BioSyM Seminar Series 2018

Design of Mucoadhesive Microparticles for Ocular Drug Delivery

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Venue : Level 5, Perseverance Room

Abstract

Topically administered ocular drug delivery systems typically face severe bioavailability challenges due to the natural protective mechanisms of eyes. The rational design of drug delivery systems that are able to persist on corneal surfaces for sustained drug release is critical to tackle this problem. In this study, we fabricated monodisperse chitosan-coated PLGA microparticles with tailored diameters from 5 to 120 µm and conducted detailed investigations of their mucoadhesion to artificial mucin-coated substrates by AFM force spectroscopy. Particle detachment tests under shear flow in a mucin-coated flow cell were in accord with the AFM measurements, and revealed that microparticles smaller than 25 µm exhibited strong persistence in the flow cell, withstanding the harshest *in vivo* ocular conditions. A simple scaling analysis connects the AFM and detachment tests, which reveals the existence of a threshold diameter below that mucoadhesion performance essentially saturates – an important insight in managing the opposing design criteria of enhanced mucoadhesion and slow, sustained drug delivery. Our findings thus pave the way for the rational design of mucoadhesive micro-particulate ocular drug delivery systems that are capable of enhancing the bioavailability of topically applied drugs to eyes, as well as to other tissues whose epithelial surfaces contain mucosae.

Short Biography

Dawei joined SMART-BioSyM in Aug 2016 as a Postdoc Associate under Prof. Patrick Doyle. He obtained his Ph.D. degree in Materials Science and Engineering at Nanyang Technological University in 2016. His research interests are engineering biocompatible polymeric materials and their applications in targeted or topical drug delivery systems.