Bordetella pertussis by DNA Amplification

Refer to CPAL Technical Bulletin # 144 – *Bordetella pertussis*: Method Change

CPAL performs a *Bordetella pertussis* amplified assay on NP swab specimens (available from the laboratory (717-851-1416 or email) employing a DNA amplification assay based on loop-mediated amplification (LAMP) technology. Loop-mediated amplification uses specially designed primers to provide for specific and continuous isothermal DNA amplification. A by-product of this amplification is the formation of magnesium pyrophosphate, which forms a white precipitate leading to a turbid reaction solution. Reaction solution absorbance characteristics are monitored by the Meridian ***illumi****pro-10*™ Incubator/Reader. Changes in reaction solution absorbance characteristics created by precipitation of magnesium pyrophosphate indicate the presence of target DNA. The absence of target DNA results in no significant change in sample absorbance.

- This test should be used only in patients in whom there is a suspicion of *Bordetella*-related illness and should never be used for screening asymptomatic individuals. As with any diagnostic test, there is a possibility of false positive and false negative results. The results of this laboratory test should be interpreted in the context of the entire clinical presentation of the patient.
- The illumigene Pertussis assay targets the IS481 insertional element of the Bordetella genome. The IS481 insertional element is present in *B. pertussis, B. holmesii* and some strains of *B. bronchiseptica.*
- The assay does not detect *B. parapertussis*; however, upon request, the same sample can be referred for *B. parapertussis* testing if necessary.
- This assay is not recommended for follow up of patients previously diagnosed with pertussis (i.e., as a test of cure).

Pertussis or whooping cough is an infection of the respiratory system characterized by a "whooping" sound when the person breathes in. Its early symptoms are similar to the common cold: runny nose, sneezing, mild cough and /or low grade fever, with an incubation period of 7 to 14 days. People are deemed most contagious about 2 weeks after the coughing begins as the disease is spread by airborne droplets. The characteristic coughing spells may last a minute or more and can produce cyanosis, apnea and possible seizures in addition to post-tussive (after coughing) vomiting. When not coughing, the person does not experience trouble breathing as little mucous is generated in the lungs.

Prior to the development of the DTaP vaccine, which does not ensure lifelong immunity, pertussis was one of the leading causes of mortality in children. The infection occurs mostly in children under the age of 1 or in children with faded immunity, around ages 11 to 18. Pertussis is still considered by the CDC to be endemic in the US due to faded immunity from the vaccine and/or the failure to be immunized at all. According to the WHO, worldwide in 2000, around 39 million people were infected annually and about 297,000 died from the disease. Antibiotics will improve a person's condition if administered early as the earlier symptoms are the result of bacterial damage to the respiratory tract. The antibiotics will eradicate the microorganisms, however it will not reverse the effects of the toxins released by the bacteria which accounts for the later symptoms (the "whooping cough").

Complications of pertussis include pneumonia, convulsions, encephalopathy or death in children and anorexia, dehydration, loss of bladder function or encephalopathy in teens and adults

Bordetella pertussis, the causative agent of pertussis, is a gram-negative aerobic coccobacillus capsulate. Humans are the only host for *B. pertussis* which infects by colonizing the lung epithelial cells. *B. pertussis* has numerous virulent factors including pertussis toxin, pertactin and tracheal cytotoxin. It also contains a surface protein, filamentous haemagglutinin adhesion, which binds to the cilia of the epithelial cells in the lungs. Once anchored, it produces tracheal cytotoxin, which stops the cilia from beating. This prevents the cilia from clearing debris from the lungs so the body responds by sending the infected person into a coughing fit. B. pertussis also has the ability to inhibit the function of the host's immune system by causing lymphocytosis, a decrease in the entry of lymphocytes into the lymph nodes.

Similarly, *Bordetella parapertussis*, a gram-negative, aerobic coccobacillus, also manifests itself in humans with symptoms similar to pertussis. *B. parapertussis* has adapted to colonize the mammalian respiratory tract and consists of two lineages. One infects humans and is responsible for a minority of cases of pertussis (aka parapertussis) and the second or "ovine" line infects sheep causing a chronic non-progressive pneumonia. Research has shown that there is no transmission between the two lineages. Infections with *B. parapertussis* tend to be of shorter duration and not as severe as the bacteria does not contain the pertussis toxin and does not cause lymphocytosis. It should also be noted that immunity derived from *B. pertussis* does not protect against infection by *B. parapertussis*.

Resources: CDC Fast Facts

The preferred specimen is an NP swab collected using the BD ESwab Collection/Transport System (supplied by CPAL).