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Public Health Surveillance System Update

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The purpose of the Indiana Public Health Emergency Surveillance System (PHESS) is to detect acts of bioterrorism, disease outbreaks, and other public health emergencies as early as possible. In addition, the PHESS augments traditional disease surveillance by offering a "situational awareness" capability during known outbreaks. The purpose of this article is to describe the continued evolution of Indiana's PHESS.

Over the past year, we have enhanced the Indiana PHESS by connecting 29 additional hospital emergency departments (ED) to the system. The PHESS now includes 67 EDs securely transmitting patient chief complaint data to the ISDH in near real-time. (We anticipate connecting 12 additional hospitals by August 2007.) These additional ED data sources have nearly doubled the daily surveillance data flow through the ESSENCE data analysis tool, from 3,500 patient encounters in August 2005 to 6,000 currently. Further, these hospital connections provide enhanced geographic coverage, thereby improving the performance capability of the PHESS. While expanding the PHESS by simply adding more ED data sources is necessary to achieve adequate coverage, another way to improve the system is to increase the number of appropriate public health officials who view these data. With additional users viewing data through ESSENCE, analysis and response time are enhanced.

Early in 2006, the ISDH PHESS staff partnered with a group of Indiana public health professionals participating in a leadership development program through the Mid-America Regional Public Health Training Institute (MARPHLI). As their final project, group members volunteered to develop training materials to pilot with counties and hospitals participating in the

PHESS. This pilot was conducted in Marion, Montgomery, Delaware, Monroe, Vigo, Vanderburgh, and Warrick Counties. Local health department (LHD) and hospital personnel were given a general orientation to the PHESS and educated specifically on the use of the ESSENCE data analysis tool. User accounts were created for the appropriate individuals at each organization so they could access the data for their LHDs or hospital(s). The ESSENCE pilot project was time well spent in developing important relationships, enhancing capacity at the local level, and improving the ISDH's approach to the future statewide rollout of ESSENCE. Expanding access to the PHESS syndromic surveillance data in this way greatly improves the ability to identify, and if needed, respond to significant public health events.

During the early development phase of the PHESS, access to syndromic surveillance data was necessarily limited to the Indiana State Department of Health (ISDH) PHESS staff and a small group of individuals at the Marion County Health Department. This time was used to establish a reliable syndromic data flow and for epidemiology staff to learn how to "read" the data. While the ESSENCE interface does an outstanding job of categorizing and statistically processing the data, a skilled epidemiologist must ultimately discern what data truly appear to have both statistical significance, as well as practical public health significance. When PHESS epidemiologists think alert data merit further investigation, these data are relayed to an ISDH field epidemiologist for follow-up with the hospital and LHD. As LHDs and hospitals gain access to ESSENCE, the field epidemiologists will be able to send secure data links to them via email, vastly improving the investigation process.

Currently, the ISDH PHESS staff are gearing up to provide ESSENCE access and training for key infection control and ED personnel at all Indiana hospitals connected to the PHESS and all LHDs. This rollout is expected to be completed by early 2007.

OUTBREAK SPOTLIGHT....

Outbreak Spotlight is a regularly occurring feature in the Indiana Epidemiology Newsletter to illustrate the importance of various aspects of an outbreak investigation. The event described below highlights an investigation for an unusual waterborne outbreak .

It Must Be the Water

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Background

On February 17, 2006, a representative of a local health department (LHD) notified the Indiana State Department of Health (ISDH) that the infection control nurse of the local hospital had reported three confirmed cases of campylobacteriosis. The three confirmed cases were residents of a small community of approximately 600-800 persons. That same day, the LHD received three telephone calls from citizens of the same town indicating they were experiencing gastrointestinal symptoms.

