FATAL FALLOUT:
The Dangers of Ionizing Radiation

by Gary Null, PhD

Note: The information in this paper website is not a substitute for the advice of & treatment by a qualified professional.

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PART I: The Radiation Cover-Up

The adverse effects of radiation on human health are now of increasing public concern, since the terrorist attacks of September 11, 2001. It's hard to believe that the very existence of penetrating radiation, such as X-rays and gamma rays emitted by radioactive materials, so familiar to us today, had never even been heard of until a little over a hundred years ago.

In November 1895, the German physicist Wilhelm Conrad Roentgen accidentally discovered a new form of light that was able to penetrate the human body and provide pictures of the bones in his hand. He named the light that enabled him to see through the body "X-rays," and when he announced his findings in December 1895 his famous manuscript, "On a New Kind of Ray," created a worldwide sensation of unprecedented magnitude.

For his discovery of X-rays, signaling the birth of medical radiation, Wilhelm Conrad Roentgen received the first Nobel Prize for physics in 1901. In his honor, the "Roentgen," is a unit in radiobiology.

Experimenting with an early form of cathode-ray tube similar to present day television tubes, Roentgen found that where the cathode rays (electrons), accelerated by a few thousand volts, struck the front of the tube, a faint luminescent spot appeared, emitting a highly penetrating form of radiation that could produce an image on a photographic film or a phosphorescent screen.

The clinical potential of X-rays for both diagnosis and therapy was recognized at once. Skin lesions were easily healed, and more powerful equipment, multiple therapy beams, and radium would gradually evolve to treat deeper lesions. Within weeks after Roentgen announced his amazing discovery, scientists and physicians all over the world began using similar cathode-ray tubes to take pictures of what were previously invisible bones and organs of the human body, and X-rays rapidly became the prominent tools of medical practice that they are today.

But the radiation cover-up began early, for what is not widely known is that, according to the journal, Radiation Research: "Within months of Roentgen's discovery of X-rays, severe adverse effects were reported, but not well publicized." As a result, over the next twenty years, fluoroscope operators would suffer lethal skin carcinomas. Later, case reports would appear "concerning leukemia in radiation workers, and infants born with severe mental retardation after their mothers had been given pelvic radiotherapy early in pregnancy." Fluoroscopy, and "radiotherapy for benign disorders continued to be used with abandon until authoritative reports were published on the adverse effects of ionizing radiation" by the U.S. and Great Britain in 1956. (R.W. Miller, "Delayed effects of external radiation exposure: a brief history," Radiation Research 1995 Nov; 144(2): 160-9. Many of us are familiar with the fluoroscopy that was used routinely and repetitively on children in shoe stores, later described by the U.S. Food and Drug Administration as "'a rather frivolous application of ionizing radiation . . . a sales ploy, with fairly high exposures,' admits Thomas Shope, deputy division director at the Center for Devices and Radiological Health at FDA," (Ricki Lewis, Ph.D., "Radiation Continuing Concern with Fluoroscopy," FDA Consumer, November 1993.)

In February 1896, believing that X-rays were somehow connected with the luminescence of the spot from which the X-rays emerged, the French physicist Henri Becquerel found that certain minerals containing uranium also emitted a penetrating form of radiation that could blacken a photographic film and that did not seem to diminish in intensity over time. Thus, "radioactivity" was discovered to exist in nature, a powerful form of previously hidden energy that would be released half a century later in the fission or splitting of a uranium atom to produce the first nuclear reactor and the first nuclear bomb.

Tragically, we were misled by the lack of serious side effects of the low radiation doses used for individual chest X-rays to greatly underestimate, by hundreds to thousands of times, the adverse effects of prolonged internal exposures to inhaled and ingested fission products. Thus, our government allowed strontium-90 and other radioactive elements to be released into the environment from nuclear tests and reactors for decades on the basis of the mistaken mild comparison with brief diagnostic X-rays.

When it comes to nuclear power, people tend to fear the worst-case scenario -- a large-scale, Chernobyl-type meltdown that spews high-level doses of radiation across thousands of miles. But recent evidence shows that the dangers of nuclear power may be much more insidious -- and far more dangerous -- than even such a tragic accident suggests. By one estimate, the low-level radiation caused by atomic-weapons testing and nuclear power plants has claimed the lives of some nine million Americans over the years and harmed countless others.

Granted, most scientists did not understand the full impact of low-level radiation when nuclear power got its start. Early studies of Hiroshima and Nagasaki survivors showed that high doses of radiation from bomb blasts could cause severe health problems, but until recently, scientists assumed that small doses of radioactive fallout would do little harm. Today statistics show that low-level radiation may have done far

more damage over the years than previously thought. That means the continued operation of civilian nuclear reactors may do irreversible harm to future generations.

As early as 1943, over half a century ago, nuclear scientists Enrico Fermi, Robert Oppenheimer, and Edward Teller recognized the lethal nature of low-level radiation from atmospheric contamination. The book, Deadly Deceit: Low-Level Radiation, High-Level Cover-Up, by Jay M. Gould and Benjamin A. Goldman (published in 1991 by Four Walls Eight Windows), reports that these scientists speculated that if we could not develop an atomic bomb in time, it would still be possible to kill millions of Germans by dumping strontium-90 -- which concentrates "dangerously and irretrievably" in human bone marrow -- over the German landmass. Their reasoning was based on animal experiments, the results of which remained classified until 1969.

The rise in childhood leukemia and other forms of cancer following the large series of nuclear bomb tests in the 1950s and early 1960s by the U.S., the Soviet Union and Britain, together with the rise in septicemia in young adults 30-40 years old in the U.S. illustrates the fact that the damage to the cells of the immune system that fight cancer cells, bacteria and viruses occurs as a result of the inhalation and ingestion of fission products such as strontium-90. (Figures 7.5 and 7.6 in Deadly Deceit by J. M. Gould and Benjamin Goldman for childhood cancer mortality, ages 5-9.)

Not only did childhood leukemia and other forms of cancer deaths result from exposure during early development in the mother's womb and the years of infancy, but also infections that led to a rise in premature births and in mortality due to all causes during infancy above the normally expected rate. These deaths took place both in the first month of life (shown in the data published in the U.S. and in England in 1995 by Canadian Professor of Pediatrics, R. K. Whyte), and in the first year after birth as had been found by E. J. Sternglass at the University of Pittsburgh School of Medicine in direct relation to the concentration of strontium-90 in the pasteurized milk. (Fig. 1 of the 1993 Townsend Letter, and Fig. 4 of the Sternglass paper in The International Journal of Biosocial Research, Vol. 8, 7-36 (1986), which shows the excess in pneumonia and influenza mortality for the 0-1 year age group beginning with the first U.S.S.R. tests in 1959 and the U.S. Nevada tests starting in 1951, with a sharp decline after the end of U.S. and Soviet tests in 1963.)

By 1958 two of the word's greatest scientists -- Linus Pauling, who won his second Nobel Prize for a book predicting that the 150 megatons of explosive power released by 1958 would produce one million seriously defective children and an equal number of fetal and neonatal deaths, and Andrei Sakharov, inventor of the Soviet hydrogen bomb -- both warned that the ingestion of bomb-test fission products would cause harm to millions of hormonal and immune systems.

The damage to the immune system by fission products that concentrate in the bone, and irradiate the white cells originating in the bone marrow for extended periods of time, is further supported by the anomalous rise in the mortality rates of young men and women in the age group 25 to 44 in the U.S., born during the height of nuclear weapons

testing in the atmosphere. As for the case of neonatal and infant mortality, a large excess number of all deaths due to all causes occurred for those born in 1949-50, following the first Soviet atmospheric tests in Siberia which rained out mainly in the northern hemisphere.

Relative to the normal decline since 1935, some 500,000 excess deaths occurred for males and 230,000 for females by the end of the 1990s. Such a rise in the death-rate for individuals exposed to fallout in the early period of development was predicted by Sakharov, who warned in a 1958 article that radioactive strontium-90, particularly massively produced in the Hydrogen bombs that he helped to develop, would lead to worldwide epidemics. He warned that not only would those exposed to fission products in early development have weakened immune systems, but that fallout would cause bacteria and viruses to mutate more rapidly into more deadly strains. (An example is found in the case of Lyme disease that began in Connecticut in the area close to the Haddam Neck and Millstone nuclear plants that began operation in the early 1970s, and which had some of the largest reported airborne releases of nuclear fission products.)

In his memoirs, Sakharov describes how after the success of his first hydrogen-bomb test, and with the results of animal tests, he worried so much about the biological consequences of nuclear testing that he calculated that every 50 megatons of explosive power would accelerate the deaths of 500,000 to one million persons worldwide.

Although neonatal mortality, or death in the first month of life, as well as mortality of infants due to pneumonia and influenza declined sharply after the end of large-scale atmospheric testing in 1963, total infant mortality for age 0-1 due to all causes did not decline all the way down to the expected rate based on the 1935-50 rate of decline for the U.S. as a whole. However, after the end of testing it did decline back to the expected low level in states that had no large nuclear power plants.

This is illustrated by the case of Wyoming, heavily exposed to Nevada fallout but where there is no nuclear power plant, and where the infant mortality rate had declined from a high of 30 in 1962 to the expected rate of close to 6 per thousand live births by the early 1980s. This is in sharp contrast to the pattern for Maryland, whose border is just 25 miles south of the Three Mile Island nuclear plant where a major accident took place in 1979, 5 miles south of the Peach Bottom nuclear plant, with a third plant, namely the Calvert Cliffs plant in Maryland itself, only 40 miles south of Baltimore. Thus, the Maryland rate had only declined to a rate of 10 deaths per thousand live births from a closely similar high to that in Wyoming in the early 1960s, more than double the expected rate of slightly less than 4.

By 1999, the gap between the observed and expected infant mortality for the U.S. since 1950 represents some one million infants dying in the first year of life, apparently due to the synergistic effect of fission products and other forms of air and chemical pollution that Rachel Carson had anticipated in Silent Spring forty years ago. (Figures 2, 6 and 7 of the article in the International Journal of Biosocial Research, cited above.

By 1962 Rachel Carson wrote in the prophetic Silent Spring that the sudden emergence of massive amounts of ionizing radiation could make other toxic chemicals even more dangerous. The great sensitivity of breast cancer to the low-level fission products released by nuclear plants is most clearly shown by an enormous unintended human experiment involving the cities of Philadelphia on the east coast and San Francisco on the west coast of the U.S. As a graph of breast cancer mortality rates for women over 65 in the two cities for the 1980s and 90s shows, the rates were similar and rising in both cities until 1986 when an accident in December of 1985 forced a shut-down of Rancho Seco (which became permanent in 1989), the only nuclear plant operating near San Francisco some 70 miles to the east.

At the same time, two nuclear plants began to operate near Philadelphia in 1986, Limerick Unit I in nearby Pottstown and Hope Creek in southern New Jersey, in addition to six other reactors within 75 miles that had begun commercial operation since 1974. Beginning in 1987, breast cancer rates declined 18% in San Francisco, while they rose in Philadelphia by nearly the same percentage to record high deaths by 1989-90.

As still another plant was opened near Philadelphia in 1990, Limerick Unit II, the gap continued to widen until for the years 1995-97, the Philadelphia breast cancer death rate exceeded that for San Francisco by 67%. Women in the two cities had continued to smoke, and to use pesticides and herbicides, as well as hair coloring. They continued to be exposed to automobile and Diesel exhaust as well as carbon dioxide, sulfate particles and nitrogen oxides from local fossil fuel power plants and incinerators producing fine particulates in the air. The only difference that had suddenly occurred within a few years was the end of nuclear plant operations near the city with the reduced breast cancer death rate, San Francisco,-- while nuclear plant operations had increased near the other city with the increased breast cancer death rate, Philadelphia.

Moreover, there were no large nuclear accidents near these two cities after 1986, such as Three Mile Island in 1979, that might have caused different degrees of stress that could affect the immune response and thus possibly cause rises in cancer mortality, as has been suggested in the literature for the TMI rise in local cancer rates. Thus the crucial synergistic role of fission products acting together with all the other pollutants appears to be the only explanation, greatly strengthening the evidence that we have vastly underestimated the biological damage from very small nuclear releases into our air, our food, our milk and our drinking water, exactly as Rachel Carson had warned.

The nuclear powers chose to ignore these warnings, and between 1945 and 1963, they released into the atmosphere fission products equivalent to the explosion of 40,000 Hiroshima bombs, each with the explosive power of 15,000 tons of TNT, producing worldwide fallout, with French and Chinese atmospheric tests adding to the fallout until the last Chinese atmospheric test in 1980.

The United States alone -- with the explosion of 124 atomic and hydrogen bombs in Nevada in the 1950s and early 1960s -- accounted for about one-third of this huge total. As a result, every part of the continent was showered with radioactive iodine,

cesium, strontium, and other radionuclides known from animal studies to be lethal when ingested.

The true impact of this orgy of atmospheric bomb testing was revealed by the Canadian pediatrician who was cited earlier, Dr. R. K. Whyte, in an article he published in the prestigious British Medical Journal, of February 8, 1992. Dr. Whyte noted that such bomb tests appeared to be the only possible explanation for an excess of some 320,000 infant deaths he found in the United States and the United Kingdom in the 1950s and 1960s (R.K. Whyte (1992), "First day neonatal mortality since 1935: a re-examination of the Cross hypothesis," British Medical Journal 304: 343-6.)

While Dr. Whyte did not ask what happened to those babies who survived birth in those years, Dr. Gould -- in a subsequent letter published in the British Medical Journal of March 21, 1992, exploring the implications of Dr. Whyte's startling revelations -- observed that the answer can be found in the data showing the rise in America since 1950 of the percentage of live births weighing less than 5.5 pounds. At the same time, there was a corresponding rise in the amount of radioactive strontium found in human bone in those years. This report will indicate what happened to those underweight babies.

