



## Electrostatically charged aerosols for lung scintigraphy

Philip Chi Lip Kwok<sup>1</sup>, Darson Dezheng Li<sup>1,2</sup>, Patricia Tang<sup>1</sup>, Luke Fincher<sup>3</sup>, Effie Browne<sup>3</sup>,  
Warren H Finlay<sup>4</sup>, Hak-Kim Chan<sup>1</sup>

<sup>1</sup>Advanced Drug Delivery Group, School of Pharmacy, Faculty of Medicine and Health, The University of Sydney, Camperdown, New South Wales, Australia

<sup>2</sup>School of Mechanical and Manufacturing Engineering, The University of New South Wales, Kensington, New South Wales, Australia (present affiliation)

<sup>3</sup>Department of Nuclear Medicine, St George Hospital, Kogarah, New South Wales, Australia

<sup>4</sup>Department of Mechanical Engineering, University of Alberta, Edmonton, Alberta, Canada

E-mail: [philip.kwok@sydney.edu.au](mailto:philip.kwok@sydney.edu.au)

Particles and droplets generated from pharmaceutical inhalation devices are naturally charged. The levels of these electrostatic charges may potentially affect lung deposition. However, this has not been confirmed *in vivo*. Human lung scintigraphic studies using radiolabelled, charged particles would provide important data on mapping the deposition locations. This presentation focuses on an aerosol charging rig developed for this purpose. Droplets from an Aerogen® Solo vibrating mesh nebuliser radiolabelled with technetium-99m were charged by induction and then dried to produce positively charged particles. Particles carrying near-neutral and 10-4,000 elementary charges per particle were obtained at induction voltages of -0.4 and -4.5 kV, respectively. Particle charges generally decreased with radioactivity, especially for solutions at 400 and 800 MBq/mL. We speculate that this is due to the indirect ionising effect of gamma radiation, which produced bipolar ions in the air that neutralised the initially charged particles. Radioactivity at 100 MBq/mL generated the highest particle charges, and may be high enough to alter *in vivo* deposition. The aerosol charging rig is suitable for use in human scintigraphy studies that we will soon conduct.