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To: Physicians and other Healthcare Professionals

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Re: Pertussis PCR Performance Characteristics

At the request of several local physicians, MHD has compiled this summary of the performance characteristics of PCR testing when used for diagnosis of pertussis.

Pertussis PCR is the best available lab test for pertussis. It has a relatively rapid turn-around time (~24 hours) and the specificity of pertussis PCR is nearly 100%. Therefore, a positive PCR result is extremely reliable (i.e., has a high positive predictive value), especially in the context of an outbreak, typical pertussis symptoms, and/or known exposure.

The sensitivity of pertussis PCR, however, ranges from 60% – 96%, depending on a number of factors. Therefore, a negative PCR can occur in many patients who actually have pertussis.

Factors that can affect the predictive value (i.e., “reliability”) of a negative pertussis PCR test result include duration of illness at time of testing, specimen collection technique, specimen handling, and extent of pre-test antibiotic usage. Specifically:

- 1) Timing of testing. Pertussis PCR testing optimally occurs during the catarrhal (nasal symptoms) phase of illness, i.e., prior to cough onset. Sensitivity decreases steadily after cough onset, especially after >1wk of cough, although children tend to remain PCR positive a few days longer than adults. PCR’s sensitivity in adults at >3 weeks after symptom onset is only about 60%, and is essentially 0% in both children and adults by 6 weeks after symptom onset.
- 2) Specimen collection and handling. The optimal specimen is a nasopharyngeal swab (or aspirate); throat swabs are not good. See other MHD documents describing optimal NP swab technique. Specimens should be on rayon (or dacron) swabs with plastic (or aluminum) shafts. Cotton or calcium alginate swabs interfere with the assay, and wood-shafted swabs are not acceptable. Specimens are stable at refrigerated temperature for up to 7 days; do not expose to excessive heat.

- 3) Antibiotic effects. Nearly 90% of positive PCR tests will still be positive after up to 4 days of antibiotics. After that, however, antibiotic use rapidly decreases the sensitivity of pertussis PCR; only half will still be positive after 1 week of antibiotic treatment.

Culture tests for pertussis are also essentially 100% specific. However, culture is much less sensitive than PCR for pertussis; the sensitivity for culture ranges from 42-54%, and culture is even more susceptible to timing and especially antibiotic use than PCR is. Thus, a negative culture has even lower predictive value than a negative PCR. Some authorities recommend testing with both PCR and culture; in that situation, if either one is positive, the patient is considered lab-confirmed positive, but if both are negative the predictive value may still be low (depending on the clinical situation).

In summary, a positive pertussis PCR test is very reliable. However, a negative pertussis PCR is only reliable to the extent that it was a) collected and handled appropriately, and b) taken early in the course of symptom development (day 7 of cough at the latest) and prior to being on antibiotics for more than 3-4 days.

Therefore, persons clinically suspected of having pertussis should be started on antibiotics immediately rather than waiting for test results - - and a negative pertussis PCR, unless taken extremely early in the illness, should not be used to rule out pertussis nor to support discontinuing antibiotics.

For additional information, call your local health department, see the MHD website (www.milwaukee.gov/health) or call us at 414-286-3616. Thank you.