



Pertussis Disease and Control Measures

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Pertussis (Whooping Cough)

- Caused by bacterium *Bordetella pertussis*
- Prolonged cough illness that can last 10 weeks or more, with frequent coughing spells (often followed by vomiting), whoop and apnea. Sleep disturbance common.
- Transmission most commonly occurs by respiratory route through contact with respiratory droplets, or by contact with airborne droplets of respiratory secretions.



Pertussis

- Incubation period is usually 7-10 days, with a range of 5-21 days
- Infectious period: 1 week before onset of cough through 21 days after cough onset, or until have completed 5 days of appropriate antibiotics.
- Highly communicable, with secondary attack rate of 80% among susceptible household contacts.

Pertussis

Catarrhal stage (1-2 weeks)

- Coryza, sneezing, mild occasional cough.

Paroxysmal (1-6 weeks)

- Cough becomes more severe, occurs in burst of numerous rapid coughs, often accompanied by whoop and post-tussive vomiting at end of paroxysm. Appear well between attacks. Often worse at night.

Convalescent (weeks to months)

- Gradual recovery, may have paroxysms occur with subsequent respiratory infections for many months afterwards.



Presentation of Pertussis in Infants

- Disease in infants less than 6 months of age may be atypical, with a short catarrhal stage and gagging, gasping or apnea as the primary manifestation.
- Whoop may be absent.

Clinical Characteristics of Pertussis Cases in Wisconsin, 2011

Age Group	Paroxysms	Whoop	Post-tussive Vomiting	Apnea	Sleep Disturbance
< 1 y	96%	37%	64%	37%	82%
1- 4 y	91%	40%	65%	31%	85%
5-9 y	93%	32%	49%	16%	78%
10-19 y	98%	25%	43%	15%	80%
20+ y	98%	23%	42%	39%	80%



Cough Duration of Pertussis Cases, 2011

- 60% of cases had a cough that lasted 2-4 weeks
- 35% of cases had a cough that lasted 1-2 months
- 5% had a cough that lasted more than 2 months

Direct and Indirect Costs of Pertussis in Adults

Causes substantial direct costs in adults¹:

- Medical costs range between \$243-\$338 (mild versus severe cough)

Indirect costs in adults²:

- Mean loss of work days for adults: 7
- Mean # of medical visits for pertussis: 2.5
- 2% of adults were hospitalized
 - mean duration of stay was 3 days
- 6% of adults aged ≥ 50 years were hospitalized
 - mean duration of stay was 17 days

1 Lee GM et al. *Clin Infect Dis*. 2004;39:1572.

2 De Serres et al. *J Infect Dis* 2000;182:174.



Complications in Adults

- Difficulty sleeping
- Urinary incontinence
- Pneumonia
- Rib Fracture

Complications in Infants

- Young infants are at highest risk for complications:
 - Secondary bacterial pneumonia
 - Seizures and encephalopathy
 - Death, particularly in children <3 months of age
- Nationally, there were 111 deaths due to pertussis from 2004 to 2008, and children <3 months of age accounted for 92 (83%) of these deaths

Pertussis- Testing

Recommended Test

- PCR and culture (ideally).
- If only 1 specimen can be collected, then order PCR.

Specimen collection

- Nasopharyngeal swab is the recommended laboratory specimen for testing by culture or PCR.

