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SEMINAR SERIES

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Seminar Presentation: 11:00am – 12:00pm
SME room 248

"CRISPR-powered graphene electronics for CRISPR editing quality control"

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Abstract: The discovery of CRISPR technology has revolutionized the fields of transcriptional activation and repression, genome editing, gene-based therapeutics, and diagnostics. The applications of this technology have been rapidly expanding as researchers continue to discover new Cas enzymes, engineer high fidelity Cas orthologs, and modify and synthesize guide RNAs to efficiently direct these Cas enzymes to their targets. In this talk, we will introduce the first-generation DNA biosensors that combine CRISPR technology with the ultra-sensitivity of graphene-based field effect transistors (gFETs) to detect target DNA sequences within the whole genome without the need for DNA amplification. This technology, termed CRISPR-Chip™, utilizes the genome searching capability of Cas and reprogrammable RNA molecule to unzip the double-stranded DNA and bind to its target. This binding event causes a change in graphene conductivity which can be detected in real-time within the gFET construct. CRISPR-Chip was utilized to detect target genes within clinical samples obtained from patients with Duchenne Muscular Dystrophy (Cover of Nature BME-2019), and single cell point mutations in Sickle cell disease and ALS without the need for amplification (Nature BME 2021), within less than 30 minutes. The applications of this technology platform go beyond diagnostics. CRISPR-Chip can provide greater insights on the mechanism of CRISPR and can lead to safe and more effective utilization of this gene editing technology for therapeutic applications. By precisely predicting CRISPR editing outcomes based on key drivers of success like RNP stability and cleaving activity, the CRISPR-Chip enables us to confidently identify the best gRNAs, Cas proteins, and conditions for CRISPR gene editing experiment from the outset.

Biosketch: Prof. Aran received her PhD in Biomedical Engineering at Rutgers University in 2012. She then continued her postdoctoral studies in bioengineering at the University of California, Berkeley and was a recipient of the National Institutes of Health (NIH) postdoctoral training fellowship at the Buck Institute for Aging Research in 2015. Her efforts have been recognized within the scientific community by the Clinical OMICs 10 under 40 Award, Athena Pinnacle Award in Life Sciences, NSF Career award, Nature Research Awards for Inspiring Women in Science: Scientific Achievement Category's Overall Winner in 2021 and Distinguished Engineering Medal of Excellence from Rutgers University in 2022 and Inc. USA top 200 female founders in 2023.