Measles & Mumps: implications for college health

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Objectives
- Describe the clinical presentation
- Discuss appropriate laboratory testing
- Describe the epidemiology
- Understand the challenges associated with measles and mumps in a college setting

MEASLES
Measles Clinical Features
- Viral illness
- Prodrome (2-4 days)
  - Fever (>101°F)
  - Cough, coryza, and/or conjunctivitis
  - Koplik spots
- Rash
  - Maculopapular
  - Spreads from head to trunk to extremities
  - May be confluent
  - Lasts 5-6 days and fades in order of appearance

Measles Complications
- More common in children < 5 years and adults
- Diarrhea: 8%
- Otitis media: 7-9%
- Pneumonia: 1-6%
- Encephalitis: 1 per 1,000 cases
- Death: 1-3 per 1,000 cases
- Subacute Sclerosing Panencephalitis (SSPE):
  - 1 per 100,000 cases 7-10 years after measles

Measles Transmission
- Airborne via aerosolized respiratory droplet
  - Spread by coughing and sneezing, close personal contacts or direct contact with infected nasal or throat secretions
  - Survives in air up to 2 hours
- Average incubation period: 14 days (range 7-21)
- Infectious 4 days before through 4 days after rash onset
  - Total of 9 days
- Secondary attack rate in susceptible contacts ~90%
Measles Postexposure Prophylaxis (PEP)

- MMR Vaccine
  - Administer within 72 hours of 1st exposure
    - May return to normal activities
    - Monitor for symptoms
    - Be aware of possibility of vaccine rash
- Immune Globulin
  - Administer within 6 days of exposure
  - Recommended for groups at risk of severe disease/complications
    - Infants < 12 m.o.a.
    - Pregnant women without evidence of immunity
    - Severely immunocompromised patients


Definition of Measles Exposure

- Anyone who has shared the same airspace as an infectious case without using respiratory protection (N95 or higher level respirator) while the infectious person is in the airspace, until 2 hours after the person leaves
  - This includes other patients, visitors and all HCP (security guards, admissions clerks, etc.)
  - In healthcare settings, contact investigations can involve hundreds of contacts if suspect measles cases are not promptly identified and isolated
- When in contact with an infectious measles patient, all HCP should use a respirator, regardless of immune status

Laboratory Diagnosis

- Isolation of measles virus (culture)
- Detection of measles RNA by PCR
- Serologic testing
  - Positive IgM antibody
    - False negative results in vaccinated individuals is common
  - Significant increase in IgG antibody between acute and convalescent specimens
  - Serology may be difficult to interpret in those previously vaccinated or who received PEP vaccination or immunoglobulin
Viral Testing

- NJDOH Testing Guidance
  - Measles Laboratory Testing FAQs
  - Quick Guide for Measles Specimen Collection & Testing

Specimens (best ≤ 3 days of onset, no later than 10 days)

- Throat or NP swab
- Urine
- Sensitivity increased if both are sent

Illustration of NP Swab Collection

- Swab: synthetic (non-cotton), Dacron® and Copan
- Transport: VTM or saline in sterile container

Illustration: https://www.cdc.gov/pertussis/clinical/diagnostic-testing/specimen-collection.html

Viral Testing

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Specimens (best ≤ 3 days of onset, no later than 10 days)

- Throat or NP swab
- Urine

Labs

- Commercial labs – PCR not available!
- CDC/Wadsworth – obtain permission from NJDOH

https://www.cdc.gov/measles/lab-tools/rt-pcr.html
Measles Vaccine

- Effectiveness: 93% after 1 dose (x% to y%), 97% after 2 doses (x% to y%)
- Duration of Immunity: Generally lifelong
- Schedule: 1st dose at 12-15 months, 2nd dose after age 4 and for adults at higher risk
- Administered with mumps and rubella (MMR)

[https://www.cdc.gov/measles/vaccination.html](https://www.cdc.gov/measles/vaccination.html)