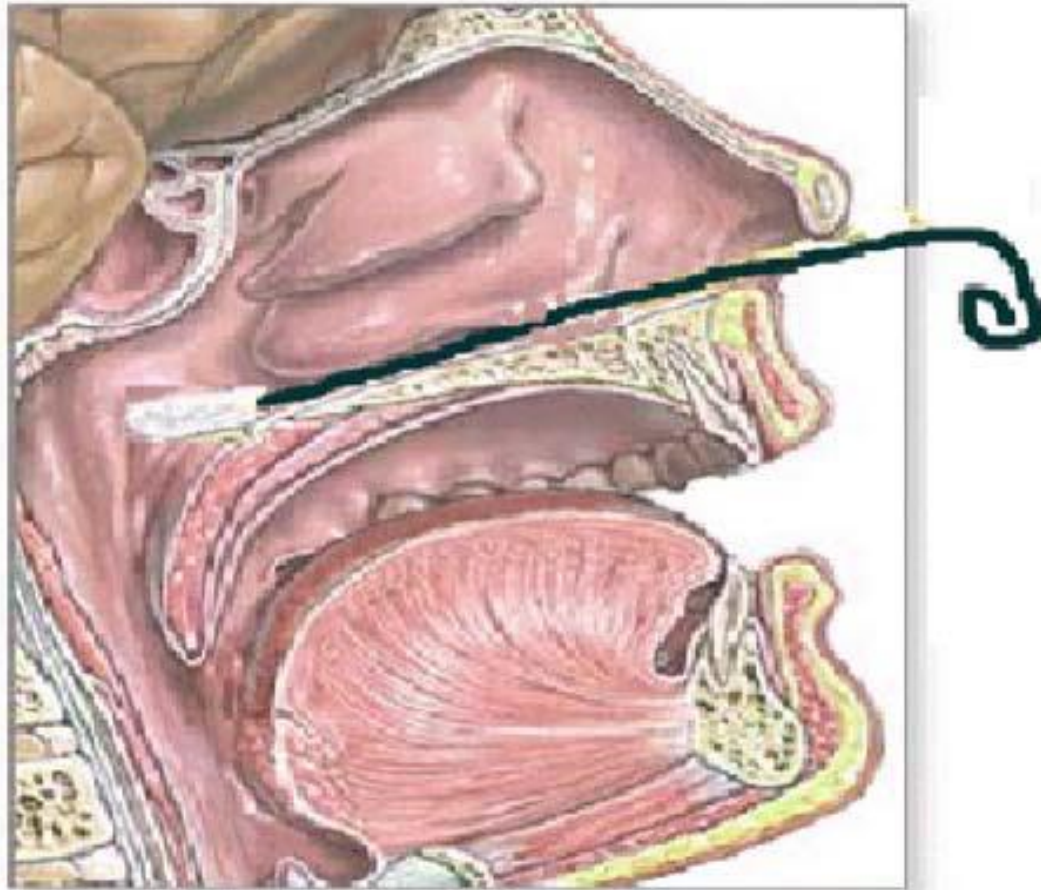
Timing

- PCR is most reliable within 21 days of cough onset and before initiation of appropriate antibiotic treatment.
- Culture is most reliable within 14 days of cough, and must be done before initiation of antibiotics.

Pertussis- Testing

- Serology or DFA are not acceptable diagnostic tests.
- PCR testing at the Wisconsin State Laboratory of Hygiene (WSLH) will include testing for *B. parapertussis* and *B. holmseii* as well.