In Nevada, for example, where the U.S. bomb tests began in 1951, Dr. Gould found that the percentage of premature, underweight babies more than doubled in that year from the 1950 rate -- and has remained at above average levels ever since, even in the years after 1962, when underground testing replaced the more dangerous atmospheric tests.

The large increases in neonatal and infant mortality above the normally expected rates both in the U.S., Great Britain and other industrially developed countries is explained by the damage to the immune and hormonal system of bone-seeking strontium-90 and its highly radioactive daughter product yttrium-90 that seeks out key hormone producing glands both in the mother and the developing baby in the mother's womb. This concentration of yttrium-90 is particularly serious in the case of the pituitary gland, the master gland of the body. The combination of strontium-90 and yttrium-90 has been found in laboratory studies in an increased risk of premature birth, which is a major cause of underweight births which soared to a peak at the height of large-scale atmospheric testing in the early 1960s, when strontium-90 was found to peak in both the milk, the diet and human bone as well as in the teeth of newborn babies.

A renewed rise in the percentage of babies born below the normal weight of five and a half pounds began in the mid -1980s, following the arrival of the Chernobyl fallout and the rising amount of releases by the growing number of large nuclear plants as discussed in connection with the rise of the infant mortality rate. The crowns of deciduous teeth shed by children between age 6 and 12 provide a record of exposure in utero and early childhood, as first measured by Dr. Harold Rosenthal at the University of Washington School of Dentistry, and more recently for the Radiation and Public Health Project by Dr. Hari Sharmi at REMS, Inc., now retired from the University of Waterloo in Canada. (See Gould et al., "Strontium-90 in Deciduous Teeth as a Factor in Early

Childhood Cancer," International Journal of Health Services 30(3):515-539, 2000. Also see Gould Web site at http://www.radiation.org for links to other pertinent references. Note: This is the Web site of The Radiation and Public Health Project. RPHP is a nonprofit educational and scientific organization, founded by scientists and physicians dedicated to understanding the relationships between low-level nuclear radiation and public health.)

Another important fission product, iodine-131, which accompanies strontium-90, concentrates in the thyroid gland, not only producing thyroid cancer but also damaging thyroid function that in turn impairs the production of growth hormone in the developing fetus. This affects not only the weight of the newborn, but also the normal development of the brain, leading to learning problems later in life as found in the decline of IQ, school performance and SAT scores some 17-18 years later as shown in a series of articles in the literature. Not only was this effect on the weight and brain function of children found in the years of large-scale atmospheric testing, with greatest effects in the early 1960s, but it was also found to increase again when major accidents occurred in nuclear plants such as following Three Mile Island in 1979 and Chernobyl in 1986. Moreover, as a study of test scores in Iowa schools recorded uniformly since 1935 revealed, not only did the major bomb tests at the time of birth lead to declining school performance, but so did the start of three nuclear power plants in Iowa and adjacent Nebraska in the early 1970s, resulting in spelling and reading scores as low as those reached for those born at the height of atmospheric testing.

The damage to the thyroid of the newborn is further supported by the sharp rise of congenital hypothyroidism diagnosed at birth, which rose 50% in the U.S. between the low rate recorded in the period 1981-85 (before the 1986 Chernobyl accident) to a record high by 1992-94. The role of iodine-131 is greatly strengthened by the fact that the area of the U.S. hardest hit by the Chernobyl fallout, namely the Pacific northwest, shows the largest rise in hypothyroidism cases in 1986-87 (23% in that single year), while the southeast that experienced the lowest measured fallout reported 1% fewer cases. Moreover, a plot for the various regions of the U.S. shows a dose-response curve that rises most rapidly for the lowest iodine-131 levels and flattens out for the highest levels rather than a linear or straight line relation between exposure and effect on the thyroid function. This adds further support to the laboratory finding of Dr. Abram Petkau at the Canadian Atomic Energy Laboratory in Pinawa, Manitoba, who found that low levels of radiation protracted over periods of hours, days or weeks are hundreds to thousands of times as damaging to cells such as those in the bone marrow or thyroid than very short exposures to diagnostic X-rays or the flash of gamma rays produced by an atomic bomb. He was able to show that such low-level, extended exposures involve free-radical oxygen damage to cell-membranes that become much more efficient than direct damage to the genetic material or DNA in the cell nucleus when fewer and fewer short-lived free-radicals are present at a given moment. It explains why the adverse effects on human health of fission products that accumulate in various organs and thus give prolonged exposures involving free-radical damage were grossly underestimated by assuming that short, high dose exposures can be linearly extrapolated to very low, prolonged exposures such as occur from distant bombs or reactor accidents, and the even smaller permitted

releases from normally operating nuclear plants. (See Figure 2 of the paper by J. Mangano et al. published in the Proceedings of the 1998 Muenster Conference.)

The precedent for dishonest nuclear policy-making was set during the height of the Cold War, when President Eisenhower issued a top-secret memorandum that told insiders to "keep them confused" about the dangers of radiation. With this memo a policy of fabrication was set at the highest governmental levels to ensure public acceptance of continued nuclear tests.

The deception actually preceded Eisenhower's presidency, beginning with a 1946 accident at Los Alamos, New Mexico, when physicist Dr. Louis Slotin, working with the core of an atomic bomb, was briefly exposed to more than 1,000 rads, more than twice the amount needed to kill a healthy adult. Others nearby were also exposed to high radiation levels but were denied access to the records. The government -- recognizing the accident as a sensitive and potentially damaging issue -- decided to suppress the information for fear that public disclosure would interfere with the bomb-test program and the operation of the military nuclear reactors already under construction.

With the cover-up strategy established, the government chose to intimidate and silence those experts who knew the truth and wanted to warn the public. Here is a roll call of some of these truly heroic scientists, many of whom -- unlike Pauling, Sakharov, and Carson -- are still quite unknown.

We should begin with Dr. Karl Z. Morgan, who was the nation's first nuclear-health physicist, founder of the Health Division, and who fought a lifelong battle to set safer radiation-protection standards. When the Journal of the American Medical Association asked Dr. Morgan for an article on the contribution to medicine of health physicists, it was rejected when he wrote rather briefly that the principal function of the discipline he founded was to find reasons to deny compensation to radiation victims.

Another American hero who should be honored is Dr. John Gofman who, as a graduate student in the early 1940s, was the first to isolate workable amounts of plutonium. He later became the first head of the biomedical division of Lawrence Livermore National Laboratory in California, where most of our nuclear weapons have been designed. But he was forced to resign by the Atomic Energy Commission when, in 1959, he publicly announced that there was no safe radiation level and that there would be 20 times more cancers per unit of radiation as had been believed.

"It is very clear to me that we find cancer being produced in excess found at very low levels," he says. "Government scientists claim that no effects have been observed below 50 or 100 rads, but that simply is not true. Cancer has been demonstrated at ten rads. The hoax that you might have a safe level of radiation is at variance with the evidence." In Deadly Deceit, Dr. Gofman is quoted as saying: "I feel that at least several hundred scientists trained in the biomedical aspect of atomic energy -- myself definitely included -- are candidates for Nuremberg-type trials for crimes against humanity for our

gross negligence and irresponsibility. Now that we know the hazard of low-dose radiation, the crime is not experimentation -- it's murder."

Included among the experts consulted for this article are the eminent British epidemiologist Dr. Alice Stewart, who was the first to discover how sensitive the developing fetus is to low-level radiation, and Dr. Thomas Mancuso, Emeritus Professor of Epidemiology at the University of Pittsburgh Medical School. Both Dr. Mancuso and Dr. Stewart were asked by the Atomic Energy Commission to study the health effects of workers at the Hanford Nuclear Reservation in Washington, but they were each fired when they came up with what the A.E.C. regarded as the wrong answers.

Since the 1980s, however, the government's cover-up policy has been harder to uphold. Under the Freedom of Information Act, classified information on radiation and mortality has been taken public. In 1979, for example, an investigative report by Bill Curry of The Washington Post revealed that the United States knew for decades that the incidence of leukemia and cancer around the bomb-testing site in Nevada far surpassed expectations.

"Officials involved in the U.S. bomb tests feared in 1965 that disclosures of a secret study linking leukemia to radioactive fallout from the bombs could jeopardize further testing and result in costly damage claims," wrote Curry. "That study, as well as a proposal to examine thyroid cancer rates in Utah, touched off a series of top-level meetings within the old Atomic Energy Commission over how to influence or change the two studies. The document also indicates that the Public Health Service joined the A.E.C. in reassuring the public about any possible danger from fallout."

Very few official epidemiological investigations have been done to study the impact of atmospheric testing. Each year the U.S. Public Health Service publishes a chart showing an overall decline in mortality rates since 1930, but it never comments on the very obvious flattening out that can be observed in the 1950s and early 1960s. In Deadly Deceit, it was calculated that from 1930 to 1950 the annual rate of improvement (i.e., decline) in total mortality rates (after adjusting for an aging population) was two percent, but only 0.8 percent during the bomb-testing years.

The consequential cost in human lives is startling: the cumulative difference between the observed rates after 1950 and what would have been expected if the earlier rate of improvement had continued is approximately ten million premature deaths. As in the case of the 320,000 excess infant deaths found by Dr. Whyte, the probability that these excesses could be due to chance variation is infinitesimal.

About 142 million Americans, over half of the population, live close to one of the 100-odd currently operating civilian nuclear power plants, with the largest concentrations in the New York, Philadelphia, and Chicago metropolitan areas. As a nuclear plant must emit a certain amount of radiation to operate, those living close to a facility are automatically exposed even during normal operation. But what is even more worrisome is the fact that since reactors are most often located in rural areas near dairy farms, the

radioactive iodine gets into the fresh milk, which is then shipped overnight -- while it's still highly radioactive -- to urban areas. The mobility of nuclear-fission products increases their lethal nature. They can be carried far from their point of origin by wind and rain, as we know from the fallout from major accidents like Three Mile Island and Chernobyl.

Although the normal emissions from reactors are small -- far below the scale of meltdowns -- the cumulative exposure to such emissions over several decades may be more harmful than previously realized. A study conducted at the nuclear-weapons plant in Oak Ridge, Tennessee, found that workers who were exposed to very low levels of radiation for many years had a 63 percent higher leukemia death rate than the general public. The longer the employees were monitored, the higher the leukemia rate.

In an interview with The Washington Post, Dr. Steve Wing, one of the study's principal authors, drew this conclusion: "It has been assumed that the chances of finding an effect of exposure at this level would be like a few drops of water in a swimming pool, not enough to be measurable. Now we see it looks like it's not a few drops."

To hear the nuclear industry tell it, power plants are safe, clean, inexpensive, and essential. The companies often use soothing words to describe their operations -- the radiation is measured in "sunshine units," they say, and its effects are no worse than a suntan. One campaign even suggests that a little radiation *boosts* the immune system! What they neglect to mention is that the real danger from low-level radiation comes when tiny amounts of fission products are ingested and become concentrated in certain organs, like the fetal thyroid or bone marrow, as was anticipated by Pauling and Sakharov.

It was not until 1972 that we had a full understanding of the biochemical mechanism underlying the damage done by ingested radionuclides, as a result of the discoveries of a biophysicist named Dr. Abram Petkau, of the Canadian Atomic Energy commission. Working with animal cell membranes -- which he noted typically required as much as 500 rads to be destroyed -- he was amazed to find, quite by accident, that they could be far more easily destroyed overnight by a solution of slightly radioactive salts, measured at less than one-tenth of a rad.

This led to our current understanding that chronic internal exposure to very low radiation levels, such as from strontium-90 lodged in the bone marrow, promoted the formation of "free radicals," which are particles with an extra negative charge, and which by the force of electrical attraction can penetrate cell membranes. In this way blood cells making up the immune system can be damaged and lose their ability to fight off infectious agents or mutant cancer cells. Dr. Petkau found that at high levels of radiation, the many free radicals negated one another and did less damage per unit of radiation than at low levels, when a free radical can most efficiently find and destroy a cell. Thus he settled a long-standing debate among nuclear scientists about the shape of the dose-response curve to radiation. It was not linear, an assumption that had encouraged the hope that there was some level of radiation low enough to be "safe."

According to Dr. Ernest Sternglass, of the University of Pittsburgh Medical School, it was the lack of an understanding of the "supra-linear" shape of the dose-response curve that misled us about the dangers of internal low-level radiation, thus leading us to ignore the epidemiological evidence that he had offered, as far back as 1969, of the many premature deaths associated with radiation releases.

Sternglass has long been regarded by members of the nuclear establishment as their chief opponent. They have never forgiven him for having shamed Governor Dick Thornburg into ordering the evacuation of women and children from the immediate Three Mile Island area on the third day after the accident in March 1979, after having on the previous day informed a roomful of news correspondents in Harrisburg that radiation levels as he was speaking were dangerously high.

Deadly Deceit has documented the wave of cancer deaths that has since swept through a ten-county area around the stricken reactor. It has even been noted that a curiously high proportion of news correspondents who covered the accident have since died of cancer.

Dr. Sternglass has contributed greatly to the information contained in Deadly Deceit, and he and Dr. Gould, a member of the E.P.A. Science Advisory Board during the Carter administration, collaborate as expert witnesses in class-action suits involving radiation victims. For example, it is not generally known that there were over 2,000 cases filed against the Three Mile Island utility, with the provision that there be no disclosure of the amount of any of the numerous settlements. Recent admissions by the Department of Energy that large emissions from Hanford in the late 1940s have caused thousands of thyroid cancer problems have been reported to have generated the preparation of some 26,000 lawsuits against companies that were contracted to operate those facilities.

