NANOPARTICLE PROBES AND MID-INFRARED CHEMICAL IMAGING FOR DNA MICROARRAY DETECTION

Technology Summary

Most mid-infrared spectroscopic studies are limited, due to lack of sensitivity, to the structural characterization of a single oligonucleotide probe immobilized over the entire surface of a gold coated slide or other infrared substrate. Infrared microspectroscopy has not been applied to the detection of DNA microarrays due to lack of sensitivity of the infrared detectors for measuring trace amounts of biological material.

Available for licensing, FDA researchers developed a faster, flexible, and cost-effective method for microarray visualization to detect DNA from low expressing genes. The method applies mid-infrared chemical imaging (IRCI) of nucleic acid microarrays by using mid-infrared reflective labels combined with detection in the reflection mode. The method provides intrinsic image contrast, and permit detection of DNA microarray hybridization on infrared absorbing substrates such as glass. The invention's use of IRCI results in improved sensitivity, signal-to-noise ratio, and precision for detecting hybridized microarrayed spots of DNA from low-expressing genes that cannot be identified by traditional fluorescent-based DNA microarrays. Furthermore, automated IRCI systems can be fabricated for the detection of other (protein, tissue, biochemical, or chemical) microarrays.

Potential Commercial Applications

- DNA microarrays can be applied to the areas of environmental sciences, agriculture research, bio-defense, diagnostics, forensics, pharmacogenomics and toxicogenomics
- Use of IRCI to identify strains of foodborne bacteria pathogens, low expressing genes, and nanostructure-based DNA microarrays

Competitive Advantages

- Improved sensitivity and precision for detecting pathogenic bacterial genes and low-expressing genes that cannot be identified by fluorescent-based DNA microarrays
- A cost-effective, faster, more flexible, and less labor intensive microarray technology

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Publications:

"Nanoparticle probes and mid-infrared chemical imaging for DNA microarray detection." *Appl Spectrosc.* 2010 Nov; 64(11):1191-8. PMID: 21073786

Intellectual Property:

United States patent: US 9,279,770 B2, issued 03.08.2016

Product Area: Biologics, Food

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