DEPARTMENT OF HEALTH AND HOSPITALS
Public Health

Infectious Disease Epidemiology Section
Office of Public Health
800-256-2748 (24 hr. number)
Fax (504) 568-8290
www.infectiousdisease.dhh.louisiana.gov

Information on Pertussis for Medical Staff

The **incubation period** of pertussis is commonly 7 to10 days, with a range of 4 to 21 days, and rarely may be as long as 42 days. The clinical course of the illness is divided into three stages.

The first stage, the **catarrhal stage**, is characterized by the insidious onset of coryza (runny nose), sneezing, low-grade fever, and a mild, occasional cough, similar to the common cold.

The cough gradually becomes more severe, and after 1 to 2 weeks, **the second, or paroxysmal stage**, begins. Fever is generally minimal throughout the course of the illness. Paroxysmal attacks occur more frequently at night, with an average of 15 attacks per 24 hours.

It is during the paroxysmal stage that the diagnosis of pertussis is usually suspected. Characteristically, the patient has bursts, or paroxysms, of numerous, rapid coughs, apparently due to difficulty expelling thick mucus from the trachea-bronchial tree. At the end of the paroxysm, a long inspiratory effort is usually accompanied by a characteristic high-pitched whoop. During such an attack, the patient may become cyanotic (turn blue).

Infants younger than 6 months of age may not have the strength to have a whoop, but they do have paroxysms of coughing.

Children and young infants, especially, appear very ill and distressed. Vomiting and exhaustion commonly follow the episode. The person does not appear to be ill between attacks.

In the **convalescent stage**, recovery is gradual. The cough becomes less paroxysmal and disappears in 2 to 3 weeks.

However, paroxysms often recur with subsequent respiratory infections for many months after onset of pertussis.

Time line:

Wk1	2	3	4	5	6	7	8	9-12
Incubation								
	Catarrhal							
			Paroxysmal					
					Convalescent			
								Cough
	Communicability							
	Culture +							
	PCR +							
			Serology +					

This long delay between onset and complete recovery causes anxiety among families leading to repeat medical visits. If PCR are repeated, they are often false positive leading to repeat treatments with antibiotics that are not necessary.

Laboratory Confirmation

Timing: *B. pertussis* is most frequently recovered in the catarrhal or early paroxysmal stage of illness. Once cough has been present for more than 3 weeks, recovering the organism is unlikely.

The **preferred methods** for the laboratory diagnosis of pertussis are culture and polymerase chain reaction (PCR), and it is recommended in most cases that both tests be performed. These tests are the basis for the Centers for Disease Control and Prevention (CDC) definition of a confirmed case of pertussis.

Culture of *B. pertussis* is the gold standard and the preferred laboratory test for pertussis; however, the organism can be difficult to isolate. Culture is less sensitive than PCR, but is 100% specific (no false positives). A negative culture result does not rule out pertussis infection. Confirm outbreaks with more than a one- culture confirmed case. *B. pertussis* usually grows after 3 to 4 days, however cultures cannot be considered negative for pertussis until after 10 days.

The primary reasons for **failure to isolate *B. pertussis*** are bacterial or fungal contamination, lack of fresh media, and specimen collection too late in illness. Cultures can also be negative if taken from a previously immunized person or if antimicrobial therapy has been started.

Polymerase chain reaction (PCR) assay provides rapid results and is more sensitive (less likely to be falsely negative) than culture. However, false positive test results can be a problem.

A person with a positive PCR who does not have a cough is not considered a case.

PCR tests are less sensitive in previously immunized individuals, but are more sensitive than cultures in such patients. PCR tests are also more likely than cultures to be positive in patients who have received antimicrobial treatment. Length of PCR positivity is similar to that for cultures. Delay in specimen collection is the main reason for a negative PCR test result in a patient with pertussis.

No PCR product has been approved by the Food and Drug Administration (FDA), and there are no standardized protocols, reagents, or reporting formats for pertussis PCR testing. Consequently, PCR assays vary widely among laboratories.

