Laboratory Diagnosis of *Bordetella pertussis*

Bordetella pertussis attaches to the cilia of respiratory epithelial cells and produces toxins which paralyze the cilia, causing inflammation of the respiratory tract and interferes with the clearing of pulmonary secretions.

Culture

Culture for pertussis is the gold standard. It is 100% specific, but has low sensitivity (12-60%). Cultures should be taken as soon as possible (<2 weeks post-cough onset) as the organism disappears before patient recovery. Specimen should be a nasopharyngeal aspirate (best) or posterior nasopharyngeal swab. Throat and anterior nasal swabs have unacceptably low rates of recovery. Swabs should be made of Dacron (not cotton). Calcium alginate swabs may also be used for culture, but will inhibit PCR. Best results are obtained when planted at bedside, but as this is often not possible, special transport media is needed for swabs. Acceptable transport mediums include Regan-Lowe transport medium, 1% acid-hydrolyzed casein (Casamino Acids), and Amies medium with charcoal. Transport at 4ºC provides better recovery of *B. pertussis* than does transport at room temperature. Specialized media and growth conditions are required. Growth is slow (3 to 4 days), and cultures must be held 7 to 12 days before being called negative. Not all microbiology laboratories stock the appropriate media, so check with them first.

PCR

PCR should be used in addition to, and not as a replacement for culture. There are no FDA approved or standardized tests for PCR. False positives and DNA contamination can be problematic. PCR is a rapid test with greater sensitivity than culture (70 to 99%), but less specificity (86-100%). Some PCR tests do not differentiate between closely related species of *Bordetella.* Organisms do not need to be viable, and the test may be positive post-antibiotics. The specimen may be taken up to <4 weeks post-cough onset. Specimen should be a nasopharyngeal aspirate (best) or posterior nasopharyngeal swab. Swabs should be made of Dacron (not cotton). PCR should not be performed on the same swab as culture to avoid DNA contamination of the swab during culture plating. Collect two (2) swabs. Aspirates can be split.

Serology

Paired sera (at symptom onset and 4-6 weeks later) and single sera (at least 2 weeks post-cough onset; ideally 4-8 weeks post-cough) for antibody titer may also be used for diagnosis. There are no FDA approved or standardized tests. They may be useful for late diagnosis or post-antibiotics. Paired sera have a sensitivity of 90-92% and a specificity of 72-100%. A single serum sample has a sensitivity of 36-76% and a specificity of 99%.

Sources: CDC, APHL, Manual of Clinical Microbiology, 9th Edition