

Vaccine Preventable Disease Outbreaks:

What is happening in your backyard?
To titer or not to titer?

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VPD Annual Surveillance Report

New York State 2011

Disease	Cases
Haemophilus Influenza, Inv B (≤ 5 yo)	4
Hepatitis A	48
Hepatitis B, acute (Infant Perinatal)	58/0
Measles, Import non US, indigenous	7
Mumps	10
Pertussis	931
Rubella	0
S. Pneumo Invasive, Drug Res	42
S. Pneumo Invasive, Intermediate	39
S. Pneumo Invasive, Sens / Unk	901/199
Tetanus	0

PERTUSSIS

NYS Comparative Trends in Pertussis

YEAR	REPORTED CASES	INCIDENCE (PER 100,000)
2002	450	4.1
2004	1969	17.67
2006	1091	9.9
2009	265	2.4
2010	722	6.5
2011	931	8.4

Pertussis NYS 2012

□ 1/1/2012 – 3/31/2012

- Preliminary case numbers: >500
- Infants < 1yo: 50

□ Counties most affected:

- | | | |
|----------------|-----------------|---------------|
| ▪ Suffolk: 109 | Westchester: 40 | Broome: 38 |
| ▪ Onondaga: 31 | Erie: 35 | Orange: 31 |
| ▪ Nassau: 29 | Tompkins: 27 | Jefferson: 18 |

Pertussis Characteristics

- ❑ Highly contagious bacterial illness caused by *Bordetella pertussis*
 - Gram negative rod, difficult to grow in culture
- ❑ Vaccine-preventable
- ❑ > 200,000 cases / year in US prior to vaccine (1940's)
 - Major cause of childhood mortality
- ❑ ~500 cases per year in NYS since 1992 (range: 200–2,000)
- ❑ Cyclical every 3–5 years

Pertussis Transmission

- ❑ Reservoir: adolescent and adults
- ❑ Respiratory droplet transmission
 - Rarely fomite
- ❑ Incubation period
 - 7–10 days (range 4–21 days)
- ❑ Infectious period
 - Up to 21 days after onset *OR* until 5 days of appropriate antibiotic treatment
- ❑ Secondary transmission to up to 80% of household contacts

Public Health Concerns

- ❑ Highly transmissible
- ❑ Severe (sometimes fatal) disease, especially in very young
- ❑ Vaccination not 100% effective
- ❑ Goals of public health
 - Prevention
 - Outbreak control
 - Surveillance
- ❑ Reportable in New York and nationally
 - Report to local health department of patient's residence within 24 hours of suspicion

Public Health Response

- ❑ Provider and patient/parent interviews
 - Signs and symptoms, onset, complications
 - Treatment
 - Pertussis testing history
 - Vaccination history (if unvaccinated, reason)
 - Repeat interview at least 14 days after cough onset (duration)
- ❑ School or work exclusion
- ❑ Contact investigation
 - Identify close contacts and recommend post-exposure prophylaxis
 - Determine epidemiologic links
- ❑ Education, vaccination clinics

Pertussis Diagnosis Intervention

- ❑ CDC “Best Practice for Health Care Professionals; and the Use of PCR for Diagnosing Pertussis” distributed
 - <http://www.cdc.gov/pertussis/clinical/diagnostic-testing/diagnosis-pcr-bestpractices.html>
- ❑ “NYS Guidance on Testing and Treatment/prophylaxis of Suspect Pertussis Cases” developed
- ❑ Multistate Emerging Infections Program enhanced surveillance grant
- ❑ Provider advisories and informational messages

MEASLES

Measles Impact 2011

- NYS : 7 confirmed cases
 - Hundreds exposed at hospital EDs
 - All cases import related

- NYCDOHMH: 22 confirmed cases
 - >70 investigations completed, thousands exposed

- US: 222 confirmed cases
 - Most reported since 1996

Measles 2012

- Reports received 1/1/2012- 3/31/2012
 - NYS: 0
 - NYCDOHMH: 1
 - US: 27

- Impact from European and other international travel expected
 - Laboratory-confirmed cases of measles in England and Wales through March 2012: 253
 - January 2012 EU: @600 measles cases
 - 63% were identified in Romania
 - January – March 3, 2012 Ukraine (western): @4500 cases reported

Measles

- ❑ Highly contagious viral illness
- ❑ First described in 7th century
- ❑ Near universal infection of childhood in prevaccination era
- ❑ Common and often fatal in developing areas

Measles Epidemiology

- ❑ Reservoir Human
- ❑ Transmission Respiratory
 Airborne
- ❑ Temporal pattern Peak in late winter–spring
- ❑ Communicability 4 days before to 4 days after
 rash onset

Suspected Measles?

