



account for experimental variations [3,4].

Applications: Microarrays have diverse applications in genomics, transcriptomics, proteomics, and diagnostics. They can be used for gene expression profiling, genotyping, DNA sequencing, protein characterization, drug discovery, biomarker identification, and personalized medicine. Microarrays enable high-throughput analysis, allowing researchers to investigate numerous targets simultaneously.

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Detailed Information of Microarray is a Multiplex Lab-On-A-Chip

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Microarray technology has significantly contributed to our understanding of gene expression patterns, disease mechanisms, and the discovery of new biomarkers. While newer technologies like next-generation sequencing have gained popularity, microarrays still offer advantages in terms of cost, ease of use, and the ability to analyze large sample sets in a single experiment [5].

Abstract

Microarray technology has revolutionized the field of molecular biology and genetics by enabling the simultaneous analysis of multiple biomolecules on a single lab-on-a-chip platform. Microarrays consist of a solid support, typically a glass slide or silicon chip, with thousands to millions of microscopic spots arranged in a grid pattern. Each spot contains probe molecules that selectively bind to specific biomolecules of interest. The sample, labelled with fluorescent or radioactive tags, is applied to the microarray, and the bound molecules are detected using specialized scanners or imaging systems. The resulting data is analyzed using bioinformatics tools to gain insights into gene expression patterns, genotyping, protein interactions, and biomarker discovery. Microarrays offer high-throughput capabilities, cost-effectiveness, and the ability to analyze large sample sets simultaneously. Although newer technologies have emerged, microarrays remain valuable tools in molecular research and diagnostics.

Keywords: Microarray; Bioinformatics tools; Molecules; Diagnostics

Introduction

A microarray is a multiplex lab-on-a-chip technology used in molecular biology and genetics research. It allows for the simultaneous analysis of multiple biomolecules (such as DNA, RNA, proteins, or antibodies) in a highly parallel manner.

Principle: Microarrays consist of a solid support, typically a glass slide or silicon chip, onto which thousands to millions of microscopic spots are arranged in an ordered grid pattern. Each spot contains a specific probe molecule that can selectively bind to its target biomolecule. The probes are immobilized on the surface using various methods, such as covalent attachment or physical adsorption.

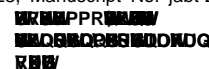
Data analysis: Once the fluorescence intensities or other signals are obtained, the data is analyzed using bioinformatics tools and statistical methods. The analysis may involve comparing different samples to identify differential gene expression, genotyping, SNP detection, protein-protein interactions, or other molecular interactions. Data normalization and quality control steps are typically performed to

Microarray: A multiplex lab-on-a-chip

Microarrays have revolutionized molecular biology and genetics research as a multiplex lab-on-a-chip technology. These miniature platforms consist of a solid support with thousands of microscopic spots, each containing specific probe molecules. By enabling simultaneous analysis of multiple biomolecules, microarrays offer several advantages. In operation, labeled samples are applied to the microarray, and the probe-target interactions occur on the chip's surface. The bound molecules are then detected using fluorescence or radioactive tags, providing valuable information about gene expression, genotyping, protein interactions, and biomarkers. One of the key strengths of microarrays is their high-throughput capability. By accommodating numerous spots on a single chip, researchers can analyze a large number of targets simultaneously, saving time and resources. Additionally, microarrays are cost-effective, allowing for efficient analysis of multiple samples in a single experiment. Data

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In conclusion, microarrays as a multiplex lab-on-a-chip technology have transformed the field of molecular biology and genetics. Their ability to simultaneously analyze multiple biomolecules has accelerated research, enabled comprehensive molecular investigations, and led to significant discoveries. Microarrays offer high-throughput capabilities, cost-effectiveness, and the integration of diverse biomolecules, making them valuable tools for a wide range of applications in basic research, diagnostics, and personalized medicine.

Conclusion

In conclusion, microarray technology represents a powerful and versatile multiplex lab-on-a-chip platform in the field of molecular biology and genetics. It enables simultaneous analysis of multiple biomolecules, such as DNA, RNA, and proteins, on a single chip, offering numerous benefits and applications. Microarrays provide high-throughput capabilities, allowing researchers to analyze a large number of targets in parallel. This enhances efficiency and saves time and resources compared to traditional single-target assays. The cost-effectiveness of microarrays makes them accessible for a wide range of research projects and facilitates comprehensive analyses within a single experiment. The ability to integrate multiple biomolecules onto a microarray chip enables a holistic approach to studying complex biological processes. Researchers can investigate gene expression patterns, genotypic variations, protein interactions, and biomarkers within the same experiment, providing a more comprehensive understanding of biological systems. Microarrays have been instrumental in advancing research in various fields, including gene expression profiling, genotyping, protein-protein interactions, and biomarker discovery. They have contributed to our understanding of disease mechanisms, drug development, personalized medicine, and other areas of biomedical research. While newer technologies continue to emerge, microarrays remain a valuable tool due to their established protocols, cost-effectiveness, and versatility. They offer researchers the ability to generate large-scale data sets and perform multiplex analysis, making them an indispensable resource for studying complex biological phenomena.

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Competing Interest

The authors say they have no competing interests.

References

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