetable soup (carrots,</td>
</tr>
<tr>
<td></td>
<td>2 Tbs walnuts</td>
<td>green beans, potatoes, tomatoes)</td>
</tr>
<tr>
<td></td>
<td>- 1 Tbs canola oil and vinegar dressing</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- 1 whole wheat roll</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- 1/2 cup calcium-fortified fruit juice</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- herb tea</td>
<td></td>
</tr>
<tr>
<td><strong>Dinner</strong></td>
<td>- burrito: 1/2 cup refried pinto beans,</td>
<td>- sandwich: 2 oz soy burger with</td>
</tr>
<tr>
<td></td>
<td>1 flour tortilla, salsa, lettuce, and</td>
<td>whole grain bun and catsup</td>
</tr>
<tr>
<td></td>
<td>tomato</td>
<td>- 3/4 cup quinoa and onion</td>
</tr>
<tr>
<td></td>
<td>- 1/2 cup Spanish rice</td>
<td>casserole with 2 Tbsp walnuts</td>
</tr>
<tr>
<td></td>
<td>- 1 ear corn</td>
<td>- 1 cup cooked okra with tomatoes</td>
</tr>
<tr>
<td></td>
<td>- 1 cup cooked collards with ginger</td>
<td>- 1 cup mixed salad greens</td>
</tr>
<tr>
<td></td>
<td>and chili spices</td>
<td>- 2 Tbs sesame tahini and parsley</td>
</tr>
<tr>
<td></td>
<td>- 1 tsp milk-free margarine</td>
<td>salad dressing</td>
</tr>
<tr>
<td></td>
<td>- water</td>
<td>- herb tea</td>
</tr>
<tr>
<td><strong>Snacks</strong></td>
<td>- small baked potato with</td>
<td>- 1/4 cup soy nuts</td>
</tr>
<tr>
<td></td>
<td>2 Tbsp almond butter</td>
<td>- 2 Tbs walnuts</td>
</tr>
<tr>
<td></td>
<td>- hot cocoa made with</td>
<td>- 1 cup nonfat plain yogurt</td>
</tr>
<tr>
<td></td>
<td>1 cup fortified soy milk</td>
<td>- 1/2 cup raspberries</td>
</tr>
<tr>
<td></td>
<td>- banana</td>
<td></td>
</tr>
</tbody>
</table>

### Table 4J-3: Serving modifications for different life-cycle stages

<table>
<thead>
<tr>
<th></th>
<th>B₁₂-rich foods</th>
<th>Protein-rich foods</th>
<th>Calcium-rich foods</th>
</tr>
</thead>
<tbody>
<tr>
<td>Children 4-8</td>
<td>2</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Adolescents 9-13</td>
<td>2</td>
<td>6</td>
<td>10</td>
</tr>
<tr>
<td>Adolescents 14-18</td>
<td>3</td>
<td>6</td>
<td>10</td>
</tr>
<tr>
<td>Pregnancy</td>
<td>4</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>Lactation</td>
<td>4</td>
<td>8</td>
<td>8</td>
</tr>
</tbody>
</table>

Section 4J: Vegetarian Diets

References


More Information


Caffeine-Free Diet

Use

This diet is for people with sensitivities to caffeine, those using certain medications, and for those undergoing a procedure called a Myoview Stress Test.

Diet Principles

Caffeine occurs naturally in beverages and foods made from
- coffee beans,
- tea leaves,
- kola nuts, and
- cacao seeds.
Caffeine is also found in over-the-counter medications such as
- analgesics,
- appetite suppressants, and
- nervous system stimulants.
All caffeine must be avoided for the Myoview Stress Test. This includes even decaffeinated beverages, which contain a small amount of caffeine (DePasquale, 2003).
People taking theophylline, the antibiotics ciprofloxacin, norfloxacin, and enoxacin, and the herbal product ephedra (ma huang) should avoid caffeine (Mayo Clinic, 2010).
Moderate amounts of caffeine (200 to 300 milligrams) are not harmful. Caffeine in excess (500 to 600 milligrams) can cause restlessness, anxiety, irritability, muscle tremors, sleeplessness, headaches, nausea, and abnormal heart rhythms (Mayo Clinic, 2010).
See Table 4K-1 to plan a caffeine-free diet.

References


### Table 4K-1: Caffeine content of some foods

<table>
<thead>
<tr>
<th>Product</th>
<th>Portion</th>
<th>Caffeine (milligrams per serving)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Candy</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dark chocolate (semi-sweet)</td>
<td>1.45 oz bar (41 g)</td>
<td>27</td>
</tr>
<tr>
<td>Fudge, chocolate, homemade</td>
<td>6 oz piece (17 g)</td>
<td>4</td>
</tr>
<tr>
<td>Milk chocolate</td>
<td>1.55 oz bar (44 g)</td>
<td>11</td>
</tr>
<tr>
<td><strong>Coffee</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cappuccino</td>
<td>4 fl oz (120 g)</td>
<td>35</td>
</tr>
<tr>
<td>Cappuccino, decaf</td>
<td>4 fl oz (120 g)</td>
<td>Trace</td>
</tr>
<tr>
<td>Coffee, brewed</td>
<td>8 fl oz (237 g)</td>
<td>137</td>
</tr>
<tr>
<td>Coffee, decaf, brewed</td>
<td>8 fl oz (237 g)</td>
<td>2</td>
</tr>
<tr>
<td>Coffee, dripolated</td>
<td>4.8 fl oz (140 g)</td>
<td>146</td>
</tr>
<tr>
<td>Coffee, from instant</td>
<td>8 fl oz (237 g)</td>
<td>68</td>
</tr>
<tr>
<td>Coffee, decaf, from instant</td>
<td>1 rounded tsp per 6 fl oz (179 g)</td>
<td>2</td>
</tr>
<tr>
<td>Coffee, instant powder</td>
<td>1 rounded tsp (1.5 g)</td>
<td>47</td>
</tr>
<tr>
<td>Coffee, decaf, instant powder</td>
<td>1 rounded tsp (1.8 g)</td>
<td>2</td>
</tr>
<tr>
<td>Coffee, from liquid concentrate</td>
<td>8 fl oz (237 g)</td>
<td>45</td>
</tr>
<tr>
<td>Coffee, percolated</td>
<td>4.8 fl oz (140 g)</td>
<td>110</td>
</tr>
<tr>
<td>Espresso, from restaurant</td>
<td>6 fl oz (178 g)</td>
<td>377</td>
</tr>
<tr>
<td>Espresso, decaf</td>
<td>6 fl oz (178 g)</td>
<td>2</td>
</tr>
<tr>
<td><strong>Desserts</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brownie, from mix</td>
<td>1 brownie (56 g)</td>
<td>7</td>
</tr>
<tr>
<td>Cake, chocolate, from mix</td>
<td>1/8 of 18 oz cake (64 g)</td>
<td>4</td>
</tr>
<tr>
<td>Cookie, chocolate chip, soft type</td>
<td>1 cookie (15 g)</td>
<td>1</td>
</tr>
<tr>
<td>Doughnut (cake), chocolate with chocolate icing</td>
<td>3-inch diameter doughnut (43 g)</td>
<td>5</td>
</tr>
<tr>
<td>Ice cream, chocolate</td>
<td>1/2 cup (66 g)</td>
<td>2</td>
</tr>
<tr>
<td>Pie, chocolate cream</td>
<td>1/6 of 8-inch pie (113g)</td>
<td>18</td>
</tr>
<tr>
<td>Pudding, chocolate, from instant mix with whole milk</td>
<td>1/2 cup (147 g)</td>
<td>3</td>
</tr>
<tr>
<td>Shake, chocolate</td>
<td>12 fl oz (250 g)</td>
<td>8</td>
</tr>
<tr>
<td><strong>Dessert-Toppings</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Icing/frosting, chocolate, ready-to-serve</td>
<td>2 Tbs (41 g)</td>
<td>1</td>
</tr>
<tr>
<td>Syrup, chocolate</td>
<td>2 Tbs or 1 fl oz (39 g)</td>
<td>5</td>
</tr>
<tr>
<td>Topping, chocolate</td>
<td>2 Tbs (38 g)</td>
<td>4</td>
</tr>
<tr>
<td><strong>Milk Drink</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chocolate milk, whole milk</td>
<td>8 fl oz (250 g)</td>
<td>5</td>
</tr>
<tr>
<td>Cocoa (hot chocolate) from mix</td>
<td>8 fl oz (250 g)</td>
<td>4</td>
</tr>
<tr>
<td>Instant breakfast mix, chocolate</td>
<td>1.2 oz packet (35 g)</td>
<td>9</td>
</tr>
<tr>
<td><strong>Miscellaneous</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baking Chocolate (unsweetened)</td>
<td>1 oz square (28 g)</td>
<td>57</td>
</tr>
<tr>
<td>Cocoa powder, unsweetened</td>
<td>1 Tbs (5 g)</td>
<td>12</td>
</tr>
<tr>
<td><strong>Soft Drinks</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coca-Cola Classic</td>
<td>12 fl oz</td>
<td>34</td>
</tr>
<tr>
<td>Diet Coke</td>
<td>12 fl oz</td>
<td>45</td>
</tr>
<tr>
<td>Mountain Dew</td>
<td>12 fl oz</td>
<td>55</td>
</tr>
</tbody>
</table>
## Table 4K-1 continued

