

## **PERTUSSIS**

(Whooping Cough)

### **REPORTING INFORMATION**

- Class A(2)
- Report by end of next working day.
- [Confidential Case Report Card](#) (3812.11, rev. 12/81). [Lab report](#) (3833.11) or telephone.

### **AGENT**

*Bordetella pertussis*, a gram-negative bacillus; a pertussis-like syndrome can also be caused by *B. parapertussis*, *B. bronchiseptica*, respiratory syncytial virus (RSV), and certain adenoviruses.

### **CASE DEFINITION**

#### **Clinical case definition**

A cough illness lasting  $\geq 2$  weeks with one of the following: paroxysms of coughing, inspiratory "whoop," or post-tussive vomiting, without other apparent cause

#### **Laboratory criteria for diagnosis**

- Isolation of *Bordetella pertussis* from a clinical specimen, or
- Positive polymerase chain reaction [PCR] for *B. pertussis*

#### **Case classification**

Probable: a case that meets the clinical case definition, is not laboratory confirmed, and is not epidemiologically linked to a laboratory-confirmed case

Confirmed: A case of acute cough illness of any duration with a positive culture for *B. pertussis*; or a case that meets the clinical case definition and is confirmed by PCR; or a case that meets the clinical definition and is epidemiologically linked directly to a case confirmed by either culture or PCR

#### **Comment**

The clinical case definition is appropriate for endemic or sporadic cases. In outbreak settings, a case may be defined as a cough illness lasting  $>2$  weeks. Because some studies have documented that direct fluorescent antibody [DFA] testing of nasopharyngeal secretions has low sensitivity and variable specificity, it should be not relied on as a criterion for laboratory confirmation. Serologic testing for pertussis is available in some areas but is not standardized and, therefore, should not be relied on as a criterion for laboratory confirmation for national reporting purposes. Both probable and confirmed cases should be reported to NNDSS [by the state health department].

### **SIGNS AND SYMPTOMS**

The clinical course is divided into three stages: catarrhal, paroxysmal, and convalescent. The catarrhal stage has a gradual onset and initially resembles the common cold, i.e., coryza, sneezing, low grade fever, and a mild cough; this stage lasts from one to two weeks. Usually, whooping cough is not suspected until the cough gradually becomes more severe and paroxysms occur. These are characterized by repeated violent coughs without intervening inhalation, followed by a gasp for air that produces a characteristic high-pitched whoop. The patient becomes red or cyanotic, the eyes bulge, and the tongue protrudes. Thick mucus is dislodged and vomiting often follows. There is no fever and the patient appears normal between attacks.

The paroxysmal stage generally lasts from four to six weeks but might last as long as 10

weeks. Paroxysmal attacks occur more frequently at night. Adults, infants less than six months old, and partially immunized persons may lack the whoop and have few paroxysms. In convalescence the whoop and vomiting stop and the cough becomes less paroxysmal, disappearing over two to three weeks. Some patients have recurrent bouts of all symptoms, including whoop, during viral upper respiratory infections for many months after pertussis.

## **DIAGNOSIS**

Culture using Regan-Lowe medium, available at the ODHL, is the diagnostic procedure of choice and/or PCR. The organism is recovered best by using a posterior nasopharyngeal swab during the catarrhal or early paroxysmal stages. The swab should be taken prior to antibiotic therapy. The rate of recovery after 24 hours of therapy decreases rapidly. A high percentage of children will have positive cultures in the first week of illness but only 50 percent will be positive by the end of the third week; less than 20 percent are positive after the fifth week. Cultures may be transported on the Regan-Lowe medium at ambient temperatures.

## **EPIDEMIOLOGY**

### **Source**

Humans are the only reservoir.

### **Occurrence**

The disease is common to children worldwide. There has been a marked decline in the United States and other countries where immunization levels are high. The disease might be more common in adults than previously thought, but it is often not considered in the differential diagnosis.

