Nanopore Sequencing Could Slash DNA Analysis Costs

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(PhysOrg.com) -- Over the past 5 years, researchers have been exploring the use of nanoscale pores as nucleic acid sequencing tools. In theory, such pores should generate a unique response characteristic of each of the four nucleotide bases as a piece of DNA moves through the pore.

Now, investigators at Oxford Nanopore Technologies in the United Kingdom have successfully tested a system that can identify a piece of DNA's bases directly as it moves through a modified protein nanopore. With further development, this system could greatly reduce the expensive equipment, chemicals, and lab time needed for current scanning methods, said Gordon Sanghera, Ph.D., Oxford's chief executive.

"You move from days to hours to get the same information, and the equipment required is a lot simpler," Dr. Sanghera said.

Most current DNA sequencers use fluorescent chemical tags that attach to each of the four chemicals that make up a "letter" in the DNA sequence. Sophisticated cameras and software read the tags to identify the genes. In contrast, the system described by these Oxford scientists in the journal *Nature Nanotechnology* sends DNA one letter at a time through a microscopic, biologically engineered hole, or "nanopore." An electrical current passed across the hole responds differently to each of the four letters in the genetic code, allowing scientists to accurately read each letter.

"This demonstration that you can distinguish among the four bases with a purely electronic signal I think is just an incredible advance," said Jeffery Schloss, Ph.D., director of the National Human Genome Research Institute's sequencing technology program.

Advances in sequencing technology have been swift since the Human Genome Project completed its map of the genetic code in 2003 for $300 million. The current rate hovers around $100,000, although the Federal Government is pledging millions to DNA sequencing research in hopes of achieving a $1,000 genome scan by 2014. Oxford believes its nanopore sequencing could be a contender for the $1,000 scan. However, the company has used nanopores to read only individual DNA letters so far. The company is still working to improve its system to scan entire strands of DNA.

This work is detailed in the paper "Continuous base identification for single-molecule nanopore DNA sequencing." Researchers from the University of Oxford also participated in this study. An abstract of this paper is available at the journal's Web site.

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