MMR Vaccine Travel Recommendations

- Persons aged ≥ 12 months without other evidence of immunity should receive 2 doses
  - Includes providing a 2nd dose to children prior to age 4-6 years
  - Includes adults who have only received one routine dose in the past
  - 2nd dose of MMR should be administered at least 28 days after 1st dose
- Children aged 6-11 months should receive 1 dose
  - If vaccinated at age 6-11 months, still need 2 subsequent doses at age ≥ 12 months

[https://www.cdc.gov/measles/travelers.html](https://www.cdc.gov/measles/travelers.html)

NJAC 8:57-6.5 Required Immunization: Measles

- Each new student entering an institution for first time after Sept. 1, 1995, shall have received two doses of live measles virus vaccine (administered after 1968)
  - 1st dose administered on or after student’s 1st birthday & 2nd dose administered no less than 1 month after the 1st dose
  - Count measles virus containing vaccine administered up to 4 days before student’s 1st birthday or 4 days before 1-month interval (28 days) to the 2nd dose as a valid dose
- A student vaccinated with a killed measles-containing vaccine, or an unknown vaccine prior to 1968, shall be revaccinated or produce laboratory proof of immunity
- A student who presents documented laboratory evidence of immunity shall not be required to receive either the 1st or 2nd dose of measles vaccine
Confirmed Measles in NJ, 2010-2017

- 2013 Family Outbreak: 12 unvaccinated household members
- 2011 U.S. Increase

Incidence of Measles
NJ vs US

Measles, United States, 1962-2015

*2016 and 2017 data are preliminary
Case Identification/Investigation

- Establish a diagnosis
  - Clinical presentation
  - Assess immune status
  - Alternate causes (allergic reaction, other rash illness)
  - Potential exposure (recent travel)
- Collect appropriate laboratory specimens
- Isolate immediately upon suspicion
  - Airborne precautions in a negative pressure room
  - Masked with door closed
- Notify local health department immediately

http://www.state.nj.us/health/lh/community/index.shtml#1

Case Identification/Investigation

- Identify/notify contacts
  - Detailed list of ALL places case visited during infectious period
    - Names, addresses, time arrived/left (+2 hrs), method of transport
  - Assess immune status (documented proof of immunity)
  - Offer PEP as appropriate
    - Verify date of 1st exposure
  - Educate on signs/symptoms and what to do
    - Call medical provider/facility PRIOR to arriving
      - “Exposed to Measles?”
  - Quarantine or actively monitor as appropriate
    - From day 5 from 1st exposure through day 21 from last exposure

NJ University Measles Case February 2015

- 18 y.o. laboratory-confirmed via +PCR result from CDC
  - 2 documented doses of MMR
  - No known exposure
  - Atypical presentation
- Campus exposures
  - ID access/swipe card activity reviewed to identify exposures
  - Students: reviewed vaccine records
    - >99% of graduate & undergraduates were vaccinated
    - “Exemptions”
  - Faculty/staff: serology testing (IgG) made available
NJ University Measles Case February 2015

- Quarantine & active monitoring
  - 2 students & 29 faculty/staff under quarantine
  - 11 faculty/staff actively monitored
- No secondary cases identified
  - Incubation period ended 3/2
- Challenges
  - Reduced staffing & services (e.g. dining)
  - Housing for quarantine
  - Tracking immunization records
  - Laboratory testing logistics

Communications

- Collaboration between organizations (NJDOH, LHD, school, other health departments)
  - Exposures and surveillance
  - “One Voice, One Message”
- Messaging
  - NJDOH Measles Alert Website
  - NJLINCS message
  - University website, emails, FAQs for employees, supervisors, vendors

Mumps
### Mumps Clinical Features

- **Viral illness**
- **Most common symptoms**
  - **Parotitis**
    - inflammation of salivary glands under the ear
    - lasts at least 2 days, may last >10 days
    - often confused with lymph node swelling
  - Nonspecific prodrome of low-grade fever, headache, malaise, muscle aches, loss of appetite
- May present as lower respiratory illness, particularly in preschool-aged children
- 20%-30% of cases may be asymptomatic