<table>
<thead>
<tr>
<th>Product</th>
<th>Portion</th>
<th>Caffeine (milligrams per serving)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diet Mountain Dew</td>
<td>12 fl oz</td>
<td>55</td>
</tr>
<tr>
<td>Pepsi-Cola</td>
<td>12 fl oz</td>
<td>37</td>
</tr>
<tr>
<td>Diet Pepsi-Cola</td>
<td>12 fl oz</td>
<td>36</td>
</tr>
<tr>
<td>Tea</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tea, black, 3 minute brew</td>
<td>8 fl oz (237 g)</td>
<td>47</td>
</tr>
<tr>
<td>Tea, Black, 3 minute brew, decaf</td>
<td>8 fl oz (237 g)</td>
<td>2</td>
</tr>
<tr>
<td>Tea, iced, from instant</td>
<td>8 fl oz (237g)</td>
<td>31</td>
</tr>
<tr>
<td>Tea, iced, instant powder</td>
<td>1 tsp (0.7 g)</td>
<td>30</td>
</tr>
<tr>
<td>Tea, iced, decaf, instant powder</td>
<td>1 tsp (11g)</td>
<td>1</td>
</tr>
</tbody>
</table>


### More Information

Low Tyramine Diet

Use

Tyramine is a normally harmless compound found in many foods. The low tyramine diet is used to prevent a food-drug interaction between tyramine and a class of drugs called monoamine oxidase inhibitors (MAOIs). It is sometimes called a MAOI Diet for that reason. Abnormally high amounts of tyramine may build up in the blood of people who take these drugs, which can cause severe headache and high blood pressure (Thomson Micromedix, 2005). Foods with significant amounts of tyramine should be limited while these medicines are used and for up to two weeks after stopping them.

This diet also restricts similar compounds called dopamine, histamine, and phenylethelamine (ADA, 2000, p. 739). Physicians sometimes prescribe restriction of all of these amines to treat migraine headaches.

The foods to restrict on this diet have remained controversial. There is a great deal of variability between samples of the same category of foods. There is also variation between individuals, which may be influenced by the drug prescribed, the dose, or other factors (American Dietetic Association (ADA), 2000, p. 735).

Adequacy

There are no nutrient deficiencies associated with this diet.

Diet Principles

Avoid serving any foods that are high in tyramine.
Serve only 1/4 to 1/2 cup each day of foods that have a moderate amount of tyramine.
Serve only fresh, fresh-frozen, or fresh-canned foods, particularly those with meat, poultry, or fish.

Avoid all aged, improperly refrigerated, fermented, or over-ripe foods since these conditions increase tyramine content. Avoid using leftover food that has been stored for more than 2 days.

The following guide is based on the Manual of Clinical Dietetics, 6th Ed. (ADA, 2000, pp. 736-737) and the research of Walker, Shulman, Tailor, and Gardner (1996).

Beverages

Allowed: -fresh, pasteurized milk and cream
-soy or rice beverages
-non-dairy creamers made with allowed fats
-coffee, tea, and cereal beverages
-soft drinks

Caution: -buttermilk
-chocolate milk or hot chocolate
Section 4K: Other Diets

- nonalcoholic or light beer
- distilled liquor (gin, vodka, whiskey)
- red, white, and port wines

Not Allowed: 
- ales and tap beer
- burgundy wine, chianti wine, champagne, sherry, and vermouth
- unpasteurized milk

**Breads & Grains**

**Allowed:** all products except those made with cheese

**Not Allowed:** any containing aged cheese

**Fruits & Juices**

**Allowed:** all fresh or canned fruit and fruit juice

**Caution:** over-ripe avocado

**Not Allowed:** any that are fermented, moldy, spoiled, or over-ripe
- banana peel

**Desserts & Sweets**

**Allowed:** any made from allowed foods

**Caution:** chocolate pudding, ice cream, cake, cookie, or candy

**Not Allowed:** any desserts that contain foods that not allowed

**Meat & Meat Substitutes**

**Allowed:**
- fresh, fresh-frozen, or canned meat, poultry, or fish
- fresh sausage
- lunch meats except those not allowed
- cottage cheese, ricotta, farmer's cheese, cream cheese, mozzarella
- eggs
- legumes
- fresh tofu

**Caution:**
- peanuts, peanut butter
- havarti, boursin, or brie cheeses
- fresh or canned anchovies, bonito, and tuna
- fresh mackerel
- smoked or canned sardines and canned pilchards

**Not Allowed:**
- aged and processed cheese (cheddar, colby, swiss, bleu)
- dry fermented sausages (mortadella, pastrami, pepperoni, salami, summer sausage)
- smoked, dried, or pickled fish (caviar, herring, lox)
- non-fresh meat, poultry, or fish
- leftover foods containing meat, poultry, or fish
- fermented soybean products such as tempeh, miso, or tofu that is not fresh

**Soups**

**Allowed:**
- soups made with allowed ingredients

**Not Allowed:**
- soups containing meat extracts or cheese
- Bovril
Section 4K: Other Diets

Vegetables

Allowed: all except those not allowed
Not Allowed: fava bean pods
- Chinese pea pods or snow pea pods
- Italian or broad green beans
- kim chee (fermented cabbage)
- sauerkraut

Other Foods

Allowed: baker's yeast
Not Allowed: brewer's yeast, nutritional yeast (found in many protein supplements),
- yeast extracts and meat extracts (found in many commercial meat or poultry flavored products)
- Marmite or Vegamite spreads
- soy sauce

References


Appendix 5A: Pediatric Growth Charts

Weight-for-age percentiles: Boys, birth to 36 months
Weight-for-age percentiles: Girls, birth to 36 months
Length-for-age percentiles: Boys, birth to 36 months
Length-for-age percentiles: Girls, birth to 36 months
Weight-for-length percentiles: Boys, birth to 36 months
Weight-for-length percentiles: Girls, birth to 36 months
Head circumference-for-age percentiles: Boys, birth to 36 months
Head circumference-for-age percentiles: Girls, birth to 36 months
Weight-for-age percentiles: Boys, 2 to 20 years
Weight-for-age percentiles: Girls, 2 to 20 years
Stature-for-age percentiles: Boys, 2 to 20 years
Stature-for-age percentiles: Girls, 2 to 20 years
Weight-for-stature percentiles: Boys, 2 to 20 years
Weight-for-stature percentiles: Girls, 2 to 20 years
Body mass index-for-age percentiles: Boys, 2 to 20 years
Body mass index-for-age percentiles: Girls, 2 to 20 years

References


More Information

A tutorial is available on how to use and interpret the growth charts at http://www.cdc.gov/nccdphp/dnpa/growthcharts/guide_intro.htm
Weight-for-age percentiles:

Boys, birth to 36 months
<table>
<thead>
<tr>
<th>Age (months)</th>
<th>Birth</th>
<th>3</th>
<th>6</th>
<th>9</th>
<th>12</th>
<th>15</th>
<th>18</th>
<th>21</th>
<th>24</th>
<th>27</th>
<th>30</th>
<th>33</th>
<th>36</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>kg</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>lb</td>
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<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

Published May 30, 2000.

