

# NHGRI *fact sheet*

## DNA Chip Technology

### *What is the DNA microchip?*

Although scientists know that mutations, or alterations in a gene's DNA, result in certain diseases, it is often difficult for them to identify and characterize these mutations because most large genes have many regions where a mutation could occur and cause disease. Examples of such genes are BRCA1 and BRCA2, which are believed to cause as many as 60% of all cases of hereditary breast and ovarian cancers. In BRCA1 alone, over 500 different mutations have already been discovered.

The DNA microchip is a revolutionary new tool used to identify mutations in genes like BRCA1 and BRCA2. The chip, which consists of a small glass plate encased in plastic, is manufactured using a process similar to the one used to make computer microchips. On the surface, each chip contains synthetic single stranded DNA sequences identical to a normal gene.

### *How does the chip work?*

To determine whether an individual possesses a mutation for BRCA1 or BRCA2, a scientist first obtains a sample of DNA from her blood, as well as a sample that does not contain a mutation in either gene.

After denaturing, or separating the samples of DNA into single strands, and cutting the them into smaller, more manageable fragments, the researcher labels the fragments with fluorescent dyes. The individual's DNA is labeled with green dye and the normal DNA is labeled with red dye. Both sets of labeled DNA are then inserted into the chip and allowed to hybridize, or bind, to the synthetic BRCA1 or BRCA2 DNA on the chip.

If the individual does not have a mutation for the gene, both the red and green samples will hybridize with the sequences on the chip. If the individual does possess a mutation, the red (normal) DNA will still hybridize perfectly with the DNA on the chip, but the green (individual's) DNA will not hybridize properly in the region where the mutation is located. The scientist can then examine this area more closely to confirm that a mutation is present.

### *What is the chip used for?*

Because chip technology is still relatively new, it is currently only a research tool. Scientists soon hope to be able to use it to conduct population studies, for example to determine how often individuals with a particular mutation actually develop breast cancer.

In the future, new chips will be generated to help assess individuals' risks for other types of cancer, as well as other diseases, including heart disease and diabetes.