高分子学会九州支部　外国人学者講演会

Inhaled drug delivery for respiratory infections caused by superbugs

Hak-Kim Chan, PhD, DSc
Professor of Pharmaceutics (Advanced Drug Delivery)
School of Pharmacy, University of Sydney, Australia

■日　時　2019 年 10 月 28 日（月）　14:00～15:30
■場　所　九州大学先導物質化学研究所（CE41）　第1セミナー室 A・B

オーストラリア Sydney 大学の教授の Hak-Kim Chan 先生は、経肺 DDS の世界的権威です。バクテリオファージを用いて呼吸器疾患を治療する方法を開発されています。バイオ・マテリアル・ナノテクノロジーによる斬新な手法について、ご講演いただきます。

Respiratory infection caused by multidrug-resistant (MDR) Gram-negative bacteria (‘superbugs’) is a major health problem worldwide. Antibiotics (e.g. tobramycin, amikacin, ciprofloxacin) have been successfully delivered by inhalation to the lungs to increase the local drug concentration and reduce systemic side effects. However, these drugs require multiple daily administration. Ciprofloxacin was thus developed as a liposomal formulation to allow once daily dosing. We have further developed a novel formulation containing nanocrystals of ciprofloxacin in liposomes to modulate controlled release from the liposomes. Bacteriophages (‘bacteria-eaters’) have been documented to be efficacious against MDR bacteria with minimal side effects. In addition, endolysins are enzymatic proteins derived from phages with strong antibacterial properties. However, intravenous administration of these biologics may not be very effective against lung infections, as degradation and clearance in the systemic circulation occur before they can reach the infected respiratory tract. Inhalation administration for respiratory infection are thus emerging as a promising alternative route. We have successfully produced liquid and powder aerosols suitable for respiratory delivery of phages and endolysins. The powder formulations of phages were shown to be stable, highly dispersible and inhalable, and capable of killing ‘superbugs’ in the lungs of infected animals. With no new effective antibiotics being in the development pipeline for the life-threatening infections caused by Gram-negative ‘superbugs’, our study provides the much-needed formulation and pharmacological information on inhalation delivery for fast-tracking translational research into a new therapy.

Professor Hak-Kim Chan, Professor in Pharmaceutics is leading the Advanced Drug Delivery Group at the Sydney School of Pharmacy. He graduated from the National Defense Medical Center (BPharm, University Medal 1983), University of Sydney (PhD 1988 and DSc 2009), was a postdoc at the University of Minnesota in 1988-89. Prof. Chan is a world leader in respiratory drug delivery. Over a decade since joining the University of Sydney, he has developed a leading research program on aerosol drug delivery, ranging from in vitro, ranging from powder production by novel processes, particle engineering and aerosol formulation, to scintigraphic imaging of lung deposition and clinical outcome. He has more than 350 scientific publications on pharmaceutical formulation and drug delivery.

連絡先：先導物質化学研究所ソフトマテリアル学際化学　田中　賢　研究室
softmaterial-contact@ms.ifoc.kyushu-u.ac.jp