H5-4 Family History and Genetic Testing

Most of us know that we can reduce our risk of disease by eating a healthy diet, getting enough exercise, and not smoking. But did you know that your family history might be one of the strongest influences on your risk of developing heart disease, stroke, diabetes, or cancer? Even though you cannot change your genetic makeup, knowing your family history can help you reduce your risk of developing health problems.

Family History and Your Risk of Disease

Family members share their genes, as well as their environment, lifestyles, and habits. Everyone can recognize traits that run in their family, such as curly hair, dimples, leanness, or athletic ability. Risks for diseases such as asthma, diabetes, cancer, and heart disease also run in families. Everyone's family history of disease is different. Key features of a family history that may increase risk are

- Diseases that occur at an earlier age than expected (10 to 20 years before most people get the disease);
- Disease in more than one close relative;
- Disease that does not usually affect a certain gender (for example, breast cancer in a male);
- Certain combinations of diseases within a family (for example, breast and ovarian cancer, or heart disease and diabetes).

If your family has one or more of these features, your family history may hold important clues about your risk for disease.

Using Family History to Promote Your Health

People with a family history of disease may have the most to gain from lifestyle changes and screening tests. You can't change your genes, but you can change unhealthy behaviors, such as smoking, inactivity, and poor eating habits. In many cases, adopting a healthier lifestyle can reduce your risk for diseases that run in your family.

Screening tests (such as mammograms and colorectal cancer screening) can detect diseases like cancers at an early stage when they are most treatable. Screening tests can also detect disease risk factors like high cholesterol and high blood pressure, which can be treated to reduce the chances of getting disease.

Learning About Your Family History

To learn about your family history:

- ask questions,
- talk at family gatherings, and
- look at death certificates and family medical records, if possible.

Collect information about your grandparents, parents, aunts and uncles, nieces and nephews, siblings, and children. The type of information to collect includes

- major medical conditions and causes of death,
- age of disease onset and age at death, and
- ethnic background

Write down the information and share it with your doctor. Your doctor will

- assess your disease risk based on your family history and other risk factors,
- recommend lifestyle changes to help prevent disease, and
- prescribe screening tests to detect disease early.

If your doctor notices a pattern of disease in your family, it may be a sign of an inherited form of disease that is passed on from generation to generation. Your doctor may refer you to a specialist who can help determine whether you have an inherited form of disease. Genetic testing may also help determine if you or your family members are at risk. Even with inherited forms of disease, steps can be taken to reduce your risk.

What If You Have No Family History of a Particular Problem?

Even if you don't have a history of a particular health problem in your family, you could still be at risk. This is because

- your lifestyle, personal medical history, and other factors influence your chances of getting a disease;
- you may be unaware of disease in some family members;
- you could have family members who died young, before they had a chance to develop chronic conditions such as heart disease, stroke, diabetes, or cancer.

H5-4 (continued)

Being aware of your family health history is an important part of a lifelong wellness plan.

What About Genetic Testing?

What are the current indications for genetic tests and for whom are they appropriate? Genetic tests can be done to confirm a suspected diagnosis, to predict the possibility of future illness, to detect the presence of a carrier state in unaffected individuals (whose children may be at risk), and to predict response to therapy. Genetic tests may be carried out in the prenatal arena, either through pre-implantation genetic diagnosis (where the diagnosis is made of an individual embryo before implantation), chorionic villus sampling (CVS), or amniocentesis. Most newborns in industrialized countries are tested at birth for a few genetic disorders that require immediate treatment. Genetic tests may be carried out on children (to confirm a diagnosis, but generally not to predict adult-onset disorders unless an intervention in childhood is essential). Genetic tests may be carried out on adults for all of these indications.

What kinds of genetic tests are available? About 900 genetic tests are now offered by diagnostic laboratories (see www.genetests.org for a wealth of information on the specifics). Some genetic tests look at whether the number of chromosomes is correct and whether there is any evidence of a chromosome rearrangement or other abnormality. This kind of test, for instance, would detect Down syndrome (an extra chromosome 21). Most genetic problems are more subtle than this, so tests able to detect them must look at the actual DNA sequence of a particular gene. To detect a carrier of Huntington's disease, for instance, the test must discover a particular expanded repeated sequence of a gene on chromosome 4. If this repeat of CAGCAGCAG… is very long, there is a high likelihood of the future onset of illness. For many genes, however, there are multiple different ways that the gene can be misspelled; in that situation, an effective test may need to detect many possible misspellings (usually referred to as mutations). A standard test for cystic fibrosis, for instance, looks for 32 different mutations in the so-called CFTR gene, but will still miss rare ones. Other types of genetic tests do not look at DNA at all, but look at RNA (the messenger that is transcribed from the gene), or at the actual protein product of the gene. Carrier detection for Tay-Sachs disease, for instance, actually measures the enzyme activity of the protein product.

What kinds of tests are available now for predicting disease susceptibility? The number of tests is growing, but most of these are currently applied only in families where there is a strong history of the disorder. For instance, BRCA1 and BRCA2 testing are only offered to individuals with a strong family history of breast and ovarian cancer. Similar situations exist for diseases such as colon cancer or Huntington's disease.

But in the next few years, it is expected that a much longer list of susceptibility tests will become available, and may be offered to anyone interested in the information, regardless of family history. It will be important to remember, however, that most of these tests will not be "yes or no" but rather will predict relative risk. For this paradigm to succeed, it will also be essential that predictive genetic information is used to benefit individuals, rather than to injure them by discriminatory misuse.

SOURCES: Centers for Disease Control and Prevention. 2005. *Genomics and Disease Prevention: Family History* (http://www.cdc.gov/genomics/public/famhix/fs_web.htm; retrieved June 1, 2005). National Human Genome Research Institute. 2004. *A Brief Primer on Genetic Testing* (http://www.genome.gov/page.cfm?pageID=10506784; retrieved June 1, 2005).