MECHANICAL ENGINEERING SEMINAR

Nano/Bioengineering
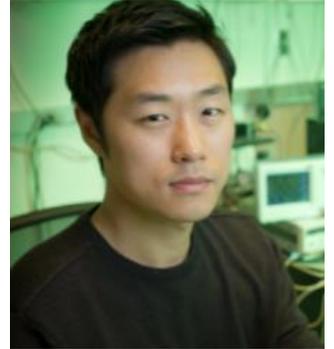
1. 제 목 : Sensitive and multiplexed RNA detection with Cas13 droplets and kinetic barcoding

2. 연 사 : Dr. Sungmin Son

(UC Berkeley, Daniel Fletcher Lab)

3. 일 시 : 2021년 6월 23일 (수) 오전 10:00-11:00

4. Zoom link: https://snu-ac-kr.zoom.us/j/85737807928

5. 내 용 :

Rapid and sensitive quantification of RNA is critical for detecting infectious diseases and identifying disease biomarkers. Recent direct detection assays based on CRISPR-Cas13a (Fozouni et al., 2021; Shinoda et al., 2021; Tian et al., 2021) avoid reverse transcription and DNA amplification required of gold-standard PCR assays (Heid et al., 1996), but these assays have not yet achieved the sensitivity of PCR and are not easily multiplexed to detect multiple viruses or variants. Here we show that Cas13a acting on single target RNAs loaded into droplets exhibits stochastic nuclease activity that can be used to enable sensitive, rapid, and multiplexed virus quantification. Using SARS-CoV-2 RNA as the target and combinations of CRISPR RNA (crRNA) that recognize different parts of the viral genome, we demonstrate that reactions confined to small volumes can rapidly achieve PCR-level sensitivity. By tracking nuclease activity within individual droplets over time, we find that Cas13a exhibits rich kinetic behavior that depends on both the target RNA and crRNA. We demonstrate that these kinetic signatures can be harnessed to differentiate between different human coronavirus species as well as SARS-CoV-2 variants within a single droplet. The combination of high sensitivity, short reaction times, and multiplexing makes droplet Cas13a assay with kinetic barcoding a promising strategy for direct RNA identification and quantification.

6. 약 력 :

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2013, Massachusetts Institute of Technology, Ph.D. in Mechanical Engineering, Advisor: Scott Manalis.

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ENGINEERING
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NRF National Research Foundation of Korea