**Science**

Pseudomonas aeruginosa, represented by Pru in this story, is a Gram negative bacteria. It is able to grow in water and so is found in wet and moist environments such as ponds outside, and taps indoors. It is able to form biofilms, which are complex communities of bacteria, in some of these places, including in pipework and urinary catheters.

Pseudomonas can move from the environment onto healthcare workers hands and so be transmitted to patients. When pseudomonas colonises patients who are ventilated it is able to reach the lungs and cause ventilator associated pneumonia.

Pseudomonal pneumonia is caused by toxins, such as proteases, which cause inflammation and tissue damage. It also colonises and infects the lungs when damaged by conditions including bronchiectasis and cystic fibrosis. It is important to find out if a patient is infected by pseudomonas, as specific anti-pseudomonal antibiotics are needed.

To do this, samples are collected from patients such as sputum samples, blood samples, urine samples, and wound swabs. When patient samples are sent to the microbiology laboratory the bacteria are often grown, or cultured, on a nutrient rich growth media. Bacterial culture is normally completed overnight to give time for visible growth. Pseudomonas grows a blue green shiny colour. People often say it smells sweetly and they can see or smell when a wound is colonised with pseudomonas.

Cultured bacteria can be named, or identified, by passing them through a mass spectrometer. We use a machine called MALDI-TOF which can identify bacteria based on the different molecules inside a bacteria. These molecules a produce unique mass spec profile. Knowing the species of bacteria causing an infection helps, as certain antibiotics are normally effective against certain bacteria. Pseudomonas is resistant to lots of antibiotics. They have decreased permeability of the outer membrane, efflux pumps to excrete antibiotics, and antibiotic modifying enzymes. They can also acquire resistance by acquiring plasmids from other species. Anti-pseudomonal antibiotics include ciprofloxacin, piperacillin-tazobactam, ceftazidime and meropenem.

When bacteria have been grown they can be taken for antibiotic susceptibility testing. AST testing involves putting antibiotic impregnated discs on an agar plates with bacteria. If bacteria can’t grow near the antibiotic disc it shows antibiotic diffusing out of the disc is killing the bacteria. Laboratories will send electronic reports, or call if it is urgent, to doctors on the ward. Doctors on the ward must act on the results correctly to get the right treatment started.