

epiTRENDS

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Public Health Practice in Washington State

Pertussis: New Testing Policy at the Public Health Laboratory

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Pertussis, also known as “whooping cough”, is an illness that occurs when the bacterium *Bordetella pertussis* infects the mucosa of the nose and nasal passages and produces a toxin that interferes with the function of the ciliated cells that line the upper airway. Pertussis is often mild in adolescents and adults but can be severe and life-threatening in very young infants. For this reason, pertussis is an immediately notifiable condition in Washington State and the United States.



Child with pertussis cough
Photo courtesy of CDC

Prior to widespread use of a whole-cell pertussis vaccine in the early 1950s, up to 270,000 pertussis cases were reported each year in the United States. In 1976, because of vaccination, only 1,010 cases were reported nationally. Since that time, the number of cases has progressively increased. This increase has been greatest among older children, adolescents, and adults. Because whole-cell pertussis vaccine was not recommended for these age groups, the immunity due to past childhood vaccination or previous *B. pertussis* infection waned and made these people susceptible to infection. As a result, during 2000-2006, of 103,940 cases of pertussis reported to CDC (annual average of 14,850 per year), 27,759 (27%) cases occurred among persons aged 15-39 years.



Locations of two recent pertussis
outbreaks, 2007-2008

Pertussis in the Pacific Northwest and Washington State

In the past few years, outbreaks of pertussis have been widely and regularly reported in the Pacific Northwest. From 2004 to 2007, Washington and Oregon reported more than 4,000 confirmed cases to CDC. Studies suggest that this is only a small fraction of the cases that occur. As a result, it is not uncommon to be exposed to a person with pertussis who may be contagious.

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Localized outbreaks are common. In December, 2007 through March, 2008, San Juan County experienced an outbreak that started among children attending child care centers on Orcas Island. This later spread to other islands in the county and involved persons from all age groups. In the summer of 2008, a pertussis outbreak occurred in Island County with early cases in south Whidbey Island and subsequent cases reported in all areas of Whidbey and on Camano Island. Many of these cases were in older children, including adolescents, and their parents. This outbreak in Island County was epidemiologically linked to a Skagit County outbreak in the same year. The link between cases in these two counties appeared to be participation in Little League baseball activities. In 2008, Clark County had a large pertussis outbreak that included adolescent and adult cases and appeared associated with membership in a specific religious congregation. In all of these outbreaks, significant proportions of the cases were adolescents and adults.



Multiple people contagious for pertussis attended a 2009 Statwide wrestling meet
Photos courtesy of Lisa Hannah

Vaccinating Adolescents and Adults for Disease Control

In 2006, the CDC's Advisory Committee on Immunization Practices (ACIP) recommended the use of acellular pertussis vaccine in older children, adolescents, and adults. It is hoped that, by vaccinating adults and adolescents with acellular pertussis vaccine, the disease burden would be reduced in these age groups and transmission of *B. pertussis* to infants reduced. Specifically, the ACIP recommends that:

- Persons aged 11-64 years should receive a single dose of trivalent vaccine containing acellular pertussis (Tdap) in place of their next required immunization.
- Non-pregnant adults and adolescents who will have contact with a child < 12 months of age should receive a single dose of Tdap in place of their next required immunization.

In addition, ACIP recommends an immediate "catch-up" dose for persons 11-18 years of age who have never received Tdap and who have not been vaccinated against tetanus in the past five years.

This is the primary strategy for reducing pertussis outbreaks in adolescents and adults in the United States. Pertussis control experts are also discussing the potential role of Tdap campaigns or broad distribution of antibiotics to control outbreaks and accelerating the vaccine schedule in adults so that adults would not wait until their next tetanus booster to receive acellular pertussis vaccine. The value of these strategies is still unclear and will need to be evaluated.

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Monitoring Pertussis Outbreaks

It is anticipated that the vaccination of adults and adolescents will result in fewer pertussis outbreaks. In the meantime, local public health jurisdictions continue to investigate pertussis outbreaks. The goals are to identify situations in which people at risk for severe disease are exposed and recommend appropriate preventive measures (including exclusion, antibiotic prophylaxis and/or immunization); find parts of the state where outbreaks are occurring; and determine segments of the population that may be inadequately vaccinated. In addition, local public health practitioners make sure that cases are appropriately treated; recommend measures to prevent further spread from the case; identify and evaluate contacts; educate and recommend measures to prevent further spread from potentially infected contacts; and facilitate the transport of specimens to assist with the diagnosis of other cases. In Washington, multiple pertussis outbreaks occur each year and often strain local public health resources especially with regards to obtaining specimens for rapid diagnosis.

Pertussis testing at the Washington State Public Health Laboratories (PHL) will continue to support these local health jurisdiction efforts. Although rapid polymerase chain reaction (PCR) testing is sometimes done at PHL when no other options are available and there is a need to rapidly diagnose those at risk for serious disease (e.g., neonates) and people who may transmit to these at-risk groups (e.g., healthcare workers), this should not be the standard public health laboratory test for pertussis. Except in very few settings, providing rapid diagnostics is generally not the role of local and state public health agencies. At the state level, the large demand for rapid PCR diagnosis can quickly overwhelm available resources at PHL.

In local health jurisdictions (LHJ) where there are known pertussis outbreaks, because rapidly determining the size of an outbreak using PCR for every suspected case is not necessary to meet the responsibilities of the local health jurisdiction, PHL will not use PCR for all submitted samples. When rapid PCR testing is needed for clinical reasons, rapid PCR testing is readily available at fee-for-service laboratories (see below). Despite this change in policy regarding PCR testing, PHL will continue to provide standard microbiology culture for pertussis for any and all samples submitted from LHJs.

