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State Public Health Lab Launches PCR Testing For Pertussis

Background

Pertussis (whooping cough) is an acute bacterial illness, characterized by paroxysmal cough, gagging, post-tussive vomiting, and an inspiratory whoop. Pertussis is caused by *Bordetella pertussis*, one of a number of species of *Bordetella* bacteria. Complications of pertussis, especially in infants and very young children, include pneumonia, seizures, encephalopathy and death. Although vaccination protects young children, older children and adults may become infected due to waning immunity. Because they usually have milder symptoms, older children and adults with pertussis may not seek medical care, thereby increasing the likelihood of transmission to unvaccinated infants and very young children.

Outbreak Investigation

On March 29, 2005, Section of Epidemiology staff received a report from the Alaska State Public Health Laboratory (ASPHL) regarding an unimmunized 23-month-old child from the Kenai Peninsula who was polymerase chain reaction (PCR)-positive for pertussis. The patient had been treated with amoxicillin for pneumonia on March 15, only to return to the Emergency Department on March 24 with classic signs and symptoms of pertussis. Our investigation identified three families with illness, including two additional children who were PCR-positive for pertussis. Fourteen members of the three families were prophylaxed with azithromycin.

Pertussis Tests

Culture is the gold standard test for pertussis; however, due to the slow growth and fastidious nature of the bacteria, results can take up to 2 weeks to obtain. The direct immunofluorescent assay (DFA) test, which has low sensitivity and specificity, is no longer recommended by the U.S. Centers for Disease Control and Prevention (CDC) and will no longer be provided by ASPHL. Serology is not recommended due to lack of standardization.

ASPHL has recently developed capacity to perform PCR testing for pertussis. PCR is a rapid (1–2 business days) and highly sensitive molecular diagnostic technique that allows faster confirmation of cases and will thus enhance outbreak response.

PCR Testing at ASPHL

B. pertussis PCR detects the presence of a specific insertion sequence, IS481, present in the chromosome of *B. pertussis*. PCR results will be reported as "IS481 DNA detected" or "IS481 DNA not detected." A PCR-positive result provides laboratory confirmation of pertussis when the patient meets the CDC clinical case definition.

Pertussis Case Definition¹

Clinical case

A cough illness lasting at least 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 *B. pertussis* from a clinical specimen
- Positive PCR assay for *B. pertussis* DNA

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 that is laboratory confirmed or one that meets the clinical case definition and is either laboratory confirmed or epidemiologically linked to a laboratory-confirmed case.

Limitations of PCR

As with many PCR tests, the *B. pertussis* PCR test is not FDA-approved and results must be correlated with cultures and/or patient history to confirm the patient as a case. The target IS481 DNA sequence is also present in *Bordetella holmesii*, an uncommon respiratory pathogen of humans. PCR also detects dead organisms, even after treatment with appropriate antibiotics.

Collecting Specimens

A nasopharyngeal swab specimen should be collected for culture, as usual, and **a second nasopharyngeal swab specimen should be collected for PCR.** The PCR swab will come in its own sterile empty tube, which should be used for transport of the swab. Because calcium alginate (found in Calgiswabs) is extremely inhibitory for PCR, **both swab specimens should be collected using polyester-tipped nasopharyngeal swabs.** ASPHL now provides polyester-tipped swabs in a pertussis collection kit. ASPHL will also replace any calcium alginate swabs currently in clinics. Once the new polyester swabs are received, the calcium alginate swabs should be discarded.

Recommendations

1. Report all suspected or confirmed cases of pertussis to the Section of Epidemiology at 907-269-8000 during office hours or 1-800-478-0084 after hours.
2. Contact ASPHL at 907-334-2100 to order pertussis collection kits or replacement polyester-tipped swabs. Kits and testing are free-of-charge.
3. Follow the new two-swab procedure using polyester-tipped swabs.
4. Prophylax household and other close contacts of confirmed cases of pertussis. Antibiotic recommendations are discussed in an earlier *Epidemiology Bulletin*.²
5. Keep all children up-to-date with pertussis and other childhood immunizations.³

References

- ¹ CDC. Vaccine Preventable Diseases Surveillance Manual, 3rd edition, 2002, Chapter 8C; available online at www.cdc.gov/nip/publications/surv-annual/chpt08_pertussis.pdf.
- ² *Epidemiology Bulletin*, Pertussis in Homer Region – Interim Report, No. 30, October 30, 2003.
- ³ Current immunization schedule available online at www.epi.Alaska.gov/id/iz/schedules/schedule.pdf.