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Nanopore-based detection of circulating microRNAs in lung cancer patients

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MicroRNAs are short RNA molecules that regulate gene expression, and have been investigated as potential biomarkersbecause their expression levels are correlated with various diseases. However, detecting microRNAs in the bloodstream remains difficult because current methods are not sufficiently selective or sensitive. Here, we show that a nanopore sensor based on the a-haemolysin protein can selectively detect microRNAs at the single molecular level in plasma samples from lung cancer patients without the need for labels or amplification of the microRNA. The sensor, which uses a programmableoligonucleotide probe to generate a target-specific signature signal, can quantify subpicomolar levels of cancer-associated microRNAs and can distinguish single-nucleotide differences between microRNA family members. This approach is potentially useful for quantitative microRNA detection, the discovery of disease markers and non-invasive early diagnosis of cancer.

Biography

Li-Qun Gu, an Associate Professor of Bioengineering at the University of Missouri, is leading an interdisciplinary laboratory that has a long term vision: Integrating biomolecular engineering with nanobiotechnology to explore life science problems and to develop sophisticated molecular diagnostic tools for personalized medicine. He received the NSF CAREER award the NIH grant to develop ultrasensitive single-molecule technology for disease biomarker detection. He has published over 40 peer-reviewed papers in high tier journals including Nature, Nature Nanotechnology, Science and PNAS. The nanopore-nanosensor he developed can detect circulating microRNAs in cancer patient plasma, offering a non-invasive approach to screening and disease diagnose.

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