- ❑ Recent international travel, exposure to international visitors
- ❑ Clinically compatible illness
- ❑ Proper respiratory isolation
- ❑ **Immediate reporting** to local health department
- ❑ Laboratory specimen obtained for confirmation
 - Serology
 - Viral specimen

Prevention of Imported Strains of Measles from Establishing Endemic Transmission

- ❑ Rapid detection of cases is necessary so that appropriate control measures can be quickly implemented
- ❑ The major challenges to sustaining the elimination of measles from the United States are:
 - Continuing to vaccinate all children aged 12–15 months with a first dose of MMR
 - Ensuring that all school-aged children receive a second dose of MMR vaccine
 - Working with other countries to set and achieve national measles elimination goals

Proactive Measles Prevention

- ❑ Pan American Health Organization (PAHO)
 - PAHO urges all travelers visiting any country in the region to get vaccinated for measles and rubella before arriving in the Americas
- ❑ CDC quarantine notifications
 - Delays in receipt of airline manifests
 - Coordination of contact notices state to state
- ❑ CDC Advisory April 2011
 - Vaccine recommendations for travelers, especially infants 6-12 months old

Proactive Measles Prevention

- CDC Measles HAN Advisory 6/22/2011
 - “High Number of Reported Measles Cases in the U.S. in 2011—Linked to Outbreaks Abroad”
 - <http://emergency.cdc.gov/HAN/han00323.asp>

- CDC MMWR April 2012 – “Measles – US 2011”
 - Continued emphasis on preventing measles in all international travelers

SIR (Secondary Immune Response) to Measles

- HCP exposed in a NYC clinical setting
 - DOB 1959, history of IgG+ for measles 1993
 - Developed rash, “waxed and waned”, subjective fever, mild cough, no other symptoms
 - Acute serology IgG+, IgM-
 - Paired sera IgG strongly positive with no 4 fold increase
 - Viral culture negative
 - PCR+ per CDC lab
 - Reported to CDC as measles

SIR continued

□ SIR

- Immunity to measles may not be absolute
- Depending on preexisting antibody, may reflect a continuum of clinical illness
- Intensity of exposure is important risk factor
 - Absence of periodic boosting may alter paradigm of lifelong immunity
- Additional studies needed to determine whether modified measles is infectious
 - Absence of spread suggests limited replication of virus in vaccinated persons with mild or short-lived symptoms

What is the community provider/organization role in an outbreak?

- ❑ Prevention: provide recommended vaccines to all ages including staff

- ❑ Partner with your local health department
 - Timely reporting at the time of suspicion of disease or laboratory testing
 - Recommend and reinforce proper isolation

- ❑ Ensure patient compliance with treatment

- ❑ Educate your community

The role of serology in determining immunity

SEROLOGY

Background Science

From the textbook, VACCINES, 4th edition:

- ❑ The immune response after vaccination is similar in almost all respects to that noted after natural infection
- ❑ Immunization induces both humoral and cellular immunity and the production of interferon

Science, con't

- ❑ Laboratory evidence of immunity is documented by use of antibody assays
 - Tests for cell-mediated immunity are not standardized
- ❑ Antibody assay results from vaccine-induced immunity vary depending on the sensitivity of the assay
 - A negative test does not always mean lack of immunity

Science, con't

- ❑ IgG antibodies generally persist for many years
 - Antibody titers do decline over time for both vaccine and natural infection
 - May become undetectable
 - Immunity is subject to boosting by additional vaccine or natural infection challenge
- ❑ Vaccine antibody titers are typically lower than natural infection
- ❑ Immunization provides immunity as solid as that induced by natural infection

ACIP definition of immunity: MMR

- ❑ Born before 1957
- ❑ 2 doses of MMR vaccine
 - 2 doses given after the 1st birthday, separated by at least 28 days
 - No serology recommended or required to confirm immunity
- ❑ If no record of vaccine, test for immunity or provide 2 doses of MMR at 4 weeks apart
 - If non-immune, 2 doses of MMR should be administered
 - No recommendation for serologic testing after vaccination

ACIP Recommendations, con't

- ACIP does not routinely recommend more than 2 doses of MMR vaccine
- If a health care setting relies on post-vaccination testing to determine immunity, a negative serology can erroneously indicate the HCP needs additional doses
- ACIP does not recommend routine testing after MMR vaccination*
 - A negative serology after 2 documented doses probably represents a false negative, as a result of an insensitive test rather than a true vaccine failure

