



## CANCER PREVENTION & RESEARCH INSTITUTE OF TEXAS

Award ID:  
RP140132

Project Title:  
Towards Point-of-Care Nucleic Acid Cancer Diagnostics

Award Mechanism:  
Individual Investigator

Principal Investigator:  
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Entity:  
Rice University

### Lay Summary:

Cancer is fundamentally caused by changes (mutations) in DNA, which cause cells to go haywire and divide uncontrollably. Like any other disease, cancer, if detected early, can be much more effectively treated than if diagnosed after overt clinical symptoms show up. The logical thing to do to mitigate the ill effects of cancer on humanity would thus be to employ frequent and non-invasive screening, based on detection of cancer-specific DNA. But this turns out to be a very difficult technical problem -- it can be done, but it currently requires equipment with six-figure price tags. There are three major difficulties in detecting cancer-specific DNA that necessitate the equipment: specificity, sensitivity, and multiplexing. Specificity refers to the fact that cancer-specific DNA is very closely related to healthy human DNA -- it's like trying to find a typo (e.g. "cancer" vs. "canser") in a book, rather than a Chinese phrase in an English book (which would be akin to detecting bacterial/viral infections). Sensitivity refers to the fact that cancer-specific DNA is very rare -- the book in which the typo (mutation) resides is billions of pages long. Multiplexing refers to the fact that there's not actually a single mutation that indicates cancer -- we're looking for many potential typos. It is unlikely that instrument engineering will lead to drastic hundred-fold decreases in price within the near future, so instead the research team proposes molecular methods to pre-process the DNA -- inventing "magic ink" that highlights the typos. Promising preliminary results for specificity and sensitivity have already been demonstrated.