

Pertussis

CLINICAL CASE DEFINITION

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

- ◆ Paroxysms of coughing, or
- ◆ Inspiratory “whoop,” or
- ◆ Post-tussive vomiting, or
- ◆ *FOR INFANTS AGED <1 YEAR ONLY*: Apnea (with or without cyanosis)

and without other apparent cause (as reported by a healthcare professional).

Note: *B. pertussis* infection among adults and older children or adolescents can range from mild cough illness to classic pertussis; infection also can be asymptomatic in persons with some level of immunity. When the presentation of pertussis is not classic, the cough illness can be clinically indistinguishable from other respiratory illnesses. Prolonged cough is a common feature of pertussis. In studies of adults with pertussis, the majority coughed for ≥ 3 weeks and some coughed for many months.

Note: As of January 2014, apnea has been added to the list of case-defining clinical signs and symptoms **for infants**.

CASE CLASSIFICATION

- ◆ **Probable:** Meets the above clinical case definition (>2 weeks of cough and at least one of paroxysms, whoop, or post-tussive vomiting), is not laboratory-confirmed, and is not epidemiologically-linked to a laboratory-confirmed case.
 - For infants *FOR INFANTS AGED <1 YEAR ONLY*, **Probable** cases include those with acute cough illness of **any duration**, 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)
 - AND**
 - Polymerase chain reaction (PCR) positive for pertussis OR Contact with a laboratory-confirmed case of pertussis.
- ◆ **Confirmed:**
 - A person with an acute cough illness of any duration who is culture-positive; **or**
 - A case that meets the clinical case definition and is confirmed by polymerase chain reaction (PCR); **or**
 - A case that meets the clinical definition and is epidemiologically-linked directly to a case confirmed by either culture or PCR.

TRANSMISSION

Person-to-person through direct contact with respiratory fluids/discharges, or airborne respiratory fluid droplets.

INCUBATION PERIOD

Commonly 7-10 days, range 6-20 days. See [Pertussis Timeline](#), below.

PERIOD OF COMMUNICABILITY

From early in the catarrhal phase (the first 1-2 weeks of illness, characterized by minor upper respiratory tract symptoms similar to the common cold) to approximately 3 weeks after onset of cough; appropriate antibiotic treatment will shorten communicability to 5 days from start of treatment.

REPORTING/INVESTIGATION

Health care providers should immediately report cases/suspect cases of pertussis to local health department serving the residence of the case.

Local health department responsibilities:

- ◆ Contact case/guardian and health care provider.
- ◆ Determine if case meets clinical case definition.
- ◆ If definition met (probable or confirmed cases), investigate using CDC surveillance worksheet and control guidelines below.
- ◆ Assist with coordination of specimen collection and coordination if public health lab resources (MDHHS, CDC, etc) are used.
- ◆ Report/ensure reporting of case to the Michigan Disease Surveillance System (MDSS). [CDC Pertussis Surveillance Worksheet](#) CDC Pertussis Surveillance Worksheet may be helpful in field investigation to collect and capture data. Obtain immunization history information from provider record or MI Care Improvement Registry (MCIR - state immunization registry).
- ◆ Update the MDSS record in a timely manner with new or additional info as it becomes available; enter information from Worksheet to the MDSS Detail form screens. Finalize MDSS record when case investigation is complete.
- ◆ In the event of death, obtain and send copies of hospital discharge summary, death certificate, and autopsy report to MDHHS Immunization Division.

LABORATORY CONFIRMATION

- ◆ Isolation of *Bordetella pertussis* from a clinical specimen, or
- ◆ Positive polymerase chain reaction (PCR) assay for *Bordetella pertussis* (in conjunction with meeting Clinical Case Definition, described above).

Appropriate specimens for testing are nasopharyngeal (NP) swabs or aspirates. Whenever possible, suspected cases of pertussis should have a NP swab or NP aspirate obtained for bacterial culture or PCR analysis. The MDHHS Laboratory offers pertussis PCR testing (and culture by special arrangement).

See [LABORATORY SPECIMENS: PROCEDURES AND CONSIDERATIONS](#), below, for additional information.

IMMUNITY/SUSCEPTIBILITY

Non-immunized persons should be considered susceptible.