SOURCE: Developed by the National Center for Health Statistics in collaboration with the National Center for Chronic Disease Prevention and Health Promotion (2000).
CDC Growth Charts: United States

**Weight-for-age percentiles: Girls, birth to 36 months**
<table>
<thead>
<tr>
<th>Age (months)</th>
<th>kg</th>
<th>lb</th>
</tr>
</thead>
<tbody>
<tr>
<td>Birth</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>18</td>
<td></td>
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<td>18</td>
<td>21</td>
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<tr>
<td>21</td>
<td>24</td>
<td></td>
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<tr>
<td>24</td>
<td>27</td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>33</td>
<td></td>
</tr>
<tr>
<td>33</td>
<td>36</td>
<td></td>
</tr>
</tbody>
</table>

Published May 30, 2000.
SOURCE: Developed by the National Center for Health Statistics in collaboration with the National Center for Chronic Disease Prevention and Health Promotion (2000).
Length-for-age percentiles:
Boys, birth to 36 months

CDC Growth Charts: United States
Length-for-age percentiles:
Girls, birth to 36 months

Published May 30, 2000.
SOURCE: Developed by the National Center for Health Statistics in collaboration with the National Center for Chronic Disease Prevention and Health Promotion (2000).

SAFER•HEALTHIER•PEOPLE
Weight-for-length percentiles: Boys, birth to 36 months

Published May 30, 2000 (modified 6/8/00).
SOURCE: Developed by the National Center for Health Statistics in collaboration with the National Center for Chronic Disease Prevention and Health Promotion (2000).
CDC Growth Charts: United States

Weight-for-length percentiles:
Girls, birth to 36 months

Published May 30, 2000 (modified 6/8/00).
SOURCE: Developed by the National Center for Health Statistics in collaboration with the National Center for Chronic Disease Prevention and Health Promotion (2000).
Head circumference-for-age percentiles:
Boys, birth to 36 months

CDC Growth Charts: United States
<table>
<thead>
<tr>
<th>Birth</th>
<th>3</th>
<th>6</th>
<th>9</th>
<th>12</th>
<th>15</th>
<th>18</th>
<th>21</th>
<th>24</th>
<th>27</th>
<th>30</th>
<th>33</th>
<th>36</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (months)</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>1st</td>
<td>2nd</td>
<td>3rd</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5th</td>
<td>10th</td>
<td>15th</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

Published May 30, 2000.
SOURCE: Developed by the National Center for Health Statistics in collaboration with the National Center for Chronic Disease Prevention and Health Promotion (2000).
Head circumference-for-age percentiles:
Girls, birth to 36 months
<table>
<thead>
<tr>
<th>Age (months)</th>
<th>30</th>
<th>33</th>
<th>36</th>
</tr>
</thead>
<tbody>
<tr>
<td>Birth</td>
<td>3</td>
<td>6</td>
<td>9</td>
</tr>
<tr>
<td>12</td>
<td>12</td>
<td>15</td>
<td>18</td>
</tr>
<tr>
<td>21</td>
<td>24</td>
<td>27</td>
<td>30</td>
</tr>
<tr>
<td>32</td>
<td>34</td>
<td>36</td>
<td>14</td>
</tr>
<tr>
<td>13</td>
<td>14</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Published May 30, 2000.
SOURCE: Developed by the National Center for Health Statistics in collaboration with the National Center for Chronic Disease Prevention and Health Promotion (2000).
CDC Growth Charts: United States

Weight-for-age percentiles:
Boys, 2 to 20 years

Published May 30, 2000.
CDC Growth Charts: United States

Weight-for-age percentiles:
Girls, 2 to 20 years
Published May 30, 2000.
SOURCE: Developed by the National Center for Health Statistics in collaboration with the National Center for Chronic Disease Prevention and Health Promotion (2000).
CDC Growth Charts: United States

Stature-for-age percentiles:

Boys, 2 to 20 years
Published May 30, 2000.
SOURCE: Developed by the National Center for Health Statistics in collaboration with the National Center for Chronic Disease Prevention and Health Promotion (2000).
Stature-for-age percentiles:
Girls, 2 to 20 years
| Age (years) | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| 100        |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 95         |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 90         |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 85         |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 80         |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 75         |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| under 5    |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
CDC Growth Charts: United States

Weight-for-stature percentiles: Boys

kg – lb
34
33 – 72
32 –
31 – 68
30
29 – 64
28 –
27 – 60
26 –
25
24
23 –
22 – 48
21 –
20 – 44
19
18 – 40
17 –
16 – 36
15
14
13 – 28
12 –
11 – 24
10
9 – 20
8 –
Published May 30, 2000 (modified 11/21/00).

SOURCE: Developed by the National Center for Health Statistics in collaboration with the National Center for Chronic Disease Prevention and Health Promotion (2000).

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<table>
<thead>
<tr>
<th>Stature</th>
<th>80</th>
<th>85</th>
<th>90</th>
<th>95</th>
<th>100</th>
<th>105</th>
<th>110</th>
<th>115</th>
<th>120</th>
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</table>
CDC Growth Charts: United States

Weight-for-stature percentiles: Girls

Published May 30, 2000 (modified 11/21/00).
SOURCE: Developed by the National Center for Health Statistics in collaboration with
Body mass index-for-age percentiles:
Boys, 2 to 20 years

CDC Growth Charts: United States
CDC Growth Charts: United States

Body mass index-for-age percentiles:
Girls, 2 to 20 years
Published May 30, 2000.

SOURCE: Developed by the National Center for Health Statistics in collaboration with the National Center for Chronic Disease Prevention and Health Promotion (2000).

