

Rachel's Environment & Health News

#244 - Dangers Of Low-Level Radiation

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A study published earlier this year in the JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION reveals that the occurrence of leukemia (cancer of the blood-forming cells) is 63% higher among white male atomic workers at the Oak Ridge National Laboratory (ORNL) than among all U.S. white males.[1] ORNL, in Oak Ridge, Tennessee, has been a federal research and development laboratory for U.S. nuclear weapons development since 1943.

If its findings are confirmed by additional research, this study will affect the future of every part of the nuclear industry, including electric power reactors, weapons factories and medical uses.

The study compared radiation exposures and deaths among 8318 workers hired by ORNL between 1943 and 1972; the workers' health status was followed through 1984. Previous studies of these individuals--the latest being 1977--had not shown any unusual cancer problems. It was during the period 1977-1984 that the excessive cancers began to appear. At end of the study period (1984), 1524 of the 8318 workers had died. Study of these workers in the future will provide important additional information.

The research team reporting these results--several of whom are employed by ORNL--was clearly distressed by its own findings because very few workers at ORNL received radiation doses greater than those permissible for radiation workers today. Of nearly 88,000 individual records of an annual dose received by a worker at ORNL, only 135 exceeded the yearly dose limit permissible today, which is 5 rem per year. Most of the workers in the study received total radiation doses well below what is permissible today. Nearly 75% of the ORNL workers had cumulative radiation doses of less than one rem total exposure throughout their employment. This study therefore casts doubt on the safety of today's radiation standards for atomic workers.

Even more importantly, the study provides reason to doubt the safety of the allowable limits for radiation to which the general public can legally be exposed today. If the risks revealed by this study are confirmed, it could force a lowering of permissible radiation exposures to workers and to the public, thus affecting the design and operation of nuclear power plants, the shipment of nuclear materials by truck and by train, the packaging and burial of nuclear wastes in the ground, exposures allowed during medical procedures, and on and on. Today the general public can legally be exposed to 1/10th of a rem per year. An individual exposed to this legal limit for 10 years would achieve a total exposure larger than that received by 75% of the workers at ORNL.

This study was very carefully done and was not rushed into print hastily. The last year of the study period was 1984 and the study appeared in print in 1991. Clearly, a great deal of thought and analysis went into this study before it was finally published. An unusual aspect of the study is that the authors have made available a 19 page supplement that discusses the statistical techniques they employed. [Order National Auxiliary Publication Service document 04849 for \$7.75 from NAPS c/o Microfiche Publications, P.O. Box 3513, Grand Central Station, NYC, NY 10163-3513.]

The study not only reveals an elevated risk of cancer among workers exposed for long periods to low doses of radiation; it also shows that the risk of cancer increased as the exposure to radiation increased. In other words, there was an observable relationship between dose (amount of radiation) and response (cancer). This observable dose-response relationship is important in convincing scientists that the relationship between small doses of radiation and leukemia is most likely one of cause and effect and not pure chance.

Furthermore this new study makes an important contribution to a debate

that has been going on for two decades between groups that might be called "high dose danger advocates" vs. "low dose danger

advocates." The reason for the debate is that most data on harm from radiation are derived from events in which humans received high doses of radiation in short periods. The best-known such event was the bombing of two Japanese cities in 1945. Yet most radiation exposures to humans are not high doses delivered quickly but are low doses delivered over decades. The core of the debate is how to judge what the effects of low doses will be on humans, given that most of the available data are derived not from low-dose studies but from high-dose studies. (The various arguments were presented in some detail in RHWN #184 and #185.)

The study of ORNL workers indicates that low doses of radiation delivered slowly (over decades) are about 10 times more efficient at producing cancer in humans than are high doses of radiation delivered quickly. (One possible explanation for such a phenomenon would be that high radiation doses kill cells outright whereas low doses merely damage cells which can then go on to cause cancer.)

The ORNL study shows that chronic exposure to low doses of radiation is about 10 times more efficient at producing cancer than one would expect, based on studies of bomb survivors in Japan.

This is not the first study of atomic workers that reached such a conclusion. An investigation of British atomic workers published in 1988 reported very similar results,[1] so the ORNL study confirms the earlier British work. This is definitely not good news for people who are enthusiastic about expanding nuclear technologies because many nuclear technologies would be difficult and very expensive to redesign to reduce human exposures to radiation. In the case of nuclear power plants to generate electricity, and nuclear weapons, a philosophy of prevention would very likely provide the least-cost solution to the problem.

As if to confirm that this study is really bad news for every part of the nuclear industry, the JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION printed an editorial to accompany the study.[2] It says, "If correct, the conclusions of Wing et al [and others] are highly significant" meaning that they deal a severe blow to people who have argued for decades that low doses of radiation are inconsequential. The editorial then goes on to stake out an interesting position for a medical journal; it is called "There's no free lunch" and it basically says, "Hey--you want the benefits of nuclear weapons and nuclear-generated electricity and nuclear medicine? Then you've got to expect that some people will be killed as a result." The editorial does not even discuss the possibility of redesigning nuclear facilities to provide lower doses; inherent in such an omission is the unstated conclusion that redesign would be prohibitively expensive.

Get: Steve Wing, Carl M. Shy, Joy L. Wood, Susanne Wolf, Donna L. Craig, and E.L. Frome, "Mortality Among Workers at Oak Ridge National Laboratory," JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION Vol. 265, No. 11 (March 20, 1991), pgs. 1397-1402. Request a free reprint from Dr. Wing at Department of Epidemiology, CB 7400, University of North Carolina, Chapel Hill, NC 27599-7400.

--Peter Montague

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[1] V. Beral, P. Fraser, L. Carpenter, M. Booth, A. Brown, and G. Rose, "Mortality of Employees of the Atomic Weapons Establishment, 1951- 1982." BRITISH MEDICAL JOURNAL, Vol. 97 (1988), pgs. 757-770.

[2] William R. Hendee, "There's No Free Lunch; The Benefits and Risks of Technologies." JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION Vol. 265, No. 11 (March 20, 1991), pgs. 1437-1438. Additional reading we recommend: Catherine Caufield, MULTIPLE EXPOSURES; CHRONICLES OF THE

RADIATION AGE (Chicago: University of Chicago Press, 1990). \$13.95. [See RHWN #200, #201, #202.] John W. Gofman, RADIATION-INDUCED CANCER FROM LOW-DOSE EXPOSURE: AN INDEPENDENT ANALYSIS (San Francisco, CA: Committee for Nuclear Responsibility [C.N.R. Book Division, P.O. Box 11207, San Francisco, CA 94101], 1990. \$29.95. [See RHWN #184.]

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Descriptor terms: radiation; american medical association; studies; cancer; leukemia; oak ridge, tn; tn; nuclear weapons; electricity; energy; workers; exposure; occupational safety and health; nuclear power; standards; japan; hiroshima; nagasaki; uk;