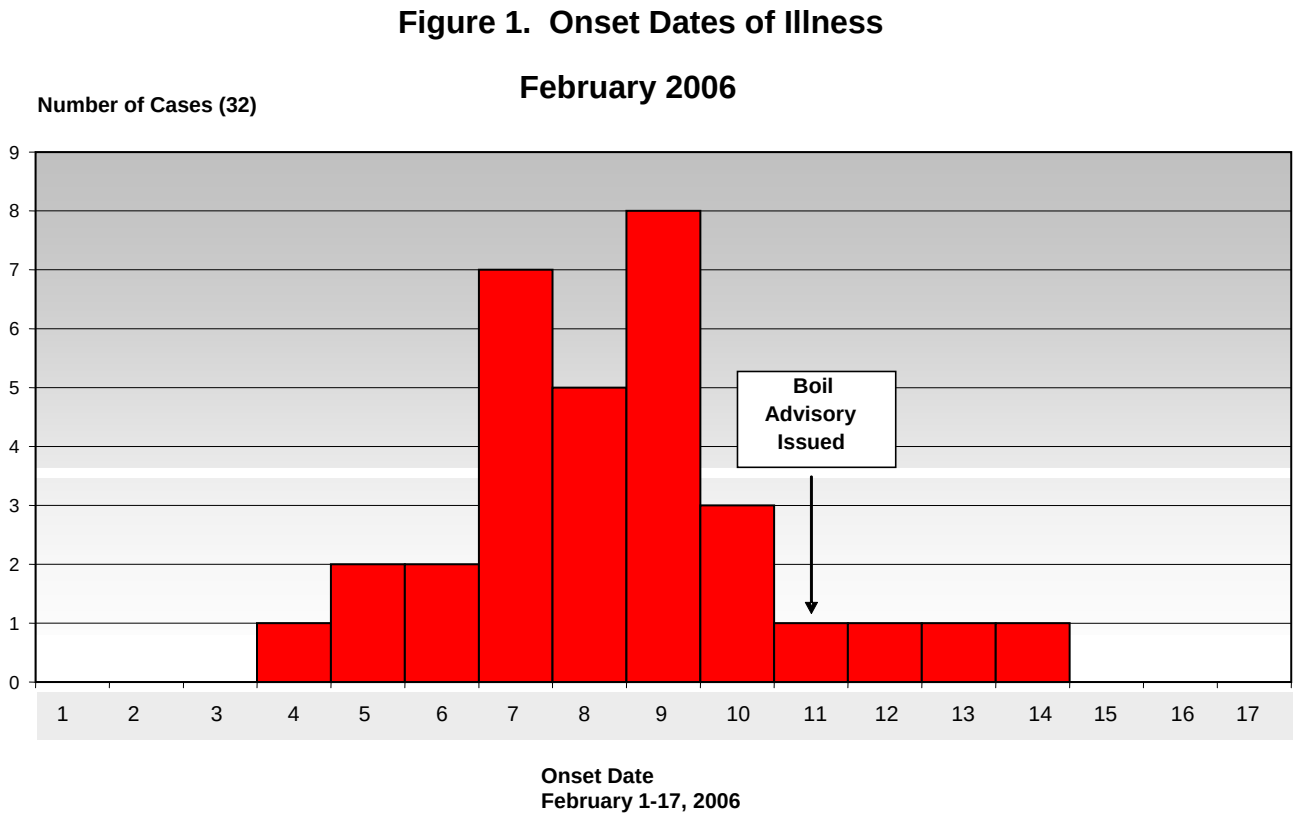
Epidemiologic Investigation

The ISDH and the LHD initiated a collaborative investigation of this outbreak. A case-control study was conducted in order to determine whether the source may have been food- or water-related. The ISDH developed a questionnaire that documented illness and exposure history and forwarded it to the LHD. The ISDH and the LHD conducted telephone interviews with residents who reported illness and unmatched controls identified through interviews and random digit dialing. Completed questionnaires were forwarded to the ISDH Epidemiology Resource Center for analysis. A case was defined as any previously healthy person who resided in the town and became ill on or after February 4, 2006, with diarrhea, abdominal cramps, nausea, fatigue, fever, and/or vomiting. Any person who did not become ill was eligible to be included as a control. Any person who was ill with symptoms that did not include diarrhea, abdominal cramps, nausea, fatigue, fever, and/or vomiting was excluded from the study.

Residents who called the LHD on February 17, 2006, indicated that the municipal tap water was discolored and had an unusual odor. The LHD contacted the water operator of the town to ask if the water system was experiencing any problems. The water operator indicated there had been recent problems with the water system in the town. The LHD issued a boil-order advisory effective February 17, 2006, recommending that all residents using municipal water boil their water before use. The ISDH and LHD continued surveillance for additional cases of gastrointestinal symptoms.