Immunity from immunization wanes, probably after a period of 7-10 years and possibly earlier.

Natural disease confers immunity but is also not permanent.

Children who have recovered from **documented** pertussis do not need additional doses of pediatric pertussis vaccine (but do need tetanus and diphtheria vaccine doses). **However**, Tdap vaccine is recommended when the child becomes age-eligible (11-12 years old). Satisfactory documentation of pertussis diagnosis includes isolation of *B. pertussis* on culture or typical symptoms and clinical course when these are epidemiologically linked to a culture-confirmed case, as may occur during outbreaks. When such confirmation of diagnosis is lacking, pertussis vaccination should be completed because cough illness thought to be pertussis may be caused by other *Bordetella* species, other bacteria, or certain viruses.

CONTROL MEASURES

- ◆ Investigate reports of possible pertussis immediately.
- ◆ If clinical case definition is met, regard as a true pertussis case.
- ◆ Cases should receive antimicrobial treatment to help limit spread of the disease to others and should be excluded and isolated from group activity settings (e.g. schools, day-care centers, work place, camps, etc.) until they have received at least 5 days of an appropriate course of antibiotics for pertussis (generally the macrolide agents erythromycin, clarithromycin, or azithromycin; see [table of Recommended Antimicrobial Agents](#) below for further details). In health care settings, use of Droplet Precautions is recommended.
- ◆ Identify exposed close contacts, including household contacts, child care contacts, etc.
Note: Patients with pertussis are highly infectious; attack rates among exposed, non-immune household contacts are as high as 80%--90%
- ◆ Administer course of antibiotics to close contacts **within three weeks of exposure**, especially in high risk settings.
- ◆ Household and other close contacts should be treated prophylactically with appropriate antimicrobial therapy. The recommended antimicrobial agents and dosing regimens for postexposure prophylaxis are the same as those for treatment of pertussis; see [table of Recommended Antimicrobial Agents](#) below for further details.
 - Defining “close contacts” outside the household is especially challenging. Therefore, outside household environments, the risk for secondary transmission of pertussis should be evaluated on a case-by-case basis and decisions to recommend prophylaxis should be based on infectiousness of the case, transmission setting, risk for transmission to others, and risk status of the contacts.
 - Specific definitions of a contact for purposes of pertussis control are problematic and will vary according to the situation. Transmission can be expected with the following situations:
 - ◆ Direct face-to-face contact for a period (not defined) with a case-patient who is symptomatic (e.g., in the catarrhal or paroxysmal period of illness);
 - ◆ Shared confined space in close proximity for a prolonged period of time, such as >1 hour, with a symptomatic case-patient; or

- ◆ Direct contact with respiratory, oral, or nasal secretions from a symptomatic case-patient (e.g., an explosive cough or sneeze in the face, sharing food, sharing eating utensils during a meal, kissing, mouth-to-mouth resuscitation, or performing a full medical exam including examination of the nose and throat).

- ◆ Use of vaccine in disease control
 - **Children under age 7**

The immunization status of all contacts under 7 years of age should be assessed. All contacts ≤6 years of age who are not up-to-date with DTaP/DTP should be brought up to date with doses of DTaP using the minimal recommended intervals. If the child has had three doses of DTaP or DTP, is ≥12 months of age, and ≥6 months have passed since the third dose of DTaP or DTP, then a fourth dose of DTaP should be given. If the child has had four doses of DTaP or DTP, is 4 - 6 years of age, and received the fourth dose before the 4th birthday, then the fifth dose of DTaP should be given.

 - **Persons 7- 10 years of age**

Pertussis vaccines are not currently licensed for persons 7- 9 years of age. **However**, ACIP (Advisory Committee on Immunization Practices, US Public Health Service) expanded its guidance for pertussis vaccine use (October 2010) to include these age groups as follows:

ACIP recommends that children aged 7 through 10 years who are not fully vaccinated (defined as 5 doses of DTaP or 4 doses of DTaP if the fourth dose was administered on or after the fourth birthday) against pertussis and for whom no contraindication to pertussis vaccine exists should receive a single dose of Tdap to provide protection against pertussis. If additional doses of tetanus and diphtheria toxoid--containing vaccines are needed, then children aged 7 through 10 years should be vaccinated according to catch-up guidance, with Tdap preferred as the first dose.