For litigation purposes, Dr. Gould's non-profit Radiation and Public Health Project has assembled from official sources giant computer databases containing annual mortality rates for major causes of death for every county since 1945. Thus he can report that the six Washington counties downwind of the Hanford reactors have since registered cancer-mortality increases ten times greater than the national average. Similar data can be offered for counties affected by reactor meltdowns at the Savannah River nuclear weapons plants in 1970, which were first revealed by Senator John Glenn in fall 1988. (Some of this data has been published by Benjamin Goldman in map form in a Times Books title called The Truth About Where You Live.)

The excess mortality of the bomb-testing years can be taken as validation of Sakharov's prediction that millions of immune systems would be immediately harmed by radiation, and in this way explains what must be regarded as the greatest epidemiological mystery of the century. But he even offered an explanation for why U.S. mortality rates for the first time since the 1950s rose in the 1980s -- an explanation that was finally addressed by the Atlanta Centers for Disease Control in an important article entitled "Impact of the Human Immunodeficiency Virus Epidemic on Mortality Trends of Young Men" in the September 1990 issue of the American Journal of Public Health.

Sakharov had warned that the radiation would also accelerate the mutation of new strains of viruses and bacteria that would prove to be particularly harmful to persons whose immune systems were already damaged by radiation. The C.D.C., in effect, offered support to this hypothesis by noting that the mortality rate of young men aged 25 to 44 had been declining in the 1970s but, particularly since 1983, had risen, for the first time ever; the rise was attributed to AIDS.

The C.D.C. even showed that if the declining trend of the 1970s was projected into the 1980s, the gap between those expected rates and the observed rates would approximate the 100,000 AIDS deaths recorded since 1981.

The C.D.C. neglected to note that these young men had been born in the bomb-testing period of 1945 to 1965, and that the same anomalous mortality rise in the 1980s was also true for women in this age group.

But when the C.D.C. technique of comparing observed rates in the 1980s with the declining rates of the 1970s is applied to all age groups -- for both sexes, and whites and nonwhites -- the excess mortality observed in the period of 1980 to 1989 amounts to 1.2 million, 12 times greater than the number of AIDS deaths. In fact, the greatest number of excess deaths in the 1980s was accounted for by women over 45, who are dying prematurely of such immune-deficiency diseases as cancer, septicemia, and pneumonia.

This raises many questions about the role of the HIV virus, which, while known to be constantly mutating, in accord with Sakharov's predictions, may turn out to be a symptom rather than a cause of the AIDS epidemic, for surely not all those older women dying prematurely today would have a positive test for the HIV virus. Another mystery that remains unsolved is why the deterioration of mortality rates of young people since 1983 found in the United States by the C.D.C. can -- according to the United Nations Demographic Yearbook -- also be found in the United Kingdom, France and (probably) the former Soviet Union, but *not* in Japan or western Germany. Could it be that these two nations were precluded from exposing their populations to emissions from making or testing nuclear bombs?

We now know that Chernobyl was the third great nuclear disaster in the Soviet Union, and that a large percentage of the population has already eaten or will ingest radioactive food or water, thus triggering grave health problems. These problems have contributed to the sudden collapse of the former Soviet Union, since Gorbachev came into power one year before the disaster.

Less obvious is the insidious fact that the U.S. has been directly affected by the Chernobyl fallout. The evidence that very low levels of fission products in the diet can produce cancer at a much higher rate than the same dose from short diagnostic X-ray exposures is further supported by the rise of thyroid cancer in the U.S. after the Chernobyl fallout arrived in May of 1986.

Moreover, the increase occurred only 4 years after arrival of the fallout, with the greatest rise for children 0-14 years old, just as took place in Belarus and the Ukraine near the Chernobyl reactor. The reported incidence of thyroid cancer in Connecticut rose 117% between 1985-89 and 1990-93 for this age group, and rose 28% for individuals over 65. In two other states with established cancer registries, Iowa and Utah, which received significant amounts of fallout, the age-adjusted incidence also rose during this period.

For the case of Connecticut, for which historical data are available back to 1935, there were three previous periods when thyroid cancer incidence rose following the arrival of iodine-131. The first was an 86% increase from 1945-49 to 1950-54, when the first atomic bombs were exploded. The second rise of 20% took place between 1955-59 and 1960-64, when fallout from large-scale atmospheric testing took place. The third rise by 15% took place between 1970-74 and 1975-79, five years after the Millstone nuclear plant started to operate in 1970, with the greatest announced release of airborne iodine-131 occurring in 1975. Moreover, the thyroid cancer incidence in New London county where the Millstone reactor is located, rose from 43% below the rate for the state as a whole in 1951-55 to 34% above the rate for the state by 1991-93, rising steadily by 290%, clearly implicating not only distant fallout but also releases from the local nuclear reactors.

Moreover, since the rise in Belarus by 665% and the rise in the Ukraine by 209% were not thousands of times greater than the 117% rise in distant Connecticut, it again supports a curvilinear dose response rising rapidly for very low exposures and flattening out at high doses, as Petkau discovered in 1972. (See Tables 2, 3 and 4 in the paper by J.J. Mangano, European Journal of Cancer Prevention, Vol. 5, pp. 75-81, and references cited therein.) (See also J.J. Mangano, "Childhood leukaemia in US may have risen due to fallout from Chernobyl," British Medical Journal (1997) Apr 19; 314(7088):1200.)

The same conclusion is derived from the dose-response relation for breast cancer for different regions of the U.S. exposed to announced airborne releases of fission products, which has the same concave downward or "supralinear form" seen for thyroid cancer after Chernobyl. This was reported in the 1993 paper by Gary Null, Ernest J. Sternglass and Jay Gould using the cancer mortality data by census region for the United States, compared with the cumulative airborne releases of "iodine-131 and particulate" releases for the period 1970-87 published by the Nuclear Regulatory Commission. (Gary Null, Ernest Sternglass, and Jay Gould, "What Physicians Should Know About the Biological Effects of Ingested Fission Products," Townsend Letter for Doctors, August/September 1993.)

These releases contain a few dozen fission products, including strontium-90, strontium-89, and barium-140 which are chemically similar to calcium and are therefore concentrated particularly strongly in bone, thus continuously irradiating the stem cells of the bone marrow that give rise to the white cells, which find and destroy cancer cells all over the body.

Breast cancer is so sensitive to strontium-90 because it is readily taken up by the body along with calcium, essential for bone-building in the developing fetus and infant, and thus it concentrates in both breast milk and cow's milk. At the same time, the yttrium-90 daughter product irradiates the hormone producing glandular organs, changing the concentration of hormones known to play an important role in the risk of breast cancer. (See Figure 2 in the 1993 article in The International Journal of Health Services, Vol. 23, pp. 783-804 for the supralinear dose-response curve.)

If Americans, too, ignore the link between the man-made radiation of the past half century and our fragile immune systems (which took millions of years just to adapt to natural background radiation), as proscribed by Sakharov but ignored by the Russian people, we may suffer the same fate. The wave of immune-deficiency diseases is already overtaking us.

With such growing evidence of radiation's dangers, why do we tolerate an industry that pollutes the environment, threatens our health and well-being, and is increasingly seen to be far more costly to operate than fossil-fuel plants?

Here we can be guided by some knowledge of the true crisis confronting the nuclear establishment today. Concerning the personal liability issue of people exposed at the government's nuclear facilities, the simple truth is that they had become so radioactively dangerous that the supervisory staff was reluctant to enter the buildings, and the displaced workers found themselves regarded by insurance companies as unacceptable risks for other jobs. The same fate awaits the civilian reactors when they reach the end of their lives.

According to documents discovered in recent years, the government has intentionally exposed people to radiation without their knowledge and secretly released tremendous amounts of radiation into the atmosphere during the bomb-testing years.

In the forties, fifties, and sixties, 220,000 American servicemen were exposed to radiation from atmospheric bomb tests. To date, over 10,000 of these victims have filed claims against the government for their injuries. The United States has, for the most part, denied any responsibility.

Nineteen thousand pages of documents obtained under the Freedom of Information Act, for example, reveal that the Hanford Nuclear Reservation poured thousands of curies of radioactive iodine into the air between 1944 and 1955 -- both deliberately and accidentally. Officials at the plant were aware that workers and the public were being exposed to potentially harmful levels of radiation and chose not to inform them.

Hanford radiation specialists also revealed that millions of curies of radiation -- enough to build several atomic bombs -- were routinely dumped into the Columbia River. This information contradicted the government's standard line about the safety of the plant. The state of Washington has since estimated that 20,000 babies born in the

region between 1944 and 1960 are at risk of developing disease, according to a 1990 New York Times article. One victim, 43-year-old Tom Bailie, grew up near the Hanford Nuclear Reservation. He commented, "Without our consent, without our knowledge, this was done to us. It sounds like something done in Russia, but it was done here. We want to know why they placed children like me on the front lines of the Cold War."

In another instance, records from the Rocky Flats nuclear weapons plant in Colorado -- which was operated until 1975 by the Dow Chemical Company -- indicate that some workers absorbed so much plutonium that the chromosomes of their blood cells became deformed; 13 workers have died of cancer. From 1975 to 1989, the Rockwell International Corporation operated the plant in much the same manner, and has recently paid an $18.5 million fine for violations of the Resource Conservation and Recovery Act.

Meanwhile, the Savannah River plant in South Carolina released nearly one million curies of radioactive tritium -- a key element in modern thermonuclear weapons -- into the atmosphere. The plant -- then operated by DuPont and now by Westinghouse -- has stored more than a million curies of nuclear waste, more than half of the U.S. government's inventory. According to Deadly Deceit, it is considered to be one of the most radioactive places on earth.

The United States is now buckling under the sheer weight of the evidence against it and paying out-of-court settlements to people who were exposed to radiation. The most famous of these cases took place in Fernald, Ohio, where the government essentially admitted to leaving several thousand pounds of radioactive uranium -- some of which ended up in people's backyards and drinking water -- to pollute the atmosphere.

"Little more than a year ago, most pundits were predicting a gradual phase-out of nuclear power in the U.S. But now the Bush Administration wants to license new nuclear power plants, and many of the 103 nuclear power plants soon up for re-licensing may get a previously unexpected lease on life." (Praded, cited below) "Unless the government taboo on studying radiation-caused health risks is broken, say researchers, countless" people will be endangered. We need to know why "childhood cancer rates are soaring among children living near nuclear power plants." (J. Praded, "Green Living Your Health -- Glowing in the Dark: Baby Teeth Studies Reveal Childhood Radiation Exposure," E/The Environmental Magazine, vol. 13, no.3, May - June 2002) http://www.emagazine.com/may-june_2002/0502gl_health.html

Popular opposition forced the closing of the Shoreham and Yankee Rowe reactors -- which offers us great hope. We should demand that *all* reactors operating today be closed immediately -- for quick conversion to burn cheap and plentiful natural gas. It is environmentally benign, will save many lives, and can even save money for an ailing utility industry that's struggling to deal with the mounting costs of radioactive-waste disposal.

Nuclear power doesn't need a Hiroshima or a Chernobyl to kill. Low-level radiation from atomic bomb testing and power plants has already murdered at least nine million Americans.

Fatal Fallout

by Gary Null, PhD

Note: The information in this paper is not a substitute for the advice of & treatment by a qualified professional.

PART II: What Physicians Should Know About The Biological Effects of Ingested Fission Products

The material in Part II includes facts presented in the scientific paper entitled, "What Physicians Should Know About the Biological Effects of Ingested Fission Products," by Gary Null, Ph.D., Ernest Sternglass, M.D., Emeritus Professor of Radiological Physics at the University of Pittsburgh Medical School, and Jay Gould, Ph.D., a member of the EPA Science Advisory Board in the Carter Administration, and coauthor of the book Deadly Deceit: Low-Level Radiation, High Level Cover-up. The paper by Null, Sternglass and Gould was published in the Townsend Letter for Doctors, in the August/September 1993 issue.

As the Cold War that spawned the nuclear arms race with the attendant need for secrecy is ending, the long hidden story of the enormous effects of nuclear weapons production and testing that has devastated US health and productivity can finally be told. Moreover, without a nuclear threat from a dismembered Soviet Union, we can now hope that a new generation of political leaders, scientists, physicians, and public health officials will be able to face the tragic facts emerging from the studies of the millions exposed to the fallout from Chernobyl and other large releases dating as far back as 1944. It is imperative to end the enormous rise in the incidence of low birth weights and cancer now driving the cost of health care and threatening the economic well-being of the nation.

We now know from declassified documents that in 1945, in the rush to produce plutonium for the initial atomic bombs detonated in 1945, some 555,000 trillion picocuries of radioactive iodine were released into the biosphere from the Hanford nuclear weapons complex in Washington. We also now know that there was an immediate increase in the percentage of underweight births as far away as New York State. This phenomenon began in 1945, accelerated rapidly with the first A-bomb explosions by the U.S. and USSR in the following years and reached peak levels in the mid-1960s, along with corresponding peaks in strontium-90 levels measured in human bone.

After declining from its highest levels after the atmospheric test ban came into effect 40 years ago, within the last 15 years, the percentage of low birth weight babies is rising again in the U.S. We are now experiencing an unprecedented rise in the number of people requiring medical care and disability payments that have been driving state and local governments, particularly in the northeast regions of the U.S., into insolvency, increasing the federal deficit, and threatening the nation with bankruptcy if not brought under control.

Recent studies now suggest that one hitherto neglected factor is the unexpectedly severe biological action of radioactive releases from aging nuclear reactors into the milk and water supplies of major metropolitan areas. These releases act as a secondary insult to the immune systems initially damaged by the fallout from atmospheric bomb tests in the period extending roughly from 1944 to 1965, equivalent to some 40,000 Hiroshima bombs.

