# DNA Sensors Using Single-Walled Carbon Nanotubes

***Novel technologies that can be used to rapidly detect specific viruses and disease markers and other novel nanotechnologies***


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**Inventors**
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**Field**
Microbiology & Infectious Diseases

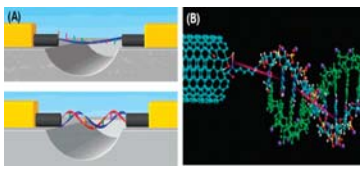
**Technology**
Nanotechnology

**Key Features**
Nanoelectric Platform
- *SWNTs w/nanogap*
- nanotrench
- DNA Probe
- Direct Reading

**Stage of Development**
Proof of concept completed
Scale-up tests underway

**Status**
Seeking development & licensing partner

**Patent Status**
Patent Pending




**Background**

The properties of DNA that enable it to self-replicate and self-assemble have also been used in recent years to detect sequences of DNA that identify specific genes. Through a process of hybridization, a single strand of DNA can be used as a probe to find a complimentary section of DNA that identifies a gene. Polymorphisms, or mutations in the genetic sequence can be used to positively identify certain viral strains, disease states, or other genetically significant differences.

This group of technologies is based on a novel process of functionalizing carbon nanotubes so that they may be used as electrodes to directly measure the difference in electrical conductivity between a single strand of DNA and a completed double helix formed through hybridization. The core discovery uses nanogaps in single-walled carbon nanotubes (SWNTS) to create an effective platform for DNA sensing and recognition.

**Benefits of Technology**
- Chip-scale sensor, mass produced with current technology
- Compatible with lab-on-a-chip and microfluidics technologies
- Faster than current methodologies

**Potential Commercial Applications**
- Medical Diagnostics – Cancer, AIDS, Cystic Fibrosis, etc.
- Public Health – Avian and Swine Flu Virus, Dengue, Tuberculosis, etc.
- Bioterrorism – Viral, Bacterial and Fungal threats such as Anthrax

**Description of Technology**

Researchers at Florida International University have developed a novel nanoelectronic platform based on single-walled carbon nanotubes (SWNTS) for measuring direct electrical transport in single-molecule DNA of genomic significance. By using a single stranded DNA molecule of known sequence as an electrical probe, specific genes can be identified based on the hybridization-induced change in electrical current.

Unlike current microarrays which require a large and complicated secondary process to detect fluorescence, these technologies are direct-reading and the electronic circuitry required can be contained in a hand-held device. The scope of these inventions includes but is not limited to: a *Carbon Nanotube Based MultiSensor™ Biochip for Point of Care Clinical Diagnosis* (including a transdermal design), *Nanotube Based Lab-on-a-Chip, DNA Detection System Using Species-and Disease Specific Probes, and a Nanoscale DNA Detection System and Method of Identifying Specific Virulent Genes.*

Additional discoveries from this lab are:

- a nanostructure sensor for nitric oxide gas detection at PPB levels, which could be a bio-marker for monitoring cardiovascular and pulmonary disease
- A method of synthesizing Y junction single walled nanotubes – key components of nanoscale three terminal electronic devices for molecular electronic circuits

**Opportunity**

FIU is looking for a commercial partner for licensing and development.