Diagnostic Testing

Because the organism is fastidious, the sensitivity of culturing for pertussis can be as low as 20%. However, isolation of *B. pertussis* is 100% specific and has a 100% positive predictive



Vaccination at all stages of life
Photos courtesy of CDC

value. Culture remains the “gold standard” for the diagnosis of *B. pertussis* infection but diagnosis is limited by the low sensitivity. In contrast, PCR assays for pertussis are estimated to be more than 90% sensitive and approximately 95% specific. The higher sensitivity of PCR testing has resulted in a change in pertussis surveillance since the test became widely available in Washington in 1999. Consequently, more persons with pertussis are likely to have a laboratory confirmation of the disease due to the PCR test sensitivity.

In general, a positive PCR test is reliable evidence of pertussis but a negative PCR alone does not rule out the possibility that a cough illness was due to *B. pertussis*. It is important to submit specimens for both culture and PCR whenever possible. A few outbreaks with only PCR confirmation and no cultures were attributed to pertussis but later shown to have been due to other causes. (See Outbreaks of Respiratory Illness Mistakenly Attributed to Pertussis --- New Hampshire, Massachusetts, and Tennessee, 2004—2006. *MMWR Weekly*; August 24, 2007 / 56(33);837-842)

Public Health Laboratories Operations During Outbreaks

During outbreaks and at times when demand for lab services are high, PHL will continue to perform rapid PCR and microbiology culture for suspected pertussis cases with appropriate clinical features if diagnosis is important for making public health decisions at the local level. But, testing individual patients for clinical reasons alone should be done at commercial laboratories (see below).

With these points in mind, this is the new policy with regards to testing for pertussis at PHL:

1. Only samples approved by the LHJ will be accepted at PHL. When submitting to PHL, appropriate samples for both standard microbiology cultures and PCR must be submitted simultaneously.
2. LHJs should notify the Communicable Disease Epidemiology Section when they are sending specimens to the state lab. In LHJs where there is **NO KNOWN** pertussis outbreak, PHL will continue to offer cultures and rapid PCR testing of symptomatic patients in whom pertussis is suspected on the basis of:
 - a. The duration or quality of their cough,
 - b. Other associated clinical symptoms, and
 - c. Known exposure to an infectious person with pertussis.This testing is done to rapidly identify areas with a pertussis outbreak. When a pertussis outbreak is documented, local public health staff should use the criteria described in #3.
3. In LHJs where there is a **KNOWN** pertussis outbreak, culture and PCR testing at PHL will be available for the following groups if no other testing options are available:
 - a. Symptomatic (coughing) people in high-risk groups* who will benefit from rapid and highly sensitive diagnostic methods such as PCR
 - b. Symptomatic (coughing) people who care for person in high-risk groups**

* High-risk persons are those at-risk for severe clinical pertussis. These include children < 1 year of age and pregnant women.

** This would include healthcare workers who have face-to-face patient contact and persons who are epidemiologically linked to known cases of pertussis and have high likelihood of transmitting to high-risk persons.

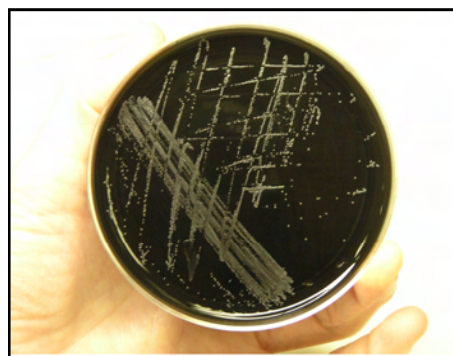
Should a physician or clinic desire pertussis testing in situations that don't meet the criteria for testing at PHL, they will be referred to a fee-for-service laboratory. In Washington, PCR and microbiologic culture for pertussis are provided by the following fee-for-service laboratories:

1. PacLab Network Laboratories (<http://www.paclab.com/>)
2. Seattle Children's Hospital (<http://www.seattlechildrens.org/>)
3. DynaCare Laboratories (<http://www.dynacare.com/washington.html>)
4. Oregon Medical Laboratories (<http://www.omlabs.com/>)
5. PAML (<http://www.paml.com/>)
6. Public Health Laboratory, Public Health — Seattle & King County (<http://www.kingcounty.gov/healthservices/health/communicable/lab.aspx>)

This is not a comprehensive list; other laboratories may also offer this service for a fee. In addition, this is not an endorsement for any particular facility.

The Importance of Cultures

Standard microbiological culturing for pertussis should be encouraged for all persons suspected of having pertussis and living in areas with known outbreaks. These isolates are extremely valuable and give us a great deal of information that is not available from PCR alone. When no other microbiology laboratory is available, samples can be submitted to the PHL for culture. Culture results from specific laboratories and from the PHL will be monitored to determine if a pertussis outbreak is ongoing in a particular jurisdiction.



***B. pertussis* culture, 9 days**
Washington State
Public Health Laboratories

Treatment

The decision to treat coughing persons empirically or after a positive laboratory result must be made by healthcare providers using clinical judgment and an exposure assessment to determine the likelihood that an illness is due to pertussis. Many infectious disease specialists recommend empiric treatment when pertussis is strongly suspected. For additional information regarding treatment and chemoprophylaxis, see www.doh.wa.gov/notify/guidelines/pdf/pertussis.pdf.