Nasopharyngeal Swab

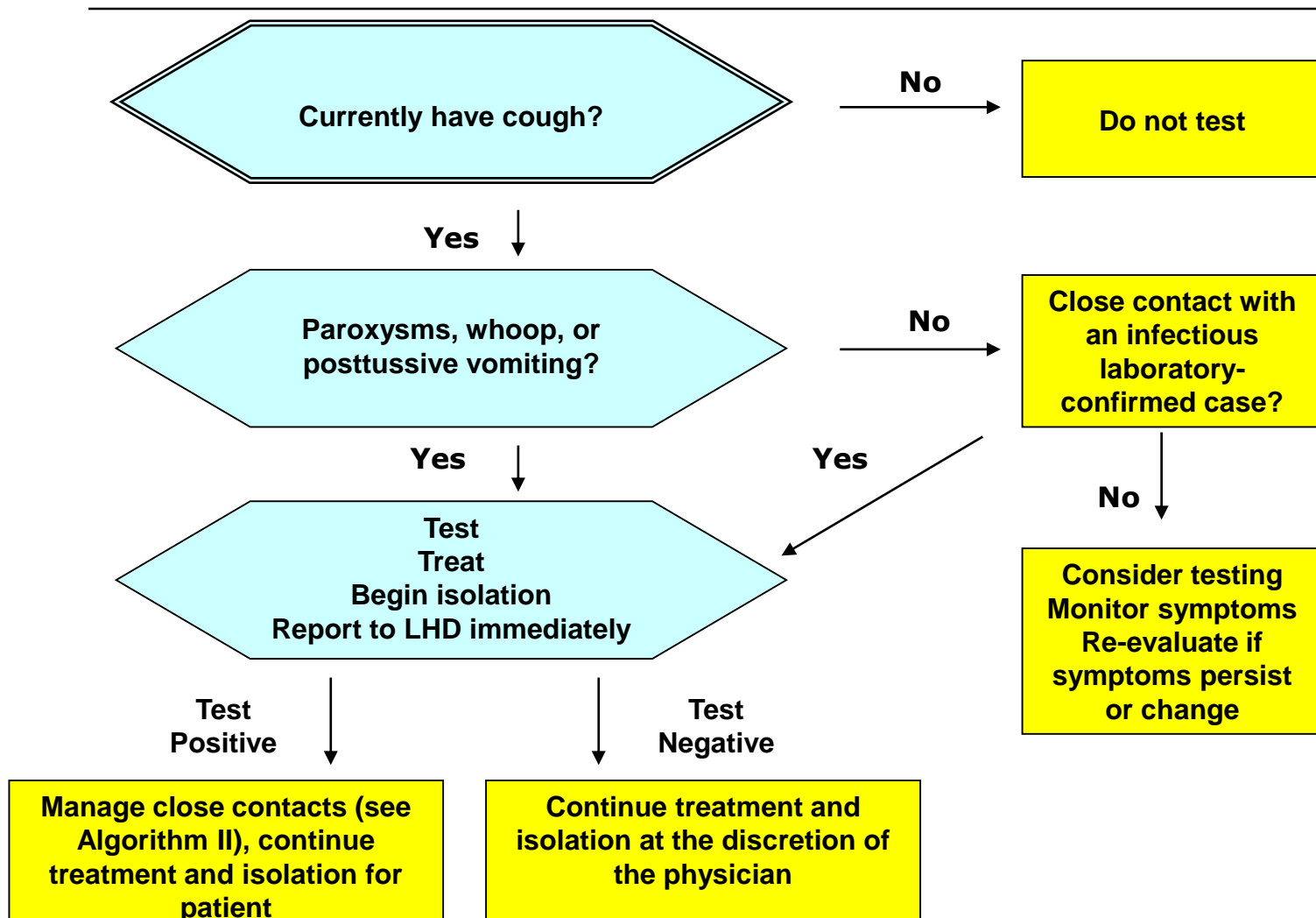


Pertussis- Treatment

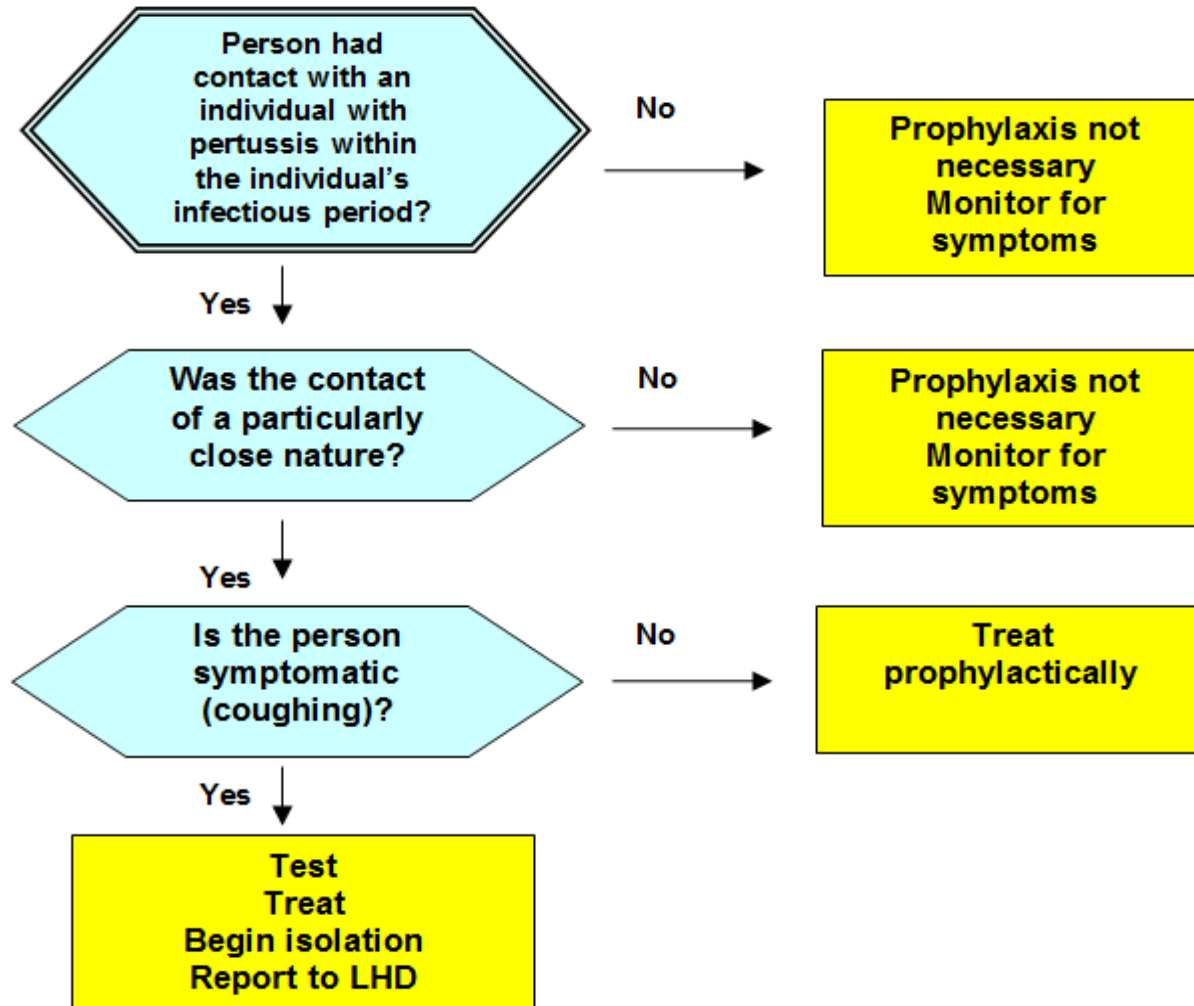
- Regimens for treatment and prophylaxis are the same
 - Azithromycin is preferred
- Alternatives include:
 - Erythromycin
 - Clarithromycin
 - Trimethoprim-sulfamethoxazole
- Other antibiotics have not been shown to be clinically effective and are not recommended.