### Classic Swelling of Cheek and Neck (Parotitis) Seen with Mumps


### Mumps Complications

- Severe complications are rare
- **Orchitis**
  - 12%-66% prevaccine
  - 3%-10% postvaccine
- **Oophoritis** (may mimic appendicitis)
  - ≤1%
- **Aseptic meningitis, encephalitis, hearing loss, mastitis, pancreatitis**
  - <1%
- Long-term sequele: rare
- Death: 0 in recent U.S. outbreaks
Mumps Transmission

- Respiratory droplet
  - Direct contact with infected respiratory secretions or fomites
  - Per CDC, being within 3 feet of an infectious person without the use of a surgical mask = close contact
- Average incubation period: 16-18 days (range 12-25 days)
- Infectious several days before and after parotitis onset
  - Virus isolated 7 days before through 14 days after
  - Contact tracing recommended 2 days before through 5 days after
- No postexposure prophylaxis (PEP) exists

Laboratory Diagnosis

- Isolation of mumps virus (culture)
- Detection of mumps RNA by PCR
- Serologic testing
  - Positive IgM antibody
    - False negative results in vaccinated individuals is common
  - Significant increase in IgG antibody between acute and convalescent specimens

Viral Testing

- NJDOH Testing Guidance
- Mumps Laboratory Testing FAQs
- Quick Guide for Mumps Specimen Collection & Testing
- Specimens
  - Buccal: within 3 days of onset
  - Urine: day 4 through day 12 from onset
Swab: synthetic (non-cotton), Dacron® and Copan
- Transport: VTM or saline in sterile container

Viral Testing
- NJDOH Testing Guidance
  - Mumps Laboratory Testing FAQs
  - Quick Guide for Mumps Specimen Collection & Testing
- Specimens
  - Buccal: within 3 days of onset
  - Urine: day 4 through day 12 from onset
- Labs
  - Commercial labs – must check test requirements!
  - CDC/Wadsworth – obtain permission from NJDOH

Mumps Vaccine
- Effectiveness
  - 78% after 1 dose (49% to 92%)
  - 88% after 2 doses (66% to 95%)
- Duration of Immunity
  - Generally lifelong
- Schedule
  - 1st dose at 12-15 months,
    2nd dose after age 4 and for adults at higher risk
- Administered with measles and rubella (MMR)
- MMR protects against currently circulating strains. Some people who received 2 doses of mumps vaccine can still get mumps. 

https://www.cdc.gov/mumps/vaccination.html
NJAC 8:57-6.6 Required Immunization; Mumps

- Each new student entering an institution for first time after Sept. 1, 1995, shall have received one dose of live mumps virus vaccine
- Administered on or after student’s first birthday
- Count mumps virus containing vaccine administered up to four days before student’s first birthday as valid dose
- A student who presents documented laboratory evidence of mumps immunity shall not be required to receive mumps vaccine

Immunization Requirements: http://www.nj.gov/health/cd/reporting.shtml

Recent Mumps Outbreaks

- 2006
  - >6,500 cases, predominantly college-aged students living in Midwest, many different campuses
- 2009-2010
  - Two large outbreaks
    - >3,000 cases, mostly high school-aged students, close-knit religious community in NYC.
    - 500 cases, school-aged in U.S. Territory of Guam
- 2011-2013
  - Smaller outbreaks on college campuses in CA, MD, VA
- 2014
  - 400 cases linked to university in OH; NHL outbreak; several outbreak affiliated with universities
- 2015-2016
  - Several hundred cases each, universities in IA and IL; several smaller university outbreaks

Mumps Cases in U.S., by Year

*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.

https://www.cdc.gov/mumps/outbreaks.html
Incidence of Mumps
NJ vs US

Case Identification/Investigation
- Establish a diagnosis
  - Do not r/o based on MMR status
  - Collect appropriate laboratory specimens
- Isolate for period of 5 days after parotitis onset
- Identify the source of infection
  - Travel, contact w/ other ill persons, unknown
- Identify/notify contacts
  - Assess immunity
  - Offer vaccine as appropriate
  - Educate on signs/symptoms and what to do
- Enhance Surveillance

