

Faculty of Engineering

Summer Research Program 2023-2024

Project Title: Engineering new technologies for respiratory drug delivery

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Objective

As part of this project, you will contribute to the development and characterization of a hand-held aerosol drug delivery device, which is progressing through commercialisation.

Project Details

Respiratory drug delivery is primarily used for the treatment of chronic diseases such as asthma and chronic obstructive pulmonary disease (COPD), both inflammatory diseases of the lower airways. Over 13% of Australians, and 16% of Americans are affected by these diseases and, despite new treatments, they continue to be amongst the leading causes of deaths in Australia (Australia, 11,202 people in 2019, USA, 224,987 people in 2019) and internationally. There is also a growing interest in using the extensive surface area of the lungs as portals for the systemic delivery of other therapeutic agents. This needle-free alternative route is especially advantageous to improve the absorption of poorly bioavailable drugs and also to target difficult to reach organs.

We have recently invented PALM: Personalised Airway and Lung Management, a portable integrated aerosol system, which can address the specific needs of patients, for the specific delivery route. The device gives physicians precise control over their patient's treatment by tuning the particle size, and provides users an easier, more effective treatment. PALM employs a small form-factor breathing device, which sits comfortably in the *palm of the hand*, and fits a variety of face shapes thanks to its universal design. (Figure 1) Using built in sensors it can measure a patient's breathing cycle and deliver medication at exactly the right moment, eliminating coordination issues. Moreover, the particle size can be controlled on-demand to address the specific needs of patients. These capabilities ensure the greatest potential for lung deposition and are currently not possible with any other commercially available device. The device is packaged within a system designed specifically to improve user experience and patient monitoring. We have patented the core technology, microfluidic droplet generation, as well as protected the unique design of our device.

As part of the project you will work on this patented droplet generation technology and collaborate with a diverse multidisciplinary team involving engineers, respiratory physicians, pharmacists and industrial designers.

Prerequisites

No prerequisites except scientific curiosity and interest in translational research