The Chinese University of Hong Kong
Department of Biomedical Engineering

Graduate Seminar – PhD Oral Defence

Student	***:***	Ms. HAN Ruifang
Supervisor	***:***	Prof. CHOI Chung Hang Jonathan
Date	***:***	1 November, 2021 (Monday)
Time	***:***	2:00 pm
Venue	***:***	Room 1122 Computer Lab, 11/F William M W Mong Engineering Building
Zoom Link	***:***	https://cuhk.zoom.us/j/98673247424?pwd=ajJWYmU0TUYzOEdhTDdBcjB1amxPZz09
Meeting ID	***:***	986 7324 7424
Password	***:***	241091

Title: Alkyl-terminated Gold Nanoparticles for Enhancing Delivery to Skin Keratinocytes and Treating Psoriasis

Psoriasis is a chronic inflammatory skin disease affecting over 125 million people worldwide. There is no cure for psoriasis, and many existing anti-psoriatic therapeutics exhibit poor efficacy and safety profiles due to inefficient delivery to and poor retention in the epidermis. Methods for boosting drug delivery to epidermal keratinocytes, which proliferate uncontrollably in psoriasis, are limited.

In this thesis, we present a self-therapeutic nanoparticle that can be topically delivered to epidermal keratinocytes to prevent and treat psoriasis. The nanoparticle contains a ~3 nm gold core and a shell of 1000 Da polyethylene glycol strands modified with 30% octadecyl chains (Au_3@PEG-octadecyl$_{30\%}$ NP); overall, the nanoparticle is less than 15 nm and does not contain known chemical or biological anti-psoriatic drugs. When applied to imiquimod (IMQ)-induced psoriasis mouse models without excipient, the nanoparticle can cross stratum corneum and preferentially enter keratinocytes. Surprisingly, applying the nanoparticles concurrently with IMQ prevents psoriasis and inhibits genes that are enriched in the downstream of the interleukin-17 signaling pathway and linked to epidermis hyperproliferation and inflammation. Applying the nanoparticles after psoriasis is established treats the psoriatic skin as effectively as standard steroid- and vitamin D analog-based therapy but without causing drastic hair loss and skin wrinkling. The nanoparticles do not accumulate in major organs or induce long-term toxicity. This work offers a simple, safe, and effective alternative for treating psoriasis and suggests the therapeutic potential of gold nanoparticles for skin diseases.

***** ALL ARE WELCOME *****

For enquiries, please contact Ms. Joyce Chan, Department of Biomedical Engineering at 3943 8278