Specificity can be poor, with high rates of false-positive results in some laboratories. Like culture, PCR is also affected by specimen collection. An inappropriately obtained nasopharyngeal swab will likely be negative by both culture and PCR. PCR is less affected by prior antibiotic therapy, since the organism does not need to be viable to be positive by PCR. Continued use of culture is essential for confirmation of PCR results

Alternative when culture or PCR is not available or when it has been more than 3 weeks since cough onset:
There is no FDA-approved diagnostic test. The currently available serologic tests measure antibodies that could result from either infection or vaccination, so a positive serologic response simply means that the person has been exposed to pertussis by either recent or remote infection, or by recent or remote vaccination. Since vaccination can induce both IgM and IgA antibodies (in addition to IgG antibodies), use of such serologic assays cannot differentiate infection from vaccine response. At this time, **serologic test results should not be relied upon for case confirmation of pertussis infection.**

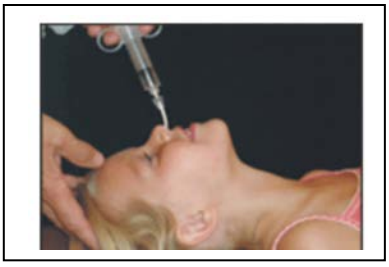
Commercially available serologic tests to detect IgG and IgA antibodies to pertussis toxin:
Such tests have not been clinically validated and are not generally recommended; however, one serologic enzyme-linked immunosorbent assay (ELISA)-like test (Focus Technologies, Cypress, CA) for detection of IgG and IgA antibodies to pertussis toxin may be useful for diagnosis. Diagnosis of pertussis on the basis of a high single serum titer from this test is expected to be reasonably sensitive and specific in persons older than 10 years of age if it has been more than 2 years since the last dose of pertussis containing vaccine was received.

Tests that are not recommended:
Commercial ELISA tests that use whole *B. pertussis* or *B. pertussis* antigens rather than pertussis toxin (i.e., FHA tests) have high false positive rates and are not recommended.

Testing for pertussis IgM antibody is also not recommended.

Direct fluorescent antibody (DFA) tests on smears made from nasopharyngeal specimens are not recommended for pertussis diagnosis, nor does a positive DFA test meet the CDC criteria for laboratory confirmation of a pertussis case. The sensitivity of these tests is low and they are performed reliably only by experienced technologists.

Specimens for culture or PCR must be obtained from a nasal aspirate or nasopharyngeal swab. A nasal aspirate is the preferred specimen; however, a nasopharyngeal swab is acceptable. A video demonstrating nasal aspiration and nasopharyngeal swab collection is available at: http://www.youtube.com/watch?v=TFwSefezIHU.



Nasal aspiration
Materials:
☐0.9% saline: 6 ml sterile, non-bacteriostatic
☐Sterile feeding tube #8 French, 16" length
☐ 5cc disposable syringe with disposable needle for drawing saline
☐Sterile specimen container, tight sealing, leak-proof (such as a sterile sputum or urine cup)
☐Mask and gloves

Procedure:
1- Attach the needle to the syringe and draw 3 ml of sterile, non-bacteriostatic saline into the barrel of the syringe. Attach a soft feeding tube to the syringe tip. Slowly push saline through the tube and let a drop or two come out of the tip for lubrication.

2-Put on mask and gloves.

3-Have patient lie on their back with their neck extended. Neck extension is very important as itallows pooling of the aspirate in the nasopharynx.

4-Ask patient to hold their breath, if possible (age and cooperation dependent). Advance the tube along the floor of the nose about 3 to 4 inches (less for a child) until resistance is met at the nasopharynx.