Note: Boostrix® is licensed for persons 10 years of age and older; Adacel® is licensed for persons 11 – 64 years of age; in situations where Tdap is indicated, either Adacel or Boostrix may be used for persons aged 7-10 years

 - **Persons age 11 – 64 years**

Tdap vaccine is routinely recommended as a single dose booster at 11-12 years of age, and is also recommended for adults to replace a single dose of Td in the decennial (“every 10 years”) booster series if they have not previously received a dose of Tdap. Boostrix® is approved for persons 10 years of age and older; Adacel® is approved for persons 11 – 64 years of age. Persons in these age groups who are close contacts to a pertussis case and who have not received Tdap should receive a dose of Tdap.

 - It is especially important that adults who have or who anticipate having close contact with an infant <12 months of age (e.g., parents, grandparents, childcare providers, health-care workers) receive a single dose of Tdap if they have not previously received Tdap (after this they should get a Td booster vaccine every 10 years; an exception is pregnant women, who should get a Tdap dose during each pregnancy – see **Pregnant women**, below):
 - ◆ Tdap should be administered regardless of the interval since the last

- ◆ tetanus or diphtheria (Td) toxoid-containing vaccine.
- ◆ Ideally, Tdap should be given at least one month before beginning close contact with the infant.
- ◆ **Pregnant women:**
 - Pregnant women should receive Tdap during each pregnancy, regardless of the patient's prior history of receiving Tdap. To maximize the maternal antibody response and passive antibody transfer to the infant, optimal timing for Tdap administration is between 27 and 36 weeks gestation. If Tdap is not administered during pregnancy, Tdap should be administered immediately postpartum.
- ◆ After receipt of Tdap, persons should continue to receive Td for routine booster immunization against tetanus and diphtheria every 10 years.
- **Persons ≥ 65 years of age**

Adults aged 65 years and older who have not previously received Tdap and who have (or anticipated having) close contact with an infant aged less than 12 months also should be vaccinated. Other adults aged 65 years and older may receive Tdap. Tdap can be administered regardless of interval since the most recent tetanus or diphtheria-containing vaccine.
- Pertussis vaccines have not been specifically recommended for post-exposure prophylaxis, but may be considered in outbreak or control situations. For details see ACIP recommendations at <http://www.cdc.gov/vaccines/hcp/acip-recs/index.html> (scroll to ACIP Tdap Vaccine Recommendations).
- ◆ Provide information about pertussis to persons at risk and/or the general public. An excellent Question-&-Answer [pertussis information sheet](#) in .PDF format is available from the Immunization Action Coalition.

LABORATORY PROCEDURES AND CONSIDERATIONS

- ◆ Cases of pertussis should be confirmed by laboratory testing whenever possible. Appropriate specimens for testing are nasopharyngeal (NP) swabs or aspirates. Acceptable tests are bacterial culture and PCR. Culture is considered the standard and preferred test; it is specific for a diagnosis of pertussis, but is somewhat insensitive due to fastidious growth requirements of the organism. Culture is the only method that allows evaluation of antimicrobial resistance and molecular typing of organism strains.
- ◆ PCR methods are becoming widely available; positive results are considered confirmatory **if** the illness meets the clinical case definition (see above). However, false positives are a common problem. Some pertussis vaccines contain PCR-detectable pertussis; it is important to avoid contamination of clinical specimens with pertussis DNA from these and other environmental sources when collecting specimens. See [CDC's Best Practices](#) on the use of PCR for pertussis diagnosis.
- ◆ [Guidance on proper collection of specimens](#) is available from CDC.
- ◆ Specimens should be obtained from the posterior nasopharynx, **not** the throat or the anterior nose; see [Collection of NP Swab Diagram](#), below. For culture either Dacron or calcium alginate swabs may be used; for PCR only Dacron (or other polyester material such as rayon or nylon-flocked) swabs are recommended. Cotton swabs should **not** be used for either

culture or PCR.

