CARNEGIE MELLON UNIVERSITY
BME 2020 SUMMER SEMINAR SERIES

Micro/Nano biomedical devices: from cancer diagnosis and treatment to virus detection

PRESENTED BY

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SCHEDULE

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(9:00 AM-10:00AM)

Micro/nano engineering can provide novel nanomaterials and new fabrication methods for biomedical devices. In this talk, I will discuss our most recent endeavors to develop micro/nano biomedical devices to solve challenges in some critical biomedical applications. In molecular diagnosis, enrichment of biomarker-containing materials from body fluids and subsequent biomarker detection are both critically needed, but fundamentally challenging. Using lipid nanoprobe (LNP), and an LNP-integrated microdevice, cell-released extracellular vesicles (EVs) can be isolated from blood plasma and EV DNA mutations can be detected as a liquid biopsy method for cancer diagnosis. Viral infectious diseases can erupt unpredictably, spread rapidly, and ravage mass populations. Although established methods have been used to detect viral targets, field samples containing emerging or new viruses with low virus count pose major challenges in virus surveillance and discovery. We invented a carbon nanotube (CNT)-integrated microfluidic device for tunable size-based virus isolation, followed by on-chip sample preparation. The technology successfully discovered emerging viruses from environmental and clinical samples. On the therapeutic side, we exploited using EVs as an efficient nanoscale vehicle for targeted drug delivery, by taking advantages of its excellent biocompatibility, long circulation time, flexible cargo loading and targeting. Finally, I will introduce our effort for rapid COVID-19 diagnosis.

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