

# Pertussis<sup>1</sup>

**Organism:** *Bordetella pertussis*, a fastidious, gram-negative, pleomorphic bacillus.

**Incubation period:** 6-20 days, usually 7-10 days.

**Infectious period:** Highly communicable in the early catarrhal stage before the paroxysmal cough begins. Thereafter, communicability gradually decreases and becomes negligible in about 3 weeks despite persisting spasmodic cough. After antibiotic treatment, infectiousness usually ends after 5 days or less.

**Transmission Routes:** Person to person via aerosolized droplets produced from a cough or a sneeze or by direct contact with secretions from the respiratory tract of infectious individuals. Humans are the only known host for the bacteria.

**Treatment:** Recommended antimicrobial agents for treatment or chemoprophylaxis of pertussis are azithromycin\*, clarithromycin, and erythromycin. Trimethoprim-sulfamethoxazole can also be used.

## Information Needed for the Investigation

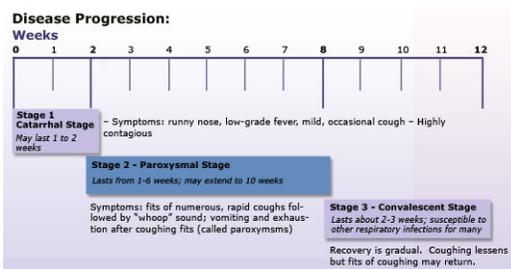
Alaska Section of Epidemiology (SOE) Infectious Disease Program staff work with public health nursing entities to collect clinical and epidemiological information by completing the [Pertussis Case-Report Investigation Report form](#).

## Verify the Diagnosis

Determine if signs or symptoms are compatible with pertussis in conjunction with laboratory test result criteria (isolation of *B. pertussis* from a clinical specimen or polymerase chain reaction (PCR) positive for *B. pertussis* DNA).

Clinical case definition: in the absence of a more likely diagnosis, a cough illness lasting >2 weeks with at least one of the following signs or symptoms:

- Paroxysms of coughing; OR
- Inspiratory “whoop;” OR
- Post-tussive vomiting; OR
- Apnea (with or without cyanosis) FOR INFANTS <1 YEAR OF AGE ONLY.



Disease in infants younger than 6 months of age may be atypical, apnea is a common manifestation and whoop is often absent. Older children and adults frequently have an atypical manifestation with prolonged cough, with or without paroxysms and no whoop; however, individuals can exhibit classic illness.

<sup>1</sup> Information on *Bordetella parapertussis* included in an appendix within this document.

## Case Classification

### **Suspect**

A clinical syndrome or illness consistent with pertussis and without other apparent cause such as:

- Any acute cough illness lasting 7 days or more; or
- Any acute cough illness with paroxysmal cough or inspiratory whoop; or
- Any acute cough illness in a person who is a contact to a case of pertussis.

### **Probable**

In the absence of a more likely diagnosis, a cough illness lasting  $\geq 2$  weeks, with at least one of the following signs or symptoms:

- paroxysms of coughing; or inspiratory "whoop", post-tussive vomiting, or apnea (with or without cyanosis) (FOR INFANTS AGED <1 YEAR ONLY)

And

- absence of laboratory confirmation; and
- no epidemiologic linkage to a laboratory-confirmed case of pertussis.

### **OR, FOR INFANTS AGED <1 YEAR ONLY:**

Acute cough illness of any duration, with at least one of the following signs or symptoms:

- Paroxysms of coughing, inspiratory "whoop", post-tussive vomiting, or apnea (with or without cyanosis)

And

- PCR-positive for pertussis.

### **OR, FOR INFANTS AGED <1 YEAR ONLY:**

Acute cough illness of any duration, with at least one of the following signs or symptoms:

- Paroxysms of coughing, inspiratory "whoop", post-tussive vomiting, or apnea (with or without cyanosis)

And

- Contact with a laboratory-confirmed case of pertussis.