### **Transmission**

Through direct contact with discharges from an infected person, usually by the airborne route. Communicability is greatest in the early catarrhal stage, before the paroxysmal cough begins.

### **Period of Communicability**

Communicability gradually decreases and becomes negligible for ordinary nonfamilial contacts in about three weeks, despite spasmodic cough with whoop. For control purposes communicability extends from seven days after exposure to three weeks after the paroxysmal stage in patients not treated with appropriate antibiotics. In treated patients, infectiousness extends for five to seven days after onset of therapy.

### **Incubation Period**

Commonly 5-10 days, with an upper limit of 21 days.

## **PUBLIC HEALTH MANAGEMENT**

### **Case**

#### Treatment

Spread of pertussis can be limited by decreasing infectivity of the patient and by protecting close contacts of that patient. Antimicrobials given in the catarrhal stage may ameliorate the disease. After paroxysms are established, however, antimicrobials have no discernible effect on the course of the illness and are given primarily to limit the spread of the organisms to others. The macrolide agents azithromycin (Zithromax), erythromycin and clarithromycin (Biaxin) are preferred for treatment of pertussis in persons aged  $\geq 1$  month (see table for dosing recommendations). For infants  $< 1$  month azithromycin is preferred, erythromycin and clarithromycin are not recommended. For persons  $\geq 2$  months who cannot tolerate macrolides, an alternative agent is trimethoprim-sulfamethoxazole [TMP-SMX

(Bactrim)]. The choice of antibiotic for treatment or prophylaxis should take into account effectiveness, safety, tolerability, ease of adherence to the regimen prescribed and cost.

### Isolation

The Ohio Administrative Code (OAC 3701-3-13[S]) states that "a person with pertussis who is not treated with appropriate antimicrobial therapy shall be isolated, including exclusion from school or child care center, until three weeks after the onset of paroxysms. If appropriate antimicrobial therapy is given, the person shall be isolated for five days after initiation of antimicrobial therapy" (see section 2 of this manual).

### **Contacts**

A close contact of a patient with pertussis is a person who had face-to-face exposure within 3 feet of a symptomatic patient. Respiratory droplet particles can be propelled through the air for distances of approximately 3 feet. Close contacts also can include persons who have direct contact with respiratory, oral or nasal secretions from a symptomatic patient (e.g. cough, sneeze, sharing food and eating utensils, mouth-to-mouth resuscitation, or performing a medical examination of the mouth, nose, and throat), or shared the same confined space in close proximity with a symptomatic patient for  $\geq 1$  hour. Postexposure prophylaxis with an appropriate antimicrobial agent can be administered to contacts. The decision to prophylaxis is made after considering the infectiousness of the patient and the intensity of the exposure, the potential consequences of severe pertussis in the contact, and the possibilities for secondary exposure of persons at high risk from the contact (e.g. infants aged  $< 12$  months, persons with some immunodeficiency conditions, or other underlying medical conditions such as chronic lung disease, respiratory insufficiency, or cystic fibrosis.) Prophylaxis of asymptomatic household contacts within 21 days of onset of cough in the index patient can prevent symptomatic infection. Symptomatic (coughing) household members of a pertussis patient should be treated as if they have pertussis. Because severe and sometimes fatal pertussis-related complications occur in infants aged  $< 12$  months, especially among infants aged  $< 4$  months, postexposure prophylaxis should be administered in exposure settings that include infants aged  $< 12$  months or women in the third trimester of pregnancy. The recommended antimicrobial agents and dosing regimens for postexposure prophylaxis are the same as those for treatment of pertussis (see table). All persons should be watched closely for respiratory symptoms for 14-21 days after contact is broken.

### Vaccine (in addition to antimicrobials)

Household and other close contacts who have had at least 4 doses of pertussis vaccine should receive a booster dose (DTaP) unless a dose has been given within the past three years.

