Got Mumps?

Overview of Mumps Epidemiology and Surveillance in Colorado and the U.S.

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Overview

• Epidemiology and clinical features
• US and Colorado trends
• Current outbreaks
• Diagnostics
• Vaccination and prevention
• Why are vaccinated communities getting mumps?

Mr. Chipmunk
Mumps causes puffy cheeks and a swollen jaw. MMR vaccine is the best protection against mumps. #mumps
www.cdc.gov/mumps
Background

- Paramyxovirus
- Pre-Vaccine Era
  - ~186,000 cases reported/year (mostly school-aged)
- 99% decrease in mumps cases in the US since vaccine
- Increases over the past year, including outbreaks
## Epidemiology

<table>
<thead>
<tr>
<th>Reservoir</th>
<th>Humans are the only known natural hosts</th>
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</thead>
<tbody>
<tr>
<td>Transmission</td>
<td>Direct contact with respiratory droplets or saliva from infected person</td>
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<tr>
<td></td>
<td>Spreads rapidly among individuals in close settings</td>
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<tr>
<td>Incubation Period</td>
<td>Average: 16-18 days (Range: 12-25 days)</td>
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<tr>
<td>Infectious Period</td>
<td>2 days before onset of parotitis to 5 days after onset</td>
</tr>
<tr>
<td>Treatment</td>
<td>None; symptom relief</td>
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</table>
Clinical Features

- **Parotitis**
  - Swelling and tenderness of one or more of the salivary glands > 2 days
  - Unilateral or bilateral

- **Prodrome symptoms**
  - Myalgia, malaise, lack of appetite, headache, low grade fever

- **Can be asymptomatic**

- **Complications**
  - Orchitis
  - Oophoritis
  - Aseptic meningitis
  - Encephalitis
  - Hearing loss
  - Mastitis
  - Pancreatitis
Parotitis

- Sometimes confused with lymph swelling
- Parotitis - other viruses
  - Influenza A
  - Parainfluenza
  - Coxsackie A virus
  - Epstein Barr virus
- Parotitis in 30-40% of infected persons
U.S. Mumps Trends
*Cases as of December 31, 2016. Case count is preliminary and subject to change.
**Cases as of January 28, 2017. Case count is preliminary and subject to change.
Source: Morbidity and Mortality Weekly Report (MMWR), Notifiable Diseases and Mortality Tables
Mumps Cases and Outbreaks as of December 31, 2016
U.S. Mumps Cases by Epi Week, 1-52, 2016* (n=5,311)

*NNIS data, last accessed Jan 6th, 2016, data is preliminary and subject to change
Mumps Cases and Incidence Rates by Year, 2010-2016*

*NNDSS and NCIRD data, last accessed Dec 6th, 2016. 2016 data is preliminary and subject to change

CDC, 2016
Reported U.S. Mumps Incidence Rate by Year and Age Group, 2010-2016*

*NNDSS and NCIRD data, last accessed Jan 6th, 2016. 2016 data is preliminary and subject to change
Current US Outbreaks

• Arkansas
  • 2,783 cases (as of 2/10/2017; began in August)
  • 58% between 5-17 years of age
  • 40 schools in 12 school districts, 24 workplaces, and 3 colleges/vocational schools, and 4 private schools impacted

• Washington
  • 404 cases (as of 2/8/2017; began in October)
  • Most cases in King County (43%) and Spokane County (41%)

• University of Missouri
  • 334 cases (as of 2/9/2017; began in November)
Colorado Mumps Trends
Mumps Cases in Colorado, 2011-2017

Case Count

Years


CDPHE, 2/9/2017
Colorado Mumps Cases By Age Group, 2016-2017

CDPHE, 2/9/2017
Current Colorado Outbreak

• Occurring in a small community in Denver Metro
  • CDPHE, Tri County Health Department, and Denver Public Health are investigating

• Under vaccinated community
  • Not against vaccines

• Likely linked to outbreaks from other states

• Local health department hosting vaccine clinics for affected community

• No spread beyond community at this point
Colorado Mumps Outbreak Epi Curve (n=25)

Parotitis Onset Date

Case Count

Confirmed
Probable

CDPHE, 2/9/2017
Public Health Response

- Clinical recognition
- Prevent transmission
- Appropriate testing
- Report to public health
- School notification
- Vaccine clinic (Outbreak situation)
Mumps Management Timeline

Onset of Salivary Gland Swelling

**EXPOSURE PERIOD**—Incubation is 16 to 18 days (range 12 to 25 days) to onset of salivary gland swelling.

**Prodrome**

**Salivary Gland Swelling:** pain, tenderness, swelling in one/both parotid or other salivary glands. Swelling lasts at least 2 days then subsides over the next week to 10 days. Asymptomatic infection occurs.

