Last week’s discussion of “Big Picture organizing around human health issues” will be continued next week.

Cancer is uncontrolled growth of cells. Normal, healthy cells grow by dividing; one cell divides and becomes 2; those 2 divide and become 4 cells, and so on. Cell division is normal. When a cell divides, its genetic molecules (called DNA, or deoxyribonucleic acid) are reproduced in its descendants, the new cells. The genetic molecules (the DNA) contain complete instructions telling the new cells how to function, how to behave, including how (and how fast) to divide.

Normal DNA also contains instructions telling cells when to stop dividing. Normal cell division always stops at some point, by natural means; none of us continues to grow forever. When cells fail to stop dividing, they can continue to grow until they kill their host (the person whose body contains the runaway cells). This is cancer.

Cancer is now thought to be a genetic disease, or, more properly, about 100 different genetic diseases. According to current medical theory, a cancer tumor develops in stages, starting from a single cell.[1] As a cell accumulates a series of “genetic lesions,” a full-blown cancer can begin. A lesion is an injury or loss of function. Genetic lesions are lesions that occur in the DNA molecules that control a cell’s proper operation, including the accuracy and appropriate rate of cell division. Genetic lesions in a cell can occur at any age, including the time when a fetus is forming in its mother’s womb.

Some genetic lesions can be inherited from parents. In other words, some people start life with DNA that has been damaged in some way. Such inherited lesions are present in the fertilized human egg, the single cell from which the new person will grow. Since every cell in a person’s body is descended from that first cell (the fertilized egg), the inherited DNA lesion is present in every cell in the new person’s body.

In contrast to an inherited lesion, which affects every cell, a person can also develop a genetic lesion during childhood or as an adult. Such a lesion affects the single cell that first acquired the damage (from exposure to ionizing radiation, or certain chemicals, for example); it will also affect any cells that are descendants of that particular cell, but it will not affect unrelated cells in the body.

Cancer is thought to develop after a cell has accumulated several cancer-causing lesions. Medical authorities commonly estimate that 4 to 10 lesions in a cell’s DNA are necessary before a cancer can develop. Some of these lesions may be inherited, and others may be acquired at any age after conception. If this theory is correct, the vast majority of people are not “destined” to get cancer, even though they may inherit a cancer-causing genetic lesion from one of their parents. If they are prudent and avoid unnecessary exposures to carcinogens (materials such as radiation and certain chemicals), get adequate exercise, and eat a healthy diet rich in anti-cancer foods (such as dark green and yellow/orange vegetables, and fruits), they can reduce their chances of developing a tumor.

A few people inherit powerful genetic lesions that confer a high chance of getting cancer in a specific organ, with the cancer often occurring at a young age. Such powerful inherited lesions seem to account for 10 percent (of all human cancers). Even these powerful inherited lesions may need additional lesions before they can turn into a cancer. The relationship of inherited lesions, and lesions that develop later, are poorly understood. It may turn out that cancer never develops without an inherited “head start” and almost always requires the interaction of an inherited lesion with other forces. The “other forces” would be pesticides or pesticide by-products, carcinogens in the diet, certain industrial chemicals, inadequate exercise, EMFs (electromagnetic fields), ionizing radiation, and so on.

This theory of cancer implies that a large proportion of all cancers can be avoided or eliminated if we correctly identify and eliminate the non-inherited forces which act alone, or act along with inherited lesions, to produce cancer.

As we saw last week, the rates of incidence (occurrence) of 19 kinds of cancer are increasing in the U.S., and the death rates for 12 kinds of cancer are increasing. (Those cancers for which incidence rates are rising and death rates are falling are the cancers we are “learning to live with.” They are: cancers of the colon/rectum; larynx; testicles; bladder; Hodgkin’s disease; childhood cancers; leukemia; and thyroid. People are surviving these cancers because of surgery, chemotherapy, and radiation treatments. Although it is good news that more people are surviving these cancers, it is hard to argue that this is an unqualified medical success because the quality of life for cancer survivors, and their families, is often wretched.)

Among the most rapidly-increasing and PREVENTABLE cancers is breast cancer. In the U.S., about 182,000 new cases of breast cancer will be reported in 1994 (1000 in men, 181,000 in women); and about 50,000 American women now die each year from breast cancer.

In a new book to be published in February, 1995, Dr. John Gofman presents compelling evidence that about 75 percent of breast cancer is caused by exposure to ionizing radiation, principally from medical x-rays. In his usual fashion, Gofman argues methodically and carefully, clearly explaining all assumptions, and all calculations. Gofman demonstrated in his earlier books[2] that he is one of our greatest teachers; this new book provides additional evidence of his gift.

