



# Biomedical Engineering Seminar Series

1<sup>st</sup> Semester, Academic Year 2015

**Date: November 3, 2015**

**Time: 10.00-11.00 PM**

**Room Room 6373, 3<sup>rd</sup> level, Building 3,  
Department of Biomedical Engineering,  
Faculty of Engineering;  
Mahidol University**



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## **“NanoCluster Budesonide Formulation Enhances Drug Delivery in Mechanical Ventilation”**

Agglomerates of budesonide (bud) nanoparticles (also known as ‘NanoClusters’) were formulated to enhance drug delivery through an endotracheal tube. NC-Bud formulations successfully navigated endotracheal tubes and a traditional dry powder formula failed. In this study, novel DPLs were developed to optimize NanoCluster powder delivery through endotracheal tubes. Then, these DPLs were fitted to a catheter and explored as a unique system to bypass the highly variable ventilator environment. Some parameters such as inspiration pattern, inspiration volume, and inspiration flow rate were investigated. The selected formulation was delivered via the Monodose<sup>®</sup> inhaler or the novel device and then entrained through commercial endotracheal tubes and analyzed by cascade impaction. NanoCluster budesonide formulations had a higher efficiency of aerosol delivery compared to micronized budesonide as received when applied through endotracheal tubes. It showed a higher percent-emitted fraction (%EF) compared to Bud as received ( $p < 0.05$ ). The performance of NC-Bud did not change with the inspiration volume (1.5 – 2.5 L) nor with the inspiration flow rate (20 – 40 L/min). The novel device and the Monodose<sup>®</sup> inhaler showed the same efficiency of drug delivery but the novel device can connect directly to ventilator tubing. The new device combined with NanoCluster formulation technology allowed convenient and efficient drug delivery through endotracheal tubes or through catheters that bypass the endotracheal tube.

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