

# Rachel's Environment & Health News

## #693 - The Major Cause of Cancer--Part 3

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John Gofman is a medical doctor with a Ph.D. degree in nuclear and physical chemistry. He is professor emeritus of molecular and cell biology at University of California, Berkeley, and a member of the faculty at University of California Medical School at San Francisco. During his long career, he has pursued two separate fields of research -- heart disease, and the health effects of low-level radiation. He has won several awards for original research into the causes of atherosclerosis, which is the growth of fatty "plaque" inside the blood vessels, often causing fatal heart attacks. In 1974, the American College of Cardiology selected him as one of the 25 leading researchers in cardiology of the past quarter-century.

In the early 1960s, the U.S. Atomic Energy Commission (AEC) asked Gofman to develop a Biomedical Research Division at the AEC's Livermore National Laboratory (LNL) to evaluate the health effects of all types of nuclear activities. In 1970, he became convinced that radiation was more dangerous than previously believed, and he spoke out against Project Plowshare, the AEC's plan to explode hundreds of nuclear weapons to release gas trapped in rock beneath the Rocky Mountains and to excavate new harbors and canals by exploding nuclear bombs above-ground. (See REHW #691.) He also called for a 5-year moratorium on the AEC's plan to develop 1000 commercial nuclear power plants. By 1974, his government funding was cut. He then began a series of books on the dangers of radiation: RADIATION AND HUMAN HEALTH (1981); X-RAYS -- HEALTH EFFECTS OF COMMON EXAMS (1985); RADIATION-INDUCED CANCER FROM LOW-DOSE EXPOSURE -- AN INDEPENDENT ANALYSIS (1990); PREVENTING BREAST CANCER -- THE STORY OF A MAJOR, PROVEN, PREVENTABLE CAUSE OF THIS DISEASE (1995; second edition, 1996); and RADIATION FROM MEDICAL PROCEDURES IN THE PATHOGENESIS OF CANCER AND ISCHEMIC HEART DISEASE (1999).[1,2,3,4,5]

Gofman is a superb teacher. In his books, he explains the raw data, where it came from, its shortcomings, how it might be improved (or why we're stuck with what we've got). Then he moves the reader step by step toward his conclusions, explaining each step for the novice as well as the expert. When he is forced to make assumptions, he explains why he thinks he is making the right ones. He often describes alternative assumptions and the effect they would have on his conclusions. Nothing of importance is omitted. As a result, Gofman's books are lengthy -- typically 500 to 900 pages filled with tables of data accompanied by detailed explanations. The reader gets a thorough education in the topic, satisfactory for both novice and professional. I consider Gofman one of the greatest teachers of the 20th century. His work has already changed the way the world views the dangers of radiation, and his latest book will -- eventually, after a long fight -- revolutionize the way the world looks at medical radiation. Cumulatively his work will save tens of millions of lives.

In his latest (1999) book, Gofman presents strong evidence that medical radiation is a major cause of cancer AND of atherosclerosis (coronary heart disease).[5] By "medical radiation" Dr. Gofman is referring mainly to x-rays, including fluoroscopy and CT ("cat") scans. The mechanism is simple to state: radiation causes genetic mutations, which eventually give rise to disease.

What is Gofman saying? Does he mean that medical radiation is necessarily the ONLY cause of cancer and coronary heart disease? Certainly not. Does he mean that cancer is NOT caused by smoking, poor diet, genetic inheritance, pesticides, diesel exhaust, dioxin, and toxic chemicals encountered on the job? Certainly not. Cancer and heart disease both have multiple causes. For a cancer (or an atherosclerotic plaque) to develop, a cell must undergo several (probably 5 to 10) separate gene mutations. Some of these mutations might be inherited but most occur from exposure to gene-damaging substances in the environment.

Here is a way to understand multiple causation. Gofman gives the following hypothetical example of 100 cases of cancer:

- \*\* 40 cancers caused by co-action of x-rays + smoking + poor diet;
- \*\* 25 cancers caused by co-action of x-rays + poor diet + inherited genetic mutations;
- \*\* 25 cancers caused by co-action of x-rays + smoking + inherited genetic mutations;
- \*\* 10 cancers caused by co-action of smoking + poor diet + inherited genetic mutations.

In the first case, the 40 cancers are caused by genetic mutations that are, in turn, caused by x-rays, smoking, and poor diet. Each of these three factors is necessary for the cancer to occur; if any one of the three factors is missing, the cancer will not occur.

We can see that, in this example, x-rays contribute to  $40 + 25 + 25 = 90$  cases out of 100. In this example, if x-rays were not present, 90% of the cancers would not occur. Now, in the same example, look at "poor diet." Poor diet contributes to  $40 + 25 + 10 = 75$  of the 100 cases. If poor diet were not present, 75% of the cancers in this example would not occur.

You can see that, in this example, we have x-rays "causing" 90% of the cancers -- "causing" in the sense that the cancers wouldn't occur in the absence of x-rays. But we also have poor diet "causing" 75% of the same cancers, meaning that 75% of the cancers wouldn't occur in the absence of poor diet.

Thus we can see that, when Gofman says x-rays are responsible for a large proportion of all cancers in the U.S., he is NOT saying that x-rays are the ONLY cause of those cancers. However, he IS saying that most of those cancers would not occur in the absence of x-rays.

