Multi-action antibiotics to treat chronic biofilm infections

First Annual Progress Report – September 2016

In August 2015, the Trustees for the Australian Cystic Fibrosis Research Trust (ACFRT) signed a contract with the University of Wollongong (UOW) for a research project called – 'Multi-action antibiotics to treat chronic biofilm infections'. The ACFRT has committed to fund the project to $588,687 over three years.

Biofilms often build up in the lungs of people with CF. The biofilms contain large populations of bacterial cells and are encapsulated within gum-like materials.

Biofilms protect bacteria against the action of antibiotics and against the action of cells in the patient's immune system. Antibiotic resistance can be increased up to 1000-fold in biofilms.

The Chief Investigator for the Project is Dr Michael Kelso from UOW. He and his research team were the first to discover that low concentrations of nitric oxide (NO) act as a signal that triggers bacteria in biofilms to disperse.

This means that the bacteria become more sensitive to antibiotics and to the body's immune system. When the researchers combined the use of NO-releasing compounds with antibiotics, they developed a new way of targeting delivery of NO to biofilms.

Over the last year, the researchers have greatly improved the synthesis of these compounds (NO-donor cephalosporins), as well as synthesising the first "all-in-one" 3rd generation cephalosporin NO-donor antibiotics. All of these compounds are expected to retain their ability to release NO when they encounter biofilms.

Some of these compounds have been shown to be active against a range of organisms in biofilms, including Pseudomonas aeruginosa. The compounds are continuing to undergo comprehensive evaluation for their microbiological activities and drug-like properties.