

Industrial & Molecular Pharmaceutics Special Seminar

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“How do nanoparticles enter and exit tumors?”



Shrey Sindhwani

University of Chicago Medicine

Nanoparticles hold great potential to deliver drugs and imaging agents to tumors. However, the clinical translation of cancer nanomedicine has been poor. This has motivated researchers to interrogate the underlying mechanisms of nanoparticle delivery to tumors. The current dogma of cancer nanomedicine is the Enhanced Permeation and Retention (EPR) effect, which postulates that nanoparticles transport via gaps in the endothelium and are retained because of impaired lymphatics. In contrast to the EPR effect, we found nanoparticles enter via active transport through endothelial cells. Endothelial gaps within the tumor vasculature are rare, and up to 97% of the nanoparticles are transported by endothelial cells of the tumor vasculature. On the other hand, lymphatics within and outside the tumor play a crucial role in the exit of nanoparticles. We propose an alternate mechanism, the Active Transport and Retention (ATR) principle, for the delivery of nanoparticles to solid tumors. These mechanistic discoveries have reset the design principles for developing cancer nanomedicine.

Biography:

Shrey is a clinical fellow in Hematology/Oncology and a postdoctoral researcher at the University of Chicago. He previously completed an M.D. and Ph.D. from the University of Toronto. His graduate work was in the lab of Dr. Warren Chan, where he focused on the mechanisms of cancer nanomedicine delivery. Specifically, he discovered the mechanism for the entry of nanoparticles into solid tumors. He also developed a 3D mapping technique for tumors to identify the precise location of nanoparticles and the surrounding microenvironment. Shrey completed his undergraduate degree in nanotechnology engineering from the University of Waterloo. He aspires to be a physician-scientist as a medical oncologist with a lab focus on cancer nanomedicine.