

# Research on the Major Killers of Americans

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**M**edical research is at a crossroads. The major killer diseases are not solved by old experimental techniques. In order to win against the major diseases, researchers are looking to new technologies, and doctors are forced to learn new approaches.

## Heart Disease

### The Number One Killer

**T**he greatest advance in the understanding of heart disease was the discovery that it can be virtually eliminated by controlling three factors—cholesterol, smoking, and blood pressure. This extraordinary advance came from sophisticated studies of human patients.

Over the past four decades, in Framingham, Massachusetts, thousands of individuals in two generations have been carefully studied to see which factors are responsible for heart disease. The Framingham Heart Study showed that if one's cholesterol level stays below 150, a heart attack is extremely unlikely. Every 1 percent increase in cholesterol leads to approximately a 2 percent increase in risk. Other studies, such as the Lipid Research Clinic's Trial and the Multiple Risk Factor Intervention Trial, have also demonstrated the importance of controlling cholesterol levels.

Dean Ornish, M.D., of the University of California at San Francisco, has shown that if people who have advanced heart disease adopt a low-fat vegetarian diet, stop smoking, reduce stress, and engage in mild daily exercise, the plaques in their arteries will actually start to disappear.

Coronary artery bypasses and heart transplants, while helpful for some patients, have not matched the potency of dietary and other lifestyle measures. Bypasses and transplants develop aggressive atherosclerosis unless strict dietary steps are taken. Clearly, medicine's best strategy is to institute such steps while the patient is still healthy.

More research is needed: what we need are human behavioral studies on how to help people change long-standing smoking and dietary habits. Economic and political studies on how to shift farm production away from tobacco and livestock and toward grains, legumes, vegetables, and fruits are also essential.

## Cancer

### The Number Two Killer

**I**n 1971, President Nixon declared the new, aggressive "War on Cancer." In spite of these efforts, cancer death rates continue to climb.

A standard technique in the search for new anticancer drugs has been to give test substances to laboratory mice with leukemia. This is a slow and expensive procedure. It has yielded few effective agents while consuming millions of dollars and no fewer than one million animals each year.

A new method developed by Michael Boyd, Robert Shoemaker, and others at the National Cancer Institute tests potential drugs on actual human tumor cells.<sup>1</sup> In an automated system, the effectiveness of a substance in killing cancer cells is checked and entered into a computer. Potential drugs which have been overlooked by the mouse screening system may be found to work in the new human cell screen.

Instead of struggling—and often failing—to cure established cancer, a large body of data now shows that cancer can be prevented. The National Cancer Institute estimates that as much as 80 percent of cancer cases can be prevented.

Thirty percent of cancers are due to tobacco. Avoid smoking, and lung cancer becomes very unlikely. At least 35 percent of cancers are due to dietary factors.

In 1982, the National Research Council released a technical report, *Diet, Nutrition, and Cancer*,<sup>2</sup> showing that diet was probably the greatest single factor in the epidemic of cancer. Since then, more evidence has implicated specific dietary factors in several types of cancer. Foods rich in fats and oils increase risk of cancer in organs related to digestion (e.g., colon, rectum) and organs that are sensitive to sex hormones (e.g., breast, prostate).<sup>3</sup>

In addition, certain food constituents help protect against cancer. Dietary fiber, principally found in whole grain cereals and legumes, helps prevent cancer of the colon and rectum. It also appears to reduce risk of breast cancer, perhaps by lowering cholesterol and sex hormones. Several vitamins have shown anticancer activity: beta-carotene (the form of vitamin A found in dark green and yellow vegetables and fruits), vitamins C and

E, and the mineral selenium may help prevent cancer.

Avoiding excessive exposure to sunlight is a critical step in the prevention of skin cancer. In addition, radon, a natural radioactive gas that seeps up from certain underground rocks into groundwater supplies, has been implicated in certain cancers. Improved ventilation stops radon from building up in enclosed areas.

Prevention is the light at the end of the tunnel for those looking for a way to reduce the cancer epidemic. By avoiding factors that lead to cancer and including foods that strengthen us against the disease, we can, to a great extent, control our own risk.

### Estimated Percentages of Cancer Due to Selected Factors\*

|                               |        |
|-------------------------------|--------|
| Tobacco .....                 | 30%    |
| Diet .....                    | 35–60% |
| Alcohol .....                 | 3%     |
| Radiation .....               | 3%     |
| Air and Water Pollution ..... | 1–5%   |
| Medications .....             | 2%     |

*\*These figures are rough estimates based on data from Cancer Rates and Risks, National Cancer Institute (Washington, DC: 1985), and R. Doll and R. Peto, Journal of the National Cancer Institute, 1981, 66(6):1191–1308. Other factors may also play a role in certain forms of cancer and are not included in this table. Categories may overlap. For example, both tobacco and alcohol contribute to esophageal cancer.*

### Cellular Tests for Cancer-Causing Chemicals

While cumbersome and expensive animal tests take years to yield a verdict on potentially dangerous chemicals, rapid non-animal tests can give results in a matter of hours or

days. The Ames Test, the best known of these, uses bacteriologic methods that are markedly cheaper and faster than animal tests. The test checks whether substances can cause genetic damage in salmonella bacteria. If so, the chemical is likely to be a carcinogen. A cancer text states:

“The progressive arrival upon the scene of the Ames salmonella mutation test culminating in the (so far) definitive version in 1975 undoubtedly signalled a change in the way in which the field of carcinogenesis had to be viewed. It reflected almost a quantum jump in our progress towards understanding of this difficult area.”<sup>4</sup>

## Stroke

### The Number Three Killer

In stroke, a part of the brain is killed, leading to paralysis, loss of sensory function, and often death. Clinical and epidemiologic studies have shown how stroke is caused and how it can be prevented. It has become clear that the same factors that lead to heart disease—high blood pressure, elevated cholesterol levels, and smoking—can also cause stroke. Controlling these factors can prevent stroke. To reduce the incidence of stroke, more aggressive measures to help people change dietary and smoking behavior must be developed.

### References

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4. Bridges BA. Environmental Carcinogenesis. Emmelot P, Kriek E, eds., p. 319.