Gofman quotes people who say, “We know nothing about the causes of breast cancer.” He is appalled that in 1994 anyone could make such claims. He cites a series of studies, dating back to 1965, which showed that exposure to ionizing radiation is a prominent and proven cause of breast cancer.

In 1961, Dr. Ian MacKenzie, a physician in Nova Scotia, examined a patient with rapidly-growing breast cancer. He noticed that the skin on her chest showed signs of radiation burns. He explained that she had had tuberculosis and that, as part of her treatment, she had had “artificial pneumothorax therapy” (one of her lungs was intentionally collapsed); this therapy included about 200 fluoroscopic x-rays of her lungs. (A standard x-ray makes a snapshot image on photographic film; in fluoroscopy, examination of a patient takes place while the x-ray beam stays turned on so the physician can observe what happens when the patient, or the patient's organs, are in motion. Fluoroscopes deliver a much larger dose of radiation than normal x-ray snapshots.)

Dr. MacKenzie then studied 800 women who had been treated for tuberculosis in one hospital between 1940 and 1949. He found that women who had not had “artificial pneumothorax therapy” had a 1-in-510 chance of getting breast cancer; women who had had the therapy had a one-in-21 chance of getting breast cancer. In other words, women who had had many fluoroscopic exams of their lungs had 24 times as great a chance of getting breast cancer as women who had avoided fluoroscopy.[3]

MacKenzie’s work caused quite a “stir” in the radiation community. Happily, it stimulated a Japanese researcher, C. K. Wanebo, to examine the data gathered from the atomic bombings of Hiroshima and Nagasaki in Japan in 1945. In 1968, Wanebo reported that radiation exposure at Hiroshima and Nagasaki had caused a demonstrable increase in breast cancers among surviving women.[4]

Since then, numerous scientific and medical papers have confirmed that ionizing radiation causes breast cancer. The latest confirmation, based on further analysis of A-bomb survivors, was published in 1994.[5]
Several other factors besides radiation have been linked to breast cancer: age at which a women's period begins (later is safer); age at which menopause occurs (earlier is safer); age at birth of first child (earlier is safer); diet (less fat and more fiber are safer); alcohol intake (less is safer); and exercise (more is safer). All of these factors have a common thread: they all affect the estrogen levels in a woman's blood stream. However, these known "risk factors" only account for 30% of breast cancers; some 70% remains unexplained. Dr. Gofman's most recent analysis (which he first presented at the annual meeting of the American Association for the Advancement of Science in February 1994)[6] indicates that the "other 70%" can be explained by excessive exposures to radiation, most of it medical radiation. This does not mean that the "other factors" (such as pesticides, and so forth) are unimportant. The multi-step genetic model of cancer development (described above) permits contributions even to a single case of cancer from heredity, ionizing radiation, viruses, hormone pills, chemicals, and other factors as well. Dr. Gofman believes that radiation is a MAJOR cause, not the ONLY cause.

Gofman argues in his new book that most breast cancer can be prevented by reducing women's exposure to medical radiation WITHOUT denying women the benefits of diagnostic radiology. This is an important book.

GET: PREVENTING BREAST CANCER: THE STORY OF A MAJOR, PROVEN, PREVENTABLE CAUSE OF THIS DISEASE. It will be available for $15.00 in February, 1995, from: The Committee for Nuclear Responsibility (CNR), P.O. Box 421993, San Francisco, CA 94142.

--Peter Montague

[1] This week's newsletter contains long paraphrases and unattributed quotations from work by John Gofman and Egan O'Connor of the Committee for Nuclear Responsibility (CNR), P.O. Box 421993, San Francisco, CA 94142. However, any errors of interpretation are ours and not theirs.

[2] John W. Gofman, RADIATION AND HUMAN HEALTH (San Francisco: Sierra Club, 1981); John Gofman and Egan O'Connor, X-RAYS; HEALTH EFFECTS OF COMMON EXAMS (San Francisco: Sierra Club Books, 1985; $25.00 from CNR); John Gofman, RADIATION-INDUCED CANCER FROM LOW-DOSE EXPOSURE: AN INDEPENDENT ANALYSIS (San Francisco, Ca.: Committee for Nuclear Responsibility [first copy, $29.95; $15.00 each additional copy], 1990).


Descriptor terms: ionizing radiation; breast cancer; dna; genetic disorders; diet; antioxidants; pesticides; electromagnetic fields; cancer statistics; john gofman; egan o'connor; committee for nuclear responsibility; ian mackenzie; fluoroscopy; x-rays; hiroshima; nagasaki; a-bomb; nuclear weapons; estrogen;