הטכניון - מכון טכנולוגי לישראל

TECHNION - ISRAEL INSTITUTE OF TECHNOLOGY

הפקולטה להנדסה כימית
ע"ש וולפסון
The Wolfson Department of Chemical Engineering

Wolfson Department of Chemical Engineering Seminar
Lecture Hall 6, Wolfson Department of Chemical Engineering,
Tuesday December 17th, 2019 at 9:30 AM

Disease Specific Biomimetic Nano Delivery

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Nanoparticles (NPs) have been long investigated for the selective delivery of therapeutics and for the avoidance of off-target effects. However, once administered into the body, NPs face both physical and biological barriers that impede the capability of reaching the diseased tissues at therapeutic levels. Current strategies to modify the surface of NPs with targeting antibodies or hydrophilic polymers have not yielded effective results and have failed to translate to the clinic, leaving the entire field of nanomedicine in dire need of an alternative approach.

By turning to nature for design cues, **my lab will create an innovative biomimetic nanoparticle platform via cloaking synthetic nanoparticles with cellular membranes extracted directly from natural cells. The biomimetic fabrication process will be based on microfluidic bottom up approach that was proofed as controllable, batch to batch consistent and scalable.** This approach offers a robust tool for controlled fabrication of NPs as – nucleic acid lipid nanoparticles, liposomes, polymer NPs (Poly-Lactic-co-Glycolic Acid (PLGA), Polysaccharides), emulsions and organic and inorganic NPs and biomimetic NPs. As one example, I have equipped nanoparticles with complex of proteins that are naturally found on neurons membrane. These NPs were associated and were up taken by neurons to effectively deliver their drug payload to treat neurodegenerative diseases. As another example, by coating NPs in the plasma membrane of leukocytes, the NPs exhibit leukocytes mimicking properties such as evasion of immune cell sequestration, tropism towards inflamed endothelium, and infiltration of the cancer mass. During my postdoctoral work we have showed that these leukocytes biomimetic NPs escape immune cell uptake, increase systemic circulation time, target activated vessels and inflamed tissues, and possess intrinsic anti-inflammatory activity. These cell membranes embedding technology approach opens a whole new set of opportunities for the nanotechnology and nanomedicine communities.

One of my research goals is to overcome the various therapeutic barriers in the treatment of: neurodegenerative diseases, inflammatory diseases and cancer. **I strongly believe that if we will ask which engineered and biological aspects of a disease directly impact our ability to effectively deliver a drug to treat that specific disease, we can then address these questions with biomimetic nanotechnology.**

Refreshments will be served at 9:15