Micropathology Ltd
Tel 24hrs: +44 (0) 24 - 76 – 323222
Fax / Ans: +44 (0) 24 - 76 - 323333
University of Warwick Science Park, Venture Centre, Sir William Lyons Road, Coventry CV4 7EZ
Website: www.micropathology.com E-mail: info@micropathology.com

Bordetella pertussis

Bordetella pertussis is a Gram-negative, encapsulated coccobacillus and the causative agent of Whooping cough, a respiratory infection so called due to its characteristic sound when inhaling after coughing. *B. pertussis* is highly contagious and is transmitted person-person via airborne respiratory droplets from the nose and throat of infected individuals.

Symptoms typically appear seven to ten days after infection, but may also appear up to 21 days later. Individuals are most infectious in the early catarrhal phase but can remain infectious up to 21 days following the onset of the cough. People of all ages are affected and around 16 million people are infected worldwide, annually. Whooping cough can be fatal for young babies as they are most at risk of developing severe complications. In adults, the disease is milder, and is less likely to result in severe complications or death. Complications in babies include: pneumonia, dehydration, difficulty breathing, kidney failure, and brain damage. A similar illness can be caused by *B. parapertussis*, but this is not preventable with currently available vaccines.

Historically, pertussis was a cyclical disease peaking every three to five years alongside a seasonal pattern with the highest levels of activity usually in the Autumn. Before the introduction of pertussis immunisation in the 1950s, the average annual number of notifications exceeded 120,000 in England and Wales. Cases dropped markedly with the introduction of the infant and child vaccine regime (5 in 1 vaccine at ages 8, 12 and 16 weeks, and an additional booster before starting school), with the exception of two major epidemics occurring in 1977–79 and 1981–83 (mirroring the lower vaccine coverage at these times) achieving the low prevalence during the period 2000-2011 where there were 1,500 cases or less notified annually.

In 2011 however, despite 95% vaccine coverage, cases began to rise causing the declaration of a national outbreak in April 2012 which was followed by the introduction of the emergency maternal pertussis vaccination programme to immunise during pregnancy to passively protect the infant. In 2019 the prenatal pertussis vaccine became a routine programme.

In the UK, intervention measures implemented to help control the spread of SARS-CoV-2 between March 2020 and July 2021 had a significant impact on the transmission of other infectious diseases including pertussis. Consequently, pertussis activity was exceptionally low across England from April 2020 and remained low until summer 2023 when case numbers began to increase. In the last three months of 2023 confirmed pertussis case numbers were more than 10- fold higher than they had been during the previous three years of suppressed pertussis activity but overall numbers remained lower than pre-pandemic years. See Health Protection Report volume 18 (2024). Case numbers across all age groups and all regions in England continued to increase in the first four months of 2024 with a total of 4,793 confirmed cases reported in England between January to April 2024.

The number of confirmed pertussis cases in infants under three months, who are at most risk of severe disease and too young to be fully vaccinated, increased from two cases in 2022 to 48 cases in 2023 but remained lower than pre-pandemic years; there were 83 cases in infants under three months in 2019. Incidence continues to be highest in infants under three months. There had been eight reported deaths in infants who developed pertussis between January and April 2024 (UKHSA data). Infections are also seen in unvaccinated adults and in adults whose immunity has waned over time.

Diagnosis:

B. pertussis is predominantly identified using laboratory methods including culture, often using selective media incubated for up to seven days. Despite this, molecular methods such as PCR can be particularly useful, offering a rapid detection method with increased sensitivity when compared with typical culture methods. Hence, PCR can be an important tool in the detection of *B. pertussis,* particularly in patients with signs symptoms consistent with *B. pertussis* infection. The Centers of Disease Control and Prevention states that nasopharyngeal aspirates (NPAs) and nasopharyngeal swabs are the most suitable specimens for *Bordetella pertussis* DNA detection. Specimen collection during the initial four weeks of cough onset is also recommended for optimal PCR sensitivity.

Our assay:

At Micropathology Ltd, we use a qualitative, semi-nested PCR assay which targets the *B. pertussis* toxin gene for the detection of *B. pertussis* DNA. Additionally, the IS*481* assay targeting the IS*481* insertion sequence is run in parallel, to increase the sensitivity of detection. UKAS accredited specimen types for this assay include NPAs and upper respiratory swabs. Other sample types may be tested and are reported alongside an appropriate caveat stating that the assay is not UKAS accredited for testing of alternate sample types.

Turnaround times are stated in the laboratory user manual with results usually available in practice much sooner than the given time frame. Where there is a delay, we are usually confirming a result and addressing clinical data given with the specimen.