ORANGE COUNTY HEALTH DEPARTMENT

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1/12/2018

Dear Community Partner,

With an increase in Pertussis cases in our area in the last few months and with 256 cases in 2016 in North Carolina, Orange County Health Department encourages all health care providers to be aware of this increase in cases.

Background

In the pre-vaccine era, pertussis was a common childhood disease and a major cause of child and infant mortality in the United States. Routine childhood vaccination led to a reduction in disease incidence from an average of 150 reported cases per 100,000 persons between 1922 and 1940, to 0.5 cases per 100,000 persons in 1976. The incidence of reported pertussis began increasing in the 1980s, however, and significant peaks in disease have been observed in recent years. In 2012, 48,277 cases were reported nationwide, exceeding levels observed since 1955. Reported pertussis cases have decreased since 2012, with 20,762 cases reported during 2015; however, levels remain significantly increased compared to those observed during the 1990s and early 2000s. Multiple factors have likely contributed to the increase including waning immunity from acellular pertussis vaccines; heightened provider and public awareness; improved diagnostic testing; and possibly molecular changes within the pertussis bacterium. The incidence of pertussis remains highest among young infants. From 2010 through 2015, 80.4%, of all pertussis-related deaths (n = 92) reported to CDC were among infants less than 6 months of age, who were too young to have received 3 doses of DTaP vaccine. As of 2015, the second highest incidence of pertussis continues to occur among school-aged children and adolescents, and the proportion of cases in this age group appears to be increasing.

Importance of Rapid Case Identification

Early diagnosis and treatment of pertussis might limit its spread to other susceptible people. When pertussis is strongly suspected, attempts to identify and provide prophylaxis to household and other close contacts at high risk should proceed without waiting for laboratory confirmation. When suspicion of pertussis is low, the investigation can be delayed until there is laboratory confirmation of the diagnosis. However, prophylaxis of pregnant women and infants, as well as their household contacts, should not be delayed.

Laboratory Testing

Determining who has pertussis and who does not can be difficult. Whenever possible, a nasopharyngeal swab or aspirate should be obtained from all persons with suspected pertussis. A properly obtained nasopharyngeal swab or aspirate is essential for optimal laboratory diagnosis. CDC has developed 2 short training videos for collection of nasopharyngeal aspirate and swab specimens, which can be accessed on the CDC pertussis website.

Culture

Isolation of *B. pertussis* by bacterial culture remains the gold standard for diagnosing pertussis. A positive culture for *B. pertussis* confirms a pertussis diagnosis. Culture of the organism is also important for antimicrobial susceptibility testing and molecular typing. Although bacterial culture is specific for diagnosis, it is relatively insensitive. Fastidious growth requirements make *B. pertussis* difficult to isolate. Isolation of the organism using direct plating is most successful during the catarrhal stage (i.e., the first 1–2 weeks of cough). Success in isolating the organism declines if: 1) the patient has received prior antibiotic therapy effective against *B. pertussis*, 2) specimen collection has been delayed beyond the first 2 weeks of illness, or 3) the patient has been vaccinated.

All persons with suspected cases of pertussis should have a nasopharyngeal swab or aspirate obtained from the posterior nasopharynx for culture. For *B. pertussis*, nasopharyngeal aspirates will yield similar or higher rates of recovery than nasopharyngeal swabs; throat and anterior nasal swabs yield unacceptably low rates of recovery. Therefore, specimens should be obtained from the posterior nasopharynx, not the throat. Specimens should

be obtained using polyester, rayon, nylon, or calcium alginate (not cotton) swabs and should be plated directly onto selective culture medium or placed in transport medium. Regan-Lowe agar or freshly prepared Bordet-Gengou medium is generally used for culture; half-strength Regan-Lowe should be used as the transport medium. Specimens should be transported on cold packs and plated at the laboratory within 24 hours.

PCR for B. pertussis DNA

PCR is an important tool for timely diagnosis of pertussis and is widely available to clinicians. PCR is a molecular technique used to detect DNA sequences of the *Bordetella pertussis* bacterium, and unlike culture, does not require viable (live) bacteria present in the specimen.

Despite these advantages, PCR can give results that are falsely-negative or falsely-positive. PCR results can be optimized by avoiding some of the more common pitfalls leading to inaccurate results. Although early signs and symptoms of pertussis are often non-specific, only patients with signs and symptoms consistent with pertussis should be tested. Asymptomatic contacts of confirmed cases should not be tested, and testing of contacts should not be used for post-exposure prophylaxis decisions. False-positive results may also occur as a result of specimen contamination, which can occur during specimen collection and testing. The timing of PCR testing for pertussis can significantly affect its ability to accurately diagnose the disease. PCR has optimal sensitivity during the first 3 weeks of cough when bacterial DNA is still present in the nasopharynx. After the fourth week of cough, the amount of bacterial DNA rapidly diminishes, which increases the risk of obtaining falsely-negative results.

While PCR is increasingly used as the sole diagnostic test for pertussis, CDC recommends that PCR be used in conjunction with culture when feasible, rather than as an alternative test. Even when a laboratory has validated its PCR method, culturing for *B. pertussis* should continue; this is especially important to confirm the circulation of *B. pertussis* when an outbreak is suspected. State laboratories should retain the capability to culture pertussis.

Serologic testing

Commercial serologic tests for pertussis infection can be helpful for diagnosis, especially later in illness. However, there is no commercial kit approved by the U.S. Food and Drug Administration (FDA) for diagnostic use. Cutoff points for diagnostic values of immunoglobulin (Ig)G antibody to pertussis toxin (PT) have not been established, and current IgA and IgM assays lack adequate sensitivity and specificity. In the absence of recent immunization, an elevated serum IgG antibody to PT after 2 weeks of cough onset is suggestive of recent *B. pertussis* infection. An increasing titer or a single IgG anti-PT value of approximately 100 IU/mL or greater (using standard reference sera as a comparator) can be used for diagnosis. As of March 2017, positive serology results from commercial laboratories are not confirmatory for the purpose of reporting. A single-point serologic assay has been validated at the Massachusetts Department of Public Health State Laboratory for persons 11 years of age or older and is used for clinical diagnosis and reporting in that state only. A single-point, calibrated IgG anti-pertussis toxin serologic test was developed and validated by CDC/FDA and is currently performed at the Minnesota Department of Health Public Health Laboratory to support other state health departments, as part of the "Vaccine Preventable Diseases Reference Centers Program", with laboratory confirmation. In states other than Massachusetts, cases meeting the clinical case definition that are serologically positive but not culture or PCR positive should be reported as probable cases.

Reporting

Please make sure you contact the Orange County Health Department if you have positive Pertussis lab results and report the case. You can email the Part 1 Communicable Disease form (attached to this email) to the Communicable Disease Confidential Fax number at 919-644-3373.

2016 Surveillance Report from the CDC
https://www.cdc.gov/pertussis/downloads/pertuss-surv-report-2016-provisional.pdf

Respectfully,

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Public Health Services Manager

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