Thirty-four residents reported illness, and 32 met the case definition. Thirty-seven controls were identified. Symptoms reported by the 32 cases included: diarrhea (50.7%), abdominal cramps (38.0%), fatigue (38.0%), nausea (33.8%), fever (26.8%), and vomiting (18.3%). Other symptoms included headache, joint pain, and loss of appetite. Illness onset dates ranged from February 4 until February 21 (Figure 1). Based on the issues regarding the water system, these dates represent the time period when a majority of the residents became ill. The mean duration of illness was 6.3 days (range: 1 day to 14 days). Nine people submitted stool samples for laboratory diagnosis (see Laboratory Results). At least 19 people did seek medical attention, and 3 were hospitalized. No statistical comparisons of different water sources (i.e., bottled water, well water, or alternative water source) could be analyzed, because the majority of those interviewed received and consumed water from the municipal supply.

Figure 1. Onset dates of gastroenteritis during February 2006.



Information about possible sources of the outbreak was collected during the investigation. Exact logistic regression (SAS 9.1) was used to evaluate the association between illness and specific risk factors. The following factors were analyzed: drinking municipal tap water, contact with pets, contact with ill people, and eating at restaurants. Table 1 shows the odds ratios, confidence intervals, and p-values for each event. Drinking tap water was found to have a statistically significant association to illness (odds ratio = 18.30, p-value = .002).

Table 1: Comparisons of odds ratios, confidence intervals, and p-values associated with specific risk factors (February 2006)

Variable	Odds Ratio (95% CI)	P-Value
Drinking municipal tap water	18.295 (2.590 – >100)	0.0018
Contact with pets	1.849 (0.275 – 13.17)	0.7095
Contact with ill people	0.564 (0.103 – 2.819)	0.6446
Eating at restaurants	0.184 (0.004 – 1.689)	0.1974

Environmental Assessment

A representative of the LHD contacted the water operator of the town on February 17, 2006, to inquire about any problems with the water system. The water supply to the town comes from a groundwater source. The water operator informed the LHD and Indiana Department of Environmental Management (IDEM) that the chlorine feed possibly did not work properly several weeks prior to the outbreak. During this time, the water supply did not meet the recommended chlorination concentration level of 1.00 ppm. The representative from the LHD issued a boil-water advisory, and the ISDH informed IDEM of the situation.

On February 20, 2006, an inspector from IDEM visited the water treatment facility to investigate the water system. Prior to the outbreak, a new water main was installed without a valid permit. The water main was pressure tested and was left under pressure with nonpotable water, resulting in a cross-contamination hazard. Prior to the outbreak, the chlorine feed did not function properly; therefore, the water supply was not receiving the proper amount of chlorination. This equipment malfunction caused the chlorine levels in the water to fall below the recommended concentration levels of 1.00 ppm. When routine samples of the water were collected on February 16, the samples tested positive for total coliform. On February 17, water samples tested positive for total coliform and *E. coli*, an indication of fecal contamination. IDEM advised that the boil-water advisory could be lifted on March 3, after two sets of two absent total coliform water samples were collected and tested. IDEM further required the water operator to submit weekly coliform samples for five weeks and to maintain total chlorine levels of at least 1.00 ppm in the distribution system.

Laboratory Results

Nine cases submitted stool specimens for analysis. Seven specimens were positive for *Campylobacter* species. All tested negative for *E. coli* O157:H7, *Salmonella,* and *Shigella*.

Conclusions

This investigation confirms that an outbreak of campylobacteriosis occurred among residents between February 4-21, 2006. The only consistent and statistically significant exposure among the cases was consuming municipal tap water. The causative agent was *Campylobacter*. A confirmed case was defined as a resident who tested positive for *Campylobacter* and experienced gastrointestinal illness on or after February 4, 2006. A probable case was defined as any person who experienced all symptoms but had no laboratory confirmation. A suspect case was defined as any person who exhibited some symptoms without laboratory confirmation.

