

Microarray

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Microarray is a hybridization of a nucleic acid sample to a very large set of oligonucleotide probes, which are attached to a solid support, to determine sequence or to detect variations in a gene sequence or expression or for gene mapping. It is a two dimensional array on a solid substrate mainly a glass slide or silicon thin-film cell that assays large amounts of biological material using high-throughput screening methods. The concept and methodology of microarrays was first introduced and illustrated in antibody

microarrays (also referred to as antibody matrix) in 1983 in a scientific publication and a series of patents. As the "gene chip" industry started to grow in the 1990's, with the establishment of companies, such as **Affymetrix**, **Illumina**, and others, the technology of DNA microarrays has become the most sophisticated and the most widely used. Several competing technologies for microarray probe implementation have emerged. **Affymetrix** pioneered this field with by using *in situ* synthesized oligonucleotides as probes and by designing microarrays *in silico*, thereby obviating the need for the management of clone libraries. Microarray technology has two major applications viz gene expression analysis and genetic variation analysis.

Microarray includes:

- DNA microarrays, such as c DNA microarrays, oligonucleotide microarrays and SNP microarrays
- MM Chips, for surveillance of micro RNA populations
- Protein microarrays
- Peptide microarrays, for detailed analyses or optimization of protein-protein interactions
- Tissue microarrays
- Cellular microarrays also called transfection microarrays
- Chemical compound microarrays
- Antibody microarrays
- Carbohydrate arrays glycoarrays
- Phenotype microarrays

The most and prominent microarray using now a day in the applied filed of Biotechnology is DNA microarray.

DNA microarray also commonly known as **DNA chip** or **biochip** is a collection of microscopic DNA spots attached to a solid surface. The core principle behind microarrays is hybridization between two DNA strands, the property of complementary nucleic acid sequences to specifically pair with each other by forming hydrogen bonds between complementary nucleotide base pairs. The solid surface can be glass or a silicon chip, in which case they are colloquially known as an *Affy chip* when an Affymetrix chip is used. A short section of a gene or other DNA element used to hybridize a cDNA sample under high-stringency conditions. Probe-target hybridization is usually detected and quantified by detection of fluorophore, silver, or chemiluminescence labeled targets to determine relative abundance of nucleic acid sequences in the target.

DNA microarray technique

DNA microarray used for the detection of down regulated genes on a DNA chip which consists of entire genome. DNA chip where genes are of natural cDNA and diseased cDNA are embedded together on solid substrate. The techniques where by using the mixture of fluorescent cDNA, it can be visualize the heat map of genes.

Depending on the heat map score , if the score is 1.0 to 4.75 which could be considered as off regulated genes and which are < 0.75 considered as down regulated genes. DNA microarrays can be used to measure changes in expression levels, to detect **Single Nucleotide Polymorphisms (SNPs)**, or to genotype or targeted resequencing.