**Infectious Period**—2 days before through 5 days after onset of salivary gland swelling.

**PCR**—Diagnostic yield best for specimens collected within 3 days of salivary gland swelling. Buccal swab preferred.

**Acute Serum for IgM**—collect sample ASAP. **Unvaccinated:** IgM detectable within 5 days after onset of swelling and peals about 1 week after onset; remains positive for weeks to months. If negative and drawn ≤2 days after swelling onset AND highly suspect for mumps, repeat test 5 to 7 days after onset. **Vaccinated:** IgM response highly variable. If acute specimen is negative and highly suspect for mumps, repeat test at least 5 days after onset.

**Acute Serum for IgG**—collect sample ASAP

**Isolate Case** through 5 days after onset of salivary gland swelling. No treatment for mumps.

**Contacts**

Spread by contact with respiratory droplets. No prophylaxis for mumps. Determine mumps immunity of close contacts (refer to manual for definitions) and provide education. Recommend mumps vaccine for susceptible contacts for future exposures. Monitor for symptoms 12 to 25 days after last exposure.

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3 Nonspecific prodrome symptoms including myalgia, malaise, headache and low grade fever may occur several days prior to salivary gland swelling.

2 Swab of the buccal mucosa/parotid duct (massage gland prior to collecting specimen). Diagnostic yield is lower for specimens collected 9 or more days after salivary gland swelling. PCR testing is available through CDPHE (contact CDPHE first). In addition to PCR, collect serology ASAP.

3 False positive and negative serology results are not uncommon. Vaccinated persons may not have detectable mumps IgM antibody regardless of timing of specimen collection.

4 Mumps may be confirmed by demonstrating a 4-fold increase in mumps IgG titer using paired acute and convalescent serum samples. Paired sera from vaccinated persons may not show a rise in IgG titer.

Testing for Mumps

- RT-PCR
- Serology
- Viral Culture
Testing – RT-PCR

• **Buccal Swab**
  • Virus detected from fluid collected from the parotid duct or other affected salivary gland ducts
  • Follow specimen collection guidelines:
    • Use PPE for droplet precautions
    • Massage the salivary gland area for ~30 seconds prior to swabbing
    • Synthetic swabs preferred!
    • Swabs should be stored in standard viral transport medium and kept cold
  • Obtain sample ASAP after parotitis onset
    • Within 3 days and not more than 8 days after onset

• Available at CDPHE Lab
Testing – RT-PCR

• Results
  • Unvaccinated:
    • Virus may be isolated until 11-14 days after parotitis
    • Most successful results are within 3 days of onset
  • Vaccinated:
    • Collect within 1-3 days after onset
    • Negative PCR results *DO NOT RULE OUT MUMPS*
      • Timing and quality of specimen can prevent successful detection
Testing – Serology

• Immunoglobulin G (IgG)
  • Tests for immunity
  • Seroconversion from negative to positive by EIA or a four-fold rise in titer
    • Paired serology rarely done!
  • Difficult to interpret results
  • Available at commercial labs

• Unvaccinated:
  • IgG antibody increases rapidly after onset of symptoms and is long lasting

• Vaccinated:
  • IgG may already be elevated in the acute phase blood sample which may prevent detection of a four-fold rise in IgG titer in the convalescent serum specimen
Testing – Serology

- Immunoglobulin M (IgM)
  - Available at commercial labs
- Unvaccinated:
  - IgM detectable within 5 days after onset, max about a week after onset
  - Remains elevated for weeks to months
- Vaccinated:
  - May not have a detectable IgM response \(\rightarrow\) false-negative results occur
  - Some evidence indicate that the ability to detect IgM increases >10 days after parotitis onset
  - Negative IgM results *DO NOT RULE OUT MUMPS!*
## Testing – Interpreting Serology Results

<table>
<thead>
<tr>
<th>Mumps Exposure History</th>
<th>IgM</th>
<th>IgG</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unvaccinated or no history of mumps</td>
<td>+</td>
<td>+ or -</td>
<td>- IgM may be detected for weeks to months</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>- IgM positive results in 80% - 100% of serum samples</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>- Low levels of IgG may be present at symptom onset</td>
</tr>
<tr>
<td>1-dose vaccine history</td>
<td>+ or -</td>
<td>Likely +</td>
<td>- IgM positive results in 50% of samples that were collected 1-10 days after symptom onset</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>- IgM positive results in 50-80% of samples collected &gt;10 days after symptom onset</td>
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<td></td>
<td></td>
<td></td>
<td>- IgG will be positive because of vaccine</td>
</tr>
<tr>
<td>2-dose vaccine history</td>
<td>+ or -</td>
<td>Likely +</td>
<td>- IgM positive results in 13-46% of samples collected &lt;3 days after symptoms onset</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- IgM positive results in 71% of samples collected &gt;3 days after symptom onset</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- IgG will be positive because of vaccine</td>
</tr>
</tbody>
</table>
Testing – Viral Culture