Campylobacteriosis is an infectious disease caused by bacteria of the genus *Campylobacter*[1]. *Campylobacter* is one of the most common bacterial causes of diarrheal illness in the United States[1]. Symptoms include diarrhea (frequently with bloody stools), abdominal pain, malaise, fever, nausea and/or vomiting[2]. The incubation period is usually 2-5 days, but can range from 1-10 days depending on the dose ingested[2]. Individuals can shed the bacteria throughout the course of infection, lasting several days to several weeks[2]. Transmission occurs by ingestion of undercooked or contaminated food, including unpasteurized milk and untreated water, by direct contact with fecal material from infected animals (particularly puppies and cats) or contact with infected individuals[3]. Antibiotics can shorten the duration of illness if taken early in the illness[3]. Although rare, some long-term consequences such as reactive arthritis and Guillain-Barré syndrome can result from C*ampylobacter* infection[1].

According to the epidemiologic and environmental investigations, illness most likely resulted from consuming contaminated municipal water shortly before February 4, 2006 through February 11, 2006. Positive total coliform tests indicate the presence of various types of potential disease-causing microorganisms in the water from environmental sources. Some microorganisms, including *Campylobacter*, can cause acute infection. If water samples test positive for total coliform, the water is then tested for *E. coli* to determine if fecal contamination is present. Water samples collected from the municipal water system tested positive for both total coliform and *E. coli*, indicating contamination of the municipal water system.

Several factors may have led to the contamination of the water supply to the residents of the town. It is possible that installation of the new water main could have led to a drop in pressure and a cross-contamination hazard. Muddy conditions existed when the pipes were installed. It is essential to sanitize and super-chlorinate when work on water mains is conducted. Disinfection of water ensures that dangerous microbial contaminants are killed. When the chlorine feed in the town did not function prior to the outbreak, the chlorine levels did not meet recommended concentration levels. Thus, contaminants such as *E. coli* and *Campylobacter* could have infiltrated the water distribution system and been ingested by residents. Once the boil-water advisory was issued, the number of cases greatly decreased, and the outbreak ended.

This study included some limitations. First, exposure bias by the town's residents that the water was the source of their infection may have occurred due to significant local media attention. Second, recall bias also may have occurred, because some individuals who were interviewed

could not remember various exposures, including foods eaten. Another limitation of this study was missing data, including possible exposures and symptoms, were not collected on initial interviews. However, statistical associations between exposures and illness were not affected significantly.

The LHD and the ISDH issued several news releases to the media and surrounding LHDs describing the outbreak. The collaborative effort between the LHD, ISDH, and IDEM ensured the rapid identification and prevention of additional cases of illness.

References

1. Centers for Disease Control and Prevention. Campylobacter infections. [online posting] 2005 October 6. www.cdc.gov/ncidod/dbmd/diseaseinfo/campylobacter_g.htm. Accessed 2006 June 20.

2. Heymann, DL, ed. Control of Communicable Diseases Manual. 18th ed. Baltimore: United Book Pr; 2004. 81-4.

3. Pickering, LK, ed. Red book. 26th ed. Elk Grove Village: Am Academy of Ped; 2003. 227-8.

REVISED, UPDATED ISDH PANDEMIC INFLUENZA PLAN NOW AVAILABLE

The ISDH Pandemic Influenza Planning Committee has revised and updated the first edition of the *ISDH Pandemic Influenza Plan* that was published in August 2005. The Plan was reorganized and expanded to reflect topics included in the federal HHS Plan (www.pandemicflu.gov) published in November 2005. More information on vaccines and antiviral medication, infection control, laboratory testing, clinical guidelines, ethical considerations, and guidance on submitting influenza specimens for laboratory testing has been included.

The purpose of the ISDH Plan is to provide an overview of the many medical and public health issues related to an influenza pandemic. The Plan can be accessed through the ISDH Web site: http://www.in.gov/isdh/bioterrorism/PandemicFlu/pdfs/PandemicInfluenzaPlan.pdf . Other information about pandemic influenza is also available at http://www.fluinfo.In.gov.

Training Room

INDIANA STATE DEPARTMENT OF HEALTH IMMUNIZATION PROGRAM PRESENTS:

Immunizations from A to Z

Immunization Health Educators offer this FREE, one-day educational course that includes:

- Principles of Vaccination
- Childhood and Adolescent Vaccine-Preventable Diseases
- Adult Immunizations
    - Pandemic Influenza
- General Recommendations on Immunization
    - Timing and Spacing
    - Indiana Immunization Requirements
    - Administration Recommendations
    - Contraindications and Precautions to Vaccination
- Safe and Effective Vaccine Administration
- Vaccine Storage and Handling
- Vaccine Misconceptions
- Reliable Resources