Do We Have an Outbreak?
- Outbreak definition: 3 or more mumps cases linked by time and place
- Notify LHD and/or NJDOH
- Confirm diagnosis
  - Viral isolation
- Define population affected
  - Entire school, sports team, Greek-life event, etc
We Have an Outbreak…

- Assess immunity
- Exclude susceptible students
  - Exclude beginning 12th day from 1st exposure through 25th day after onset of parotitis in last case in affected school
  - Once vaccinated, may be readmitted immediately
- Promote awareness
  - “One voice, One message”
  - Students and surrounding community
- Conduct surveillance
  - 2 full incubation periods from last exposure

NJ College Mumps Outbreak, Spring 2014

- 4/9: notified of suspect OB affecting women’s and men’s lacrosse teams on a college campus (4 cases)
  - All complained of sore throat, jaw pain, general myalgia
- 4/16: confirmed outbreak via culture positive results
- Total of 15 cases among students
  - Onset of parotitis ranged 4/6 through 05/18
  - All cases were isolated
  - Ages ranged 18 to 22 years
  - All had 2 MMRs documented

Communications

- Collaboration between organizations (NJDOH, LHD, school, other health departments)
  - Exposures and surveillance
  - “One Voice, One Message”
- Messaging
  - NJDOH Mumps Alert Website
  - NULINCS message
  - FAQs: college-specific; public; clinical
  - End of semester communications
3rd Dose of MMR

- Insufficient data to recommend for or against 3rd dose
- CDC issued guidance for consideration
  - High 2-dose coverage (>90%)
  - Intense exposure settings (schools, healthcare)
  - High attack rate with ongoing transmission for at least 2 weeks
- Other considerations
  - Obtaining vaccine (cost, doses)
  - Administration logistics (staff, clinics, tracking)

CDC Mumps Communication Resources

- Healthcare Professionals
  - CDC Expert Commentary: Would You Recognize mumps?

- College Students
  - Infographic: Don’t Let Mumps Spoil Your Fun
    https://www.cdc.gov/mumps/infographics/mumps-mmr.html
  - Web graphic: Mumps Can Really Ruin a Selfie
    https://www.cdc.gov/mumps/infographics/web-graphic.html

CDC Mumps Communication Assistance

- Social Media
  - CDC can provide sample social media messages and JPEGs

- Outbreak-specific graphics
  - CDC assisted Arkansas in developing graphics in Marshallese
Challenges

- Setting
  - Residential vs commuter
  - Undergraduate vs graduate vs international
  - Housing: traditional dorms, family housing

- Assessing immunity
  - Immunization records for students
  - Faculty, staff, volunteers

- Isolation and quarantine logistics
  - Separate housing
  - Virtual access to class
  - Providing meals or necessities

Challenges

- Resources
  - Access to healthcare (campus vs hospital)
  - Laboratory testing logistics (materials, collection, contracts with labs)
  - Responding to questions/phone calls/press inquiries

- Communications
  - On campus vs surrounding community
  - Method: website, email, letter, text message
  - Messaging: Health educator, press office, student groups, NJDOH, CDC

- Trust of students
  - Non-punitive
  - Authoritative figure

Challenges

- Business continuity
  - Reduced staffing due to quarantine
  - Dedicating staff to assist with response
    - Healthcare
    - Communications
    - Administrative (e.g. reviewing records, tracking, phone calls)
  - Vendors, deliveries
  - School activities (e.g. sporting events, orientation, social events)
  - Outside activities (e.g. camps)

- Financial
  - Paying for testing
Resources

- NJDOH
  - CDS: http://www.nj.gov/health/cd/

- CDC
  - Pink Book: https://www.cdc.gov/vaccines/pubs/pinkbook/index.html


Thank you!

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