

Omega-3 Fatty Acids:

Can They Thwart Certain Cancers?

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Rich fish, such as wild Alaska Salmon, are known for their ability to reduce the risk of heart disease when they are consumed regularly. The recently revised Dietary Guidelines for Americans and the American Heart Association have advised people to eat rich fish, the primary source of omega-3 fatty acids (omega-3s), more often, particularly for heart health. Most American diets are low in omega-3s and high in omega-6s, the two main classes of polyunsaturated fatty acids in foods. Recent findings from cancer research suggest that omega-3s may be important in discouraging the development or spread of certain cancers.

Just in case you may have overlooked the size of the cancer problem, consider these numbers: In 2001, the American Cancer Society estimated there would be 198,100 new cases of prostate cancer and 192,200 new cases of breast cancer (see table on back page). Lung cancer will be diagnosed in 169,500 people. Although lung cancer claims more lives each year than any other cancer, breast and prostate cancer are by far the leading cancers in the U.S. today. The way we eat almost certainly has a lot to do with these numbers. Eating a lot more fruits and vegetables and feasting on rich fish much more often are likely to help.

Early studies of populations who customarily eat more fish more often than Americans do - Japanese, Greenland Inuit, Thais and other Asians - noted lower rates of breast and prostate cancer than occurred in the U.S. and western Europe. Except for traditional Inuit, these populations also consume less fat. Asians who immigrate to the U.S. and adopt western dietary patterns increase their risk of breast and prostate cancer¹. These epidemiological observations provided the first indication that omega-3 fatty acids may be cancer protective. But some diet and cancer studies failed to detect a beneficial effect of fish consumption, probably because fish consumption was relatively low and fat intake relatively high. A look at studies

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in laboratory animals and cell cultures, where a wider range of consumption or exposure can be examined, gives a more detailed picture of what may be happening in people who do or do not consume rich fish on a regular basis.

Breast Cancer Studies

It has been known for some time that linoleic acid, an omega-6 fatty acid and the main polyunsaturated fatty acid in corn, sunflower, safflower, and soybean oils, enhances tumor growth, development, and metastases (spread to other tissues)². No one knows why. By con-

trast, when animals implanted with human tumors are fed fish oil, they have fewer and smaller tumors that are less likely to spread³. When just one of the fish omega-3s, DHA, was fed, tumor growth decreased and tumor cell death increased, so long as the amount of linoleic acid in the diet was low. When large amounts of linoleic acid were included, DHA was not effective⁴. It is well known that once metabolized, linoleic acid competes with omega-3s in several metabolic pathways and is usually present in human diets in amounts sufficient to overwhelm small amounts of omega-3s. In a different study, fish oil compared with linoleic acid, enhanced the effectiveness of a cancer therapeutic drug, doxorubicin⁵.

These encouraging findings provide a rationale for understanding how fish oils may inhibit tumor development and limit its growth once it has become established. They also support previous studies indicating that diets overabundant in omega-6 fatty acids - those found mainly in vegetable oils - may override the benefits of small amounts of omega-3s. We know that people's diets contain many types of fatty acids, but there is uncertainty about the ideal proportions of each kind that promote the best health. Current data indicate that it is wise to be selective about the fatty acids we eat and to:

- limit saturated fatty acid consumption (those found mainly the fats of dairy products, meats, coconut oil, commercially hydrogenated fats and shortening)
- avoid consuming large amounts of highly unsaturated vegetable oils (particularly corn, safflower, sunflower and soybean oils)
- include rich fish regularly, two to three times a week, like Alaska Salmon
- make up the rest with monounsaturated or "neutral" fatty acids such as those in olive and canola oils or oils specially developed to be rich in oleic acid (e.g., "high oleic" soy, sunflower and safflower oils)

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Prostate Cancer Studies

Commonalities between prostate and breast cancer have become intriguing. Certain forms of both cancers share a sensitivity to hormones and may also share similar responses to dietary fatty acids and other factors such as vitamin E and selenium⁶. Research is also uncovering similar genetic disturbances in which mutations in the breast cancer genes (BRCA1 and 2) appear to increase risk of both breast and prostate cancer. Lamentably, prostate and breast cancers are the leading cancers in men and women, respectively. Recent research on prostate cancer, however, looks particularly encouraging.