This course is designed for all immunization providers and staff. Training manual, materials, and certificate of attendance are provided to all attendees. Please see the Training Calendar for presentations throughout Indiana. Registration is required. To attend, schedule/host a course in your area or for more information, please contact Angie Schick **317.460.3671 or aschick@isdh.IN.gov; or http://www.IN.gov/isdh/programs/immunization.htm**

ISDH Data Reports Available

The ISDH Epidemiology Resource Center has the following data reports and the Indiana Epidemiology Newsletter available on the ISDH Web Page:

http://www.IN.gov/isdh/dataandstats/data_and_statistics.htm

HIV/STD Quarterly Reports (1998-Dec 05)	Indiana Mortality Report (1999, 2000, 2001, 2002, 2003, 2004)
Indiana Cancer Incidence Report (1990, 95, 96, 97, 98)	Indiana Infant Mortality Report (1999, 2002, 2003, 2004)
Indiana Cancer Mortality Report (1990-94, 1992-96)	Indiana Natality Report (1998, 99, 2000, 2001, 2002, 2003, 2004)
Combined Cancer Mortality and Incidence in Indiana Report (1999, 2000, 2001, 2002)	Indiana Induced Termination of Pregnancy Report (1998, 99, 2000, 2001, 2002, 2003, 2004)
Indiana Health Behavior Risk Factors (1999, 2000, 2001, 2002, 2003, 2004, 2005)	Indiana Marriage Report (1995, 97, 98, 99, 2000, 2001, 2002)
Indiana Health Behavior Risk Factors (BRFSS) Newsletter (9/2003, 10/2003, 6/2004, 9/2004, 4/2005, 7/2005, 12/2005, 1/2006, 8/2006, 10/2006)	Indiana Infectious Disease Report (1997, 98, 99, 2000, 2001, 2002, 2003)
Indiana Hospital Consumer Guide (1996)	Indiana Maternal & Child Health Outcomes & Performance Measures (1990-99, 1991-2000, 1992-2001, 1993-2002, 1994-2003)
Public Hospital Discharge Data (1999, 2000, 2001, 2002, 2003, 2004)	

HIV Disease Summary

Information as of September 30, 2006 (based on 2000 population of 6,080,485)

HIV - without AIDS to date:

344	New HIV cases from October 2005 thru September 30, 2006	12-month incidence	5.98 cases/100,000
3,640	Total HIV-positive, alive and without AIDS on September 30, 2006	Point prevalence	63.28 cases/100,000

AIDS cases to date:

315	New AIDS cases from October 2005 thru September 2006	12-month incidence	5.48 cases/100,000
3,873	Total AIDS cases, alive on September 30, 2006	Point prevalence	67.33 cases/100,000
8,055	Total AIDS cases, cumulative (alive and dead)		

REPORTED CASES of selected notifiable diseases

Disease	Cases Reported in September *MMWR* Weeks 35-39		Cumulative Cases Reported January – September *MMWR* Weeks 1-39	
	2005	2006	2005	2006
Campylobacteriosis	47	69	334	409
Chlamydia	2,184	1,703	15,090	14,895
E. coli O157:H7	6	17	46	67
Hepatitis A	2	4	14	23
Hepatitis B	4	7	32	42
Invasive Drug Resistant *S. pneumoniae* (DRSP)	13	6	157	118
Invasive pneumococcal (less than 5 years of age)	5	5	54	51
Gonorrhea	896	875	6,110	6,627
Legionellosis	6	5	20	25
Lyme Disease	3	0	27	16
Measles	0	0	33	1
Meningococcal, invasive	2	2	18	20
Mumps	0	0	1	10
Pertussis	39	32	241	184
Rocky Mountain Spotted Fever	0	0	0	4
Salmonellosis	82	131	463	684
Shigellosis	12	27	119	114
Syphilis (Primary and Secondary)	4	12	49	66
Tuberculosis	14	4	106	93
Animal Rabies	4 (bats)	3 (bats)	11 (bats)	11 (bats)

For information on reporting of communicable diseases in Indiana, call the *Epidemiology Resource Center* at (317) 233-7125.

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Cover photo of Cryo-EM reconstruction of a norovirus capsid.courtesy of Dr. B.V.V. Prasad, Baylor College of Medicine, Houston, TX 77030

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