Carbon Nanotube Transistor Can Detect Genetic Mutations

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University of Pittsburgh researcher Alexander Star and colleagues at a California-based company, Nanomix, Inc., have developed devices made of carbon nanotubes that can find mutations in genes causing hereditary diseases, they report in the Jan. 16 issue of the journal *Proceedings of the National Academy of Science*. This method is less expensive and takes less time than conventional techniques.

Carbon nanotubes are rolled-up sheets of graphite only a few nanometers wide-about the width of a molecule of DNA. The researchers used these nanotubes' electrical properties to find a particular mutation in the gene that causes hereditary hemochromatosis, a disease in which too much iron accumulates in body tissues.

“The size compatibility between the detector and the detected species-DNA molecules in this case-makes this approach very attractive for further development of label-free electronic methods,” said Star, who is an assistant professor of chemistry at Pitt.

Star and his colleagues at Nanomix also tested fluorescently labeled DNA molecules in order to confirm that DNA had attached to the nanotube surfaces and was subsequently hybridized, or matched to its complementary DNA.

“We have found that electrical measurement of carbon nanotube devices produce sensor results that are comparable to state-of-the-art optical techniques,” Star said.

He added, “The applications of our method for detection of other, more serious genetic diseases can be seen.”

Label-free electronic detection of DNA has several advantages over state-of-the-art optical techniques, including cost, time, and simplicity.

“Our technology can bring to market hand-held, field-ready devices for genetic screening, as opposed to laboratory methods using labor-intense labeling and sophisticated optical equipment,” Star said.

Source: University of Pittsburgh