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Appendix 5B: Infant and Pediatric Feedings or Formulas

Table 5B-1: Composition of human milk and standard infant formulas (cow milk based: whey or casein predominant)

Table 5B-2: Composition of follow-up formulas for older infants and toddlers

Table 5B-3: General categories of specialized infant feedings and the conditions for appropriate use

Table 5B-4: Composition of formulas free of lactose and/or cow milk and special milk-based (casein hydrolysate-based) formulas

Table 5B-5: Composition of formulas with altered fat, protein, and carbohydrates

Table 5B-6: Pediatric lactose-free oral and/or tube feedings for children over 1 year of age

Legend for Tables 5B-1 through 5B-6

# MCT = medium-chain triglycerides
a Mead Johnson Nutritional Division (Evansville, IN), www.meadjohnson.com
b Nestle Infant Nutrition (Glendale, CA), www.nestle-nutrition.com
c Abbott Laboratories (Columbus, OH), http://abbottnutrition.com/
d SHS (Scientific Hospital Systems) North American (Gaithersburg, MD), www.shsna.com
e Wyeth-Ayerst Laboratories (Philadelphia, PA), www.brightbeginnings.com
<table>
<thead>
<tr>
<th>Formula Type</th>
<th>Distribution of Calories</th>
<th>Type Carbohydrate</th>
<th>Type Protein</th>
<th>Type Fat</th>
<th>Osmolality (m0sm/kg water)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Human milk</td>
<td>% Carbohydrate 42</td>
<td>Lactose</td>
<td>% Whey ~70</td>
<td>Human milk fat</td>
<td>290</td>
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<tr>
<td></td>
<td>% Protein 6</td>
<td></td>
<td>% Casein ~30</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>% Fat 52</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Enfamil Lipil a</td>
<td>% Carbohydrate 43.5</td>
<td>Lactose</td>
<td>% Nonfat cow milk 50</td>
<td>Palm olein</td>
<td>300</td>
</tr>
<tr>
<td></td>
<td>% Protein 8.5</td>
<td></td>
<td>% Reduced minerals whey 50</td>
<td>Coconut oil</td>
<td></td>
</tr>
<tr>
<td></td>
<td>% Fat 48</td>
<td></td>
<td>Whey 60%</td>
<td>Soy oil</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Casein 40%</td>
<td>High oleic sunflower oil</td>
<td></td>
</tr>
<tr>
<td>Similac e</td>
<td>% Carbohydrate 43</td>
<td>Lactose</td>
<td>Nonfat cow milk 50</td>
<td>High oleic safflower oil</td>
<td>300</td>
</tr>
<tr>
<td>Similac Advance c</td>
<td>% Protein 8</td>
<td></td>
<td>Whey protein concentrate</td>
<td>Soy oil</td>
<td></td>
</tr>
<tr>
<td></td>
<td>% Fat 49</td>
<td></td>
<td>Whey 48%</td>
<td>Coconut oil</td>
<td></td>
</tr>
<tr>
<td>Good Start Supreme b</td>
<td>% Carbohydrate 44</td>
<td>Lactose</td>
<td>% Demineralized whey 100</td>
<td>Palm olein</td>
<td>250</td>
</tr>
<tr>
<td>Good Start Essentials b</td>
<td>% Protein 10</td>
<td>Maltodextrin</td>
<td>% hydrolyzed 42</td>
<td>Soy oil</td>
<td></td>
</tr>
<tr>
<td></td>
<td>% Fat 46</td>
<td>Lactose</td>
<td>Demineralized whey</td>
<td>Coconut oil</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Corn syrup</td>
<td>Nonfat cow milk</td>
<td>High oleic safflower oil or</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Whey 60%</td>
<td>high oleic sunflower oil</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Casein 40%</td>
<td>Oleo</td>
<td></td>
</tr>
<tr>
<td>Store Brand Standard</td>
<td>% Carbohydrate 43 to 44</td>
<td>Lactose</td>
<td>Nonfat cow milk</td>
<td>Palm olein or palm oil</td>
<td>300</td>
</tr>
<tr>
<td>Formulas with Lipids e</td>
<td>% Protein 8 to 9</td>
<td></td>
<td>Demineralized whey</td>
<td>Coconut oil</td>
<td></td>
</tr>
<tr>
<td>Bright Beginnings with</td>
<td>% Fat 48</td>
<td></td>
<td>Whey 60%</td>
<td>Soy oil</td>
<td></td>
</tr>
<tr>
<td>Lipids e</td>
<td></td>
<td></td>
<td>Casein 40%</td>
<td>High oleic safflower oil or</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>sunflower oil</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Oleo</td>
<td></td>
</tr>
<tr>
<td>Enfamil AR Lipil a</td>
<td>% Carbohydrate 44</td>
<td>Lactose</td>
<td>Nonfat cow milk</td>
<td>Palm olein</td>
<td>240</td>
</tr>
<tr>
<td></td>
<td>% Protein 10</td>
<td>Rice starch</td>
<td>Casein 82%</td>
<td>Coconut oil</td>
<td></td>
</tr>
<tr>
<td></td>
<td>% Fat 46</td>
<td>Maltodextrin</td>
<td>Whey 18%</td>
<td>Soy oil</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>High oleic sunflower oil</td>
<td></td>
</tr>
</tbody>
</table>

Note. a Brady, Rickard, Fitzgerald, & Lemons. Department of Nutrition & Dietetics, Indiana University School Health & Rehabilitation Sciences.
Table 5B-2: Composition of follow-up formulas for older infants and toddlers

<table>
<thead>
<tr>
<th>Formula Type</th>
<th>Distribution of Calories</th>
<th>Type Carbohydrate</th>
<th>Type Protein</th>
<th>Type Fat</th>
<th>Osmolality (mOsm/kg water)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Good Start 2 Essentials&lt;sup&gt;a&lt;/sup&gt; (for 9 months and beyond) with extra Ca &amp; P</td>
<td>% Carbohydrate 53</td>
<td>% Corn syrup solids 59</td>
<td>Nonfat cow milk</td>
<td>Palm olein</td>
<td>325</td>
</tr>
<tr>
<td>Ca = 120 mg/100 calories</td>
<td>% Protein 10</td>
<td>% Lactose 30</td>
<td>Casein 82%</td>
<td>Soy oil</td>
<td></td>
</tr>
<tr>
<td>P = 80 mg/100 calories</td>
<td>% Fat 37</td>
<td>% Maltodextrin 11</td>
<td>Whey 18%</td>
<td>Coconut oil</td>
<td></td>
</tr>
<tr>
<td>Good Start 2 Supreme Soy&lt;sup&gt;b&lt;/sup&gt; (for 9 months and beyond) with extra Ca &amp; P</td>
<td>% Carbohydrate 44</td>
<td>% Corn maltodextrin 69</td>
<td>Soy protein isolate</td>
<td>Palm olein</td>
<td>175</td>
</tr>
<tr>
<td>Ca = 190 mg/100 calories</td>
<td>% Protein 11</td>
<td>% Sucrose 31</td>
<td></td>
<td>Soy oil</td>
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<tr>
<td>P = 106 mg/100 calories</td>
<td>% Fat 45</td>
<td></td>
<td></td>
<td>Coconut oil</td>
<td></td>
</tr>
<tr>
<td>Enfamil Next Step Lipil&lt;sup&gt;c&lt;/sup&gt; (for 9 months and beyond) with extra Ca &amp; P</td>
<td>% Carbohydrate 42</td>
<td>% Lactose 55</td>
<td>Nonfat cow milk</td>
<td>Palm olein</td>
<td>240</td>
</tr>
<tr>
<td>Ca = 195 mg/100 calories</td>
<td>% Protein 10</td>
<td>% Corn syrup solids 45</td>
<td>Casein 82%</td>
<td>Soy oil</td>
<td></td>
</tr>
<tr>
<td>P = 130 mg/100 calories</td>
<td>% Fat 48</td>
<td></td>
<td>Whey 18%</td>
<td>Coconut oil</td>
<td></td>
</tr>
<tr>
<td>Enfamil Next Step ProSobee Lipil&lt;sup&gt;d&lt;/sup&gt; (for 9 months and beyond) with extra Ca &amp; P</td>
<td>% Carbohydrate 47</td>
<td>Corn syrup solids</td>
<td>Soy protein isolate with L-methionine</td>
<td>Palm Olein</td>
<td>230</td>
</tr>
<tr>
<td>Ca = 195 mg/100 calories</td>
<td>% Protein 13</td>
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<td></td>
<td>Soy oil</td>
<td></td>
</tr>
<tr>
<td>P = 130 mg/100 calories</td>
<td>% Fat 40</td>
<td></td>
<td></td>
<td>Coconut oil</td>
<td></td>
</tr>
<tr>
<td>Similac 2 Advance&lt;sup&gt;e&lt;/sup&gt; (for 6 months and beyond) with extra Ca &amp; P</td>
<td>% Carbohydrate 43</td>
<td>Lactose</td>
<td>Nonfat cow milk</td>
<td>High oleic safflower oil</td>
<td>300</td>
</tr>
<tr>
<td>Ca = 118 mg/100 calories</td>
<td>% Protein 8</td>
<td></td>
<td>Whey protein concentrate</td>
<td>Soy oil</td>
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<tr>
<td>P = 64 mg/100 calories</td>
<td>% Fat 49</td>
<td></td>
<td>Casein 52%</td>
<td>Coconut oil</td>
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<tr>
<td>Isomil 2 Advance&lt;sup&gt;f&lt;/sup&gt; (for 6 months and beyond) with extra Ca &amp; P</td>
<td>% Carbohydrate 41</td>
<td>% Corn syrup solids 80</td>
<td>Soy protein isolate with L-methionine</td>
<td>High oleic safflower oil</td>
<td>200</td>
</tr>
<tr>
<td>Ca = 135 mg/100 calories</td>
<td>% Protein 10</td>
<td>% Sucrose 20</td>
<td></td>
<td>Soy oil</td>
<td></td>
</tr>
<tr>
<td>P = 90 mg/100 calories</td>
<td>% Fat 49</td>
<td></td>
<td></td>
<td>Coconut oil</td>
<td></td>
</tr>
</tbody>
</table>