### **Confirmed**

Acute cough illness of any duration, with isolation of *B. pertussis* from a clinical specimen.

**OR** Cough illness lasting  $\geq 2$  weeks, with at least one of the following signs or symptoms:

- Paroxysms of coughing, inspiratory "whoop", post-tussive vomiting; or apnea (with or without cyanosis) (FOR INFANTS AGED <1 YEAR ONLY)

And

- PCR-positive for pertussis or contact with a laboratory-confirmed case of pertussis\*.

\*Note: An illness meeting the clinical case definition should be classified as "probable" rather than "confirmed" if it occurs in a patient who has contact with an infant aged <1 year who is PCR positive for pertussis and has  $\geq 1$  sign or symptom and cough duration <14 days (classified as "probable" case).

## Outbreak Definition

- Two or more cases that have occurred within 42 days of each other and clustered in a common setting. One or more of the cases should be confirmed to be pertussis by laboratory diagnosis (isolation of *B. pertussis* from a clinical specimen or PCR-positive for *B. pertussis* DNA).

## **Determine the Extent of Illness**

Early diagnosis and treatment of pertussis limits its spread to other susceptible people.

- Attempt to identify household and other close contacts that may have symptoms of illness or have been exposed.
- Determine if disease may be transmitted to others at high-risk for severe pertussis including pregnant women and infants.
- Priority should be given to managing high-risk cases and contacts.

## **Laboratory Specimens**

Determining who has pertussis and who does not is often difficult. Whenever possible, a nasopharyngeal sample should be [properly obtained](#) for optimal laboratory diagnosis.

- Obtain specimen using a polyester nasopharyngeal swab (Copan or Dacron; not cotton). Place inoculated swab in a sterile plain tube. Refrigerate specimen until shipment to the laboratory. Ship at ambient temperature.
- Acceptable test methods include Pertussis PCR (preferred) or culture.
  - Samples for PCR testing may be sent to the Alaska State Public Health Laboratory-Anchorage using the following laboratory requisition form: <http://www.dhss.alaska.gov/dph/Labs/Documents/publications/AncSupplyReq.pdf>
  - Serological tests are not standardized, are not diagnostic, and are not recommended.

Note: In general, when a single laboratory-confirmed case of pertussis is identified in a household, childcare facility, or a similar setting, additional laboratory testing is not needed. Additional cases may be identified by clinical symptoms alone. However, if providers are seeing symptomatic patients who do not have a direct epi-link, it makes sense to test.

## **Contact and Control Measures**

- Vaccination of susceptible persons is the most important preventive strategy against pertussis.
  - A primary DTaP vaccine series is routinely recommended at 2, 4, and 6 months, at 15 through 18 months, and at 4 through 6 years of age. During a community outbreak, infants can receive vaccine on an accelerated [catch-up schedule](#).
  - Tdap is routinely recommended as a single dose for those:
    - 11 through 18 years of age with preferred administration at 11 through 12 years of age.
    - Any adult 19 years of age and older who have not received Tdap vaccine or for whom vaccine status is unknown
    - Pregnant women during each pregnancy, preferably at 27 through 36 weeks gestation.

- Healthcare workers should receive a single dose of Tdap as soon as feasible if they have not previously received Tdap and regardless of the time since their most recent Td vaccination.
- Vaccination should be recommended for all persons who are not up-to-date for pertussis vaccine.
  - State-supplied vaccine is available. Refer to the state-supplied vaccine eligibility criteria for additional information.  
<http://dhss.alaska.gov/dph/Epi/iz/Pages/vaxpacket/default.aspx>
- The macrolide agents erythromycin, clarithromycin, and azithromycin are preferred for the treatment of pertussis in persons aged  $\geq 1$  month. For infants aged  $< 1$  month, azithromycin is preferred; erythromycin and clarithromycin are not recommended. For treatment of persons aged  $\geq 2$  months, an alternative agent to macrolides is trimethoprim-sulfamethoxazole (TMP--SMZ).

