WILLIAM MONG DISTINGUISHED LECTURE SERIES

Nanotherapeutics: Application of Nanotechnology to Gene and Cell Therapy

FACULTY OF ENGINEERING, THE UNIVERSITY OF HONG KONG

Speaker:
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Date:
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Time:
6:00 pm—7:15 pm

Venue:
T6, Meng Wah Complex
The University of Hong Kong

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Nanotherapeutics in the form of discreet or continuous nanostructures can impact medicine at levels ranging from the subcellular to the tissue. Nanoparticles improve bioavailability of drugs and DNA plasmids, and may achieve targeting to tissue, cell and intracellular compartments. Nanofibers and nanopatterns can influence the response of cultured cells in tissue development.

In gene therapy, polymers and lipids can condense DNA into nanoparticles that can be internalized by cells, followed by delivery of the DNA into the nucleus. The DNA-nanoparticles can deliver functional genes to correct genetic disorders such as hemophilia, cystic fibrosis, and muscular dystrophy. Current DNA-nanoparticles are inefficient in overcoming the barriers of delivering the foreign gene to the nucleus of the target cell. Nanoparticle technology improves the efficacy of gene delivery by controlling the size and composition of the DNA nanoparticles. The can help realize the tremendous potential of genetic medicine.

In cell therapy, the quality and quantity of the available cells dictate the therapeutic outcome. There is increasing evidence that cells respond in a profound manner to features in the submicron scale, mimicking the in vivo scenario where cells are surrounded by nanoscale features in the extracellular matrix, such as the network of collagen fibrils in the basement membrane. Creating 3D nanostructures that mimic the extracellular matrix will provide a more natural microenvironment to help control the expansion and differentiation of the cultured cells.

In this presentation, we will describe our effort to apply DNA nanoparticles for nonviral gene therapy and continuous nanostructures for tissue engineering.