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Nanowire Sensors To Provide Immediate Medical Test Results

Nanotech will enable faster, cheaper, and more sensitive tests that can detect medical conditions which are currently undetectable.

A tiny nanowire sensor — smaller than the width of a human hair, 1,000 times more sensitive than conventional DNA tests, and capable of producing results in minutes rather than days or weeks — could pave the way for faster, more accurate medical diagnostic tests for countless conditions and may ultimately save lives by allowing earlier disease detection and intervention, Harvard scientists say.

In preliminary laboratory studies demonstrating the capability of the new sensor, the researchers showed that it has the potential to detect the gene for cystic fibrosis more efficiently than conventional tests for the disease. CF is the most common fatal genetic disease among people of European origin.

One of a growing number of promising diagnostic tools that are based on nanotechnology, the silicon sensor represents the first example of direct electrical detection of DNA using nanotechnology, according to the researchers. The sensor and the detection of the CF gene will be described in the Jan. 14 issue of the journal *Nano Letters*, a peer-reviewed publication of the American Chemical Society, the world's largest scientific society.

"This tiny sensor could represent a new future for medical diagnostics," says study leader Charles M. Lieber, Ph.D., a professor of chemistry at Harvard and one of the leading researchers in nanotechnology.

"What one could imagine," says Lieber, "is to **go into your doctor's office, give a drop of blood from a pin prick on your finger, and within minutes, find out whether you have a particular virus, a genetic disease, or your risk for different diseases or drug interactions.**"

With its high sensitivity, the **sensor could detect diseases never before possible with conventional tests**, he says. And if all goes well in future studies, Lieber predicts that an array of sensors can ultimately be configured to a handheld PDA-type device or small computer, allowing almost instant test results during a doctor's visit or possibly even at home by a patient. It could potentially be used to screen for disease markers in any bodily fluid, including tears, urine and saliva, he says.

The sensor also shows promise for early detection of bioterrorism threats such as viruses, the researcher says.

A company called **Nanosys** is commercializing this nanotech sensor technology. **Nanosys is pursuing a number of other applications of nanotech sensors.**

Ultimately, the goal at Nanosys is to revolutionize sensors, nanoelectronics and optoelectronics by building products literally from the bottom up through molecular self-assembly that is cheaper, better and faster; uses less power; and basically delivers a lot more bang for the buck than today's most advanced devices. The technology that makes this possible is based on groundbreaking work in nanoelectronics by **Dr. Charles Lieber**, the Mark Hyman Professor of Chemistry at Harvard University.

Exactly how this process works is a closely guarded secret, but Lieber and his team have basically developed a way to make nanowires any way they want. They can control the size and shape of the wires, as well as the amount of impurities, or dopants, attached to the wires, thereby controlling the wires' conductive and photo-reactive characteristics, which, at the end of the day, dictate their usefulness.

"That was the real 'ah-ha' Charles Lieber came up with," Bock said. "That means that he can make devices much more quickly because he doesn't have to go look for the materials he wants each time, he just makes them."

Toto, pretty soon we are not going to be in Kansas any more.

Update: Carbon nanotubes may become gene therapy and drug delivery

vehicles.

The modified nanotubes have so far only been used to ferry a small peptide into the nuclei of fibroblast cells. But the researchers are hopeful that the technique may one day form the basis for new anti-cancer treatments, gene therapies and vaccines.

By Randall Parker at 2003 December 17 12:46 AM [Nanotech for Biotech](#) | [TrackBack](#)

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