CARNEGIE MELLON UNIVERSITY
BME 2021 SPRING SEMINAR SERIES

Cellular ultrasound: acoustically detonated cells and super-resolution without contrast agents

PRESENTED BY

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SCHEDULE

Thursday,
February 11, 2021
(10:45AM-11:45AM)

The ability to non-invasively visualize and control cellular function deep within living tissues is crucial for studying and treating various diseases. Recent molecular biology technologies like fluorescent proteins and optogenetics provide a new level of cellular imaging and control, but scale poorly to deep tissues due to low light penetration. Gas vesicles (GVs), a unique class of gas-filled protein nanostructures, were recently introduced as the first family of ultrasound reporters for deep tissue imaging of gene expression. Here, I will show that GVs can also nucleate the formation of oscillating and imploding bubbles, a phenomenon known as ultrasound cavitation. These genetically encoded cavitation nuclei can produce various bio-effects and turn tumor-homing cells into deep tissue therapeutic warheads. Next, I will describe how ultrasound can be used for treatment monitoring, and introduce my work on a novel super-resolution imaging method based on the natural contrast of flowing blood cells. We will conclude with a look at how these technologies could contribute to a deeper understanding of cancer's crosstalk with the immune and nervous systems, in addition to enabling precise non-invasive therapeutic and diagnostic tools for future medical applications.

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