- ◆ Direct fluorescent antibody (DFA) testing of nasopharyngeal specimens should **not** be used for laboratory confirmation due to limited specificity, but can be used for screening.
- ◆ Serology is **not** recommended at this time for lab confirmation of pertussis.
- ◆ The MDHHS Laboratory offers PCR analysis and bacterial culture. Culture is performed only by special arrangement. PCR is routinely performed because it offers greater sensitivity compared to culture. Additional information from MDHHS Bureau of Laboratories available at http://www.michigan.gov/documents/LSGBordetella_pertussis_Culture_8242_7.doc
- ◆ To obtain MDHHS serology and virology specimen collection and container kits, call MDHHS Laboratory Support Unit: 517/335-9040.

Pertussis Culture and/or PCR

Purpose: To confirm a case of pertussis.

Specimen needed: Nasopharyngeal swab.

MDHHS lab clinical specimen container: Unit 15

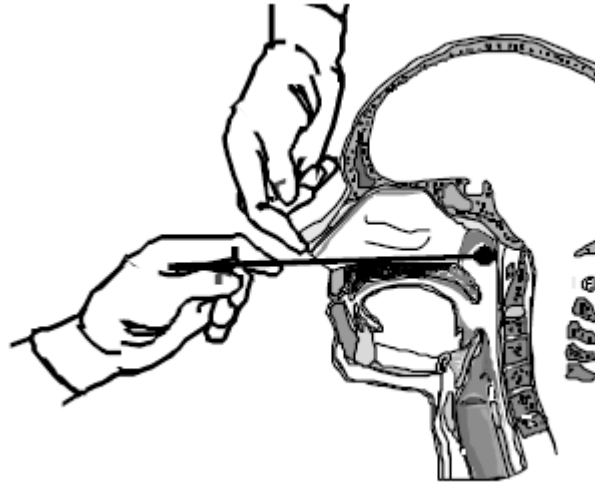
Specimen container description: Nasopharyngeal swab in in dry transport tube.

MDHHS test requisition form: [DCH-0583](#)

Specimen collection/submission procedure - Nasopharyngeal swab for culture or PCR:

- ◆ If possible, obtain specimen during the catarrhal stage of illness (generally first 1- 2 weeks of cough), before paroxysmal coughing starts.
- ◆ Dacron swabs (on aluminum or plastic shafts) are recommended. Tilt patient's head back, press nose slightly back and up to facilitate swab entry and passage into nostril; gently insert swab into nostril and continue slowly until it reaches the back of the nasopharynx; ideally the swab should be left in the posterior pharynx for about 10 seconds, then slowly and gently remove the swab and re-place in the container tube, following additional directions on tube label. See [Collection of NP Swab Diagram](#) below.
- ◆ Label tube with patient's name, type of specimen, and date collected.
- ◆ Ship specimen via overnight delivery at ambient temperature, to arrive within 24 hours.
- ◆ Send specimens to:
Michigan Department of Health & Human Services
Bureau of Laboratories
3350 N. Martin Luther King Blvd.
Building 44, Room 155
Lansing, MI 48909

Diagram: Collection of nasopharyngeal swab



Recommended antimicrobial agents for the treatment and postexposure prophylaxis of pertussis: 2005 CDC guidelines.