Age group	Azithromycin	Erythromycin	Clarithromycin	<u>Alternate agent*</u> TMP-SMX
<1 month^a	Recommended agent. 10 mg/kg per day in a single dose for 5 days (only limited safety data available)	Not preferred. Erythromycin is associated with infantile hypertrophic pyloric stenosis. Use if azithromycin is unavailable; 40–50 mg/kg per day in 4 divided doses for 14 days	Not recommended (safety data unavailable)	Contraindicated for infants aged <2 months (risk for kernicterus)
1–5 months	10 mg/kg per day in a single dose for 5 days	40–50 mg/kg per day in 4 divided doses for 14 days	15 mg/kg per day in 2 divided doses for 7 days	Contraindicated at age <2 months. For infants aged ≥ 2 months, TMP 8 mg/kg per day, SMX 40 mg/kg per day in 2 divided doses for 14 days
Infants (aged ≥ 6 months) and children	10 mg/kg (maximum: 500 mg) in a single dose on day 1 then 5 mg/kg per day (maximum: 250 mg) on days 2–5	40–50 mg/kg per day (maximum: 2 g per day) in 4 divided doses for 14 days	15 mg/kg per day in 2 divided doses (maximum: 1 g per day) for 7 days	TMP 8 mg/kg per day, SMX 40 mg/kg per day in 2 divided doses for 14 days
Adults	500 mg in a single dose on day 1 then 250 mg per day on days 2–5	2 g per day in 4 divided doses for 14 days	1 g per day in 2 divided doses for 7 days	TMP 320 mg per day, SMX 1,600 mg per day in 2 divided doses for 14 days

Algorithm I: Clinical Evaluation and Management of Persons in Whom Pertussis is Being Considered



Algorithm II: Clinical Guidelines for Management of Contacts of an Individual with Pertussis



