REVIEW ARTICLE

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# DNA MICROARRAYS: TO PROBE ENTIRE GENOMES AT AN EXQUISITELY DETAILED LEVEL

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**ABSTRACT**

DNA microarray assays and their RNA counterparts have become one of the most powerful tools for gene expression profiling, the identification of mutations, and the detection of multiple pathogens. DNA microarray is an orderly arrangement of thousands of identified sequenced genes printed on an impermeable solid support, usually glass, silicon chips or nylon membrane. DNA microarrays are created by robotic machines that arrange minuscule amounts of hundreds or thousands of gene sequences on a single microscope slide. It is high-throughput and versatile technology used for parallel gene expression analysis for thousands of genes of known and unknown function, or DNA homology analysis for detecting polymorphisms and mutations in both prokaryotic and eukaryotic genomic DNA. DNA microarrays have undergone a transformation from laboratory curiosities to devices that permit scientists to probe entire genomes at an exquisitely detailed level. DNA microarrays are becoming a common tool in many areas of microbial research, including microbial physiology, pathogenesis, epidemiology, ecology, phylogeny, pathway engineering and fermentation optimization. They are also useful in studies of gene expression profiling into broader areas of biomedicine. Microarrays are now actively used in clinical trials and are needed for drug development because they permit you to assess quickly how a particular drug is working. Microarray technology will help researchers to learn more about many different diseases, including heart disease, mental illness and infectious diseases.

**Key words:** DNA microarrays, gene chips, complimentary DNA, Hybridization.

## INTRODUCTION

The Human Genome Project has created a massive amount of DNA sequence information. To take full advantage of this latest information, scientists have developed new techniques and tools for conducting research. DNA microarrays, which are also called DNA arrays or gene chips, are an example of a tool that uses genome sequence information to analyze the structure and function of tens of thousands of genes at a time [1].

Although all of the cells in the human body contain identical genetic material, the same genes are not active in every cell. Studying which genes are active and which are inactive in different cell types helps scientists to understand both how these cells function normally and how they are affected when various genes do not perform properly. In the past, scientists have only been able to conduct these genetic analyses on a few genes at once. With the development of DNA microarray technology, however, scientists can now examine how active thousands of genes are at any given time [2]. This technology promises to monitor the whole genome on a single chip so that researchers can have a better picture of the interactions among thousands of genes simultaneously.

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## GOAL OF DNA MICROARRAY

- What are all the components & processes taking place in a cell?
- How do these components & processes interact to sustain life?

One approach: What happens to the entire cell when one particular gene/process is perturbed [3]?

## DEFINITION

A DNA microarray is an arrayed series of microscopic spots of DNA oligonucleotides, called features, where each feature contains picomoles of a specific unique sequence, such as a stretch of a gene sequence, which is used to measure the relative abundance of a sequence between samples, either differentially labeled or on different microarrays [4-5].

## PRINCIPLE

Principle is based on the fact that complementary sequences of DNA can be used to hybridize immobilized DNA molecules.

This involves three multi-stage steps:

1. Manufacturing of microarrays: This step involves the availability of a chip or a glass slide with its special surface chemistry, the robotics used for