As in breast cancer, animal and cell studies have shown that saturated fatty acids and linoleic acid promote prostate

tumor growth. EPA and DHA or fish oils inhibit tumor growth⁷. A recent study in Sweden reported that among more than 6000 Swedish men, those who ate no fish had a two to three fold higher incidence of prostate cancer than those who ate moderate or high amounts of fish⁸.

Several investigators have also noted that men with prostate cancer have lower levels of EPA and DHA in their serum, red blood cell membranes, and prostate tissue than men without the disease.

Another finding in prostate, breast, and certain other cancers is the increased production of an enzyme, called COX-2. This enzyme converts a key omega-6 fatty acid to substances that stimulate inflammatory responses and promote the growth of new blood vessels, a requirement for tumor development. However, when omega-3 fatty acids are around, COX-2 activity is reduced and along with it the production of inflammatory-stimulating substances. In laboratory studies, when COX-2 is inhibited by omega-3 fatty acids, tumor growth is inhibited and tumor cell death increased. Further, the development of new blood vessels is curbed.

Just a few months ago, the first study of what happens when men with prostate cancer consume omega-3 fatty acids was reported⁹. Men who followed a low fat diet supplemented with omega-3s for three months had increased omega-3 content in their tissues and reduced COX-2 enzyme activity. Time will tell whether tumor growth and progress of the disease will be inhibited. If this early study is confirmed in larger studies, omega-3 fatty acids and the consumption of rich fish may become an important strategy for managing prostate cancer and reducing risk of developing the disease. The work will also provide some explanation for how omega-3s may be thwarting prostate cancer.

Estimated new cases and deaths from leading cancers in the U.S. for 2001*

Cancer site	New cases	Deaths
Prostate	198,100	31,500
Breast (women)	192,200	40,200
Lung	169,500	157,400
Colon and rectum (men)	135,400	56,700

* Source: American Cancer Society, Cancer Facts and Figures 2001

What Lies Ahead?

Emerging from laboratory studies on several types of cancer is the possibility that omega-3 fatty acids stimulate the death of tumor cells. Their unique chemical structure makes them susceptible to oxidation (break-

down) and breakdown products may accumulate. Normally, these products would be considered undesirable and harmful. In cancer, however, they may have the opposite effect and promote the destruction of tumor cells. One study showed that substances that prevent fatty acid oxidation reduced tumor cell death and those that stimulate oxidation, hastened tumor cell death¹⁰. Considered along with their other metabolic effects, omega-3 fatty acids look promising for reducing risk and managing certain cancers, especially breast, prostate, and probably colon cancer. Results of clinical trials and laboratory studies now in progress will add to our understanding of how these remarkable fatty acids may thwart the course of cancer.

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Dr. Nettleton is known for her work in seafood nutrition. She is the author of three books on the subject, including **Omega-3 Fatty Acids and Health**, published in 1995. She also conducted research under a USDA contract to study the nutrient profile of farmed and wild fish and shellfish and published on related topics.

For more than four years Dr. Nettleton coordinated a consortium of 11 scientific societies that sought to ensure the scientific integrity of regulatory oversight of genetically modified plants. She has written extensively, testified, and been widely quoted on many aspects of genetically modified foods. She has conducted workshops on biotechnology communications and spoken often on the issue

Dr. Nettleton received her doctorate in nutrition science from the Harvard School of Public Health (in 1973) and holds a Masters in International Nutrition from Cornell. She is also a registered dietitian. In October 1999, she was elected Fellow of the American Association for the Advancement of Science. She is most proud, however, of her graduation from the blue runs on U.S. ski slopes and is in hot pursuit of the black diamonds.