TABLE 4. Recommended antimicrobial treatment and postexposure prophylaxis for pertussis, by age group

Age group	Primary agents			Alternate agent*
	Azithromycin	Erythromycin	Clarithromycin	TMP-SMZ
<1 month	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 $\geq 2$ months, TMP 8 mg/kg per day, SMZ 40 mg/kg per day in 2 divided doses for 14 days
Infants (aged $\geq 6$ 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 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, SMZ 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 920 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  $\geq 2$  months who are allergic to macrolides, who cannot tolerate macrolides, or who are infected with a rare macrolide-resistant strain of *Bordetella pertussis*.

- Ensure that ill persons receive antibiotic treatment if it has been  $< 21$  days since cough onset. The earlier a person, especially an infant, starts treatment is better. If treatment for pertussis is started early in the course of illness, during the first 1–2 weeks before coughing paroxysms occur, symptoms will be lessened.
- Immunity to pertussis from vaccine or disease wanes over time and persons who have been vaccinated or had disease can become infected. Data on duration of protection from acellular vaccines suggest that waning occurs within 2–3 years of vaccination, particularly in persons who have never received whole-cell vaccine.
- Management of cases in childcare and school settings
  - Exclude case(s) from the setting until 5 days of appropriate antibiotic treatment (or 21 days after cough onset if no treatment).
  - <http://dhss.alaska.gov/dph/Epi/id/SiteAssets/Pages/Pertussis/PertussisSchoolExclusion.pdf>
  - Notify parents/guardians and staff about pertussis signs/symptoms, prevention and control measures, and who is considered a high-risk contact. Consider active surveillance for cough illness and exclusion of those with cough until evaluation by healthcare provider.
    - Resources available on the [SOE Pertussis webpage](#)

## Post-exposure Prophylaxis

### Close Contacts

- CDC recommends PEP for all household contacts, regardless of age or immunization status, because secondary attack rates have been demonstrated to be high among families even when up-to-date with immunizations.
- SOE considers it reasonable to prioritize PEP only to high-risk close contacts, infants aged < 1 year or those likely to be in contact with infants. A close contact includes: a) immediate family members; b) those who spent many hours together, or who slept under the same roof; c) and anyone with direct contact to a case's respiratory secretions. High-risk close contacts that should receive pertussis chemoprophylaxis include:
  - Infants (<1 year of age);
  - Pregnant women in the 3<sup>rd</sup> trimester, since they will soon have contact with an infant;
  - ALL household contacts of a case IF there is an infant or a pregnant woman in the 3<sup>rd</sup> trimester in the same household;
  - ALL close contacts who attend/work in childcare settings in which a case of pertussis is diagnosed IF there is an infant or a pregnant woman (3<sup>rd</sup> trimester) in the setting, or;
  - Other contacts at the discretion of SOE (e.g., pediatric health care workers, unimmunized contacts, or other pregnant women).

### All Contacts

- Should have their immunization status verified and updated as appropriate for age.
- Symptomatic contacts are considered clinical cases and should be treated according to the recommendations described in the table above.
- Asymptomatic contacts who do not meet the criteria for chemoprophylaxis should be advised to seek care promptly if they become symptomatic and to inform their health care provider about their pertussis exposure.

### Exposed Healthcare Workers

- Healthcare workers with unprotected (i.e., unmasked) exposure to pertussis cases may be managed in two ways:
  - They may be offered post exposure prophylaxis; or
  - They may self-monitor for symptoms for 21 days from the time of exposure.
- Decisions on whether to offer prophylaxis or initiate symptom watch should take into consideration the patient population seen by the HCW and the likely frequency of exposures, e.g., antibiotics would likely be preferred over symptom watch for a HCW in a neonatal intensive care unit, but symptom watch may be preferred for a HCW in a pediatric clinic where repeated exposures are likely.

