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Molecular diagnosis of *Pseudomonas aeruginosa* infection

Pseudomonas is a genus of Gram-negative, rod-shaped bacteria with around 190 identified species. *Pseudomonas aeruginosa* is a well-studied species within this genus, and is considered to have high medical importance as a multidrug resistant pathogen which typically exhibits intrinsically advanced antibiotic resistance mechanisms. This species can occur commensally in the human upper respiratory tract and is recognised for its ubiquity in the environment.

Infection with this bacterium usually occurs in people in hospitals and/or with weakened immune systems and is hence considered an opportunistic pathogen. Contamination of medical equipment poses a particular problem, as this bacterium is particularly adept at forming surface-associated biofilms. For example, *P. aeruginosa* is responsible for ~12% of all nosocomial, catheter-related, urinary tract infections (UTIs), making it the third most common organism after *Escherichia coli* and enterococci isolated from UTI patients in the hospital setting (Cole et al 2014).

Symptoms of infection depend on the site of infection and include generalized inflammation and sepsis. If colonisation occurs in critical body organs, such as the lungs, the urinary tract, and kidneys, fatalities may occur. In particular, *Pseudomonas* is a major cause of lung infection in people with cystic fibrosis (CF) and is considered the most important pathogen in progressive and severe CF lung disease.

Healthy individuals may also develop mild illness resulting from infection with *Pseudomonas aeruginosa,* especially following exposure to water sources containing the bacterium. For example, ear infections and more generalized skin rashes may occur after exposure to inadequately chlorinated hot tubs or swimming pools. Eye infections have also been reported, particularly in persons using extended-wear contact lenses. In fact, *Pseudomonas aeruginosa* is the most commonly recovered causative organism in contact lens-related disease, followed by Gram-positive bacteria, fungi and *Acanthamoeba* (Stapleton and Carnt, 2012).

Pseudomonas aeruginosa infections are generally treated with antibiotics, however some strains are becoming more difficult to treat because of increasing antibiotic resistance.

Studies have shown that a combination of diagnostic methods which includes PCR, results in significant statistical differences in positive result rates in comparison to using isolated microbiological and serology methods alone (da Silva Filho et al, 2007). PCR diagnosis of infection may also prove useful to obtaining *rapid* results and additionally in cases where nonviable or auxotrophic strains of *Pseudomonas* would not grow on selective culture media.

Our assay

At Micropathology Ltd, we use a nested PCR assay targeting the *oprL* gene for the qualitative detection of *Pseudomonas aeruginosa* DNA. UKAS accredited sample types for this assay include: EDTA whole blood, corneal scrape, eye swab and contact lens soaking fluid. Other sample types may be tested and are reported alongside an appropriate caveat stating that the assay is not UKAS accredited for testing such sample types.

Turnaround times are stated in the user manual (http://www.micropathology.com/customer-downloads-handbooks.php) 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.

References

Cole et al (2014) 'Catheter-Associated Urinary Tract Infection by *Pseudomonas aeruginosa* Is Mediated by Exopolysaccharide-Independent Biofilms' *American Society for Microbiology: Infection and Immunity* **82**(5) 2048-2058.

da Silva Filho et al (2007) 'The Combination of PCR and Serology Increases the Diagnosis of *Pseudomonas aeruginosa* Colonization/Infection in Cystic Fibrosis' *Pediatric Pulmonology* **42**:938-944.

Stapleton and Carnt (2012) 'Contact lens-related microbial keratitis: how have epidemiology and genetics helped us with pathogenesis and prophylaxis' *Eye* **26** 185-193.