Array-based binary analysis for bacterial typing

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An allele-specific oligonucleotide microarray was developed for rapid typing of pathogens based on an analysis of genomic variations. Using a panel of Escherichia coli strains as a model system, selected loci were sequenced to uncover differences such as single-or multiple-nucleotide polymorphisms as well as insertion/deletions. While typical genomic profiling experiments employ specific sequences targeted to genomic DNA unique to a single strain or virulent gene, the present array is designed to type bacteria based on a patterned signature response across multiple loci. In the signature concept, all strains are interrogated by hybridizing their amplified DNA to an array containing multiple probe sequences. Allele-specific oligonucleotide probe sequences targeting each of these variable regions were synthesized and included in a custom fiber-optic array.

For each locus, a set of specific probe sequences is selected, such that hybridization gives a binary signal/no signal response to each of the probes. Using this strategy for multiple loci, many pathogens or microorganisms could be classified using a limited number of probes. Because of the advantages of the fiber-optic array platform over other array formats, including sensitivity and speed, this platform is capable of supporting a high-throughput diagnostic strategy.