We have assembled 9 exhibits that document the unexpectedly large effects produced by inhaled or ingested nuclear fission products on the immune system, leading to premature birth, to low birth weight, and renewed rises in infectious diseases and cancer, as first anticipated by Andrei Sakharov in 1958 and recounted in Chapter 14 of his Memoirs. The biological mechanism involved was discovered in 1971 by Dr. Adam Petkau. A physician trained in biophysics, working for the Canadian Atomic Energy Establishment in Pinowa, Manitoba, he performed a simple experiment on a lipid membrane that completely overturned conventional ideas on the biological damage produced by extremely low levels of radiation.

All of the research and experience of the scientific and medical community since the discovery of X-rays and radioactivity just before the turn of the century did not warn us of the seriousness of low doses of radiation from internally deposited fission products. As explained in The Petkau Effect, by Ralph Graub, the successful experience with the medical uses of X-rays without side effects convinced the nuclear scientists who developed the atomic bomb that its principal effects would be produced by blast and fire. Fallout from drifting radioactive fallout was believed to produce very low doses, far below the levels of background radiation from cosmic rays, natural sources and diagnostic X-rays, and therefore was considered to present no significant danger.

Petkau's discovery was first published in the March 1972 issue of Health Physics under the innocuous title, "Effect of Na-22 on Phospholipid Lipid Membranes." In it he describes how he found that cell membranes immersed in water which had withstood X-ray doses as large as hundreds to thousands of rads without breaking, ruptured at less than one rad when subjected to low intensity, protracted radiation such as that produced by radioactive salts immersed in water.

This finding was completely contrary to all previous observations of biological damage by radiation such as genetic effects, and cancer induction in laboratory animals or humans, which had shown almost no dependence on the rate at which radiation is delivered to tissue.

As Petkau and his associates discovered, the cell membrane damage due to low level radiation was the result of a completely different biological mechanism than the direct hit on the DNA molecules in the nucleus of cells exposed to high doses of radiation. They found that the cell membranes were destroyed by the action of negatively charged oxygen molecules or "free-radicals," produced by the absorbed radiation from the life-giving oxygen dissolved in the surrounding fluid. This highly toxic form of oxygen diffused to the outer surface of the membrane, where it initiated a chain reaction that dissolved the membrane in a matter of minutes to hours, causing the cell to leak and die.

It became clear that a single free-radical molecule was sufficient to destroy an entire cell, so that only a handful was needed to be produced per cell-volume at very low dose rates. But at high dose rates, many millions would be formed in the same volume in the lifetime of the molecule. This results in a form of "overkill," much like the case of a balloon, where a single dart is enough to destroy it, and throwing millions of darts is wasteful. In fact the more free-radicals are created in a given volume (as from higher levels of radiation intensity), the more they tend to collide with each other, causing them to become deposited in living tissue; high doses given at the rate of 10,000 rads per minute were found to be 100 billion times less efficient in destroying a cell than at one ten-millionth of a rad per minute, the rate at which we experience background radiation.

The consequence of the enormously greater efficiency of internal radiation at low dose rates is that the dose response curve rises very rapidly at the small doses and dose rates near background radiation, and flattens out at high doses and dose rates, so that the risk per unit dose declines with increasing dose rates.

Thus we have what appears to be a perverse situation in which low doses protracted over periods of days, months or years are far more dangerous, per unit of absorbed radiation, than high doses from external sources. Mathematically, this turns out to be of the form of a concave downward or logarithmic relation between dose and the biological response for individuals exposed to different amounts of radiation during a given time period, as in the case of releases into the environment that enter the diet and concentrate in critical organs such as the bone marrow, the thyroid and the pituitary gland.

Thus the so-called "Petkau Effect" explains why man-made fission products such as strontium-90 concentrating in the bone, introduced into a pristine biosphere in the earliest years of the nuclear age did so much more damage to the immune system cells than had been believed possible based on our experience with medical X-rays or the study of animals exposed to high radiation doses.

The damage to the immune system of young women of childbearing age leads both to a higher risk of pelvic infections and a greater likelihood of an immunological rejection of the fetus as a foreign body, thus producing a rise in premature and underweight births. Moreover, the fission-produced bone-seeking isotopes such as strontium-90 and 89 emit powerful beta rays with a large enough range to reach the marrow where the cells of the immune system originate, making them far more toxic than

the naturally occurring radium which emits heavy alpha particles of such short range that most of them remain in the bone.

In summary, we have found that the most immediate biological effect of the introduction of man-made fission products into the environment was an enormous increase in miscarriages and the birth of premature and underweight infants at high risk of birth defects and subsequent neurological, hormonal and immunological problems. This results in greatly increased medical expenditures to keep each infant alive, and correspondingly high subsequent educational and welfare costs to society. This problem was most acute in the atmospheric bomb test years when the U.S. and the USSR exploded the equivalent of 40,000 Hiroshima bombs, according to the Natural Resources Defense Council, but it has continued as a result of reactor accidents and large daily releases due to cracking of fuel elements and the corrosion of heath exchangers. These problems are compounded by another effect of fallout that Sakharov anticipated in 1958, namely the increased mutation rate of microorganisms, which is greater at low rather than high dose rates because of the Petkau Effect.

Recent articles in Science delineate the enormous public health crisis set off by the increasing resistance to antibiotics of those mutating microorganisms responsible for AIDS, tuberculosis, shigellosis, salmonella, toxic shock syndrome, Lyme disease and many other newly emerging and old infections. Thus in addition to causing immune deficiency, fission products would accelerate the mutation rate of microorganisms, leading to new epidemics on a worldwide basis, and the new strains would be far more deadly.

INGESTED FISSION PRODUCTS (Figures 1 through 9 in the text below refer to figures at the end of this report)

Radiation and Low Birth Weights

As shown in Figure 1 of the article entitled, "First day neonatal mortality since 1935: a re-examination of the Cross hypothesis," published in the British Medical Journal of February 1992, Dr. R. K. Whyte, (the Canadian Professor of Pediatrics whose work was cited in Part I of this report), found that falling rates of neonatal and first day infant mortality since 1935 were interrupted in the early 1950s, reaching a maximum upward deviation in the mid-1960s. The hypothesis that the observed infant mortality could be attributed to restrictions of oxygen for premature infants was ruled out by the fact that the same rise and decline occurred for stillborn infants, and only fallout could account for the excess.

As shown by Figure 2, an even more sensitive indicator of the damage to the developing fetus is the increase in the percentage of live births weighing less than 5.5 lbs. In upper New York State, this percentage rose from 6% in 1945 to an all-time peak of 8% in 1966, when the radioactive strontium buildup in the bones of New Yorkers also reached an all-time peak. Since 1945, 13 million underweight babies have been born in

the U.S.; for New York City, the decline is seen to have halted in the early 1970s, but rose sharply after 1985, as will be discussed below.

The causal link of the rise in low birth weights to fission products is dramatically illustrated in Figure 3, as indicated by a 70% rise in Nevada in 1951 in the low birth weight percentage when above ground testing began at the Nevada Test Site, and winds carried radiation clouds over Las Vegas. While later more care was taken to avoid densely populated Las Vegas, the low birth weight percentage in Nevada remained above average until well after testing was shifted underground after 1963. Note the recent rise in U.S. low birth weights, especially for non-whites, which can be attributed to increased underground tests and fallout from Chernobyl and U.S. reactors.

Nuclear Emissions Since 1970

As indicated in Figure 4, official NRC data shows that civilian power reactors in the period 1970-87 released into the atmosphere 370 curies or 370 trillion picocuries of radioactive iodine, strontium, cesium and other fission products. This amounts to 1.7 million picocuries for every person in the U.S., in the units in which dangerous levels of radioactivity in milk and water are measured.

Figure 5 shows that since civilian nuclear power reactors are largely concentrated in the New England, Middle Atlantic, and East North Central regions, per capita releases of radioactive iodine, strontium, etcetera in these regions is some 25 times greater than in the three regions that have only a few reactors, namely the 16 states in the Mountain and East and West Central regions. We show below that in these relatively "non-nuclear" regions there are statistically significant lower rates of cancer including especially breast cancer. We have found that along with low birth weights, the most sensitive indicators of the delayed damage that ingested nuclear fission products does to human immune systems, are breast cancer incidence and deaths due to infectious diseases.

Figure 6 shows that in 1985 and 1986 the Indian Point reactors close to New York City released 14 curies of I-131 and other fission products, as did Three Mile Island in 1979, while the Millstone reactors had equally large releases in the early 1970s. The Indian Point releases may have sufficiently contaminated the nearby reservoirs to explain the recent disturbing increase in NYC low birth weights after 1985 shown in Figure 2. The epidemic rise of breast cancer incidence in Connecticut and Long Island can be shown to be highly correlated with emissions from Millstone, beginning in 1970.

Radiation and Female Cancer

As shown in Figure 7, after the start of large reactor releases in the early 1970s and since the 1979 Three Mile Island accident, breast cancer incidence rates have soared, along with the incidence rates for all types of female and prostate cancer just about seven to nine years after the large releases from Three Mile Island. Mortality rates have increased less rapidly, thanks to advances in diagnosis and therapy. But it is clear that the

real explosion of the medical costs of treating cancer are associated with the rising trend in cancer incidence.

Figure 8. Here we have taken the age-adjusted breast cancer mortality rates for 1984-88, as calculated by the National Cancer Institute for each state, weighted them to secure averages for each of the nine Census regions, and then correlated them to the log values of the per capita releases to radioactive iodine and strontium for each region, as shown in Figure 5. The correlation is seen to be very high and could not be the product of chance, and is a good example of the Petkau Effect. The risk per unit dose is seen to be highest at low doses.

Figure 9 shows breast cancer incidence in Connecticut for the period 1935-79, taken from the Connecticut Tumor Registry. Here we have fitted a straight line to the breast cancer incidence for women age 50-74 from 1935 to 1970, just before the Haddam Neck and Millstone reactors began operations. The extraordinary upward divergence since 1970 from the trend line has never before been explained. Counties most affected include nearby Middlesex and New London, along with Nassau and Suffolk, directly opposite Millstone, all having the highest breast cancer mortality rates in the nation, exceeding even that of New York City.

Conclusion

The data presented above indicate that it is the unanticipated large effect of fission products released into the environment during the last 50 years that appears to be a previously neglected factor in the present healthcare crisis. Neither the medical profession, the hospitals, nor the pharmaceutical industry is responsible for the increase in low weight births, the rise in the number of individuals with weakened immune systems or the high rate of mutation of microorganisms that increasingly resist antibiotics and other drugs, thereby contributing, in part, to the physio-pathology of new infectious diseases such as AIDS, a resurgence of other immune system related diseases such as tuberculosis, and a renewed sharp rise in the incidence of cancer.

From 1980 to 1988, the age-adjusted rate of newly diagnosed cases rose by 8.9%, while the age-adjusted cancer death rates rose by only 1.8%. Thus the ratio of cancer deaths to newly diagnosed cases declined considerably, indicating an improvement in the effectiveness of our medical care system which could only have taken place as a result of advances in early diagnosis and treatment achieved by the medical community in the face of the long hidden contamination of the milk, the food and the drinking water by bomb tests and the releases from aging military and civilian nuclear reactors. But this effort required a huge rise in the total cost of medical care due to the combined effect of rising incidence of disease and rising cost of advanced forms of diagnosis and treatment.

Since the rise in poor health also reduces human productivity, we have a situation that spells disaster for any modern society, as is shown by the impact of nuclear pollution in the former Soviet Union. Only an end to the release of fission products into the environment can prevent economic collapse.

The only thing worse than the inadvertent exposure of human beings to ionizing radiation is the *intentional* exposure of human beings to ionizing radiation, with a blatant disregard for their safety. Unfortunately, American medical history is replete with such examples of human guinea pigs, as revealed in the next part of this report.

Fatal Fallout

by Gary Null, PhD

Note: The information in this paper is not a substitute for the advice of & treatment by a qualified professional.

PART III: Human Guinea Pigs

For over thirty years, our government has conducted deadly experiments affecting millions of unwitting citizens. You are an inmate in a state penitentiary. One of the staff doctors approaches you and asks you to help make "an important contribution to medical knowledge." The experiment in which he'd like you to participate involves radiating your testicles and performing a vasectomy -- all, you are assured, for the good of science and the future of the human race. Later, you learn that your vasectomy, which rendered you sterile for life, was not part of the experiment. It served no benefit to medical science. It was done solely to prevent you from ever fathering children, in order to "avoid any possibility of contaminating the general population with irradiation-induced mutants."

Does this sound like a bizarre plot for a Grade B horror movie? If only it were.

Until recently, few of us would have believed that our own government would pay respected scientists at leading academic institutions to conduct harmful medical experiments on human subjects, or that the military uses American soldiers as human guinea pigs. Few would have believed government officials would prey on subjects who have few resources to refuse such testing: poor people, prisoners, servicemen, the terminally ill. It would have been even more difficult to imagine the government deliberately exposing the public to open-air contaminants designed for chemical and biological warfare.

However, with growing public awareness of governmental corruption, profiteering, and cover-ups, many Americans would not be surprised to learn that experiments such as these were conducted throughout the forties, fifties, sixties, and seventies. Those who cynically shrug their shoulders with a "what else is new" attitude may not be aware that experiments such as these are not isolated events of the past -- but rather, they continue to provide the modus operandi for most of science and medicine in this country today.

This work documents how we are routinely exposed to human experimentation by this nation's scientific and medical communities, the government and the military. In my opinion, the results of these experiments, and the minds that conceived them, are comparable to the human experiments conducted in Nazi concentration camps during World War II.

Dozens of physicians and scientists involved in these experiments have been interviewed for this report. Some of them reveal that weaknesses in their character and judgment were involved. Others, to this day, still deny that there was anything ethically, legally, or morally wrong with these experiments, because in the end, they added to the body of scientific knowledge.