Note.  <sup>a</sup> Adapted from Brady, Rickard, Fitzgerald, & Lemons. Department of Nutrition & Dietetics, Indiana University School Health & Rehabilitation Sciences.
Table 5B-3: General categories of specialized infant feedings and the conditions for appropriate use

<table>
<thead>
<tr>
<th>Type of Specialized Feeding</th>
<th>Conditions for Appropriate Use</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lactose free formulas (contain cow milk protein)</td>
<td>Primary or secondary lactase deficiency</td>
<td></td>
</tr>
<tr>
<td>Soy formulas (cow milk protein-free)</td>
<td>Primary or secondary lactase deficiency or vegetarianian</td>
<td></td>
</tr>
<tr>
<td>Formulas with protein alterations:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Casein Hydrolysates (special milk-based formulas with reduced allergenicity)</td>
<td>Cow milk and soy protein allergy; galactosemia</td>
<td>Alimentum Advance&lt;sup&gt;a&lt;/sup&gt; Enfamil Nutramigen Lipil&lt;sup&gt;a&lt;/sup&gt; Enfamil Pregestimil&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Formulas with protein alterations:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amino Acid Formulas (special milk-based formulas with reduced allergenicity)</td>
<td>Cow milk and soy protein allergy; galactosemia</td>
<td>EleCare (infants and children)&lt;sup&gt;a&lt;/sup&gt; Neocate Infant Formula&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Formulas with protein alterations:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Semi-Elemental Formulas (ages 1-10 years)</td>
<td>Extensive bowel resection; intractable diarrhea (for infants who do not tolerate other specialized formulas such as Pregestimil, Alimentum)</td>
<td>EleCare (infants and children)&lt;sup&gt;a&lt;/sup&gt; Neocate One&lt;sup&gt;a&lt;/sup&gt; Peptamen Junior&lt;sup&gt;b&lt;/sup&gt; Vivonex Pediatric&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Formulas with fat alterations</td>
<td>Steatorrhea (cystic fibrosis, biliary atresia, severe malnutrition); intestinal resection; intractable diarrhea; intestinal lymphangiectasia</td>
<td>Alimentum Advance&lt;sup&gt;a&lt;/sup&gt; EleCare (infants and children)&lt;sup&gt;a&lt;/sup&gt; Enfamil Pregestimil&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Premature feedings</td>
<td>Premature infants</td>
<td>Milk from premature baby's own mother</td>
</tr>
<tr>
<td>Breast milk</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Premature formulas</td>
<td>Premature infants in the hospital</td>
<td>Enfamil Premature Lipil&lt;sup&gt;e&lt;/sup&gt; Similac Special Care Advance&lt;sup&gt;e&lt;/sup&gt;</td>
</tr>
<tr>
<td>Premature formulas</td>
<td>Premature infants at discharge and throughout the first year</td>
<td>Enfamil Care Lipil&lt;sup&gt;e&lt;/sup&gt; Similac NeoSure Advance&lt;sup&gt;e&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Formula Type</th>
<th>Distribution of Calories</th>
<th>Type Carbohydrate</th>
<th>Type Protein</th>
<th>Type Fat</th>
<th>Osmolality (mOsm/kg water)</th>
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</thead>
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<tr>
<td><strong>LACTOSE FREE</strong></td>
<td></td>
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<td></td>
<td></td>
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</tr>
<tr>
<td>(with cow milk protein)</td>
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<td></td>
</tr>
<tr>
<td>Enfamil Lactofree Lipil&lt;sup&gt;a&lt;/sup&gt;</td>
<td>% Carbohydrate 42</td>
<td>Corn syrup solids</td>
<td>Milk protein isolate</td>
<td>Palm olein (Enfamil)</td>
<td>200</td>
</tr>
<tr>
<td>% Protein 9</td>
<td></td>
<td></td>
<td></td>
<td>Soy oil</td>
<td></td>
</tr>
<tr>
<td>% Fat 49</td>
<td></td>
<td>Maltodextrin and Sucrose</td>
<td></td>
<td>Coconut oil</td>
<td></td>
</tr>
<tr>
<td>Similac Lactose Free Advance&lt;sup&gt;e&lt;/sup&gt;</td>
<td></td>
<td></td>
<td></td>
<td>High oleic sunflower oil or Safflower oil</td>
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<tr>
<td>Similac Lactose Free Advance&lt;sup&gt;e&lt;/sup&gt;</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td><strong>SOY</strong></td>
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<td></td>
</tr>
<tr>
<td>Isomil Advance&lt;sup&gt;b&lt;/sup&gt;</td>
<td>% Carbohydrate 40 to 41</td>
<td>Corn syrup solids</td>
<td>Soy protein isolate with L-methionine</td>
<td>Soy oil and/or Coconut oil</td>
<td>180 to 240</td>
</tr>
<tr>
<td>Isomil DP&lt;sup&gt;e&lt;/sup&gt;</td>
<td>% Carbohydrate 40 to 41</td>
<td>Corn syrup solids and/or Maltodextrin and Sucrose</td>
<td></td>
<td>High oleic safflower oil or Sunflower oil</td>
<td></td>
</tr>
<tr>
<td>Good Start Essentials Soy&lt;sup&gt;b&lt;/sup&gt;</td>
<td>% Carbohydrate 40 to 41</td>
<td>Corn syrup solids</td>
<td>Soy protein isolate with L-methionine</td>
<td>Soy oil and/or Coconut oil</td>
<td>180 to 240</td>
</tr>
<tr>
<td>Store Brand Soy Formulas&lt;sup&gt;e&lt;/sup&gt;</td>
<td>% Carbohydrate 40 to 41</td>
<td>Corn syrup solids</td>
<td>Soy protein isolate with L-methionine</td>
<td>Soy oil and/or Coconut oil</td>
<td>180 to 240</td>
</tr>
<tr>
<td>Bright Beginnings Soy&lt;sup&gt;g&lt;/sup&gt;</td>
<td>% Carbohydrate 40 to 41</td>
<td>Corn syrup solids</td>
<td>Soy protein isolate with L-methionine</td>
<td>Soy oil and/or Coconut oil</td>
<td>180 to 240</td>
</tr>
<tr>
<td><strong>SOY (and Sucrose-Free)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Enfamil Prosobee Lipil&lt;sup&gt;a&lt;/sup&gt;</td>
<td>% Carbohydrate 42</td>
<td>Corn syrup solids</td>
<td>Soy protein isolate with L-methionine</td>
<td>Palm olein or palm oil</td>
<td>200 (liquid)</td>
</tr>
<tr>
<td>% Protein 10</td>
<td></td>
<td></td>
<td></td>
<td>High oleic safflower oil or sunflower oil</td>
<td>170 (powder)</td>
</tr>
<tr>
<td>% Fat 48</td>
<td></td>
<td></td>
<td></td>
<td>Soy oil</td>
<td></td>
</tr>
<tr>
<td>**Alimentum Advance&lt;sup&gt;e&lt;/sup&gt;</td>
<td>% Carbohydrate 41</td>
<td>Sucrose</td>
<td>Casein hydrolysate with L-cystine</td>
<td>% MCT&lt;sup&gt;a&lt;/sup&gt;</td>
<td>33</td>
</tr>
<tr>
<td>% Protein 11</td>
<td>Modified tapioca starch</td>
<td></td>
<td>L-tyrosine</td>
<td>High oleic safflower oil</td>
<td>370 (liquid)</td>
</tr>
<tr>
<td>% Fat 48</td>
<td></td>
<td></td>
<td>L-tryptophan</td>
<td>Soy oil</td>
<td>320 (powder)</td>
</tr>
<tr>
<td><strong>EleCare&lt;sup&gt;e&lt;/sup&gt;</strong></td>
<td>% Carbohydrate 43</td>
<td>Corn syrup solids</td>
<td>Free amino acids</td>
<td>High oleic safflower oil</td>
<td>335 (0.67 calorie/mL)</td>
</tr>
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<td>% Protein 15</td>
<td></td>
<td></td>
<td></td>
<td>Soy oil</td>
<td>551 (1 calorie/mL)</td>
</tr>
<tr>
<td>% Fat 42</td>
<td></td>
<td></td>
<td></td>
<td>% MCT&lt;sup&gt;a&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td><strong>Neocate Infant&lt;sup&gt;d&lt;/sup&gt;</strong></td>
<td>% Carbohydrate 47</td>
<td>Corn syrup solids</td>
<td>Free amino acids</td>
<td>High oleic safflower oil</td>
<td>375</td>
</tr>
<tr>
<td>% Protein 12</td>
<td></td>
<td></td>
<td></td>
<td>Soy oil</td>
<td></td>
</tr>
<tr>
<td>% Fat 41</td>
<td></td>
<td></td>
<td></td>
<td>% MCT&lt;sup&gt;a&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td><strong>Enfamil Nutramigen Lipil&lt;sup&gt;a&lt;/sup&gt;</strong></td>
<td>% Carbohydrate 41</td>
<td>Corn syrup solids</td>
<td>Casein hydrolysate with L-cystine</td>
<td>Palm Olein</td>
<td>320 (liquid)</td>
</tr>
<tr>
<td>% Protein 11</td>
<td>Modified corn starch</td>
<td></td>
<td>L-tyrosine</td>
<td>Soy oil</td>
<td>300 (powder)</td>
</tr>
<tr>
<td>% Fat 48</td>
<td></td>
<td></td>
<td>L-tryptophan</td>
<td>Coconut oil</td>
<td></td>
</tr>
<tr>
<td><strong>Enfamil Nutramigen Lipil&lt;sup&gt;a&lt;/sup&gt;</strong></td>
<td></td>
<td></td>
<td></td>
<td>High oleic sunflower oil</td>
<td></td>
</tr>
</tbody>
</table>