It is important to point out that Gofman is not opposed to medical x-rays. Rather he is opposed to UNNECESSARY EXPOSURES from x-rays. He has shown over the years -- and he is definitely not alone in this -- that medical x-ray exposures in the U.S. could be cut by at least 50% with no loss of medical information. The careful use of modern x-ray equipment and techniques can reduce x-ray exposures by half (or more) without sacrificing any medical benefits. Thus at least half the cancers caused by medical x-rays are completely unnecessary.

How many unnecessary cancers are we talking about? Gofman calculates that in 1993, 50% of all cancers in women and 74% of all cancers in men were attributable to x-rays. In other words, about 60% of all cancers in the U.S. in 1993 were attributable to x-rays. About 500,000 people die of cancer each year in the U.S. If 60% of these deaths are attributable to x-rays and half are unnecessary, we are talking about 150,000 unnecessary cancer deaths each year in the U.S.

Gofman calculates that the proportion of coronary heart disease (CHD) attributable to x-rays is slightly higher than the proportion of cancers. Among men in 1993, 63% of CHD deaths were attributable to x-rays and among women, 78%. So, in rough numbers, 70% of CHD deaths are attributable to x-rays, Gofman believes. Since CHD caused roughly 460,000 deaths in the U.S. in 1993, if Gofman is right then 70% (or 322,000) of these deaths are attributable to x-rays and half of these, or 161,000 are unnecessary. Thus we can see that x-rays are responsible for about  $150,000 + 161,000 = 311,000$  unnecessary deaths each year in the U.S., if Gofman is right.

Gofman's study takes a novel approach, avoiding certain difficulties inherent in all data linking medical radiation to health. Here are the difficulties: there are no reliable estimates of the average per-capita radiation dose that the U.S. population receives now from medical x-rays, or has received in the past. (Gofman explains why in chapter 2.) Secondly, there are no reliable estimates of the cancer risk per unit dose from medical x-rays because no one is sure of the precise exposures received by various groups that have been studied for

cancer effects. (Again, see Gofman's chapter 2.)

Avoiding these difficulties, Gofman developed a novel approach: he found disease statistics for the entire U.S. population, broken down into 9 census districts (1940 to 1990 for cancer, and 1950 to 1990 for coronary heart disease). Then he correlated these disease statistics, year by year, to the number of physicians per 100,000 population in each of the 9 census districts. The density of physicians per 100,000 population provides a RELATIVE measure of the medical radiation per 100,000 population in the 9 districts, year by year.

Gofman shows that cancer death rates RISE in lock-step with increasing density of physicians in a census district, while non-cancer deaths DECLINE in lock-step with increasing density of physicians per 100,000 population EXCEPT in the case of coronary heart disease (CHD), which follows the rising pattern of cancer. Thus Gofman's hypothesis that CHD is linked to medical radiation "fell out of the data." Because he had decades of experience researching the causes of CHD (he has written three books on heart disease), and because he knows the radiation literature so well, Gofman was able to put 2 and 2 together: radiation induces mutations in the coronary arteries, giving rise to what he calls "dysfunctional clones" (mini-tumors) in the smooth muscle lining the arteries.

Interestingly, using his "physician density" method Gofman estimates that medical radiation caused 83% of female breast cancer in the U.S. in 1993. Using a completely different method, Gofman in 1995 had estimated that medical radiation was responsible for 75% of U.S. breast cancer. The two estimates, by two completely different methods, are remarkably similar.

It will not be easy to convince physicians to take special care to minimize radiation to their patients. Familiarity breeds contempt and many physicians and dentists treat x-rays as if they are entirely harmless. Recently I broke a tooth. My dentist, who is first-rate, needed to document the injury for insurance purposes. "I'll just snap an x-ray," he said. I asked, "Is there some other way?" He nodded and immediately scribbled a note: "I broke my tooth and I don't want an X-ray." "Sign this," he said. "The insurance company is required to accept it." One unnecessary x-ray avoided.

Next time someone says they're going to give you an x-ray, don't put them on the spot but mention that you're curious what dose of radiation you will get. If your experience is anything like mine, the person giving the x-ray will not know the answer and you will be told, "Don't worry. It's completely safe."

But it's not.

--Peter Montague (National Writers Union, UAW Local 1981/AFL-CIO)

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[1] John W. Gofman, RADIATION & HUMAN HEALTH (San Francisco: Sierra Club Books, 1981); ISBN 0-87156-275-8.

[2] John W. Gofman and Egan O'Connor, X-RAYS -- HEALTH EFFECTS OF COMMON EXAMS (San Francisco: Sierra Club Books, 1985); ISBN 0-87156-838-1.

[3] John W. Gofman, RADIATION-INDUCED CANCER FROM LOW-DOSE EXPOSURE: AN INDEPENDENT ANALYSIS (San Francisco: Committee for Nuclear Responsibility, 1990; ISBN 0-932682-89-8.

[4] John W. Gofman (edited by Egan O'Connor), PREVENTING BREAST CANCER (San Francisco: Committee for Nuclear

Responsibility, second edition, 1996); ISBN 0-932682-96-0.

[5] John W. Gofman (edited by Egan O'Connor), RADIATION FROM MEDICAL PROCEDURES IN THE PATHOGENESIS OF CANCER AND ISCHEMIC HEART DISEASE (San Francisco: Committee for Nuclear Responsibility, 1999). ISBN 0-932682-98-7. Available for \$27.00 from Committee for Nuclear Responsibility; telephone/fax: (415) 776-8299. E-mail: cnr123@webtv.net.

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