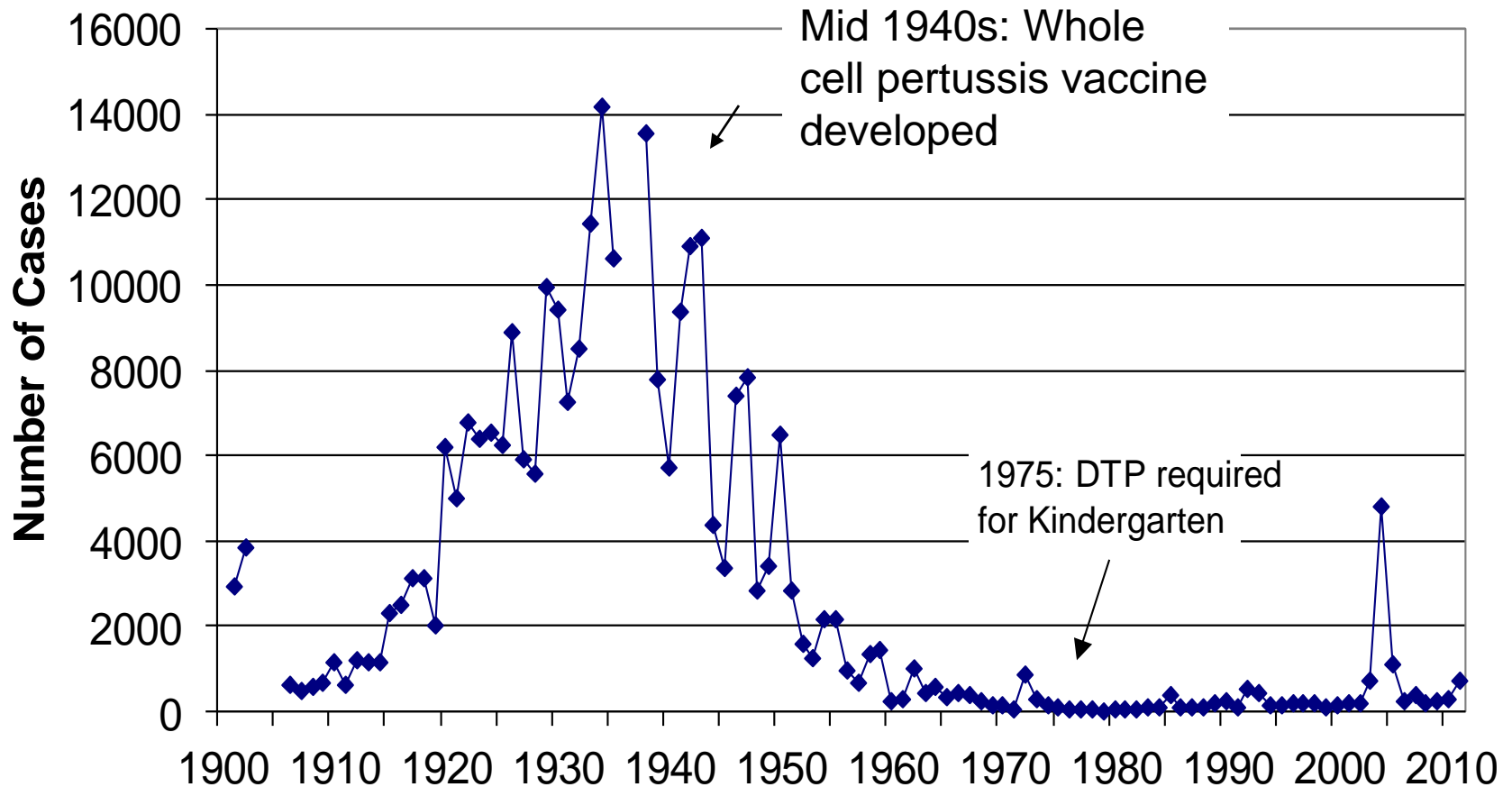
Isolation

- An individual with pertussis or suspected of having pertussis should be isolated until:
 - have completed 5 days of appropriate antibiotics, OR
 - 21 days since cough onset have passed, OR
 - pertussis has been ruled out.

