Overview of Measles & Mumps Testing at the ISDH Laboratory

Brian Pope
Virology Supervisor

ID Summit
Nov. 21, 2019
Measles Background

• Highly infectious disease
• Measles is caused by the measles virus
• Negative sense, single stranded, enveloped RNA virus
• Member of the *Paramyxoviridae* family

Source: CDC Public Health Image Library (PHIL)
Measles Signs & Symptoms

• Symptoms usually appear 10-12 days after exposure:
  • High fever
  • Cough
  • Runny nose
  • Conjunctivitis

• 2-3 days after symptoms begin
  • Koplik spots

• 3-5 days after symptoms begin
  • Measles rash
Measles Resurgence in the USA

Declared eliminated from the United States in 2000, measles has made a comeback in recent years.

2010-2019**(as of November 7, 2019)
Measles Resurgence in the USA

Measles Cases Reported by Month in 2019*

- January: 128 cases
- March: 303 cases
- May: 342 cases
- July: 77 cases
- September: 6 cases
- October: 10 cases
Measles Resurgence in the USA

Current outbreaks as of 10/16/2019
ISDH Testing

- ISDH lab performs Polymerase Chain Reaction (PCR), Viral Culture and IgG/IgM Serology
- All specimens for measles and mumps must be approved by the ISDH VPD epidemiologist prior to specimen submission and testing.
  - Payton Revolt- 317-233-7277
- For PCR and Viral Culture, we request the following:
  - Nasopharyngeal (NP) Swab - measles
  - Buccal/Oropharyngeal swab - mumps
  - Specimen must be in Viral Transport Medium (VTM)
  - Specimen must be refrigerated
  - Specimen must be received within 5 days of specimen collection
ISDH Testing

For serology, we request the following:

• Specimen should be spun for at least 15 minutes at 3,300 RPM and separated off the cells ASAP
• 1.5 mL of serum is the preferred submission amount
• Gold Top and Tiger Top SST tubes are recommended
• Serum specimens must be refrigerated at 2-8°C and received within 2 days from date of draw to the lab; please ship on ice packs to maintain temperature
• Serum specimens may be kept at -20°C to -70°C and shipped frozen on ice packs
• Frozen whole blood specimens will not be accepted
• Hemolyzed specimens will not be accepted
Measles and Mumps Shipping Instructions
ISDH Laboratory Testing- PCR

- First we extract the specimens RNA and perform PCR on it
- Our PCR targets the highly-conserved Nucleocapsid (N) gene
- If we receive the specimen before noon, results are provided same day. Expected TAT is 1-2 business days.
- We perform PCR on the ABI 7500 Fast Dx
ISDH Laboratory Testing - Viral Culture

Once PCR results have been released, the specimen is set up for virus culture

- Here an analyst will inoculate various cell lines and closely watch tubes and shell vials for cytopathic effect (CPE)
- If CPE is noticed, the analyst will stain for the suspected virus
- This will confirm that live virus is present in the VTM submitted
- This can take up to 14 days
- This helps confirm PCR results, but does not counter PCR results
ISDH Testing - Serology

ISDH can test for Measles IgG and IgM as well as Mumps IgG

- Measles IgM/IgG and Mumps IgG tests are an Enzyme-Linked Immunosorbent Assay (ELISA).
- Analysts place patient serum into a microassay plate coated with measles antigen. If measles-specific antibodies are present in the serum an antigen-antibody complex will form.
- The antigen-antibody complex is layered with goat anti-human conjugate, tetramethylbenzidine (TMB) and sulfuric acid.
- An enzymatic reaction will occur within the specimen turning the specimen well from blue to yellow.
- The color intensity within the specimen well is indicative of the concentration of antibody in the serum.
- A microwell plate reader is used to measure the concentration.
- This testing can be completed within 1-2 business days upon receipt.
Submission Guidance

Submission through LimsNet

• Preferred method
• Results immediately available for submitter to review upon release
LimsNet Submission

• Fastest turnaround time for results!
• To sign up or ask questions contact either:
  • 888-535-0011
  • LimsAppSupport@isdh.in.gov
• Website address: http://limsnet.isdh.in.gov
8/29/16 – Zika *New Zika Specimen Volume Requirements*

For serum specimens, submit at least 3 mL of serum or 10 mL of whole blood. For urine specimens, submit 1-2 mL of urine. Do not submit larger volumes of urine.

