The Chinese University of Hong Kong
Department of Biomedical Engineering

Graduate Seminar – PhD Oral Defence

Student	***:***	Ms. LIU Yao
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Date	***:***	25 August, 2021 (Wednesday)
Time	***:***	2:00 pm
Zoom Link	***:***	https://us05web.zoom.us/j/86796838129?pwd=Y3JPQUNEc3krdWRMNXByS2tRVDBudz09
Meeting ID	***:***	867 9683 8129
Password	***:***	42R0Up

Title: Interaction between polydopamine-coated nanoparticles and dopamine receptors

Polydopamine (PDA)-coated nanoparticles (NPs) are emerging carriers of therapeutic agents for nanomedicine applications due to their biocompatibility and abundant entry to various cell types, yet it remains unknown whether their cellular entry engages cell-surface receptors. As monomeric dopamine (DA) is an endogenous ligand of dopamine receptor and raw ingredient of PDA, we elucidate the interaction between polyethylene glycol-stabilized, PDA-coated gold NPs (Au@PDA@PEG NPs) and dopamine receptors, particularly D2 (D2DR). After proving the binding of Au@PDA@PEG NPs to recombinant and cellular D2DR, we employ antibody blocking, gene knockdown, and gene overexpression to establish the role of D2DR in the cellular uptake of Au@PDA@PEG NPs in vitro. By preparing a series of PEG-coated AuNPs that contain different structural analogs of DA (Au@PEG-X NPs), we demonstrate that catechol and amine groups collectively enhance the binding of NPs to D2DR and their cellular uptake. By intravenously injecting Au@PDA@PEG NPs to Balb/c mice, we reveal their in vivo binding to D2DR in the liver by competitive inhibition and immunohistochemistry together with their preferential association to D2DR-rich resident Kupffer cells by flow cytometry, a result consistent with the profuse expression of D2DR by resident Kupffer cells. Catechol and amine groups jointly contribute to the preferential association of NPs to D2DR-rich Kupffer cells. Our data highlight the importance of D2DR expression and DA-related functional groups in mediating the cell-nano interactions of PDA-based nanomedicines.

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

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