Re-prophylaxis Considerations for Contacts

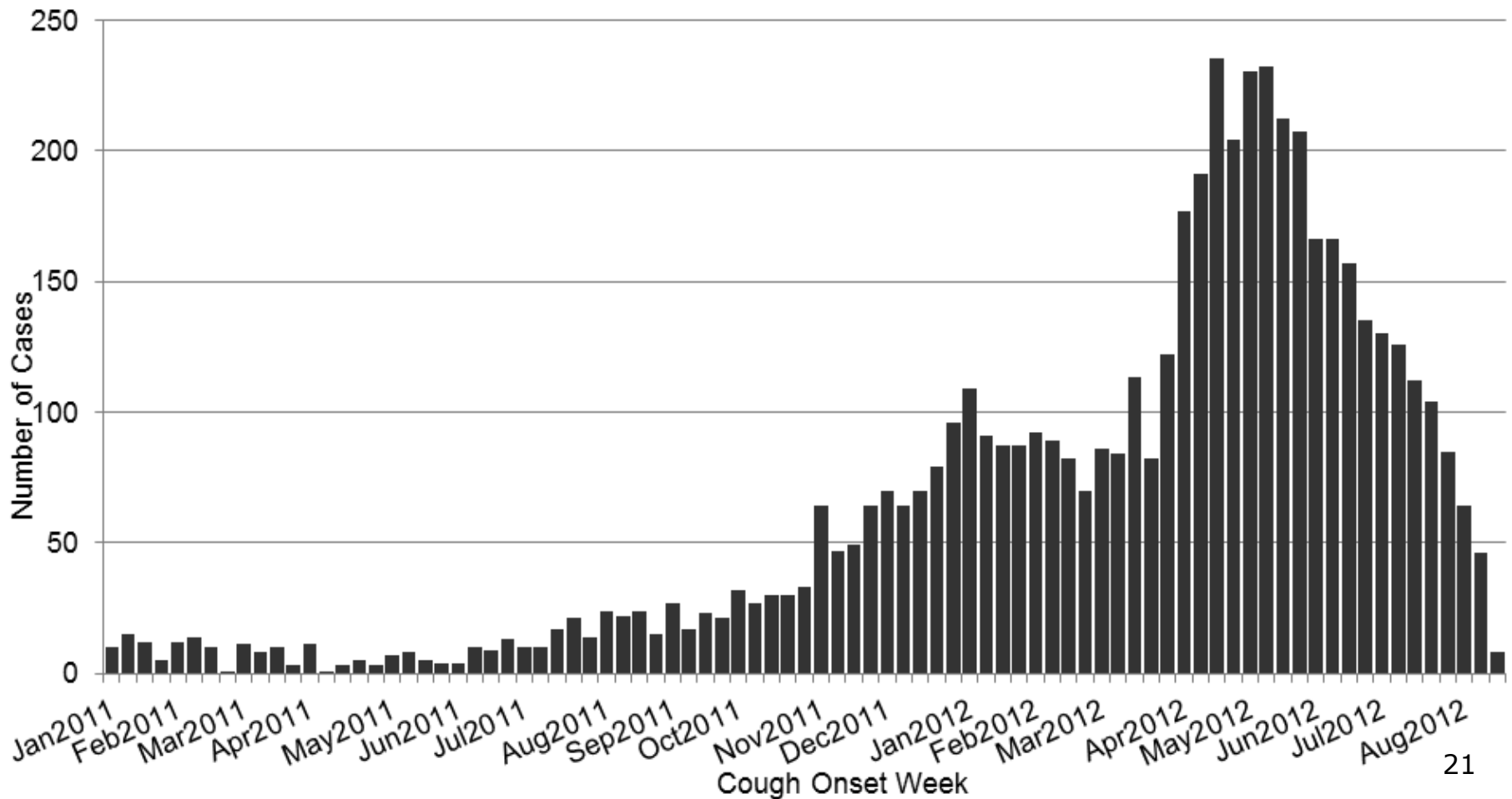
- Intensity/duration of exposure.
- Is the individual at high risk of complications (e.g. an infant).
- Timing of exposure since completion of antibiotic.
- Risks/benefits of a second course of antibiotic.