We will explore experimentation conducted by government agencies -- in particular, the Atomic Energy Commission (A.E.C.), which is now part of the Department of Energy -- as well as the more subtle forms of experimentation that pervade the practice of medicine today.

The massive scale on which these experiments were undertaken necessitated the participation of vast numbers of people in medical and scientific institutions and government agencies. Administrators, scientists, planners, and academic institutions had to be willing participants. In fact, many of this nation's most prestigious universities were and continue to be involved in one way or another. The basic judgment that in the interest of science, human beings are dispensable had to be accepted unconditionally by all participants in the experiments. From the biologist examining the slides, to the doctors administering the radiation, to the peer reviewers who read and published the results of each experiment, all had to be in absolute accord, because an objection to ethical considerations at any point of such a study could mean its demise. Accordingly, when one looks merely at the experiments conducted from the 1940s to the 1970s, literally thousands of people had to have been involved. Not a single one of these people has come forward to take responsibility for their actions. Information about these experiments became available to the general public only after it was considered too dated to arouse any serious public outcry.

A great number of these experiments were meaningless, a colossal waste of taxpayers' money. We would not be willing to pardon overzealous researchers for unethical conduct, but we could, at least, understand their motives if the results of their work truly contributed to improving the quality of life and health of people today. But this was not the case. The results of most of these studies were published in scientific journals and couched in technical jargon.

A trend that continues today is the prevalence of scientific studies that serve no definable purpose except to keep research grants alive, promote connections with government agencies that allot the funds, and secure the tenure of the individuals supervising the studies. Scientific literature is replete with useless studies. Even the government's own Office of Technology Assessment reveals that about 90 percent of the studies supported by the government are seriously flawed.

Science is guided by not one but all three of this country's most powerful entities -- government, defense, and medicine. For this reason, the radiation experiments may be justified as medical therapy when, in fact, these experiments are funded by government agencies and the military to further warfare technology. The same holds true with studies in chemotherapy, since these substances were originally derived from chemical weapons during World War II.

In October 1986, the U.S. government released a special congressional Sub-committee on Energy and Commerce report describing 31 human guinea pig experiments involving almost 700 people over a 30-year period. Subcommittee Chairman Edward J. Markey (D-Mass.) wrote in a letter to the Secretary of Energy, John Herrington, that Department of Energy documents had "revealed the frequent and systematic use of (unwitting) human subjects as guinea pigs."

These experiments, Congressman Markey said, "shock the conscience and represent a black mark on the history of medical research." The following are some of the more repugnant and bizarre experiments documented in the Markey Report:

- From 1945 to 1947 as part of the Manhattan Project, 18 patients believed to have limited life spans were injected with plutonium.
- From 1961 to 1965, at the Massachusetts Institute of Technology, 20 elderly subjects were injected or fed radium or thorium.
- During 1946 and 1947 at the University of Rochester, six patients with good kidney function were injected with uranium salts to determine the concentration that would produce kidney injury.
- From 1953 to 1957 at Massachusetts General Hospital, Boston, approximately 12 terminal brain tumor patients were injected with uranium to determine the dose at which kidney damage began to occur.
- From 1963 to 1971, 67 inmates at Oregon State Prison and 64 inmates at Washington State Prison received X-rays to their testes to examine the effects of radiation on human fertility and testicular function.
- From 1963 to 1965 at the A.E.C.'s National Reactor Testing Station in Idaho, radioactive iodine was purposely released on seven separate occasions. In one experiment, seven human subjects purposely drank milk from cows that had grazed on iodine-contaminated land.
- From 1961 to 1963 at the University of Chicago and the Argonne National Laboratory, in Argonne, Illinois, 102 human subjects were fed real fallout from the Nevada test site, radioactive simulated fallout particles, or solutions of radioactive cesium and strontium.
- During the late 1950s, at Columbia Presbyterian and Montefiore hospitals in New York, 12 terminal cancer patients were injected with radioactive calcium and strontium.

These experiments and others raise in Markey's works, "horrifying questions." "Did government agencies fund or sponsor programs which crossed the line that no scientific research can ever be permitted to traverse? Did American scientists mimic the kind of demented human experiments conducted by the Nazis?" Unfortunately, the answer to Markey's questions seems to be yes.

The nuclear medical experiments fell into two general categories. In the first group, human subjects were injected or fed radioactive material, in order that its passage through the body could be monitored. The major objective of these experiments was to compare the physiological reactions with computer-generated mathematical models that estimate the effect of various doses of radiation on the body.

As the Markey Report comments, "Although these experiments did provide information on the retention and absorption of radioactive material by the human body, the experiments are nonetheless repugnant, because human subjects were essentially used as guinea pigs and calibration devices."

In the second group of experiments, radioactive material was actually intended to cause damage to the human body, and the "experimenters sought to correlate the amount of damage done with the dose received." In many of the experiments, the human subjects were captive populations or groups of individuals that "experimenters might frighten by having considered them expendable: the elderly, prisoners, and hospital patients ...In other experiments the subjects were volunteers, but they were willing guinea pigs nonetheless."

For many of the subjects, informed consent was not obtained. And in a number of cases, as the Markey Report makes clear, "the government covered up the nature of the experiments and deceived the families of deceased victims as to what had transpired."

There is a chilling lack of humanity in the Department of Energy documents reporting these experiments. For example:

- "Category 1.001, No. 1. Subjects were diagnosed as terminal within ten years; one subject was a child; no evidence of informed consent; potential doses of radiation much greater than occupational limits."
- "Category 1.003, No. 119. Subjects were hospital patients; some doses of radiation produced kidney damage."
- "Category 11.001, No. 173. Radioactive iodine was intentionally released into the environment."

The details beyond the category and number classifications are even less reassuring. Just what does "Category 1.001, No. 1" mean? In the body of the text, we read under the heading "Plutonium Injections Into Humans" that between 1945 and 1947, 18 patients were injected with plutonium. These projects were carried out by the Manhattan Project, a consortium of American scientists and military and government

officials that gave us the atomic bomb. A number of well-known hospitals were involved, including Strong Memorial Hospital in Rochester, New York; Billings Hospital, University of Chicago; and University Hospital, University of California, San Francisco.

The rationale for this experiment was that accurate information was needed on the retention and excretion of "internally deposited plutonium" so the researchers could set safety standards. The information was supposedly needed because workers at the Manhattan Project handled plutonium, and safety criteria had to be established. Animal experiments had produced conflicting data that could not be extrapolated for humans.

All right, if you are going to conduct experiments on humans, then who do you choose to inject with the deadly radioactive plutonium? The original criteria, according to the Markey Report, specified that subjects "should be older, with relatively short life expectancies." Yet all subjects chosen were diagnosed as having diseases that gave them an expected survival rate of up to ten years. Most of the subjects were over 45, but one was only five years old. Another was 18. The oldest subject was only 68.

The quantities of plutonium injected ranged up to "98 times the body burden value recognized" as lethal. In a 1974 A.E.C. investigation, it was determined that informed consent had not been obtained from the subjects.

The government was not unaware of the consequences of their actions. Verbal games, misrepresentations, and outright lies were employed in an effort to avoid unfavorable publicity. One of the first steps was to forbid the use of certain words, such as "plutonium."

In a memo circulated at the Argonne National Laboratory the following instructions were spelled out: "Please note that outside of the 'Center for Human Radiobiology' we will never use the world *plutonium* in regard to these cases. 'These individuals are of interest to us because they may have received a radioactive material at some time' is the kind of statement to be made, if we need to say anything at all."

Obviously, if any patients were still alive when this memo was written, they were not informed that they had been injected with plutonium by their government. At best, they might have been told that "they may have received a radioactive material at some time" in their past. Relatives of deceased patients were told that exhumation of the patients' bodies was necessary to determine "the composition of an 'unknown' mixture of injected radioactive isotopes." The families were informed that these injections were part of an "experimental treatment for the patient's disease." A statement, according to the Markey Report, that was not true.

In another experiment with radioactive substances that took place from 1946 to 1947, six patients with good kidney function were "injected in increasing doses with uranium nitrate, enriched in U-234 and U-235." The objective of this experiment was to determine the dose of uranium salt that would produce kidney injury and to measure the

rate of excretion of uranium salts. The experiment, an A.E.C. project, was carried out at the University of Rochester, New York.

A later study by the A.E.C. stated that "human subjects received no medical benefits from these experiments, and in fact the treatment seemed designed to induce kidney injury in at least one patient." It was recognized at the time that uranium salts could damage the kidney; the experimenters "planned to identify the concentration that would produce 'just detectable renal injury'."

The subjects were chosen from a body of hospital patients. Those selected had normal kidney function. One was in the hospital because of rheumatoid arthritis and urethral strictures. One had pneumonia. Another was a young woman in "fairly good physical condition except for mild chronic undernutrition."

Uranium doses were successively increased with each new patient. The pneumonia patient showed trace amounts of protein in his urine, a sign of kidney dysfunction, on the last day before leaving the hospital: like the young woman with undernutrition, and the patient with arthritis, this man received no follow-up attention. No one knows exactly how much damage was done to his kidneys. No one knows how the other patients fared with veins full of radioactive plutonium. The summary fact sheet that the Department of Energy submitted to the Markey committee reported there had been "no follow-up on the experimental subjects."

Between 1963 and 1971, at Oregon State Prison, 67 volunteers were subjected to irradiation of their testicles by X-ray. Radiation doses ranged up to 600 roentgens in single exposures. (The present recognized safe limit for exposure to reproductive organs is five roentgens per year.) A number of prisoners were irradiated a second time.

The purpose of this experiment was to "obtain data on the effects of ionizing radiation on human fertility and the function of testicular cells." It included examination of testicular tissue, sperm counts, and evaluation of urinary or blood steroids and hormones. Consent forms were obtained from the prisoners. However, according to the Energy Research and Development Administration (E.R.D.A.), the successor agency of the A.E.C., "records suggest that the prime incentive to participate may have been the feeling that they were making important contributions to the state of medical knowledge."

Prisoners ranged in age from 25 to 52. All the prisoners in the Oregon group (64 inmates at Washington State Prison went through the same experiments) had vasectomies. In a peculiar deference to religious sensibilities, there were no Catholic subjects, because the radiation would no doubt affect the man's fertility.

That the scientists considered the religious faith of potential participants before performing the vasectomies is a clear indication that they knew substantial damage would result from the administration of such massive dosages of radiation. Hence, little credence can be given to apologists who say that these experiments could only have been conducted in an atmosphere of ignorance of the effects of radiation. In fact, when these

experiments were conducted, almost 20 years had passed since the bombings of Hiroshima and Nagasaki, events which had shown that exposure to even low-level radiation could result in cancer and other diseases.

John Gofman, M.D., Ph.D., professor emeritus of medical physics at the University of California at Berkeley, says, "We have very well-documented studies on Hiroshima and Nagasaki ...There is no question as to what's going on there. In fact, there is evidence that low levels of radiation, under ten rads, have caused a major increase in cancer in these places."

One of the most shocking things about these experiments is that there was no medical follow-up to check the long-term effects of irradiation on the test subjects. This failure to follow up is prevalent in experiments of this nature and is often used to deny that any long-term effects exist at all. According to Dr. Gofman, "The issue is, how did the scientists look for effects? Have they followed them for 20 years when they say they didn't see any effects? No. What happens is that they look at them for six months and say, 'Nothing happened'."

Military personnel have long been used as human guinea pigs without adequate follow-up. We see this today in the rash of cancers attributable to exposure to atom bomb explosions during the Los Alamos radiation experiments, for example. The same holds true of Vietnam vets who were exposed to the defoliant Agent Orange. Paul Rutershan, a Vietnam veteran, was the first to bring to the public's attention the role of these highly toxic chemicals in causing cancer. Rutershan himself, dying of cancer, began what was to be a snowballing effort to force the American government to take responsibility for their reckless disregard for the health of military personnel.

Today, we see tens of thousands of Vietnam veterans suffering from a wide range of disorders at an incidence far surpassing that of any other group in this society. The only common denominator is their exposure to Agent Orange in Vietnam. Although the government did settle a class action lawsuit with veterans, the government has still never acknowledged any complicity in the Agent Orange or Los Alamos fiascos. Its position has always been to deny any responsibility for its actions, to cover up whenever possible, and to go so far as to initiate harassment and surveillance by the F.B.I. and the C.I.A. of any individual or group that chooses to bring claims against it or to expose its role in using the public as human guinea pigs.

The importance of follow-up is evident by a statement made by the E.R.D.A. in which it was noted that "there is a need for continued medical surveillance of prisoners involved in both sets of experiments (Oregon and Washington). Among the health effects that should be monitored is the possibility of testicular tumors, occurring after a long latency period (25-30 years)."

But this follow-up never happened.

Another method used to determine the effects of radiation was the release of radioactive gas into the environment. This type of experiment had been funded by the A.E.C., which intentionally released radioactive iodine over an area designated as the "hot pasture" on seven separate occasions. Human subjects were purposely exposed during three of them. The experiments were designed to trace radioactive iodine as it moved through the air-vegetation-cow-milk sequence in the human food chain.

Researchers felt that they needed this information so they could develop better "siting criteria" (guidelines for locating nuclear power plants) when building nuclear reactors. Monitors in the pasture determined when and how much of the radioactivity was deposited. A herd of cows was then led into the pasture to graze for several days. The cows were then milked and the milk monitored for radioiodine. Perfectly healthy humans were purposely exposed by drinking the milk and, at one point, three people were placed in the pasture during the iodine release. Later, they were examined for exposure.

Even though radioactive iodine is known to be toxic, there was no medical follow-up of the experimental subjects, which again indicates that the purported objective of the experiment had little or nothing to do with any real purpose, about which we can only speculate. This conclusion is borne out by the disregard for human safety and health apparent in the building of nuclear reactors in densely populated areas. When reactors are sited in less populated areas, it is usually because of strong, organized community opposition and not because of the government's concern for public safety or because of experiments used to determine proper siting criteria.