*Measles ,Mumps Rubella Vaccine Use and Strategies for the Elimination of Measles, Rubella and Control of Mumps, Recommendations of ACIP, MMWR, May 22, 1998. Vol. 47, no.RR-8, p. 19

ACIP definition of immunity: Varicella

- ❑ Documentation of two age appropriate doses of varicella vaccine
 - **preschool-aged children older than 12 months: 1 dose**
 - **school-aged children, adolescents, and adults: 2 doses**
- ❑ Medical provider diagnosis of varicella or verification of varicella disease
- ❑ History of medical provider diagnosed herpes zoster
- ❑ Laboratory evidence of immunity or lab confirmation of disease

ACIP recommendations, con't

- ❑ Commercially available lab tests for varicella antibody are usually based on enzyme immunoassay (EIA)
 - Available tests are sufficient to test for antibodies resulting from wild disease
- ❑ More sensitive assays needed to detect vaccine-induced antibody are not widely available
- ❑ ACIP does not recommend antibody testing after varicella vaccine*

*Prevention of Varicella, Recommendation of ACIP, MMWR June 22, 2007, Vol56, No. RR-4 p 26

Hepatitis B

- ❑ OSHA (Federal) Standard
- ❑ Includes HCP who may have exposure to blood or blood-contaminated body fluids
 - Occupational exposure is: “...reasonably anticipated skin, eye, mucous membrane, or parenteral contact with blood or other potentially infectious materials that may result from the performance of an employee’s duties.”

Source: NYSDOH Health Advisory: Recommendations For Vaccination of Health Care Personnel (HCP), December 20, 2007

For how long is Hepatitis B vaccine protective?

- ❑ Studies indicate that immunologic memory remains intact for more than 20 years
 - Confers protection against clinical illness and chronic hepatitis B infection, even though anti-HBs levels might become low or decline below detectable levels
- ❑ Periodic testing or boosting is not recommended
- ❑ Persons who perform invasive procedures should be treated no differently from other HCP with respect to anti-HBs testing
 - If a HCP has an exposure (e.g., needlestick) he or she should be evaluated for postexposure immunoprophylaxis according to current guidelines

Hepatitis B testing

- ❑ Post-vaccination testing for anti-HBs response is indicated for HCP 1-2 months after series completion
 - Catch-up program of serologic testing for HCP is not recommended
 - Those persons should be tested as necessary if they have significant exposure to HBV
- ❑ Non-responders should complete a second three dose series and be retested

Hep B immunity under discussion

- Are the young health care personnel who were vaccinated as infants still protected?
 - Routine infant immunization started @1992
 - Effective July 1994, Hep B series required for daycare and kindergarten admission in NYS
 - Effective February 2000, Hep B series required for 7th grade admission in NYS
 - Question is under investigation by ACIP
 - To be discussed at the June 2012 meeting
 - Guidance pending discussion and vote

**NYS VACCINE REQUIREMENTS:
HEALTH CARE PERSONNEL (HCP)**

Current HCP vaccination requirements in New York State

Facility Type	Current Requirements
Hospitals	Measles and rubella required; Regulation 405.3(10)
Nursing homes, adult homes, adult day care programs, enriched housing programs, and any residence housing 5 or more persons over the age of 65	Regulations require measles and rubella immunization (nursing homes, home health) Influenza offered; PHL 21-A Employees can refuse after being educated about its benefits
Other entities: Diagnostic and treatment centers, hospices, home care agencies, ESRD centers	Measles and rubella immunity required

HCP born in 1957 or later

- To meet recommended vaccine standards, HCP must have documentation of **EITHER**
 - Laboratory evidence of measles, mumps or rubella immunity (HCP who have an “indeterminate” or “equivocal” level of immunity upon testing should be considered susceptible) **OR**
 - 2 doses of live measles and mumps vaccines administered on or after the first birthday and separated by at least 28 days **AND**
 - At least 1 dose of live rubella vaccine administered on or after the first birthday

Note: According to NYS regulations, diagnosis of measles disease by a physician, nurse practitioner, or a physician assistant is allowed as evidence of immunity. However, it is recommended that health care facilities discontinue allowing employees born after 1957 to claim immunity to measles and mumps based on health care provider diagnosis alone. Health care provider diagnosis of rubella has never been permitted as evidence of immunity.