Label the specimen tube with the patient’s name (first and last), date of birth, specimen type, and date of collection. Urine specimens that leak in transit will be rejected.

Thank you!

7/15/16 – Insurance: To bill a sample to insurance, we need not only the patient insurance information, but also referring physician information. Referring physician information includes NPI, physician first name, and physician last name. In some cases, the physician may be a hospital or practice we don’t cover, so this is particularly important.
Questions?
Contact Information

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References

- www.cdc.gov
- https://phil.cdc.gov/
- www.isdh.in.gov
Amish Pertussis Outbreak and Education

Lindsay Joy-Wenning, MPH
ISDH D7 Field Epidemiologist
Responding to Need

• 3/29/17: ISDH D7 Field Epi was contacted regarding infant death.
  – Amish community’s midwife → Parke county PHN → D7 Epi → ERC

• 4/5/17: ISDH D7 Field Epi gave presentation regarding basic biology, vaccines, and pertussis.
  – This led to an interest in mass vaccination.
Educational Presentation

• 12 adults present
  – 1 male
    • Asked most questions
  – 1 pregnant woman
    • Only female who asked questions
  – 1 midwife
    • Described clinical situation

• 2 PHNS and 1 Field Epi
Amish Pertussis Education Tools

• No PowerPoint
  – Nothing electronic
• No human photos
• Q&A
  – Ability to write questions down
  – Most asked through midwife
• Immunology: cell signaling and how the body responds to germs (and vaccines) on a microscopic level.
Drawing: Community Immunity

- Community Immunity: (to avoid the negative connotation associated with referencing humans as a herd)

  Blue: healthy
  Orange: ill
  Purple: immunized
• Cocooning: demonstrated that if most of the community chose to vaccinate, those who could not be (due to age or status of immunity) would still be protected.

Blue: healthy
Orange: ill
Purple: immunized
Questions from Presentation

• What is pertussis?
• Should adults get the vaccine even if they’ve had pertussis?
• Why is pertussis dangerous for infants?
• How are vaccines made?
  – Vaccine ingredients
Broadcast

- Written by midwife to be heard evening of 4/6 before 1st clinic
  - 4/11 at Coyote School from 4-8p “fast time”

- What vaccines, when they should be administered, sx of pertussis, etc.

- Rubella aka German measles
  - Can cause miscarriage
Outbreak

• 4/7/17: An outbreak was declared after 7 epi-linked cases were investigated in INEDSS.

• 4/11 and 4/18: vaccination clinics were held in Amish communities.
ISDH Collaboration

- Epidemiology Resource Center (ERC)
- Immunizations
- LHDs: Putnam, Vigo, and Parke
- Health Professionals: Valley Health, Dr. Swaim
## Vaccination Clinics

<table>
<thead>
<tr>
<th>Date</th>
<th># Tdap</th>
<th># DTaP</th>
<th># MMR</th>
<th># Patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>4/11 (1\textsuperscript{st} clinic)</td>
<td>8</td>
<td>4</td>
<td>15</td>
<td>22</td>
</tr>
<tr>
<td>4/18 (2\textsuperscript{nd} clinic)</td>
<td>12</td>
<td>2</td>
<td>7</td>
<td>13</td>
</tr>
</tbody>
</table>
Survey

- Did you attend the vaccine education on 4/5/17?
- Have you had whooping cough?
- Have you ever had the whooping cough vaccine?
- Have you decided to vaccinate today?
- Do you plan to vaccinate in the future?

[Four bar charts showing responses to the above questions.]