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

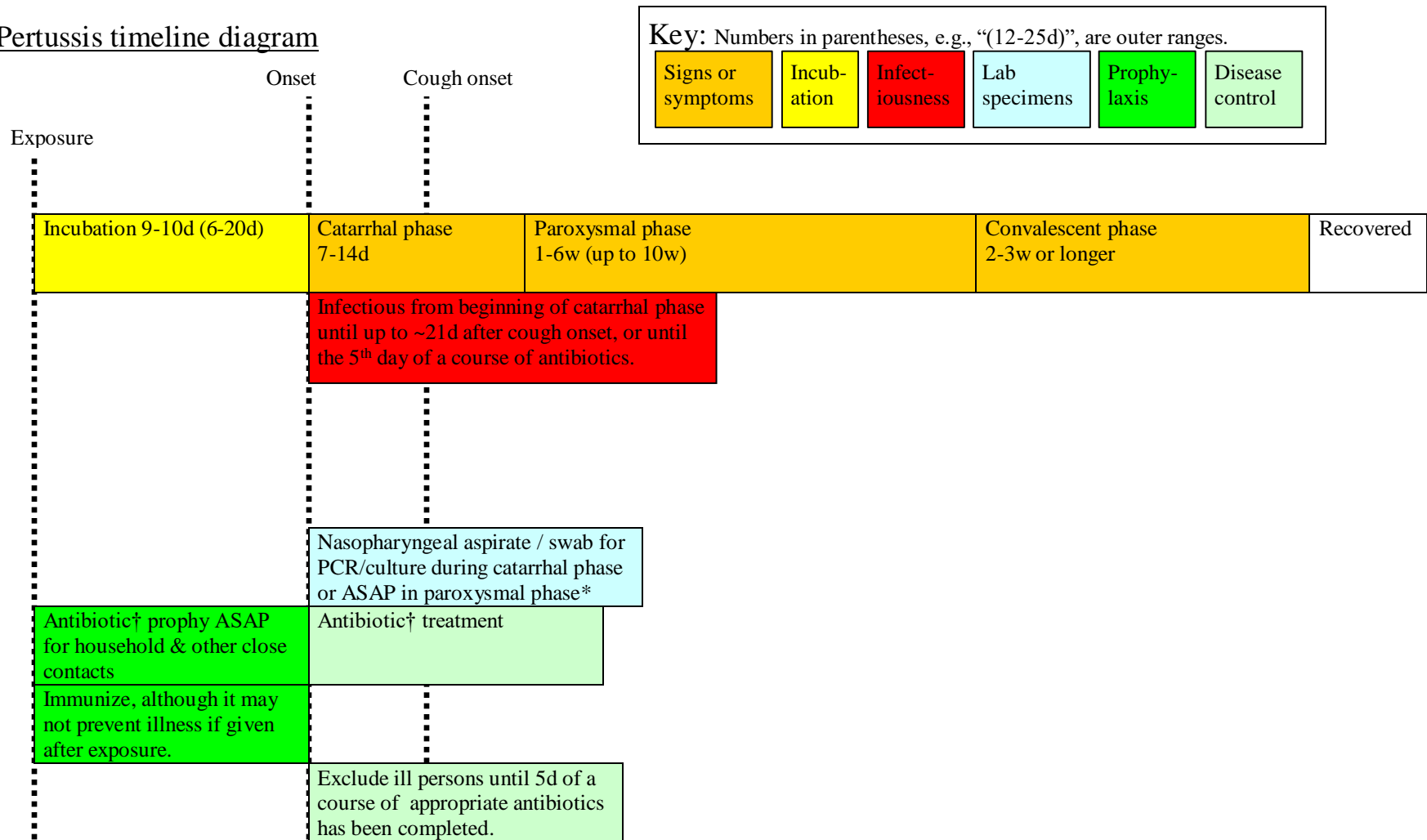
Age group	Primary agents			Alternate agent*
	Azithromycin	Erythromycin	Clarithromycin	TMP-SMZ
<1 month	Recommended agent. 10 mg/kg per day in a single dose for 5 days (only limited safety data available.)	Not preferred. Erythromycin is associated with infantile hypertrophic pyloric stenosis. Use if azithromycin 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 ≥2 months, TMP 8 mg/kg per day, SMZ 40 mg/kg per day in 2 divided doses for 14 days
Infants (aged ≥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 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 who are allergic to macrolides, who cannot tolerate macrolides, or who are infected with a rare macrolide-resistant strain of *Bordetella pertussis*.

Source: Centers for Disease Control and Prevention. Recommended antimicrobial agents for the treatment and postexposure prophylaxis of pertussis: 2005 CDC guidelines. MMWR 2005;54(No. RR-14):1-13.

Available for on-line viewing and downloading at
http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5414a1.htm?s_cid=rr5414a1_e#tab4

Pertussis timeline diagram



* Serology for pertussis is unreliable. PCR or culture is preferred if at all possible. MDHHS laboratories do not do pertussis serology.
 † Cases and contacts should receive a 14d course of macrolide (erythromycin, azithromycin, or clarithromycin) or appropriate alternate (eg. trimethoprim-sulfamethoxazole) for treatment/prophylaxis, regardless of immunization status.
 Sources: APHA Control of Communicable Diseases Manual, AAP Red Book, CDC Pink Book, CDC VPD surveillance manual, CDC Recommended antimicrobial agents for the treatment and postexposure prophylaxis of pertussis: 2005 CDC guidelines.