Source: NYSDOH Health Advisory: Recommendations For Vaccination of Health Care Personnel (HCP), December 20, 2007

HCP born before 1957

- ❑ Birth before 1957 is not considered evidence of immunity against rubella according to NYS regulations
- ❑ Person born before 1957 must have **EITHER**:
 - laboratory evidence of rubella immunity **OR**
 - 1 dose of live rubella vaccine administered on or after the first birthday
- ❑ Unvaccinated HCP born before 1957 who do not have a history of measles and mumps diagnosed by a physician, nurse practitioner, or a physician assistant or laboratory evidence of measles and mumps immunity, should receive at least 1 dose of MMR

Source: NYSDOH Health Advisory: Recommendations For Vaccination of Health Care Personnel (HCP), December 20, 2007

**NYS VACCINE REQUIREMENTS:
SCHOOL AND COLLEGE
REQUIREMENTS**

2012 New York State Immunization Requirements for School Entrance/Attendance

Vaccines	Pre-kindergarten (Day Care, Nursery, Head Start, or Pre-K) ²	School (k-12)
Diphtheria Toxoid-Containing Vaccine	3 doses (New York City Schools – 4 doses) ³	3 doses (New York City schools – 4 doses – required for kindergarten only)
Tetanus Toxoid-Containing Vaccine and Pertussis Vaccine (DTaP, DTP) ⁴	3 doses if born on or after 1/1/2005	3 doses if born on or after 1/1/2005
Tetanus, Diphtheria, and Pertussis Booster (Tdap)	Not applicable	Born on or after 1/1/1994 and enrolling in grades 6 through 11 for the 2012-2013 school year ⁵ 1 dose
Polio (IPV or OPV)	3 doses ³	3 doses
Measles, Mumps and Rubella (MMR) ⁶	1 dose	2 doses of measles-containing vaccine and 1 dose each of mumps and rubella (preferably as MMR)
Hepatitis B	3 doses	3 doses ⁷
Haemophilus influenzae type b (Hib)	3 doses if less than 15 months of age or 1 dose administered on or after 15 months of age ⁸	Not applicable
Pneumococcal Conjugate Vaccine (PCV)	Born on or after 1/1/2008 4 doses by 15 months of age, given at age-appropriate times and intervals ⁹	Not applicable
Varicella (Chickenpox) ⁶	Born on or after 1/1/2000 1 dose	Born on or after 1/1/1998 or born on or after 1/1/1994 and enrolling in grades 6 through 12 for the 2012-2013 school year ¹⁰ 1 dose

Other Proofs of Immunity

□ Serological Evidence of Immunity

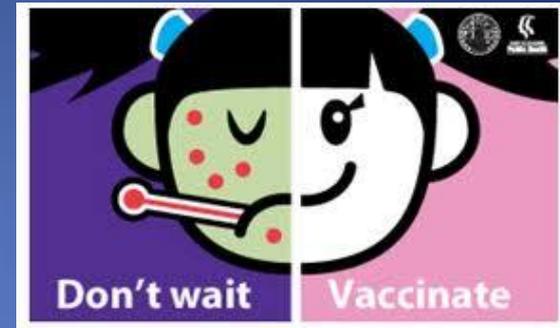
- Written statement from a physician, physician assistant, or nurse practitioner that a student's blood has been tested and demonstrated immunity to a disease
- Copy of the original laboratory results demonstrating immunity to a disease
- Valid only for measles, mumps, rubella, hepatitis B and varicella
- Equivocal and negative titer results are not considered proof of immunity

□ Diagnosis of Disease

- Diagnosis of disease statement by physician, physician assistant or nurse practitioner
- Valid only for measles, mumps, and varicella

NYS Post-Secondary Requirements

- PHL 2165, Requirements for Entrance/Attendance
 - 2 doses of measles vaccine and 1 dose of mumps and rubella vaccines **OR**
 - Diagnosis of disease for measles and mumps **OR**
 - Serological evidence of immunity for measles, mumps or rubella
 - Proof of honorable discharge from U.S. armed services within 10 years of application to the institution is acceptable pending receipt of immunization records



QUESTIONS AND DISCUSSION

Resources

- ❑ http://www.health.state.ny.us/prevention/immunization/providers/outbreak_control_guidelines.htm
- ❑ <http://www.cdc.gov/vaccines/pubs/surv-manual/index.html>
- ❑ <http://www.cdc.gov/vaccines/pubs/pinkbook/index.html>

Additional Resources:

FREQUENTLY ASKED QUESTIONS



Cost

Is it more cost effective to perform serologic testing of patients or employees with missing records than to revaccinate them?

Cost

- It depends!
 - Cost of serology
 - Cost of vaccine
 - Public vs. private vaccine
 - Insurance coverage
- One study of HCP MMR vaccination found that universal vaccination was more cost effective than using serological screening alone
 - Review of vaccine histories and vaccination of only susceptibles was the most cost effective method of all

Cost

- Time is money!