- Yes
- No
- Not Sure
Issues

• Hot Wash $\rightarrow$ AAR

• No electricity
  – Run car to keep vaccines cool

• Communication
  – No science education

• Directions
Lessons Learned

• Amish not averse to vaccinations
  – Cost matters

• No background in science is an educational barrier
WORKSHEET: RAPPORT BUILDING SKILLS

DIRECTIONS: List two examples of rapport building skills for each of the following areas.

1. Mirror the posture of the individual
   a. sit, sit or stand, stand
   b. ___________________________

2. Eye contact
   a. look if they look, don’t if they don’t
   b. ___________________________

3. Matching the rate of speech and tone of voice
   a. if they yell, stay quieter
   b. ___________________________

4. Social distance
   a. don’t be too close (18”)
   b. ___________________________

5. Intimate distance
   a. don’t be too far (4’)
   b. ___________________________

6. Distance as a barrier
   a. no object (desk, etc.) between you
   b. ___________________________
### WORKSHEET: ACTIVE LISTENING TECHNIQUES

**DIRECTIONS:** Active listening is an interactive form of communication that provides feedback and facilitates conversation. Using the list below, fill in the definitions and one example of how using active listening techniques help to build and maintain rapport.

1. **Brief comments:** “I see,” “I understand,” “hmm”
   
2. **Neutral phrases:** “tell me more,” “what happened next?”
   
3. **Echoes:** repeat last few words they said
   
4. **Neutral questions:** “what do you think about this?”
   
5. **Open-ended questions:** “who,” “what,” “where,” “why,” “how”
   
6. **Paraphrasing:** summarize w/similar language
   
7. **Empathy:** aware of feelings/point of view w/o approval or disapproval
   
8. **Silence:** allow client to fill it
   
9. **Summarizing behavior description:** confront nonverbal indicators (e.g., clenched fists)

Source: CDC TOPSAFE training 2019
Literature

  – During January 2010, 2 infants from an Amish community in east-central Illinois were hospitalized with pertussis. The local health department (LHD) intervened to control disease transmission, identify contributing factors, and determine best communications methods to improve vaccination coverage.
ESF8 Plan

• Created using Emerging Infectious Disease Plan from 2015

• Each district has different capabilities and stakeholders

• What role do you play?
Amish Pertussis Outbreak Collaboration

- **Midwife**
  - Facilitated discussion during 4/5 presentation.
  - Sent clinic “advertisement” broadcast with disease information on 4/8.
- **Vigo and Putnam County Health Departments**
  - Provided nurses for vaccination clinics.
- **Parke County Health Department**
  - Initially contacted ISDH regarding infant death and community’s desire for education (via midwife).
- **Valley Health Professionals**
  - Provided mobile bus along with 2 nurses at both clinics.
- **Dr. John Swaim (private physician in Parke county)**
  - Attended 4/11 clinic to address vaccination questions and concerns.
Amish Pertussis Outbreak Collaboration (Continued)

- ISDH Immunizations Division
  - Provided Tdap, DTaP, and MMR vaccines for both clinics.
- ISDH Epidemiology Resource Center
  - Assisted with expertise, outbreak control measures, and boots-on-the-ground.
- ISDH Preparedness
  - Provided logistics, supplies, and travel information.
Stats

• The two vaccination clinics were able to reach 5% of the total community population (n=1,295) in a two-week span.

• 46 total patients were vaccinated with 33 MMR (72%), 6 DtaP (13%), and 19 Tdap (41%).
  – 64% were children under 18 years of age.
Amish Pertussis Outbreak Infographic

- Utilized from lessons learned in outbreaks from D2, D3, and D7
Acknowledgments

• Parke County Health Department
  – Marilyn King
• Clay County Health Department
  – Kim Hyatt
• Putnam County Health Department
  – Sara Burnett
• Vigo County Health Department
• Valley Health Professionals
• ISDH Immunization Division
  – Jill King
• ISDH Epidemiology Resource Center
  – Charles Clark
  – Shawn Richards
References


Amish Pertussis Outbreak
Follow-Up

If anyone has questions or would like more details regarding the Parke County pertussis outbreak, please contact the District 7 Field Epidemiologist:

Lindsay Joy-Wenning
Lwenning@isdh.in.gov
317-697-8683
Stakeholder Activity
Main Points of ESF Plan

• Identify stakeholders to be incorporated into information flow

• Identify and develop rules and data elements and sharing
  – Ex: monthly meetings with handouts?

