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Reference: Gene/CNT Detection

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Licensing Opportunities

- This technology is available for exclusive or non-exclusive licensing
- Joint development opportunities include funded research or a joint venture

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Detection and Quantification of Genes and Carbon Nanotubes

Overview

Auburn University and the University of South Carolina are seeking a licensee or development partner for a method of detection and quantification of both genes and carbon nanotubes (CNTs) in water. There is a continuing need for more rapid and increasingly sensitive tools to detect and quantify the presence of dangerous pathogens. Further, with the advent of nanotechnology, carbon nanotubes are becoming more prevalent in the environment. This raises concerns about potential health risks of long-term exposure to CNTs. However, there is currently no known method to specifically detect and measure the presence of CNTs in water. This novel method provides both improved gene detection and an enabling detection of CNTs in water, even water that contains other carbon compounds. This technology can be utilized by organizations involved with public health, food safety, environmental protection and nanotechnology.

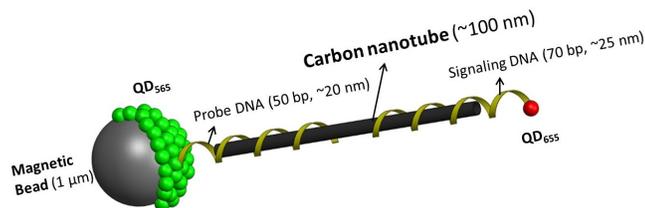
Advantages

- High sensitivity, with sub attomolar (10^{-18} molar) detection limits reached for gene detection and 2.5 $\mu\text{g/L}$ limits reached for CNT detection
- Very rapid detection (less than one hour)
- Resistant to natural occurring inhibitors and reagents, enabling *in situ* detection of genes
- Non-carbon chemistry method enables specific detection of CNTs
- Separation of targets via the use of magnetic beads allows for further analysis
- Photo-stable quantification through use of quantum dots

Description

This technology is based on a magnetic bead/quantum dot/nanoparticle system. In short, two sets of single stranded DNA (ssDNA), one tagged with a quantum dot and another tied to a magnetic bead decorated with

different quantum dots, are introduced into a sample. For gene detection, both sets of ssDNA are designed to bind to the target DNA. For carbon nanotube detection, the ssDNA strands are designed to specifically interact with the CNTs (see figure). The targets can then be separated from the sample using a magnetic field, and then quantified using the quantum dot interactions.



The quantum dot fluorescence demonstrates extreme brightness, allowing for high sensitivity, and resistance to photo-bleaching, which makes the method very robust. Further, the method has been shown to be resistant to compounds that inhibit other methods such as PCR, indicating the potential of this method for *in situ* application. Finally, since ssDNA specifically interact with CNTs, it is able to differentiate CNTs from other carbon compounds, unlike traditional carbon chemistry or molecular weight based methods.

Status

- Subject of U.S. Patent [9,051,605](#).
- Technology has been demonstrated to detect and quantify levels of *E. coli* O157:H7 below the minimum infectious dose in water
- Detection and quantification of carbon nanotubes in water down to concentrations of 2.5 $\mu\text{g/L}$ has also been demonstrated
- Gene detection reference: *Analytica Chimica Acta* **677** (2010) 90–96 ([link](#))