Table 5B-4 continued

<table>
<thead>
<tr>
<th>Formula Type</th>
<th>Distribution of Calories</th>
<th>Type Carbohydrate</th>
<th>Type Protein</th>
<th>Type Fat</th>
<th>Osmolality (mOsm/kg water)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enfamil Pregestimil&lt;sup&gt;a&lt;/sup&gt;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>% Carbohydrate</td>
<td>41</td>
<td>Corn syrup solids</td>
<td>Casein hydrolysate with % MCT&lt;sup&gt;a&lt;/sup&gt;</td>
<td>55</td>
</tr>
<tr>
<td></td>
<td>% Protein</td>
<td>11</td>
<td>Modified corn starch</td>
<td>L-cystine Soy oil</td>
<td>330 (1 calorie/mL)</td>
</tr>
<tr>
<td></td>
<td>% Fat</td>
<td>48</td>
<td>Dextrose (in powder)</td>
<td>L-tyrosine High oleic safflower oil (or L-tryptophan Corn oil (in powder)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Add type carbohydrate</td>
<td>52 gram carbohydrate and 12 oz water with 13 oz RCF equals full strength</td>
<td>Soy protein isolate Soy oil</td>
<td>High oleic safflower oil</td>
<td>Varies with source of carbohydrate</td>
</tr>
<tr>
<td></td>
<td>Add type protein</td>
<td>12</td>
<td>L-methionine</td>
<td>Coconut oil</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Add type fat</td>
<td>48</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. <sup>1</sup>From Brady, Rickard, Fitzgerald, & Lemons. Department of Nutrition & Dietetics, Indiana University School Health & Rehabilitation Sciences. Reprinted with permission.
<table>
<thead>
<tr>
<th>Formula Type</th>
<th>Distribution of Calories</th>
<th>Type Carbohydrate</th>
<th>Type Protein</th>
<th>Type Fat</th>
<th>Osmolality (mOsm/kg water)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>FAT ALTERATIONS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Portagen&lt;sup&gt;a&lt;/sup&gt;</td>
<td>% Carbohydrate 46 % Protein 14 % Fat 40</td>
<td>Corn syrup solids Sucrose</td>
<td>Sodium caseinate</td>
<td>% MCT&lt;sup&gt;#&lt;/sup&gt; Corn oil</td>
<td>87 350</td>
</tr>
<tr>
<td>Not an infant formula</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(liquid)</td>
</tr>
<tr>
<td>Enfamil Pregestimil&lt;sup&gt;a&lt;/sup&gt;</td>
<td>% Carbohydrate 41 % Protein 11 % Fat 48</td>
<td>Corn syrup solids Modified corn starch Dextrose (in powder)</td>
<td>Casein hydrolysate with L-cystine L-tyrosine L-tryptophan</td>
<td>% MCT&lt;sup&gt;#&lt;/sup&gt; Soy oil High oleic safflower oil (or sunflower in powder) Corn oil (in powder)</td>
<td>55 280 (0.67 calorie/mL) 330 (1 calorie/mL) 330 (powder)</td>
</tr>
<tr>
<td>Alimentum (Advance)&lt;sup&gt;c&lt;/sup&gt;</td>
<td>% Carbohydrate 41 % Protein 11 % Fat 48</td>
<td>Sucrose Modified tapioca starch</td>
<td>Casein hydrolysate with L-cystine L-tryptophan L-tyrosine</td>
<td>% MCT&lt;sup&gt;#&lt;/sup&gt; High oleic safflower Soy oil</td>
<td>50 370</td>
</tr>
<tr>
<td><strong>PROTEIN ALTERATIONS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Enfamil Nutramigen Lipil&lt;sup&gt;a&lt;/sup&gt;</td>
<td>See Table 5B-4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neocate Infant&lt;sup&gt;d&lt;/sup&gt;</td>
<td>See Table 5B-4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Enfamil Pregestimil&lt;sup&gt;a&lt;/sup&gt;</td>
<td>See above</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alimentum Advance&lt;sup&gt;e&lt;/sup&gt;</td>
<td>See above</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EleCare&lt;sup&gt;e&lt;/sup&gt; (infants/children)</td>
<td>% Carbohydrate 43 % Protein 15 % Fat 42</td>
<td>Corn syrup solids</td>
<td>Free L-amino acids</td>
<td>High oleic safflower oil % MCT&lt;sup&gt;#&lt;/sup&gt; Soy oil</td>
<td>33 335 (0.67 calorie/mL) 551 (1 calorie/mL)</td>
</tr>
<tr>
<td>Neocate One&lt;sup&gt;e&lt;/sup&gt;</td>
<td>(for children older than 1 year)</td>
<td>% Carbohydrate 58 % Protein 10 % Fat 32</td>
<td>Corn syrup solids</td>
<td>Free amino acids</td>
<td>Coconut oil Canola oil High oleic safflower oil % MCT&lt;sup&gt;#&lt;/sup&gt;</td>
</tr>
<tr>
<td>Vivonex Pediatric&lt;sup&gt;e&lt;/sup&gt;</td>
<td>% Carbohydrate 63 % Protein 12 % Fat 25</td>
<td>Maltodextrin Modified corn starch</td>
<td>Free amino acids</td>
<td>Soy oil MCT&lt;sup&gt;#&lt;/sup&gt;</td>
<td>68 360 (0.8 calorie/mL)</td>
</tr>
<tr>
<td>Peptamen Junior&lt;sup&gt;b&lt;/sup&gt;</td>
<td>Vanilla Unflavored (and flavor packets)</td>
<td>% Carbohydrate 55 % Protein 12 % Fat 33</td>
<td>Maltodextrin Corn starch Sucrose (in Vanillia Peptamen Jr.)</td>
<td>Hydrolyzed whey protein</td>
<td>Coconut oil Palm kernel oil Soy oil Canola oil %MCT&lt;sup&gt;#&lt;/sup&gt;</td>
</tr>
</tbody>
</table>
Table 5B-5 Continued