Children who are unimmunized or who have received fewer than 4 doses of DTaP should have DTaP immunization initiated or continued according to the recommended schedule. Children who received their third dose six months or more before exposure should be given their fourth dose at this time.

### **Prevention and Control**

Immunization with pertussis vaccine is the most important measure for the control of pertussis. See the ODH Immunization Manual for details. Human pertussis immune globulin is no longer available in the United States. Reducing the dose of pertussis vaccine or giving the full dose in multiple small doses may result in an altered immune response and is not recommended. Furthermore, there is no evidence that the frequency of significant vaccine reactions is likely to be reduced by this practice. Interrupting the recommended primary and booster immunization schedule or delaying doses probably does not lead to a reduction in the level of immunity reached on completion of the primary series. Therefore

there is no need to restart a series, regardless of the time elapsed between doses.

Recommended antimicrobial treatment and postexposure prophylaxis for pertussis, by age group

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

\* Trimethoprim sulfamethoxazole (TMP-SMZ) can be used as an alternative agent to macrolides in patients aged ≥2 months that are allergic to macrolides, who cannot tolerate macrolides, or who are infected with a rare macrolide-resistant strain of *Bordetella pertussis*.

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**What is pertussis?**

Pertussis, or whooping cough, is a highly contagious respiratory infection caused by the bacteria *Bordetella pertussis*.

**Who gets pertussis?**

Pertussis can occur at any age. Although most of the reported cases occur in children under five years, the number of cases in adolescents and adults is increasing, probably due to waning of vaccine immunity. Adolescents and adults and those partially protected by the vaccine may have milder disease which is not diagnosed as pertussis. Pertussis is thought to account for up to 7% of cough illnesses per year in adults.

**How is pertussis spread?**

Pertussis is primarily spread by direct contact with the discharges from the nose and throat of infected individuals. Frequently, older siblings or other adult household members who may be harboring the bacteria in their nose and throat can bring the disease home and infect an infant in the household.

**What are the symptoms of pertussis?**

Pertussis begins as a mild upper respiratory infection. Initially, symptoms resemble those of a common cold, including sneezing, runny nose, low-grade fever and a mild cough. Within two weeks, the cough becomes more severe and is characterized by episodes of numerous rapid coughs followed by a crowing or high-pitched whoop. A thick, clear mucous may be discharged with the coughing. These episodes may recur for one to two months, and are more frequent at night. Young infants, adolescents, and adults do not have these typical coughing spells. Older people or partially immunized children may have milder symptoms.

**How soon after infection do symptoms appear?**

The incubation period is usually 7 to 10 days, with a range of 4 to 21 days.

**When and for how long is a person able to spread pertussis?**

A person can transmit pertussis from the onset of symptoms to three weeks after the onset of coughing episodes. The period of communicability can be reduced to five days after appropriate antibiotic therapy is begun.

**Does past infection with pertussis make a person immune?**

One attack usually confers immunity comparable to that provided by vaccine.

**What are the complications associated with pertussis?**

Young infants are at the greatest risk for complications. Serious complications of pertussis include pneumonia, seizures, encephalopathy (disorders of the brain), and death. Less serious complications include ear infections, loss of appetite, and dehydration.

**What is the vaccine for pertussis?**

Children should be immunized with the DTaP (diphtheria, tetanus, acellular pertussis) vaccine at 2, 4, 6 and 15 to 18 months of age and between 4 and 6 years of age. Children and adults should receive Td boosters every 10 years. At present, it is recommended that Tdap be used for one of those boosters.

**What can be done to prevent the spread of pertussis?**

The single most effective control measure is maintaining the highest possible level of immunization in the community. The treatment of cases of pertussis with the appropriate antibiotic is important, as is the treatment of close contacts of cases. In addition, medical professionals should consider the diagnosis of pertussis in adolescents and adults with persistent coughs. People who have or may have pertussis (including those with a persistent cough) should stay away from young children and infants until properly evaluated by a physician.