While we were able to track down the names of persons involved in almost all of the experiments documented in this report, there was only one man who admitted any responsibility. The remainder either denied that they had anything to do with the experiments, refused to comment, or could not be located.

Dr. Jerry Berlin, a professor of biological sciences at Texas Tech University in Lubbock, Texas, was a young research biologist working for an organization funded by the A.E.C. Dr. Berlin affirms that serious ethical considerations were raised continuously about the nature of the experiments. "I attended several meetings where informed consent was a big issue. Supposedly, if you informed these prisoners what was happening to them, that made everything okay. I don't want anyone to think that ethics was not considered. But it happened that there were some people in the A.E.C. who thought that this was an important piece of work to do. And they thought they had developed an avenue to do it, and they did it."

Dr. Berlin says that he was told to work primarily on the tissue samples that he received from the experiments, and admits that that may have been one of the reasons he left his job there. "I wasn't too happy doing that," he says, "obviously for ethical reasons."

"I raised ethical questions. In fact, I really didn't care to do the work myself. But you understand, somebody tells you to go do something, and if you want to get a

paycheck, you go ahead and do it. I still feel uncomfortable that I did it. At the time, I got wrapped up. I was a young Ph.D. and I had my first job and I didn't want to lose it."

Dr. Berlin and other scientists who dare to question the ethics of their superiors are the exception to the general rule of unconditional compliance that allows studies such as these to take place. "Today, experiments like that would ethically create major problems, and they simply would not be done at all," says Dr. Berlin. "This is a case where somebody at the A.E.C. wanted these experiments done and they were done."

Has science suddenly become ethical today? Are researchers any more concerned with the welfare of the public than they were ten or twenty years ago?

A PBS broadcast entitled "The Pentagon and the Professor" revealed that Pentagon spending for university research was steadily increasing. Today, the Defense Department provides more than three-quarters of all research funding available to universities. This "militarization of science" raises serious questions as to the independence of research and the recipient universities.

Since September 11, a stronger alliance has been formed between the Pentagon, the universities, and industry to collaborate against terrorism, understandably. (See, for example, "Joining the fight -- for dollars" by Bob Kierva in The Worcester Telegram & Gazette of November 28, 2001.) Mr. Kierva states that "the war on terrorism could generate a technology boom . . . as the U.S. government funds a broad array of research and development . . .". University research involved in surveillance? According to Kenneth A. Georgiades, a senior director for Top Layer Networks, Inc., his company's "Internet Protocol security and surveillance products could be useful to law enforcement." The products, "which monitor a person's Internet activity, much like wiretapping a phone conversation, are available commercially, but could be enhanced and modified using government-funded research and development dollars." --Web-tapping? (Visible on the Internet at the Massachusetts Technology Collaborative Web site.) <www.mtpc.org/fedfund/fight_dollars.htm>

The association between academia and the Pentagon is not new. It started with the Manhattan Project, and by the 1950s it was an established fact. Many professors voice concern that the ever-increasing presence of the government on American campuses is resulting in a form of Faustian bargaining. Not only do the universities need the money, but aspiring Ph.D.'s need to conduct research in order to become full professors, and for their research they need grants.

While the Pentagon insists that it is merely funding basic research, one professor asks, "Why is the Department of Defense funding these projects? Out of the goodness of its heart? It has a purpose in mind." Critics of the military's increased presence on campus believe that science will naturally gravitate toward where the money is, and that the role of the university as an objective gatherer of knowledge is threatened when university administrators are forced to woo money from the Pentagon.

In an environment such as this, it is unlikely that scientific ethics will be any more evolved than they were 30 years ago. In fact, the relative decrease in funding from sources other than the Pentagon strongly suggests that today's scientists may be forced to make even more difficult decisions between ethics and science than they were in the past.

Some of the experiments detailed in the Markey Report were conducted solely to enable scientists to "calibrate" instruments that measure radioactive substances in the body. Over almost a decade, ending in 1972, subjects either inhaled Argon-41 or swallowed capsules of other radioactive material so scientists could set their instruments.

One of the most startling things about these series of radiation experiments is the relative apathy with which they have been covered by the American press. In fact, there is very little in the news about death or harm from radiation at all. This seems unusual in a medium that is characterized by its aggressive investigation into almost anything that is newsworthy. It finds out how many pairs of shoes Imelda Marcos has, reveals all the smut on Reverend Jim Baker's secret love affair, tells us of scandals on Wall Street or the White House, and even carries stories on $125 hammers purchased by the Pentagon. Why then don't we hear about radiation and its risks to human health? Maybe it's just not newsworthy enough?

Dr. Gofman estimates that approximately 50,000 develop cancer annually as a result of radiation exposure from X-rays in excess of what is needed for good diagnostic pictures. Why isn't this reported? According to Dr. Gofman, "There are very, very powerful interests that do not want that information to get out. One is the radiology profession. Another is the nuclear medicine profession. These people make their livelihood by conducting these types of experiments. And still other, even more powerful interests are the government and the nuclear industry. To all of these groups, the amount of harm done by radiation is anathema. The media can count on this.

"I've seen them descend on the radio commentator who was covering a story after the Chernobyl disaster. What happened was that he mentioned that there had been an explosion at the Three Mile Island plant. The next day, four officials from the Public Utility Commission descended on his station manager and claimed that he had falsely reported an explosion at Three Mile Island. Of course, it was documented; you just have to look at the Presidential Commission Report, which says that there were two explosions at Three Mile Island. But the four utility officials harassed the station manager anyway, thinking they could con him into suppressing the information.

"If you think you are dealing with objectivity and honesty, let me tell you, you are dealing outside the real world when you say 'Gosh, this ought to be news.' Remember, there are big vested interests on the part of the United States government, the nuclear utility industry, and the medical profession's radiological branches to keep this news from surfacing. So don't be surprised when you go to a nuclear medicine specialist and he says 'Oh, this is all nonsense about low-dosage radiation causing cancer. We've been using these dosages for years. I've been taking X-rays for a long time, and I've never seen them causing cancer.' These people are then put on the air, written about in the newspapers

with articles that say 'Radiologist finds that radiation effects have been overblown.' But you never see the press doing an analysis of the *real* evidence."

Dr. Gofman says that he is so fed up with the manner in which the press reports -- or rather, fails to report -- on the devastating effects of radiation, which kill thousands of Americans each year, that he "would not bother with the media if I didn't feel it to be part of my human duty as a physician."

"There are people out there," says Dr. Gofman, "who will kill other people for a price. Murder is not restricted to the Mafia. Murder, Inc. is alive and well in the medical profession, where they are killing people for a fee."

Experiments such as the ones set forth in this report are not strange aberrations from standard medical procedure. These experiments are illustrative of the blatant disregard for human health and dignity by a government and scientific community that is more concerned with their own self-interests than with the health and safety of the public they purport to serve.

Experiments like these raise alarming issues. Many were performed by the American military on American citizens, paid for with American tax dollars. This was not a time of war; these acts were not directed against an "enemy." Second, the experiments on prisoners offer a good example of what happens when the military and academia collaborate on scientific research. Professors on today's campuses have warned the public about the growing "militarization of science," a situation in which America's scientists are given a clear-cut choice. They can agree to join the military in its onward and upward quest for new and more efficient means of killing, destroying, and maiming, or they can refuse to do such research. If the former path is chosen, an illustrious career at one of the nation's top universities or a directorship of a government agency may lie ahead. If the latter is chosen, chances are the researcher will be ostracized by others in the community. (Look at what happened to Robert Oppenheimer when he began to question the propriety of the atom bomb.) Even a professorship at an obscure university may be hard to come by.

The third issue that arises from experiments such as these is the military's longstanding practice of using a captive audience for its human experimentation. Its most immediate and obvious guinea pigs are its own personnel, who up until recently have shown a marked reluctance to sue the military or hold it in any way responsible for its actions. This fact has given the Pentagon a virtual carte blanche to conduct a host of experiments on American GI's with impunity.

Disturbing thoughts reoccurred throughout the research and writing of this report. If it took more than twenty years to drag these facts from the government, how many more as yet unrevealed abuses are hidden in its archives? Are such unjustified, bizarre, and callous experiments still being secretly conducted by government agencies, or hospitals and universities working with the C.I.A. or the military? How do we know that

such experiments are not being conducted, and unsuspecting people are not being used as human guinea pigs?

Some supporters of these experiments argue that this type of research involving humans is within acceptable limits and does not create any long-term medical problems for the subjects. But this claim is undermined by the fact that few follow-up studies have been made.

In one of the rare long-term research programs, the Department of Energy published studies that assessed the long range health of several different populations, most of whom had been exposed to occupational radiation hazards. These studies were funded by the Atomic Energy Commission, now a part of the Department of Energy, and were carried out by the Argonne Cancer Research Hospital at the University of Chicago.

One of the groups studied was the more than 400 persons who experienced "considerable radium body burden," some for over twenty years, while working at various jobs (most were painters of radium dials and luminous watches, while others had received radium chloride by injection or orally as a medical treatment). Those with considerable radium exposure were found to have characteristic defects, destructive changes, and tumors in the skeleton. It should be noted that the victims of occupational radiation had considerably less of a body burden than did the subjects of the nuclear medical research.

A separate study examines 1,000 children who, while in their mother's wombs, were exposed to X-rays taken in the course of pelvic examinations; another administered by the Defense Nuclear Agency of the Defense Department was conducted in order to register and identify the approximately 200,000 Defense Department personnel exposed to fallout from atmospheric nuclear tests. The agency wants to determine the level of exposure, identify incidences of death or illness that may be the result of radiation contamination, and to assist veterans in claims for compensation.

Even with these government-sponsored studies, can we trust assurances that such experiments are no longer being conducted when the experiments themselves were presented to unwitting victims with clever misrepresentations or outright lies?

Unfortunately, there are no absolutes. There are no official statements that can comfort those whose lives were permanently made impossibly painful. What, then, can be done? As the Markey Report, the congressional subcommittee report on energy and commerce, strongly suggested, "If there is one thing the government can do for these experimental victims and their families, even at this late date, it is to conduct long-term medical follow-up of populations exposed to radioactive material."

In addition to its other efforts, the Department of Energy must make every effort to identify the subjects in these experiments, examine them for long-term radiation-induced diseases, and offer compensation for damage they have suffered with minimal delay.

Clearly, human experiments of this nature must never be repeated. Even though clear ethical and scientific guidelines on human experimentation existed in the 1960s and 1970s, though not codified in law, scientists and government personnel took it upon themselves to dissemble and misrepresent, to obfuscate and confuse, the subjects of their experiments -- all to allow them to pursue some misguided goal of scientific research. Must a scientist be threatened under the law that other human beings cannot be abused in the name of science?

This question is especially important, since we talked with responsible officials in the very agencies and institutions where the experiments took place. Their attitudes were surprisingly similar to the experimenters themselves. In telephone calls to the universities and hospitals involved in the research, those that were aware of the "experiments" continued to justify their institutions' involvement as scientific progress. It was disturbing to hear the same rationale that allowed the experiments to occur in the first place.

But another disconcerting fact came from these interviews: most of the present-day officials were unaware that such experiments had ever occurred at their institutions. Santayana's insightful axiom seems to apply here, with disastrous ramifications: Those who are ignorant of history are doomed to relive it.

Another way in which people are used as guinea pigs is through the commercialization of medicine. Therefore:

Do Not Be Misguided Regarding Medical *Diagnostic* Procedures Involving Ionizing Radiation.

(I). Mammograms.

"Cancer prevention physician, Dr. Samuel S. Epstein, professor of environmental and occupational medicine at the University of Illinois-Chicago School of Public Health says mammograms are at best ineffective in detecting cancers, and at worst, may themselves trigger cancers." (Environment News Service, ens.lycos.com, 20 Feb. 02 <http://www.pl.net/9.3health/avocau.htm>)

Dr. Epstein says, "It is of interest to note that the very extensive belated recent media coverage has focused virtually exclusively on questions of the effectiveness of mammography, while ignoring substantial and long-standing evidence on its dangers, apart from the availability of safe, reliable and virtually cost-free alternatives." (Samuel S. Epstein, M.D., e-mail to Gary Null, 10 July 2001.)

In their article entitled "Dangers and Unreliability of Mammography: Breast Examination is a Safe, Effective, and Practical Alternative," in the International Journal of Health Services, Vol. 31, No. 3, pp. 605-615, 2001, Samuel S. Epstein, M.D., Rosalie Bertell, and Barbara Seaman state:

Mammography screening is a profit-driven technology posing risks compounded by unreliability. In striking contrast, annual clinical breast examination (CBE) by a trained health professional, together with monthly breast self-examination (BSE), is safe, at least as effective, and low in cost. International programs for training nurses how to perform CBE and teach BSE are critical and overdue.(p. 605)

They go on to explain that "Contrary to popular belief and assurances by the U.S. media and the cancer establishment," (and here they cite the National Cancer Institute and the American Cancer Society as the misguiding parties) "**mammography is not a technique for early diagnosis**." [emphasis added.] Epstein, Bertell and Seaman state the fact that "a breast cancer has usually been present for about eight years before it can finally be detected." They also quash the notion that mammography is a form of prevention.(p. 605) In particular (on p. 606), they cite "the ACS's aggressively promoted screening" as being responsible for imaging centers "becoming flooded and overwhelmed," resulting in "potentially dangerous delays, up to several months," before women who may need immediate care are examined.(p. 606)

In a section of their article captioned in capital letters, "DANGERS OF SCREENING MAMMOGRAPHY," the authors state that "mammography poses a wide range of risks that women "worldwide" still have not been told about.