<table>
<thead>
<tr>
<th>Formula Type</th>
<th>Distribution of Calories</th>
<th>Type Carbohydrate</th>
<th>Type Protein</th>
<th>Type Fat</th>
<th>Osmolality m0sm/kg water</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pediatric Peptinex DT&lt;sup&gt;b&lt;/sup&gt; with fiber</td>
<td>% Carbohydrate 55</td>
<td>Maltodextrin</td>
<td>Free amino acids</td>
<td>Soy oil</td>
<td>290</td>
</tr>
<tr>
<td></td>
<td>% Protein 12</td>
<td>Modified corn starch</td>
<td>Casein hydrolysates</td>
<td>%MCT&lt;sup&gt;#&lt;/sup&gt; 50</td>
<td>(1 calorie/mL)</td>
</tr>
<tr>
<td></td>
<td>% Fat 33</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. <sup>1</sup>From Brady, Rickard, Fitzgerald, & Lemons. Department of Nutrition & Dietetics, Indiana University School Health & Rehabilitation Sciences.
Table 5B-6: Pediatric lactose-free oral and/or tube feedings for children over 1 year of age

<table>
<thead>
<tr>
<th>Formula Type</th>
<th>Distribution of Calories</th>
<th>Type Carbohydrate</th>
<th>Type Protein</th>
<th>Type Fat</th>
<th>Osmolality (mOsm/kg water)</th>
<th>Calories (per mL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kindercal TF&lt;sup&gt;a&lt;/sup&gt; (tube feeding with or without fiber)</td>
<td>% Carbohydrate 52 % Protein 11 % Fat 37</td>
<td>(TF without fiber) % Maltodextrin 75 % Sucrose 25 (Vanilla) % Maltodextrin 50 % Sucrose 50 (Chocolate) % Sucrose 75 % Maltodextrin 25</td>
<td>Milk protein concentrate</td>
<td>Canola oil High oleic sunflower oil Corn oil % MCT&lt;sup&gt;b&lt;/sup&gt;</td>
<td>(TF) 345 (Vanilla) 440 (Chocolate) 520</td>
<td>1.06</td>
</tr>
<tr>
<td>Kindercal Beverage&lt;sup&gt;a&lt;/sup&gt;</td>
<td>Vanilla Chocolate</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pediasure Enteral&lt;sup&gt;c&lt;/sup&gt;</td>
<td>Vanilla</td>
<td>% Carbohydrate 53 % Protein 12 % Fat 35</td>
<td>(Enteral) % Maltodextrin 85 % Sucrose 13 % Dextrose 2 (Vanilla, Strawberry, Banana Cream Oral) % Maltodextrin 30 % Sucrose 70 (Chocolate &amp; Orange Cream Oral) % Sucrose 100</td>
<td>Milk protein concentrate</td>
<td>High oleic safflower oil Soy oil % MCT&lt;sup&gt;b&lt;/sup&gt; lecithin mono- &amp; diglycerides (Oral)</td>
<td>(Enteral) 335 to 345 (Vanilla, Strawberry, Banana Cream Oral) 430 to 440 (Chocolate &amp; Orange Cream Oral) 520</td>
</tr>
<tr>
<td></td>
<td>Vanilla with fiber</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Chocolate</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Strawberry</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Banana Cream</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Orange Cream</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Resource Just for Kids&lt;sup&gt;b&lt;/sup&gt;</td>
<td>Vanilla</td>
<td>% Carbohydrate 44 % Protein 12 % Fat 44</td>
<td>Hydrolyzed cornstarch Sucrose Fructose (chocolate only)</td>
<td>Sodium caseinate Calcium caseinate Whey protein concentrate</td>
<td>High oleic safflower oil Soy oil % MCT&lt;sup&gt;b&lt;/sup&gt;</td>
<td>(Strawberry &amp; Vanilla) 390 (Chocolate) 440</td>
</tr>
<tr>
<td></td>
<td>Chocolate</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Strawberry</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Vanilla</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Compleat Pediatric&lt;sup&gt;c&lt;/sup&gt;</td>
<td>(tube feeding with fiber)</td>
<td>% Carbohydrate 50 % Protein 15 % Fat 35</td>
<td>Corn syrup solids Cranberry juice Peas, green beans Peaches</td>
<td>Chicken Sodium caseinate MCT&lt;sup&gt;a&lt;/sup&gt; Pea puree</td>
<td>Canola oil Chicken fat</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nutren Junior&lt;sup&gt;b&lt;/sup&gt;</td>
<td>Vanilla</td>
<td>% Carbohydrate 44 % Protein 12 % Fat 44</td>
<td>Maltodextrin Sucrose Pea fiber and inulin (in fiber formula)</td>
<td>Milk protein concentrate Whey protein concentrate</td>
<td>Soy oil Canola oil Coconut oil Palm kernel oil % MCT&lt;sup&gt;b&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Vanilla with fiber</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. <sup>1</sup>Adapted from Brady, Rickard, Fitzgerald, & Lemons. Department of Nutrition & Dietetics, Indiana University School Health & Rehabilitation Sciences. Reprinted with permission.
Appendix 5C: Weights and Measures Reference Tables