- An employee or patient who is titered rather than vaccinated will need to:
 - Come in for the blood draw (cost of missed work)
 - Wait for results of serology
 - Return for vaccination if non-immune serology (time and resources spent on additional health care visit)



Refugee Health

How can we verify the immune status of refugees who arrive in America without vaccine records?

Refugee Health – Incomplete or Missing Vaccine Records

- ❑ Assume the patient is unvaccinated and repeat the age-appropriate vaccinations
- ❑ Count only vaccinations that are well documented
- ❑ If patient has started a series but not completed it, continue where he or she left off
- ❑ Serologic testing is only acceptable for the following diseases
 - Measles, mumps, rubella, hepatitis A, hepatitis B, polio, and varicella

Refugee Health – Vaccination Assessment and School Entry

- ❑ NYSDOH strongly recommends that schools permit refugee students the maximum allowable 30 day grace period
- ❑ Public Health Law 2164 is meant to ensure children's health and safety and is not meant to be used to keep refugee children from attending school while immunizations are in progress



HCP and Post-Vaccination Hepatitis B Testing

How often should I retest HCP after they've received the hepatitis B vaccine series to make sure they're still protected?

Hepatitis B Vaccine

Post-Vaccination Testing

- Immunocompetent persons with adequate anti-HBs (≥ 10 mIU/ml) 1-2 months following the primary vaccine series have long-term protection and do not need further periodic testing to assess anti-HBs levels



Post-Vaccination Hepatitis B Testing of HCP

If HCP have written documentation of the hepatitis B 3-dose series in the past but were not tested for immunity, should they be tested now?

Hepatitis B Vaccine

Post-Vaccination Testing of HCP

- ❑ Serologic testing for anti-HBs is not recommended for HCP with documentation of past receipt (more than 2 months ago) of the complete hepatitis B vaccine series
- ❑ If a percutaneous or mucosal exposure to hepatitis B virus occurs, test for anti-HBs at that time



Post-Vaccination Hepatitis B Testing and the Vaccine Non- responders

What if serology reveals non-immunity
after 6 doses (2 complete series) of
hepatitis B vaccine?

Non-responders to Hepatitis B Vaccine

- ❑ ACIP recommends no further vaccine after two complete series.
- ❑ Susceptible to hepatitis B
- ❑ Treat as a non-responder (susceptible) following hepatitis B exposure

Source: MMWR, December 8, 2006;55(RR-16):1-25



MMR

A university student was initially unable to obtain vaccine records and so opted to be titered. The titer showed negative serology against mumps. She then obtained her vaccine record showing 2 valid doses of MMR. Does she need an additional dose of MMR?

MMR

- ❑ ACIP does not routinely recommend more than 2 doses of MMR
- ❑ A negative serology after 2 documented doses of MMR probably represents a false negative (i.e., antibody titer too low to detect with commercial tests)
- ★ **Recommendation from CDC, 2011:** “There is no ACIP recommendation for this situation. A negative serology would more likely be the result of an insensitive test than of a true vaccine failure. **No more doses are necessary.**”

Source: Immunization Action Coalition (IAC) “Ask the Experts”,
http://www.immunize.org/askexperts/experts_mmr.asp#products



MMR

If an HCP has 2 documented doses of MMR but has negative titers for measles, can he or she be assigned to a patient infected with measles?

MMR

- ❑ You should NOT do post-vaccination serologic testing if an employee has 2 documented doses of MMR, which is an ACIP definition of "immune"
- ❑ ACIP does not routinely recommend more than 2 doses of MMR; **no additional doses are necessary**
- ❑ Exercise caution in the event of a case of a vaccine-preventable disease and HCP with negative titers
 - Consider temporary reassignment of any non-immune HCP, including those with complete vaccination but negative titers



Varicella

Which of my patients should have varicella serology prior to receiving varicella vaccine?

Varicella

- ❑ ACIP does not recommend serologic testing for people younger than age 13 years
- ❑ At least 90% of adolescents and adults from the U.S. can be expected to be immune to varicella, including those who do not recall having had the disease
 - As a result, serologic screening may be considered for people age 13 years and older who do not have a history of chickenpox
- ❑ However, it is safe to give varicella vaccine to people already immune to the disease. Screening is not required under any circumstance



Varicella

Which of my patients should have varicella serology after receiving varicella vaccine?

Varicella

- ❑ **None!** No patients should have varicella serology after receiving varicella vaccine
- ❑ Post-vaccination serologic testing for varicella immunity is not recommended in any group, including HCP

Source: Prevention of Varicella, Recommendation of ACIP, MMWR June 22, 2007, Vol56, No. RR-4 p 26