'Nanolock' detects cancer mutation; could lead to early diagnoses, personalized therapies

July 5 2017

The moment when healthy cells turn into cancer cells is a critical point. And if caught early enough, many cancers can be stopped in their tracks. One group reports in *ACS Sensors* that they have developed an accurate and sensitive method that can recognize a particular mutation in the genetic code that has been implicated in the disease. It could help physicians diagnose cancers earlier and treat them with individualized therapies.

Cancer driver mutations assist in the initiation and progression of cancer. One such mutation in the *BRAF* gene has been associated with numerous cancers, including thyroid cancer. The current method for detecting driver mutations is real-time PCR, in which mutant DNA sequences are selectively amplified and copied, but it is not accurate enough to detect these genetic changes reliably. Researchers have developed methods to read the genetic sequence by moving it through a nanopore, but again, the method is not nearly accurate enough on its own. So, Li-Qun Gu and colleagues sought a way to better pinpoint these mutations, and with single-molecule resolution, building on their previous work developing a "nanolock-nanopore" sensor.

A nanolock is a special structure that can stabilize base pairs of the DNA at the mutation site as it goes through a nanopore. The team has now found that mutant DNA carrying a nanolock undergoes a unique type of unzipping when it moves through the pore. Detecting this activity

resulted in a highly accurate and sensitive nanopore fingerprint for the *BRAF* mutation in thyroid cancer patient tissue samples. The researchers say that they anticipate the approach, once integrated with a miniature, high-throughput device, could enable accurate and PCR-free detection of various disease-causing mutations for diagnosis and prognosis.

More information: "Nanolock-Nanopore Facilitated Digital Diagnostics of Cancer Driver Mutation in Tumor Tissue" *ACS Sensors*, pubs.acs.org/doi/abs/10.1021/acssensors.7b00235

Provided by American Chemical Society