First, there are radiation risks. "Routine mammography poses significant cumulative risks of initiating and promoting breast cancer. Contrary to conventional assurances that radiation exposure from mammography is trivial -- and similar to that from a chest X-ray. . .," the routine four films of each breast "results in some 1,000-fold greater exposure because the radiation is focused on each breast rather than on the entire chest." The premenopausal breast is at great risk because of its high sensitivity to radiation. (pp. 605-606)

This report is confined to the radiation risks of mammography, but it must be mentioned that in the course of preparing the patient to receive the diagnostic radiation, **there are also cancer risks from breast compression.**

As early as 1928, physicians were warned to handle 'cancerous breasts with care- for fear of accidentally disseminating cells" and spreading cancer. Nevertheless, mammography entails tight and often painful compression of the breast, particularly in premenopausal women. This may lead to distant and lethal spread of malignant cells by rupturing small blood vessels in or around small, as yet undetected breast cancers.(p. 606)

The authors state that the "UNRELIABILITY OF MAMMOGRAPHY," is related to **the danger of "Falsely Negative Mammograms**." The authors state that missed cancers are common in premenopausal women. Missed cancers are also common in postmenopausal women who are on estrogen replacement therapy, and they explain why. (p. 606)

Interval cancers also pose a threat.

About one-third of all cancers -- and more still of premenopausal cancers, which are aggressive, even to the extent of doubling in size in one month, and more likely to metastasize -- are diagnosed in the interval between successive annual mammograms. Premenopausal women, particularly, can thus be lulled into a false sense of security by a supposedly negative result on an annual mammogram and fail to seek medical advice. (p. 607)

Falsely positive mammograms are a danger.

Mistakenly diagnosed cancers are particularly common in premenopausal women, and also in postmenopausal women on estrogen replacement therapy, resulting in needless anxiety, more mammograms, and unnecessary biopsies. . . . -- [in] just those groups that are most strongly urged to have annual mammograms [such as those with a "strong family history" and "prolonged use of the contraceptive pill"] -- the cumulative risk of false positives increases to 'as high as 100 percent' over a decade's screening. (p. 607)

Overdiagnosis is a major risk of mammography.

Overdiagnosis and subsequent overtreatment are among the major risks of mammography. The widespread and virtually unchallenged acceptance of screening has resulted in a dramatic increase in the diagnosis of ductal carcinoma-in-situ (DCIS), a pre-invasive cancer, with a current estimated incidence of about 40,000 annually. DCIS is usually recognized as micro-calcifications and **generally treated by lumpectomy plus radiation or even mastectomy and chemotherapy. However, some 80 percent of all DCIS never become invasive even if left untreated. Furthermore, the breast cancer mortality from DCIS is the same -- about 1 percent -- both for women diagnosed and treated early and for those diagnosed later following the development of invasive cancer**. [emphasis added] (p. 607)

Early detection of this form of breast cancer (DCIS) does not reduce mortality, and this is confirmed by the 13-year follow-up results of the Canadian National Breast Cancer Screening Study.

Nevertheless, . . . 'the public is much less informed about overdiagnosis than false positive results. In a recent nationwide survey of women, 99 percent of respondents were aware of the possibility of false positive results from mammography, but only 6 percent were aware of either DCIS by name or the fact that mammography could detect a form of "cancer" that often doesn't progress.' (p. 607)

Quality Control data is not released.

In 1992 Congress passed the National Mammography Standards Quality Assurance Act requiring the Food and Drug Administration (FDA) to ensure that screening centers review their results and performance: collect data on biopsy outcomes and match them with the original radiologist's interpretation of the films. However, the centers do not release these data because the Act does not require them to do so. It is

essential that this information now be made fully public so that concerns about the reliability of mammography can be further evaluated. . . .(p. 608)

FAILURE OF MAMMOGRAMS TO REDUCE BREAST CANCER MORTALITY

Epstein, Bertell, and Seaman state:

"Despite the long-standing claims, the evidence that routine mammography screening allows early detection and treatment of breast cancer, thereby reducing mortality," is countered by the fact that "the overwhelming majority of breast cancers are unaffected by early detection, either because they are aggressive or slow growing."

> There is supportive evidence that the major variable predicting survival is 'biological determinism -- a combination of the virulence of the individual tumor plus the host's immune response,' rather than just early detection.
>
> Claims for the benefit of screening mammography in reducing breast cancer mortality are based in eight international controlled trials involving about 500,000 women. However, recent meta-analysis of these trials revealed that only two, based on 66,000 postmenopausal women, were adequately randomized to allow statistically valid conclusions. Based on these two trials, the authors concluded that '**there is no reliable evidence that screening decreases breast cancer mortality -- not even a tendency towards an effect.' Accordingly, the authors concluded that there is no longer any justification for screening mammography**. [emphasis added] (p. 608) [for the meta-analysis report referred to above, see Ole Olsen and Peter C. Gotzsche, "Systematic review of screening for breast cancer with mammography," Lancet 2001; 358:1340-1342. Olsen and Gotzsche write that "Mammographic screening . . . leads to greater use of more aggressive treatment." Their full report is available online at <//image.thelancet.com/lancet/extra/fullreport.pdf.>]
>
> Even assuming that high quality screening of a population of women between the ages of 50 and 69 would reduce breast cancer mortality by up to 25 percent, yielding a reduced relative risk of 0.75, **the chances of any individual woman benefiting are remote**. For women in this age group, about 4 percent are likely to develop breast cancer annually, about one in four of whom, or 1 percent overall, will die from this disease. Thus, the 0.75 relative risk applies to this 1 percent, **so 99.75 percent of the women screened are unlikely to benefit.** [emphasis added]. (p. 608)

ONLY THE UNITED STATES ROUTINELY OVER-SCREENS BY MAMMOGRAPHY: This involves the politics of cancer.

The authors claim that "No nation other than the United States routinely screens premenopausal women by mammography."

> In January 1997, the National Institutes of Health Consensus Conference recommended against premenopausal screening, a decision that the NCI, but not the ACS, accepted. However, under pressure from Congress and the ACS, the NCI reversed its decision some three months later in favor of premenopausal screening.
>
> The U.S. overkill extends to the standard practice of taking two or more mammograms per breast annually in postmenopausal women. This contrasts with the more restrained European practice of a single view every two to three years.(p. 609)

CONFLICTS OF INTEREST

The authors note that "The ACS has close connections to the mammography industry. Five radiologists have served as ACS presidents, and in its every move, the ACS promotes the interests of the major manufacturers of mammogram machines and films, including Siemens, DuPont, General Electric, Eastman Kodak, and Piker." They continue:

> The mammography industry [notice the commercial reference] also conducts research for the ACS and its grantees, serves on advisory boards, and donates considerable funds. DuPont also: is a substantial backer of the ACS Breast Health Awareness Program; sponsors television shows and other media productions touting mammography; produces advertising, promotional, and information literature for hospitals, clinics, medical organizations, and doctors; produces educational films; and, of course, lobbies Congress for legislation promoting availability of mammography services. In virtually all its important actions, the ACS has been and remains strongly linked with the mammography industry, while ignoring or attacking the development of viable alternatives.
>
> ACS promotion continues to lure women of all ages into mammography centers, leading them to believe that mammography is their best hope against breast cancer. A leading Massachusetts newspaper featured a photograph of two women in their twenties in an ACS advertisement that promised early detection results in a cure 'nearly 100 percent of the time.' An ACS communications director, questioned by journalist Kate Demsey, admitted in an article published by the Massachusetts Women's Community's journal Cancer, 'The ad isn't based on a study. When you make an advertisement, you just say what you can to get women in the door. You exaggerate a point. . . . Mammography today is a lucrative (and) highly competitive business.'(p. 611-612)

REFORMS ARE NEEDED

The authors conclude that "Mammography is a striking paradigm of the capture of unsuspecting women by run-away powerful technological and pharmaceutical global

industries, with the complicity of the cancer establishment, particularly the ACS, and the rollover mainstream media."

> Promotion of the multibillion dollar mammography screening industry has also become a diversionary flag around which legislators and women's product corporations can rally, protesting how much they care about women, while studiously avoiding any reference to avoidable risk factors of breast cancer, let alone other cancers.(p. 612)

The authors recommend: **"Screening mammography should be phased out in favor of annual CBE [Clinical Breast Examination] and monthly BSE [Breast Self-Examination], as an effective, safe, and low-cost alternative, with diagnostic mammography available when so indicated. (p. 612) The authors say that this action is "critical and overdue " in light of the strong but politically rejected "evidence that screening mammography does not lead to decreased breast cancer mortality."** The authors also recommend that international networks of CBE and BSE low-cost clinics, staffed by trained nurses, be established to include developing nations. (p. 612)

The fact "that most breast cancers are first recognized by women themselves was admitted in 1985 by the ACS, and they acknowledged: 'We must keep in mind the fact that at least 90 percent of the women who develop breast carcinoma discover the tumors themselves.' Yet the ACS is still "an aggressive advocate of routine mammography for all women over the age of 40."

Olsen and Gotzsche write, "It is often asserted that early detection spares patients more aggressive treatments, in particular mastectomy. However, because of overdiagnosis, one would expect more rather than less surgery of all kinds." This documented increase in aggressive treatment is in contrast to the assertions to the contrary by some trialists despite their access to the necessary data . . ." (Olsen-Gotzsche report, p. 16, cited above.

In their ground-breaking paper in the Lancet, entitled "Is screening for breast cancer with mammography justifiable?", Gotzsche and Olsen state that in view of the flawed methodology in the trials and the fact that there has been "no decrease in breast-cancer mortality in Sweden, where [mammography] screening has been recommended since 1985, the authors conclude that "screening for breast cancer with mammography is unjustified."

Furthermore, Gotzsche and Olsen state that even if the Swedish trials had been judged to be unbiased (which they were not), "the data would then show that for every 1000 women screened biennially throughout 12 years, one breast-cancer death is avoided, whereas the total number of deaths is increased by six. If the Swedish trials (apart from the Malmo trial) are judged to be biased" (which they were), then "there is no reliable evidence that screening decreases breast-cancer mortality." (P.C. Gotzsche and O. Olsen, "Is screening for breast cancer with mammography justifiable?," Lancet 355:129-134, 2000.)

A recent article published in the Townsend Letter for Doctors, entitled "The War on Cancer," also asks the question, "Does screening mammography work?" And the author concludes with Gotzsche and Olsen that "There is simply no reliable evidence that screening mammography actually reduces deaths among women who receive it." The review of Gotzsche and Olsen "failed to find a decrease in overall mortality."

> If you look in the cancer textbooks, not to mention innumerable websites, you will find vigorous recommendations for screening mammography. So how did these two authors reach such conclusions so at variance with accepted opinion? They carefully scrutinized the quality of each of the RCTs [randomized controlled trials] that allegedly proves the value of mammography. Were the patients in the two arms comparable at the start? Were they properly randomized? Was there an unbiased assessment of the outcome of the trials? . . .
>
> One of the problems they uncovered was that if a patient died in the control group her death was more likely to be ascribed to breast cancer than similar patients in the treated group. This made the outcome in untreated patients appear worse than it necessarily was.
>
> One danger of mammography, they say, is that screened women are more likely to receive radiation therapy than unscreened women. Radiation, they write, 'is expected to increase overall mortality because of cardiovascular adverse effects. These deaths were not counted as deaths related to screening in the trials we assessed.' In other words, if a woman gets screened, she is more likely to be diagnosed with breast cancer. If she is diagnosed with breast cancer, she is likely to get adjuvant radiation therapy. But because of that she is at greater risk of damage to her cardiovascular system. (Ralph W. Moss, "The War on Cancer," Townsend Letter for Doctors, Jan. 2002. <http://www.findarticles.com/cf_0/m0ISW/2002_Jan/81138238/p1/article.>)

Current Breast Tissue Research Suggests That Mammography May Cause Cancer

A very recent discovery presented at the American Association for the Advancement of Science meeting is described in an article entitled, "Radiation Makes Even Healthy Breast Tissue Cancerous." The research, carried out at Lawrence Berkeley National Laboratory (Berkeley Lab) by cell biologist Dr. Mary Helen Barcellos-Hoff, reveals "New experimental findings that **exposure to ionizing radiation creates a micro-environment in the tissue surrounding breast cells that can cause even nonirradiated cells and their progeny to become cancerous**." [emphasis added] (ens.lycos.com, cited above)

> Barcellos-Hoff and her team focused on the signaling -- crucial to normal functioning -- that takes place between a cell and the microenvironment of its surrounding tissue. ...'Our data is pointing to the tissue surrounding breast cells as a primary target of ionizing radiation damage,' Barcellos-Hoff said. Radiation damage to this surrounding tissue generated signals that changed how the breast

> cells' genomes were expressed. A new cell type was created with physical characteristics that were cued to act cancerous by the signals coming from outside the cell. The discovery suggests new and possibly more effective means for preventing breast cancer. 'Repairing damaged tissue so that it once again suppresses instead of promotes carcinogenesis is a simpler strategy for stopping the cancer process, compared to trying to repair individual damaged cells,' says Barcellos-Hoff. (ens.lycos.com, cited above)

In Barcellos-Hoff's most recent research, which is about to be published, "a special line of nonirradiated, nonmalignant breast cells were transplanted into irradiated mammary glands. Nearly 75 percent of the glands developed tumors," and the tumors continued to form for up to 14 days after the radiation exposure. Whereas, tumors developed in only "less than 20 percent" of the mammary glands when the same type of cells were transplanted into nonirradiated mice.

"Ionizing radiation is a well-known carcinogen, but previous studies of its cancer-causing effects have focused mainly on damage to the DNA of the breast cells." Barcellos-Hoff's research takes a new tack, as she notes, "It takes a tissue to make a tumor. Cells don't become tumors without cooperation from the surrounding tissue. Cancer is a process that occurs at the tissue level and the question we ought to be asking is: How do *tissues* become tumors?" Not how do *cells* become cancerous, which has been the question that medical researchers have pursued without much success.