Pertussis, Wisconsin 1900-2011



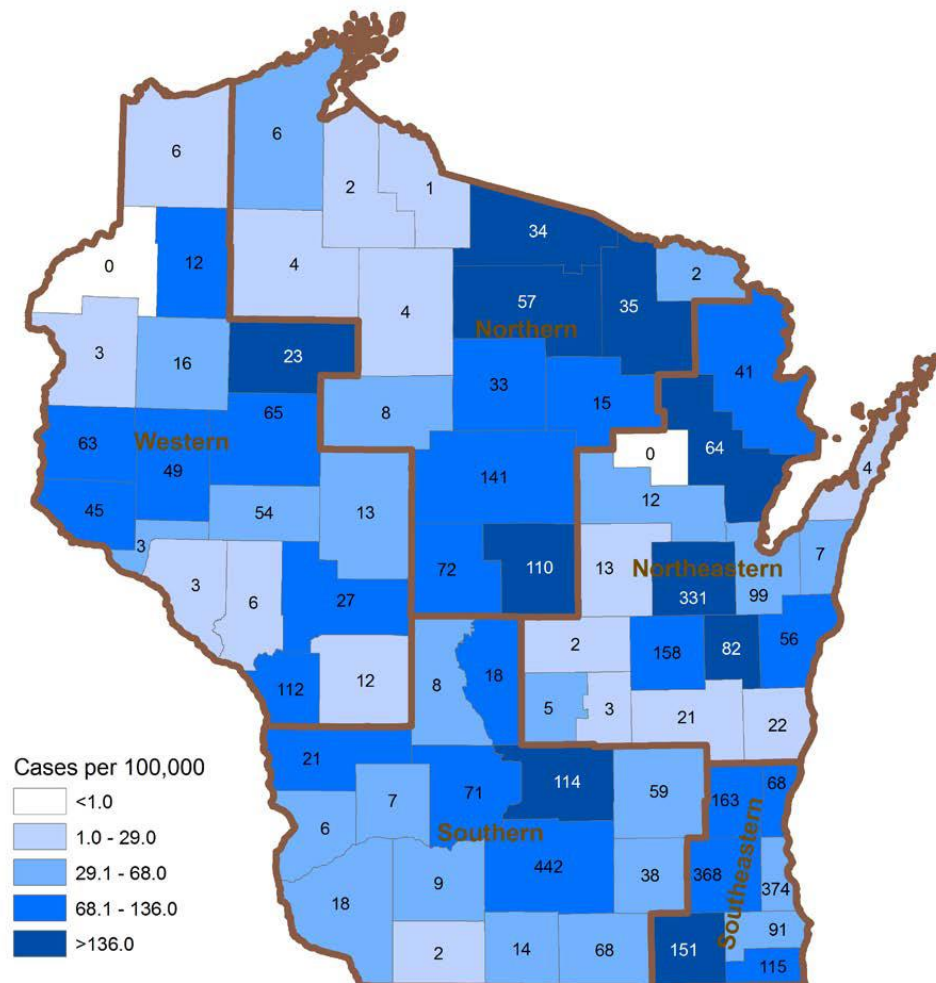
Pertussis Update

Number of reported confirmed and probable cases of pertussis by week of cough onset, Wisconsin, January 1, 2011 through September 3, 2012



Pertussis Update

Number and incidence of reported confirmed and probable cases of pertussis, by county of residence, Wisconsin, January 1, 2012 through September 3, 2012 (N=4,181)



2012 Wisconsin Cases in Infants^{1,2}

213 cases between 1/1/12 and 9/3/12

Age

- 151 (71%) were less than 6 months of age

Hospitalization

- 39 (18%) of infant cases were hospitalized
- Hospitalized: mean 3 days (range 1-15 days)

Vaccination Status

- 19% were too young to be immunized
- 56% were appropriately immunized for age
- 15% were under immunized
- 10% were up-to-date for age, but age-eligible for another dose

Deaths

- 1 death, too young to be vaccinated

¹ Data as of 9/3/12 ² Children less than 1 year of age

Tdap Recommendations for Pregnant Women

- Pregnant women should receive a dose of Tdap during pregnancy, preferably during the third or late second trimester (after 20 weeks' gestation) if they have not previously received a dose of Tdap.



Pregnant Women

- If Tdap is not administered during pregnancy, it should be administered post partum.
- Reminder: Tdap is still only licensed for one dose.

Recommended Adult Immunization Schedule—United States - 2012

Note: These recommendations must be read with the footnotes that follow containing number of doses, intervals between doses, and other important information.