• Exchange information to determine a common operating picture
  – Ex: how often will you talk?
ESF Stakeholders

• Healthcare Coalition
• Fire
• Police
• HD
• Emergency Medical Services
• Commissioners
Main Points of Emerging ID Plan

• Provide guidelines and coordinate response activities to reduce morbidity, mortality, social, and economic disruption caused by an outbreak of infectious diseases within the community.
  – Plan was driven by Ebola Virus Disease but is generally applicable to all emerging infectious diseases.
ID plan + ESF plan

• Comprehensive framework
• Federal, state, and local roles
  – Points of contact for each
• Disease epidemiology and monitoring
  – Isolation and quarantine measures
Mumps Outbreaks at IU-Bloomington: Lessons Learned

Beth Conrad Rupp, MD, Medical Director, Indiana University Health Center, brupp@Indiana.edu
SECTION 1

Overview of Outbreaks
1st Outbreak- 2016

- Arrived to IU after patient exposed to University of Iowa student where large outbreak was happening
- Occurred January-September 2016
- Involved 74 IUB students
- 4 Indiana college campuses had outbreaks
- ISDH provided MMR vaccine for IUB clinics and 1529 vaccines were given over 3 days.
Cases By University During 2016 Mumps Outbreak

- Indiana U.: 74 cases
- IUPUI: 8 cases
- Butler: 59 cases
- Purdue: 24 cases

Will Clagett, IU EH&S Intern
2016 Outbreak statistics

- Ages: 18-38 years, median 21 years old
- Immunization status of affected patients:
  - 82.5% of all had 2 or more documented MMR’s
  - 3.7% had 1 documented MMR
  - 3.8% were unvaccinated
  - 11.6% had unknown MMR status
- Vaccine clinics- 7 total among 3 universities
  2 at Butler, 3 at IUB, 2 at Purdue (5100 doses of MMR administered)
2nd smaller outbreak (Dec 2016-April 2017)

- Outbreak declared 2/1/17
- 17 cases at IU Bloomington
- MMR Clinic at a Sorority with several cases on March 1st and 2nd. Only 31 MMR’s given.
- No further cases of mumps until Feb 2019 at IU Bloomington.
2019 Outbreak

• First case: 2/12/19
• Outbreak declared: 3/8/19
• Outbreak ended: 7/20/19
• 50 total cases: 31 of the 50 were seen at the IUHC (student health)

• 2 had self report of 1-2 MMR vaccines, but no documentation
• 1 had no childhood MMR and had gotten 1st MMR just before onset of symptoms
• 47 had 2-3 MMRs documented
2019 Outbreak

- Of the 50:
  - 2 were international students
  - 17 female/33 male
  - 14 were connected to a specific fraternity
  - 6 were connected to an MBA group
  - 1 case of meningitis in fully vaccinated individual
SECTION 2

Lessons learned among the Outbreaks
Lessons/Changes from 2016-2019

1. In 2016 we worked with the other universities on messaging, letters, etc to go out, so those were all ready to go for future outbreaks.

2. In 2016: ISDH did not accept self report of MMR vaccines, so IUB started requiring documentation proof of MMR in Fall 2017 for new student registration, which helped immensely in contact investigations in 2019.

3. In 2016: Created large shot clinics and isolation plans on the fly. We were much better prepared for this in 2019.

4. 2016 we held large campus vaccination clinics, but in 2019, we were told to only target close contacts with 3rd MMR. Only held one focused vaccination clinic at the fraternity. (87 doses given to 54% of the membership)
Lessons/Changes from 2016-2019

5. In 2019: More straightforward case definitions and testing guidelines.

6. In 2019: Isolation from others made more difficult on campus because of lack of residential spaces on campus.

7. In 2019: Improved communications with the public and press coordinated by IU Communications and other IU departments. Sent out more information, held a press conference, and created a central website for daily updates.

