

Biochip Applications

Devices that use a small, flat substrate (chip) that contains biological (bio) material are commonly called biochips. Biochips are used for obtaining genetic information. A biochip is a type of miniaturized equipment that integrates tens of thousands of probes made up of genetic material having a known sequence. When the probes are placed in contact with a biological sample (such as from a patient or experiment), only the nucleotide chains complementary to those of the chip hybridize. This action produces a characteristic pattern light, which is read with a scanner and interpreted by a computer. ●

2 Samples

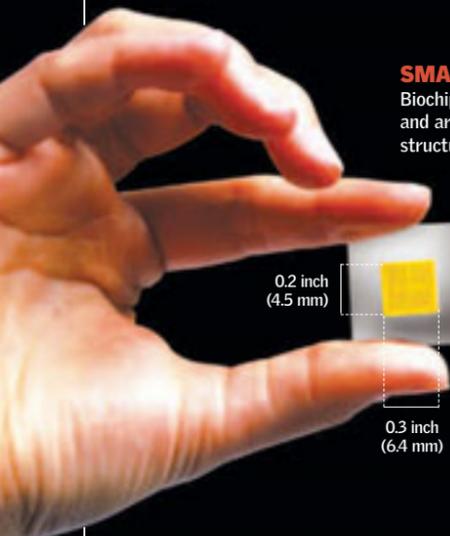
A microinjector fills each one of the pores in the biochip with samples of the different sequences of genes from the organism.

3 Microinjection

Through microinjection, each spot is filled with cDNA marker of both fluorescent substances (coming from cancerous and normal tissues combined).

4 How It Works

Once the injection of the marking mix is finished, it is necessary to detect which stuck to what spot. For this, the array is placed in a scanner with a green and a red laser, which excite the fluorescent targets. The microscope and the camera work in conjunction to create an image, and this information is stored in a computer.



SMALL SIZE

Biochips are the size of a stamp and are contained in a glass structure.

MASK

Template with microarray of cells structure.

PHOTODEGRADABLE FILM

functions as an intermediary layer.

GLASS SUBSTRATE

is chemically treated with certain reactive groups to permit the implantation of the oligonucleotides.

1 Procedure

This biochip has a template, or pattern—called a genetic microarray—that makes it possible to compare the DNA of one tissue sample from a person with the genes that cause a disease. In the case of a particular type of cancer, for example, researchers want to know the genes that are involved in the disease.

NORMAL

The cDNA (complimentary DNA) of normal cells is colored with a green fluorescent marking.



Cells of Normal Tissue

Cells of Cancerous Tissue

CANCER

The cDNA of cancerous cells is colored with a red fluorescent marking.

MIX

The tubes of green and red markings are combined in the same tube.

COMPUTER

The pattern is input into a special computer where the microinjectors will take care of filling the 96 orifices, or spots, on the biochip.

5 Results

All the points of the marked biochip have small sequences of DNA that are compared with a sequence of the samples. The fluorescent signals, detected by means of a computer, indicate which of the DNA sequences on the chip have complementary sequences in the sample. A special program is used to calculate the proportion of red to green fluorescent signals in the image.

COLOR FILTER

LIGHT RAYS

Spots filled with cDNA marked with both fluorescent substances

GREEN
The gene found in this spot expresses normal conditions.

RED
The gene found in this spot expresses cancerous conditions.

YELLOW
The gene found in this spot expresses normal conditions together with those of cancer.

