

Duke University

The Multifunctional BIOCHIP

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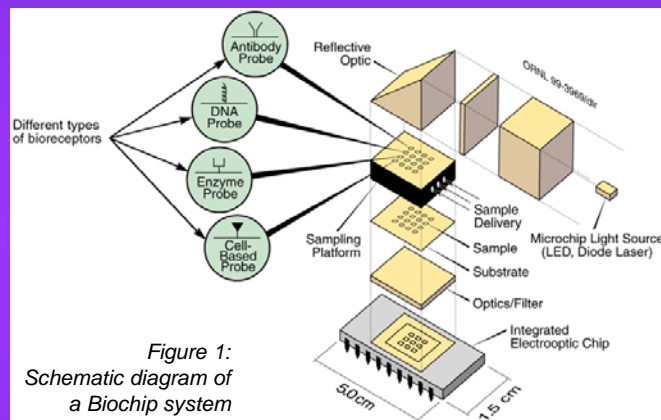
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The combination of biotechnology, integrated circuit (IC) technology, and microfabrication techniques has led to the development of a novel integrated multifunctional biochip (MFB), which allows simultaneous detection of several disease end-points using different bioreceptors (such as DNA, antibodies, enzymes, and cellular probes) on a single biochip system.

Bioreceptors and Bioprobes

Biosensors and biochips exploit the powerful molecular recognition capability of bioreceptors:

- antibodies,
- DNA,
- enzymes, and
- cellular components of living systems.



The Biochip System

- Sensing element with a two-dimensional array of probes that have bioreceptors attached to them.
- A two-dimensional array of optical detector-amplifiers integrated on a single IC chip (CMOS technology).
- On-board sensors, amplifiers, discriminators, and logic circuitry.

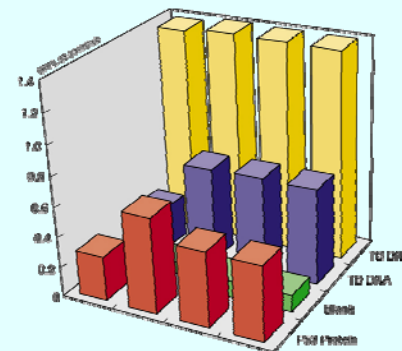


Figure 3: Photograph of the integrated circuit detection system of the Biochip

Medical Diagnostics

- Mycobacterium tuberculosis (TB),
- the HIV systems,
- antibody probes targeted to cancer, and
- tumor suppressor gene p53
- Chem-bio detection,

Figure 4: The Multifunctional Biochip used for simultaneous detection of the p53 protein (antibody probe) and the Microbacterium tuberculosis gene (DNA probe)



- biotechnology process monitoring,
- DNA sequencing, gene mapping
- environmental sensing, and
- high-throughput drug screening,
- public health protection.

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