8. During the 2019 outbreak, ISDH instructed us that we could stop notifying all classmates of mumps patients.
Lessons/Changes from 2016-2019

9. In 2019: Started notifying dorm floors of mumps contact living on their floor.

10. IUHC was using negative pressure room for evaluation of patients with symptoms of mumps and then wiping down surfaces and airing out for 2 hours after use. During 2019 outbreak, ISDH guidance changed our procedure – negative pressure room unnecessary, but careful wipe down of surfaces and equipment in room after evaluation all that was necessary.
Special thanks to:

Nancy Macklin, RN: Retired IUHC Director of Nursing
Diana Ebling, MD: Retired IUHC Medical Director
Susi French, RN: IUHC Director of Nursing
Graham McKeen: IU EH&S Public Health Manager
Will Clagett: IU EH&S Intern
Penny Caudill: Monroe County Health Department
Payton Revolt, MPH: ISDH Vaccine-Preventable Disease Epidemiologist
Questions?

Mr. Chipmunk

MUMPS CAN REALLY RUIN A SELFIE!

Mr. Chipmunk: Mumps causes puffy cheeks and a swollen jaw. MMR vaccine is the best protection against mumps. #mumps
www.cdc.gov/mumps
Seasonal Respiratory Restrictions
Technology, Teamwork, & Timing
No disclosures
Seasonal Respiratory Restrictions

- Preparation/Prevention
- Data Monitoring
- Go-Live with Visitor Restrictions
- Ramp Down & Review
Preparation/Prevention

- Review previous year restrictions
  - Make adjustments for upcoming year
    - New signage/Placement
    - Flow
    - Communication
    - Level of restriction
    - Get feedback

- Collaboration with IP’s at other facilities
- Patient influenza vaccine administration
- NICU SYNAGIS administration
Preparation/Prevention

- Team Member Influenza Vaccine
  - Deadline – Mid November
- Family Influenza Vaccination Program
  - Influenza & Tdap vaccines
  - Free to household family members of patients at Riley
Data Monitoring

- National
  - CDC
- Regional/State
  - ISDH
- Local/County
  - Marion County
- Internal
  - Lab results
    - Riley/IU Health
  - ED ILI
  - Isolation patients
  - Chief compliant, etc

Respiratory Viral Activity According to Polymerase Chain Reaction 2010-2019
Molecular Diagnostics Laboratory, IU Health Pathology Laboratory
As of November 9, 2019

Data Provided by Molecular Diagnostics, IUHPL
Any questions regarding graphs: contact John C. Christensen, MD; 317-944-7260
Making the Decision to Start Visitor Restrictions

http://gph.is/1GhDD0S
Go-Live with Visitor Restrictions

- Short notice
  - Discussed with other facilities
  - Indianapolis Coalition for Patient Safety
  - HICS activation

- Execute Communication Plan
  - Talking points – consistent message
    - Patients
    - Visitors
    - Team members
  - Internal Stakeholders
    - Team members, physicians, etc
  - External Stakeholders
    - PR, media, social media
Go-Live with Visitor Restrictions

- Screening process
  - Illness
  - Approved visitors
- Guest Relations
  - Access restrictions
- Guest Management System
  - Screening at points of access
  - Communication Technology

I Don't Understand A lot of the New Technology Coming Out

And at this point I'm too afraid to ask
Ending Restrictions

- Influenza-like illness drops
- Respiratory viral cases drop
- Influenza cases drop

- Communication
  - Internal
  - External

- Review for opportunities for improvement
- Prepare for next respiratory season
Summary – Technology, Teamwork, & Timing

- Planning/Preparation
- Continuous data monitoring
- Execute restrictions
- Make adjustments as necessary
- End restrictions
- Review and prepare for next respiratory season
Thank You!

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