Figure 1. Recommended adult immunization schedule, by vaccine and age group¹

VACCINE ▼	AGE GROUP ►	19-21 years	22-26 years	27-49 years	50-59 years	60-64 years	≥ 65 years	
Influenza ²		1 dose annually						
Tetanus, diphtheria, pertussis (Td/Tdap) ^{3,4}		Substitute 1-time dose of Tdap for Td booster; then boost with Td every 10 yrs						Td/Tdap ³
Varicella ^{4,5}		2 Doses						
Human papillomavirus (HPV) Female ^{5,6}		3 doses						
Human papillomavirus (HPV) Male ^{5,6}		3 doses						
Zoster ⁶						1 dose		
Measles, mumps, rubella (MMR) ^{7,8}		1 or 2 doses			1 dose			
Pneumococcal (polysaccharide) ^{8,9}		1 or 2 doses					1 dose	
Meningococcal ^{10,8}		1 or more doses						
Hepatitis A ^{11,8}		2 doses						
Hepatitis B ^{12,8}		3 doses						

¹Covered by the Vaccine Injury Compensation Program



For all persons in this category who meet the age requirements and who lack documentation of vaccination or have no evidence of previous



Recommended if some other risk factor is present (e.g., on the basis of medical, occupational, lifestyle, or other indications)



Tdap recommended for ≥65 if contact with <12 month old child. Either Td or Tdap can be used if no infant contact



No recommendation

Updated Tdap Recommendations for Adults-ACIP

- All adults 19 years of age and older who have not yet received a dose of Tdap should receive a single dose.
- When feasible, Boostrix should be used for adults aged 65 years and older; however ACIP concluded that either vaccine (Adacel or Boostrix) is acceptable¹.

¹ Boostrix is licensed for 10y and older; Adacel is licensed for 11-64 years



Updated Tdap Recommendations for Adults

For wound management, if a tetanus booster is warranted, Tdap is preferred in adults aged 19 years and older who have not received Tdap previously.

Immunization of Health-Care Personnel

Recommendations of the Advisory Committee on Immunization Practices (ACIP)

“On the basis of documented nosocomial transmission, HCP are considered to be at substantial risk for acquiring or transmitting hepatitis B, influenza, measles, mumps, rubella, pertussis, and varicella.”

ACIP Recommendations for HCP and Pertussis

- HCP, regardless of age, **should** receive a single dose of Tdap as soon as feasible if they have not previously received Tdap.
- Hospitals and ambulatory-care facilities should provide Tdap for HCP and use approaches that maximize vaccination rates.



Adult Immunization Rates

Nationally, only 8% of adults had reported receiving a dose of Tdap!

Pertussis Guidance

- The Wisconsin Immunization Program has issued control guidelines for pertussis
- Available at WDPH Immunization program website

VPD Surveillance and Control Manual Wisconsin Division of Public Health, Immunization Program

Pertussis

(Also known as Whooping Cough)

**Section 1:
ABOUT THE DISEASE**

A. Etiologic Agent

Pertussis is caused by *Bordetella pertussis*, a fastidious, gram-negative, pleomorphic bacillus.

B. Clinical Description

Presentation

The clinical course of a classic pertussis infection is divided into three stages: catarrhal, paroxysmal, and convalescent.

The catarrhal stage is characterized by the insidious onset of symptoms similar to the common cold: runny

New Td/Tdap VIS

- Available at www.immunize.org

VACCINE INFORMATION STATEMENT

Td or Tdap (Tetanus-Diphtheria or Tetanus-Diphtheria-Pertussis) Vaccine

What You Need to Know

Many Vaccine Information Statements are available in Spanish and other languages. See www.immunize.org/vis.
Hojas de Información Sobre Vacunas están disponibles en Español y en muchos otros idiomas.
Visite <http://www.immunize.org/vis>

1 Why get vaccinated?

Tetanus, diphtheria and pertussis can be very serious diseases.

TETANUS (Lockjaw) causes painful muscle spasms and stiffness, usually all over the body.

- It can lead to tightening of muscles in the head and neck so the victim cannot open his mouth or swallow, or sometimes even breathe. Tetanus kills about 1 out of 5 people who are infected.

DIPHTHERIA can cause a thick membrane to cover the back of the throat.

- It can lead to breathing problems, paralysis, heart failure, and

- Children and adolescents who did not get a complete series of DTaP shots by age 7 should complete the series using a combination of Td and Tdap.

Age 19 years and Older

- All adults should get a booster dose of Td every 10 years. Adults under 65 who have never gotten Tdap should get a dose of Tdap as their next booster dose. Adults 65 and older *may* get one booster dose of Tdap.
- Adults (including women who may become pregnant and adults 65 and older) who expect to have close contact with a baby younger than 12 months of age should get a dose of Tdap to help protect the baby from pertussis.

Questions?

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