Table 5C-1: Sizes and capacities of steam table pans

Table 5C-2: Full sheet tray cutting yields

Table 5C-3: Scoop or disher sizes

Table 5C-4: Common volume measures

Table 5C-5: Common weight measures

Table 5C-6: Conversion factors

Table 5C-7: Atomic weight and valence of selected elements

Reference

### Table 5C-1: Sizes and capacities of steam table pans

<table>
<thead>
<tr>
<th>General Size</th>
<th>Common Name</th>
<th>Dimensions width x length x depth (inches)</th>
<th>Brimful Capacity</th>
<th>Non-spill Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full Full</td>
<td>Full Shallow</td>
<td>12 x 20 x 2.5</td>
<td>8.3 Quarts</td>
<td>7.85 Liters</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>6 Quarts</td>
<td>5.68 Liters</td>
</tr>
<tr>
<td>Full Full</td>
<td>Full Medium</td>
<td>12 x 20 x 4</td>
<td>14 Quarts</td>
<td>13.25 Liters</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>12 Quarts</td>
<td>11.36 Liters</td>
</tr>
<tr>
<td>Full Full</td>
<td>Full Deep</td>
<td>12 x 20 x 6</td>
<td>21 Quarts</td>
<td>19.87 Liters</td>
</tr>
<tr>
<td>Standard</td>
<td>Half Shallow</td>
<td>12 x 10 x 2.5</td>
<td>4.3 Quarts</td>
<td>4.07 Liters</td>
</tr>
<tr>
<td>Long Half</td>
<td>Long Half 1 inch</td>
<td>6.5 x 20 x 1.25</td>
<td>2.1 Quarts</td>
<td>1.99 Liters</td>
</tr>
<tr>
<td></td>
<td>Long Half Shallow</td>
<td>6.5 x 20 x 2.5</td>
<td>3.7 Quarts</td>
<td>3.5 Liters</td>
</tr>
<tr>
<td></td>
<td>Long Half Medium</td>
<td>6.5 x 20 x 4</td>
<td>5.7 Quarts</td>
<td>5.39 Liters</td>
</tr>
<tr>
<td></td>
<td>Long Half Deep</td>
<td>6.5 x 20 x 6</td>
<td>8.2 Quarts</td>
<td>7.76 Liters</td>
</tr>
</tbody>
</table>

### Table 5C-2: Full sheet tray (18 x 26 inches) cutting yields

<table>
<thead>
<tr>
<th>Piece Dimensions Width x Length (inches)</th>
<th>Piece Size (square inches)</th>
<th>Number of Pieces</th>
<th>Number of Cuts per Width x Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 x 2</td>
<td>6</td>
<td>78</td>
<td>6 x 13</td>
</tr>
<tr>
<td>2 x 2</td>
<td>4</td>
<td>117</td>
<td>9 x 13</td>
</tr>
</tbody>
</table>

### Table 5C-3: Scoop or disher sizes

<table>
<thead>
<tr>
<th>Scoop Size Number*</th>
<th>Approximate Volume (fluid ounces)</th>
<th>Approximate Volume</th>
<th>Approximate Scoops per Cup</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>8</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>6.4</td>
<td>1.25</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>5.3</td>
<td>2/3 cup</td>
<td>1.5</td>
</tr>
<tr>
<td>8</td>
<td>4</td>
<td>1/2 cup</td>
<td>2</td>
</tr>
<tr>
<td>10</td>
<td>3.2</td>
<td>3/8 cup</td>
<td>2.5</td>
</tr>
<tr>
<td>12</td>
<td>2.6</td>
<td>1/3 cup</td>
<td>3</td>
</tr>
<tr>
<td>16</td>
<td>2</td>
<td>1/4 cup</td>
<td>4</td>
</tr>
<tr>
<td>20</td>
<td>1.6</td>
<td>3 1/5 Tbs</td>
<td>5</td>
</tr>
<tr>
<td>24</td>
<td>1.3</td>
<td>2 2/3 Tbs</td>
<td>6</td>
</tr>
<tr>
<td>30</td>
<td>1.1</td>
<td>2 1/5 Tbs</td>
<td>7.5</td>
</tr>
<tr>
<td>40</td>
<td>0.8</td>
<td>1 3/5 Tbs</td>
<td>10</td>
</tr>
<tr>
<td>60</td>
<td>0.5</td>
<td>1 Tbs</td>
<td>15</td>
</tr>
</tbody>
</table>

*Scoop numbers refer to the number of scoops in a quart.
### Table 5C-4: Common volume measures

<table>
<thead>
<tr>
<th>U.S. Volume Measures</th>
<th>Equivalent U.S. Fluid Ounces (rounded)</th>
<th>Equivalent Milliliters (rounded)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ounce</td>
<td>1</td>
<td>30</td>
</tr>
<tr>
<td>cup</td>
<td>8</td>
<td>237</td>
</tr>
<tr>
<td>tablespoon = 3 teaspoons</td>
<td>0.5</td>
<td>15</td>
</tr>
<tr>
<td>teaspoon</td>
<td>0.17</td>
<td>5</td>
</tr>
<tr>
<td>pint = 2 cups</td>
<td>16</td>
<td>473</td>
</tr>
<tr>
<td>quart = 2 pints</td>
<td>32</td>
<td>946</td>
</tr>
<tr>
<td>gallon = 4 quarts</td>
<td>128</td>
<td>3785</td>
</tr>
<tr>
<td>liter</td>
<td>34</td>
<td>1000</td>
</tr>
</tbody>
</table>

### Table 5C-5: Common weight measures

<table>
<thead>
<tr>
<th>U.S. Weight Measures</th>
<th>Grams (rounded)</th>
<th>Ounces (rounded)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 ounce =</td>
<td>28 (actual = 28.35)</td>
<td>1</td>
</tr>
<tr>
<td>1 pound =</td>
<td>454</td>
<td>16</td>
</tr>
<tr>
<td>1 gram =</td>
<td>1</td>
<td>0.04</td>
</tr>
<tr>
<td>1 kilogram =</td>
<td>1000</td>
<td>35</td>
</tr>
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### Table 5C-6: Conversion factors

<table>
<thead>
<tr>
<th>To convert</th>
<th>To</th>
<th>Multiply by</th>
<th>Divide by</th>
</tr>
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<tr>
<td>inch</td>
<td>centimeter</td>
<td>2.54</td>
<td></td>
</tr>
<tr>
<td>centimeter</td>
<td>inch</td>
<td>2.54</td>
<td></td>
</tr>
<tr>
<td>feet</td>
<td>inch</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>ounce</td>
<td>gram</td>
<td>28</td>
<td></td>
</tr>
<tr>
<td>pound</td>
<td>gram</td>
<td>454</td>
<td></td>
</tr>
<tr>
<td>kilogram</td>
<td>pound</td>
<td>2.2</td>
<td></td>
</tr>
<tr>
<td>kilogram</td>
<td>gram</td>
<td>1000</td>
<td></td>
</tr>
<tr>
<td>gram</td>
<td>kilogram</td>
<td>0.0001</td>
<td></td>
</tr>
<tr>
<td>gram</td>
<td>milligrams</td>
<td>1000</td>
<td></td>
</tr>
<tr>
<td>gram</td>
<td>ounce</td>
<td>0.0001</td>
<td>28</td>
</tr>
<tr>
<td>Celsius</td>
<td>Fahrenheit</td>
<td>multiply by 1.8 and add 32</td>
<td></td>
</tr>
<tr>
<td>Fahrenheit</td>
<td>Celsius</td>
<td>subtract 32 and multiple by 0.55</td>
<td></td>
</tr>
<tr>
<td>NaCl</td>
<td>Na</td>
<td>0.393</td>
<td></td>
</tr>
<tr>
<td>Na</td>
<td>NaCl</td>
<td>2.54</td>
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</table>

### Table 5C-7: Atomic weight and valence of selected elements

<table>
<thead>
<tr>
<th>Element</th>
<th>Atomic Weight</th>
<th>Valence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sodium</td>
<td>Na</td>
<td>23</td>
</tr>
<tr>
<td>Chlorine</td>
<td>Cl</td>
<td>35.4</td>
</tr>
<tr>
<td>Potassium</td>
<td>K</td>
<td>39</td>
</tr>
<tr>
<td>Magnesium</td>
<td>Mg</td>
<td>24</td>
</tr>
<tr>
<td>Phosphorus</td>
<td>P</td>
<td>31</td>
</tr>
<tr>
<td>Calcium</td>
<td>Ca</td>
<td>40</td>
</tr>
</tbody>
</table>

To convert milligrams to milliequivalents, divide milligrams by the atomic weight of the element and multiply by the valence.