5-Using a smooth motion and without moving the tube out of place, quickly push the syringe plunger to expel the saline and pull the plunger back to withdraw the aspirate (it helps to have fingers in place as the tube is inserted). All of the fluid should be instilled into the nasopharynx during the procedure. If the child is crying, try to time the aspiration with the exhalation of the cry since this should help prevent saline from leaving the nasopharynx. The recovered aspirate specimen should be approximately 2 ml in volume.

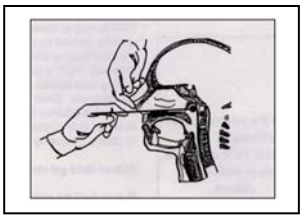
6-Carefully remove tube from nose and detach syringe.

7-Inject contents of syringe into specimen container.

8-Specimen should be transported at refrigerator temperature and received by laboratory as soon as possible and less than 3 days from time of collection.

Nasopharyngeal swab collection
Materials:
☐Dacron-tipped nasopharyngeal swab with flexible wire handle*
☐Regan-Lowe transport media
☐Mask and gloves
** Cotton or calcium alginate swabs are not acceptable.*
PCR assays may be inhibited by residues present in these materials

Procedure:
1. Put on mask and gloves.
2. Have patient sit with head against a wall as patients have a tendency to pull away during this procedure.
3. Insert swab into one nostril straight back (not upwards) and continue along the floor of the nasal passage for several centimeters until reaching the nasopharynx (resistance will be met). The distance from the nose to the ear gives an estimate of the distance the swab should be inserted. Do not force swab, if obstruction is encountered before reaching the nasopharynx, remove swab and try the other side.
4. Rotate the swab gently for 5-10 seconds to loosen the epithelial cells.



5. Remove swab and immediately inoculate Regan-Lowe transport media by inserting the swab at least ½ inch below the surface of the media. Bend or clip the wire swab handle to fit the transport medium tube and reattach the cap securely. A dry swab is acceptable for PCR testing.
6. Specimen should be transported at refrigerator temperature and received by laboratory as soon as possible and less than 3 days from time of collection.

Management

Cases

Early treatment of pertussis is very important. The earlier a person, especially an infant, starts treatment the better. If treatment for pertussis is started early in the course of illness, during the first 1 to 2 weeks before coughing paroxysms occur, symptoms may be lessened. Clinicians should strongly consider treating prior to test results if clinical history is strongly suggestive or patient is at risk for severe or complicated disease (e.g. infants). Treatment is useful for up to 3 weeks after exposure.

Late treatment less effective: If the patient is diagnosed late, antibiotics will not alter the course of the illness and, even without antibiotics, the patient should no longer be spreading pertussis.
Treatment may eliminate carriage, may prevent disease if administered early

Medications:
- Azithromycin po 10mg/kg on day one (maximum: 500mg), followed by 5 mg/kg per day (maximum: 250 kg) on days 2-5. Azithromycin remains one of the recommended drugs for treatment and chemoprophylaxis of pertussis, but consider using an alternative drug in those who have known cardiovascular disease
- Clarithromycin - 7 days
- Erythromycin po (40 to 50 mg/kg/day in 4 divided doses, maximum 2 g) for 14 days ⇨ compliance poor;
- Trimethoprim-Sulfamethoxazole alternate
- Penicillin & derivatives ineffective at clearing pertussis from nasopharynx
- Quinolones and cyclines contra-indicated in children

Contacts: An antibiotic effective against pertussis (such as azithromycin, erythromycin or trimethoprim-sulfamethoxazole) should be administered to all close contacts of persons with pertussis, regardless of age and vaccination status.

Contacts that should get prophylaxis are:
- Face to face contacts less than 3 feet 10-15 minutes
- Share confined space for 1 hour
- Cribs 3-6 feet
- Direct contact with oral, nasal, respiratory secretions
- Sharing food, drink, utensils
- Kissing
- Med exam of mouth, throat, intubation, CPR

Immune persons are protected against new disease but not against infection; they can be transmitters, they need prophylaxis

Source
www.cdc.gov/vaccines/pubs/pinkbook/downloads/pert.pdf