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## Environment--Not Heredity--Responsible for Most Cancers, Researchers Find

**Thomas S. May, Medical Writer**

### Introduction

The sad truth about cancer is that, in most cases, it cannot be cured. But results of a new study find that more often than not, it can be prevented.

Many people believe that their [risk of developing cancer](#) is mostly determined by their genetic makeup. But according to a study published in the *New England Journal of Medicine* (July 13, 2000), environment plays a much bigger role than inherited genes do in the development of most cancers.

Dr. Paul Lichtenstein, an associate professor at Sweden's Karolinska Institute, and his colleagues examined the health records of nearly 90,000 Scandinavian twins, approximately 10,000 of whom had [cancer](#). By analyzing the patterns of cancer in both "monozygotic" twins (who share all their genes) and "dizygotic" twins (who only share some, like non-twin siblings do), the scientists were able to separate the cancers that were caused by genetics from the ones caused by environmental factors. The results showed that genetic makeup plays a relatively minor role in determining a person's risk of developing cancer.

"Overall, the twin of a person with cancer had an increased risk of having the same cancer," the researchers concluded. This was especially so for cancer of the stomach, colorectum, lung, breast, and prostate. But even for these cancers, genetic makeup accounted for only a minority (26-42%) of the risk.

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Environmental factors are more important in the causation of cancer,

according to Axel Skytthe of the Danish Center for Demographic Research and Epidemiology, and one of the study's co-authors. "The heritability of the tendency to develop cancer is minor--only about 10-15%. This is indicated by the small difference between the rates of concordance [when both twins have the same disease] of monozygotic and dizygotic twins," he explains.

The absolute risk of the same cancer before age 75 for the monozygotic twin of a person with colorectal, breast, or prostate cancer was 11-18%, the study found. For dizygotic twins, the risk of these cancers was between 3% and 9%.

## Cancer Can Be Prevented

"The estimates of absolute concordance are telling," writes Robert Hoover, MD, of the National Cancer Institute, in an editorial commenting on the study. "For cancer at the common sites in monozygotic twins, the rate of concordance is generally less than 15 percent. Thus, the fatalism of the general public about the inevitability of genetic effects should be easily dispelled," he argues.

Basically, the study results say we can prevent the occurrence of most cancers, or at least minimize the risks. Once we have identified the exact environmental factor(s) that cause a particular type of cancer, we can reduce our risk of developing that cancer. For example, by not smoking, we reduce the risk of getting lung cancer.

On the down side, just because you aren't genetically susceptible to cancer does not guarantee that you will never develop the disease. For instance, even if you have a dark complexion and no family history of skin cancer, you can still develop melanoma (a form of skin cancer) as a result of repeated overexposure to the sun.

## Genetic Testing?

Based on the results of the study, Dr. Hoover questions the usefulness of genetic testing in trying to predict cancer: "There is a low absolute probability that a cancer will develop in a person whose identical twin...has the same type of cancer. This should be instructive to some scientists and others interested in individual risk assessment who believe that, with enough information, it will be possible to predict accurately who will contract a disease and who will not," Dr. Hoover argues.

Nevertheless, some scientists say that genetic counseling is important because it lets people find out if they carry the genes related to certain cancers. Knowing who is susceptible to certain types of cancers can motivate them to avoid certain environmental variables, according to Anastasia Iliadou, one of the study's researchers.

**Cancers are complex and only in very rare cases is there a single gene causing cancer.**

"Let's suppose that I eat a lot of junk food, but one day I learn that one of my parents has been diagnosed with colorectal cancer," Iliadou says. "I would then like to find out if I have the genes predisposing me to colorectal cancer. If I do, I would try to eat more broccoli--even though I've hated it since I was a kid--or bran flakes, for instance. In other words, I would try to improve my eating habits, in order to lower my risk of getting colorectal cancer." (It has been said that green vegetables and dietary fiber can prevent cancer.)

Iliadou also notes, however, that cancers are complex and only in very rare cases is there a single gene causing cancer. "The interaction between genes and the environment is very important, and our models could not account for that," she explains. "There are many unknown genetic effects, and we still have a lot to learn about the exact nature of the interaction between genes and the environment in the development of cancer," Iliadou says.

## Known Carcinogens

Following is a list of some of the most common environmental risk factors and the cancers they have been linked to.

Risk Factor	Cancer
Tobacco smoke	Lung, bladder, kidney, pancreatic, throat
Excessive alcohol consumption	Liver, breast, colon, throat
Obesity	Colon, kidney, endometrial (of the uterus)
Ionizing radiation	Breast, leukemia
UV radiation	Skin melanoma
High-fat diet	Breast, prostate
Immunosuppressive drugs	Non-Hodgkin's lymphoma, skin melanoma

Source: Harvard Report on Cancer Prevention (Channing Laboratory, Department of Medicine, Brigham and Women's Hospital and Harvard Medical School and the Harvard Center for Cancer Prevention).

For more information, visit these Web sites:

<http://www.yourcancerrisk.harvard.edu/>

<http://www.aicr.org/>

<http://www.nccn.org/>

[rex.nci.nih.gov](http://rex.nci.nih.gov)

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