Broader use of PEP in limited closed settings, when a community-wide outbreak is not ongoing, may be considered; however when continued transmission of pertussis is evident, multiple rounds of antibiotics are not recommended.

## Hospital Considerations

- Use droplet and airborne transmission-based precautions until patient has completed 5 days of appropriate antibiotics.  
<http://www.cdc.gov/hicpac/pdf/isolation/isolation2007.pdf>
- Private or single room is preferred, cohorting is an option.

## Reporting Requirements

In Alaska, health care providers and clinical laboratories are required to routinely report cases of pertussis. Reports must be made within 5 working days after being suspected or diagnosed. To report phone (907) 269-8000 or fax a completed [Infectious Disease Report Form](#) to (907) 561-4239.

## Section of Epidemiology Pertussis Webpage

<http://dhss.alaska.gov/dph/Epi/id/Pages/dod/pertussis/pertussis.aspx>

Page includes additional resources such as:

- [Summary of Pertussis Diagnostic and Treatment Guidelines](#)
- [Additional Pertussis Contact Investigation Form](#)

## References

- CSTE Position Statement 13-ID-15, Pertussis/Whooping Cough (*Bordetella pertussis*), 2014 Case Definition. <https://wwwn.cdc.gov/nndss/conditions/pertussis/case-definition/2014/>
- NY Department of Health, Pertussis Outbreak Control Guidelines, Aug 2013. Available at: [http://www.health.ny.gov/prevention/immunization/providers/docs/pertussis\\_outbreak\\_control\\_guidelines.pdf](http://www.health.ny.gov/prevention/immunization/providers/docs/pertussis_outbreak_control_guidelines.pdf)
- CDC. Advisory Committee on Immunization Practices Recommended Immunization Schedules for Children and Adults. Available at: <http://www.cdc.gov/vaccines/schedules/index.html>
- CDC. Immunization of Health-Care Personnel: Recommendations of the Advisory Committee on Immunization Practices. MMWR 2011;60(RR07):1-45. Available at: <http://www.cdc.gov/mmwr/preview/mmwrhtml/rr6007a1.htm>
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- Section of Epidemiology Bulletin. New Pertussis Chemoprophylaxis Recommendations for Alaska, No. 29, September 15, 2010. Available at: <http://epibulletins.dhss.alaska.gov/Document/Display?DocumentId=173>
- CDC. Immunization of Health-Care Personnel: Recommendations of the Advisory Committee on Immunization Practices. MMWR 2011;60(RR07):1-45. Available at: <http://www.cdc.gov/mmwr/preview/mmwrhtml/rr6007a1.htm>
- APHL. Control of Communicable Diseases Manual, 20<sup>th</sup> Edition.

## Appendix - *B. parapertussis* Infection

- There are no national recommendations/guidelines on case management of parapertussis. Based on limited data, the CDC recommends that confirmed cases of parapertussis be treated to impact disease severity, especially in infants. In Alaska, parapertussis does not need to be investigated or reported.
- *B. parapertussis* causes a milder disease but is clinically indistinguishable from illness caused by *B. pertussis*. As for disease caused by *B. pertussis*, infants may have more severe disease and should be protected.
- Pertussis containing vaccines do not protect against parapertussis. There is little evidence supporting cross protection between pertussis and parapertussis. Co-infection of both pertussis and parapertussis is possible.
- Prophylactic treatment of household contacts should be strongly considered if there is an infant under the age of 6 months in the household. All infants under 6 months of age should receive antibiotic prophylaxis if they have been in contact with a person who has parapertussis.
- Limited clinical data on antibiotics suggest parapertussis is susceptible to both erythromycin and TMP-SMX. However, if the patient has been previously treated with Clarithromycin or Azithromycin, it is not necessary to repeat treatment. The dosing schedule is the same as for pertussis.
- Symptomatic contacts should be treated but do not need to be excluded.