New study shows how nanotechnology can help detect disease earlier

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A new study led by University of Kentucky researchers shows a new way to precisely detect a single chemical at extremely low concentrations and high contamination.

The study, published online for *ACS Nano*, was carried out in the laboratory of Peixuan Guo, the William S. Farish Endowed Chair in Nanobiotechnology at the University of Kentucky Markey Cancer Center. The study shows that the phi29 DNA packaging nanomotor connector can be used to sense chemicals with reactive thioesters or maleimide using single channel conduction assays based on three observable fingerprints. This channel system could be further developed into very sensitive sensing devices.

The ability to detect a chemical at a low concentration and high contamination is especially important for environmental surveillance, homeland security, athlete drug monitoring, toxin/drug screening, and earlier disease diagnosis.

In the case of disease diagnosis, the production of an unusual metabolic product is a feature of disease, but in early stages, the concentration of this product is very low. Single molecule detection will facilitate the early detection of disease such as cancer, so as to facilitate earlier treatment.

"Sensitivity of detection is a major challenge in the diagnosis of many diseases," said Guo. "Our next step is to find one metabolic product of

one disease and determine the reality in earlier disease diagnosis."

"The proof-of-principle studies described in this study will be extended in the future to engineer multiple probes within a single pore for concurrent detection of multiple targets at the single molecule level in real time," said Farzin Haque, research assistant professor at the UK College of Pharmacy, and first author on the paper.

Provided by University of Kentucky