- Mumps virus isolated from buccal or oral swab
- Virus can be isolated even when IgM and IgG are negative
- Turn around time can take several days to several weeks
- *This method is not widely used or recommended*
The percentage of positive results obtained from testing 296 confirmed mumps cases from New York City by day of sample collection after onset of symptoms. The serum samples were tested for presence of IgM using the CDC capture IgMEIA. The buccal swab samples were tested by rRT-PCR using the mumps nucleoprotein (N) gene as the target.

Mumps virus was isolated from 209 (71%) of the 296 buccal swabs tested.

*Done in collaboration with New York City Deparment of Health and Mental Hygiene Public Health Laboratory, New York, NY*
Mumps Vaccine

- Mumps virus isolated in 1945

- The first mumps vaccine was developed in 1948 and included an inactivated vaccine (discontinued in the 1970s) and a live attenuated vaccine

- Mumps vaccine combined with measles and rubella (MMR) or measles, rubella, and varicella (MMRV)
  - MMR licensed in 1971
  - MMRV licensed in 2005

- Single-antigen vaccine not available in the US
Vaccination

• Vaccine Schedule
  - MMR for 18 years or younger
    - 1\textsuperscript{st} dose - 12-15 months
    - 2\textsuperscript{nd} dose - 4-6 years
      - 2\textsuperscript{nd} dose may be given sooner (at least 28 days after first) in certain outbreak situations
  - MMR for adults born after 1956 (if no record of immunization)
    - Should get at least 1 dose
    - In outbreak settings, a 2\textsuperscript{nd} or 3\textsuperscript{rd} dose may be recommended

• MMR or MMRV Effectiveness
  - 2 doses: 88% effective (range: 66-95%)
  - 1 dose: 78% effective (range: 49-92%)
DON'T LET MUMPS SPOIL YOUR FUN

MMR VACCINATION IS THE BEST PROTECTION AGAINST MUMPS!

KEEP FROM SPREADING MUMPS

- Don't share drinks or eating utensils
- Cover your coughs and sneezes
- Stay home when you are sick
- Wash your hands often with soap and water
- Clean and disinfect surfaces

SIGNS AND SYMPTOMS OF MUMPS

- Fever
- Headache
- Loss of appetite
- Muscle aches
- Tiredness

Mumps is best known for the puffy cheeks and swollen jaw that it causes.

THERE IS NO TREATMENT FOR MUMPS

If you have symptoms, stay home and away from others and contact Student Health Services or your doctor.

ASK YOUR STUDENT HEALTH SERVICES ABOUT WHERE YOU CAN GET VACCINATED.
Why are vaccinated people getting mumps?

✓ Vaccines can fail
  • Person may not develop an immune response (either vaccine or host related)
✓ There is evidence of waning vaccine-induced immunity over the years
✓ Mumps component in MMR has relatively lower effectiveness
✓ Congregating in close settings intensifies exposure

• Proportion of cases among people who are vaccinated may appear high; however, *should not be interpreted that the vaccine is not effective*

• Vaccine effectiveness is assessed by comparing attack rates in vaccinated individuals to attack rates in unvaccinated individuals.

• If attack rates are compared between vaccinated individuals and unvaccinated individuals, the unvaccinated individuals have a much higher attack rate.
Conclusion

• Mumps has been on the rise

• Outbreaks are occurring in highly vaccinated communities

• Can be difficult to diagnose due to clinical symptoms and low sensitivity in diagnostic testing

• Important to quickly identify suspect cases to allow for appropriate public health intervention

• MMR vaccine is still highly effective
References and Resources

• Mumps information for health care and public health professionals (CDPHE)

• Mumps (CDC)
  • https://www.cdc.gov/mumps/

• Mumps Lab Testing (CDC)
  • https://www.cdc.gov/mumps/lab/qa-lab-test-infect.html#v3
Questions?

MUMPS OUTBREAK

Some things are best not shared.

Get the MMR vaccine now to help protect yourself and your family from mumps.
Fun Reading