"Ionizing radiation is like a wound, in that it produces a defensive response from the affected tissue. Usually this helps to protect undamaged cells and eliminates those that have become abnormal," Barcellos-Hoff says. "However, if there is too much damage," the defense response can fail. (Yaris cited below.)

Dr. Barcellos-Hoff's previous research established: "Disruption of solid tissue interactions is a heretofore unrecognized activity of ionizing radiation as a carcinogen." "We have shown that ionizing radiation, a known carcinogen of human breast, elicits rapid, persistent, and **global changes** in the mammary microenvironment." (M.H. Barcellos-Hoff and S.A. Ravani, "Irradiated mammary gland stroma promotes the expression of tumorigenic potential by unirradiated epithelial cells," Cancer Research 2000 Mar 1;60(5):1254-60.)

"Ionizing radiation is a complete carcinogen, able both to initiate and promote neoplastic progression . . .The tissue response to radiation is a composite of genetic damage, cell death and induction of new gene expression patterns. ...radiation-induced microenvironments may affect epithelial cells' neoplastic transformation by altering the number of cells or their susceptibility." (M.H. Barcellos-Hoff, "The potential influence of radiation-induced microenvironment in neoplastic progression," Journal of Mammary Gland Biology and Neoplasia, 1998, 3(2):165-75.)

Again, these studies and others show that "communications between the cell and its microenvironment are crucial to normal functioning." This discovery may also lead to

new ways to prevent cancer by limiting exposure to ionizing radiation in the diagnosis of cancer. (Lynn Yaris, "Radiation Makes Even Healthy Breast Tissue Cancerous," Daily University Science News, 18 February, 2002. Visible on the Web at <http://unisci.com/stories/20021/0218024.htm.>)

Psychological Risks of Mammography

The first principle in medical diagnosis, as in treatment, is: first, do no harm. Physical damage is not the only danger in mammography screening; there are psychological risks as well. The article, "Risks in Modern Diagnosis," in the Journal of the Royal College of Physicians of London states: "Modern methods of diagnosis often create physical and mental stress to the patient, and have undesirable side-effects of varying kinds and degrees." The author includes mammography on the list of physically risky diagnostic techniques, adding that the mammogram procedure is physically and psychologically bound to "create a stress to which not every patient is accustomed, and to "demand considerable co-operation for which not every patient is prepared." (F. Rausch, "Risks in modern diagnosis," J R Coll Physicians Lond. (Clinical Medicine) (1978) Apr; 12(3):272-85.)

The psychological side-effects of mammography, including high levels of "psychopathological symptoms" in the premammogram condition, are documented in the article entitled, "Adverse psychological effects in women attending a second-stage breast cancer screening," in the May 2002 issue of the Journal of Psychosomatic Research. (B. Sandin, P. Chorot, R.M. Valiente, L. Lostao, and M.A. Santed, "Adverse psychological effects in women attending a second-stage breast cancer screening," J. Psychosom Res. 2002 May; 52(5):303-9.) The womens' concerns about testing "(premammogram, postmammogram, and follow-up)," such as "worry, fear, and perceived vulnerability" (all of which may depress the immune system) are, even if temporary, a costly price to pay if mammography is not saving lives.

Do Not Be Misguided Regarding Medical *Diagnostic* Procedures Involving Ionizing Radiation.

(II.) CT Scans

CT Scans in Children Linked to Cancer

"CT scans (also called CAT scans) use digital computers and rotating x-ray devices to create detailed cross sectional images of organs and body parts," in order to detect disease and to plan and evaluate treatment. (Imaginis cited below; Sternberg cited below). CT scans are used in about 4% of medical X-ray examinations, but they contribute to an estimated 40% of the total radiation dose to the entire population from

diagnostic tests. (Joseph Mercola, M.D., "1500 Children Die Every Year From CT Scans," Mercola.com, 4 Feb. 2001<www.mercola.com/2001/feb/4/ct_scans.htm>; Imaginis.com)

"Each year, about 1.6 million children in the United States get CT scans to the head and abdomen -- and about 1,500 of those will die later in life of radiation-induced cancer," per Dr. David Brenner of the Center for Radiological Research at Columbia University, and colleagues. This study is the first to estimate the risks of radiation-induced fatal cancer from pediatric CT scans. (See D.J. Brenner et al., "Estimated Risks of Radiation-Induced Fatal Cancer from Pediatric CT," American Journal of Roentgenology, 2001 Feb;176(2).)

"Radiation doses from computed tomography (CT) scans are often higher than needed," according to two studies published in the American Journal of Roentgenology. The Donnelly study found that "the technical components of CT scans that influence radiation exposure, such as the x-ray tube current, may be set unnecessarily high at many centers. According to the researchers, the protocols used on many children are default settings typically intended for adult use. Since children are much smaller than adults, lower x-ray doses can be used to create suitable images." (See "Studies Find Radiation Doses From CT Scans Often Too High For Children,"Imaginis.com Health News, 26 January 2001" <http://imaginis.com/ct-scan/news/news1.26.01.asp?mode=1>.)

Dr. Brenner recommended cutting the adult dose in half, which would yield a clear image and cut the risk in half, as well. (Sternberg)

An article entitled, "CT scans in children linked to cancer" in USA Today states that according to Lane F. Donnelly, M.D., a radiologist from the Department of Radiology at Children's Hospital Medical Center in Cincinnati, and colleagues -- because CT scans performed on children are usually calibrated for adults, "children absorb two to six times the radiation needed to produce clear images. These doses are 'way bigger than the sorts of doses that people at Three Mile Island were getting'," Dr. Brenner says. He adds, "Most people got a tenth or a hundredth of the dose of a CT." (Steve Sternberg, "CT scans in children linked to cancer," USAToday.com Health, 19 June 2001 <http://www.usatoday.com/news/nation/2001-01-22-scans.htm.> See L.F. Donnelly et al., "Minimizing radiation dose for pediatric body applications of single-detector helical CT: strategies at a large Children's Hospital," American Journal of Roentgenology, 2001 Feb;176(2):303-6.)

"There's a huge number of people who don't just receive one scan," says Dr. Fred Mettler of the University of New Mexico. Mettler published a study showing that 11% of the CT scans at his center are done on children under 15, and they get 70% of the total radiation dose given to all patients. Childrens' cells divide more rapidly than adults and are more susceptible to radiation damage than adults. "The breast dose from a CT scan of the chest is somewhere between 10 and 20 mammograms. You'd want to think long and hard about giving your young daughter 10 to 20 mammograms unless she really needs it," Dr. Mettler warns. (Sternberg)

The number of CT scans performed in recent years has risen drastically, further creating the need to minimize radiation exposure during the test. Dr. Donnelly recommends that the radiation dose for a pediatric CT scan be set based on the patient's weight. "These adjusted doses are significantly lower than those used in the past, yet they still produce high quality images." (Imaginis.com)

To ensure that their child receives a safe and necessary CT scan, parents may wish to follow these guidelines:

1. Ask whether the scanning protocol has been optimized for the child's weight and body type (this is especially important if the CT scan is not performed at a children's center).
2. Make sure the CT scan is absolutely necessary, especially if multiple CT scans are performed.
3. Request that the child's body (or adult's body) be properly shielded with lead aprons during the exam. For example, if a head CT is being performed, the patient's chest, abdomen, and pelvis can be shielded on all sides. (Imaginis.com)

It is important that radiologists and radiologic technologists subscribe to the principle of "As Low as Reasonably Achievable" (ALARA) or "As Low as Reasonably Possible" (ALARP). In essence, the ALARA/ALARP principle emphasizes using as little radiation as possible in order to achieve a needed diagnostic result. This can be accomplished by various means including controlling: how many x-ray exams are ordered, the type of x-ray exam ordered, how often the exam is performed, performing the exam as accurately as possible to avoid repeat x-rays, and using the lowest x-ray dose possible to achieve the needed diagnostic result. (Imaginis.com)

Dr. Joseph Mercola comments on the Donnelly study published in the American Journal of Roentgenology: "This is a hugely important study and the message is quite clear. Avoid CT scans unless you or your child's life depends upon it. Frequently an MRI imaging study can achieve similar results. MRIs are far safer than CT scans. They should also be used with caution, but, to the best of my knowledge, [they] are not associated with an increased cancer rate."(Mercola.com, 4 Feb. 01)

Body Scans Offer False Reassurances: Reconsider Having Full-Body CT Scans

"From Beverly Hills to Baltimore, free-standing scanning centers, some located in shopping malls and many owned by radiologists, have sprung up in affluent metropolitan areas," offering a head-to-pelvis CT scan "for a $700 to $1,300 fee that is rarely covered by insurance." (Sandra G. Bookman, "Body Scans Offer False Reassurances," Washington Post, 13 Nov. 2001; Page HE01; on Mercola.com <http://www.mercola.com/2001/nov/28/body_scans.htm.> Dr.E. Stephen Amis, Jr., Chairman of the Radiology Department at Albert Einstein College of Medicine in New

York says, 'These centers are entrepreneurial ventures, and they make a ton of money. That's why they're growing as fast as they are,' not because they are medically sound."(Bookman)

"Food and Drug Administration officials are worried that the growing popularity of full-body scans for early health screening might be exposing thousands of Americans to unnecessary and potentially dangerous radiation." (Marlene Cimons, "Reconsider Having Screening Full-Body CT Scans," New Jersey Star-Ledger, 5 June 2001;on Mercola.com, 20 June 2001 <http://www.mercola.com/2001/jun/20/ct_scans.htm.>)

The "Facilities offering full-body CT examinations, which are heavily advertised and expensive, are sprouting nationwide, luring affluent consumers who think they are buying peace of mind with the promise of early warning for cancers, heart problems and other diseases." (Cimons) These centers play on "people's emotions, and everybody knows somebody -- a friend or colleague or relative -- who could have been saved if only their cancer had been discovered earlier," notes Richard Mintzer, Chairman of the Radiology Department at Northwestern University Medical School in Chicago. (Bookman)

"But, FDA officials say, clinics and other facilities are giving healthy consumers higher-than-conventional doses of radiation that are unlikely to do any good." (Cimons)

In the year 2000, the American College of Radiology issued a statement saying it did not endorse such scanning. The group expressed concern "that this procedure will lead to the discovery of numerous findings that will not ultimately affect patients' health, but will result in increased patient anxiety, unnecessary follow-up examinations and treatments and wasted expense."

"Some of these people are in the business to scan anybody who comes through the door," said Thomas B. Shope of the FDA's Center for Devices and Radiological Health. "If you've got the money in your wallet, you're going to get scanned." (Cimons)

"There is little the FDA can do about it, however. After the agency has approved medical devices for any purpose, it has no authority to regulate their actual use." (Cimons)

"The FDA approved the scanning devices to peer into individual sites on the body where illness is suspected, but it cannot stop doctors from using them for full-body scans." (Cimons)

"For people without symptoms, many doctors believe the risks from the radiation more than offset the benefits from the unlikely detection of some types of early cancers or other diseases . Moreover, experts note that suspicious but ultimately harmless findings can trigger unnecessary additional testing and provoke needless anxiety." (Cimons)

"For an average Joe to walk in off the street and get himself screened from head to toe is probably a bad idea, especially if he isn't in any risk group," said John Cardella, Chief of the Radiology Department at the State University of New York-Upstate Medical University in Syracuse, who served on an FDA advisory panel examining the issue."(Cimons)

"The scans emit far more radiation than conventional X-rays -- **a CT scan of the chest delivers 100 times the radiation of a conventional chest X-ray**." (Cimons)

And "You are doing more of the body at one time," Shope said. "You're exposing all of the organs." Most physicians would not be likely to prescribe full-body scans for patients, because studies have not proven them effective. (Cimons)

"Consumers typically decide on their own to get them and pay premium prices -- as much as $1,300 in some facilities. Because the procedure is not covered by insurance, there are no records of how many such scans are being performed nationwide."(Cimons)

"But magazines and Web sites are flooded with ads promoting such scans as a way to catch health problems early." (Cimons) Thomas B. Shope, Jr., Special Assistant to the Director of the FDA's Office of Science and Health, said "There is no scientific evidence that whole-body scanning detects disease early or saves lives." "What's not clear is whether these CT scans do more good than potential harm," said Shope, a physicist, who worries that radiation exposure could increase the risk of developing cancer, especially in those who undergo repeated scans." "Shope estimates that one total-body scan exposes a patient to the amount of radiation equivalent to 400 to 500 chest X-rays."(Bookman)

It's difficult to find a radiologist unaffiliated with a scanning center who believes whole-body tests are appropriate for people without symptoms.

"These scans are a bad idea," said Michael J. Pentecost, Chairman of the Radiology Department at Georgetown University School of Medicine. "A person can have terrible metabolic problems that are not detected by CT scan,"-- such as diabetes or hypertension, two of the leading causes of disability and death." "Another drawback, Pentecost and other critics say, is inaccuracy." False negatives -- the failure to find a significant problem -- and false positives -- the incorrect indication of a serious problem -- which inevitably triggers further testing that can be risky and expensive." (Bookman)

The scanning facilities want every adult to get a full-body scan, covered by insurance. (Cimons) "But critics -- including prominent radiologists, health economists and officials at the Food and Drug Administration -- say that the practice of indiscriminately scanning healthy people is unproven, ill-advised and potentially dangerous." The FDA says that CT technology "is far too imprecise to be used as a mass screening tool." (Bookman)

Joseph Mercola, M.D. comments, "There just does not appear to be any significant benefit from having these CT scans to detect disease. This is especially true for the Ultrafast CT heart scans that have been so prominently promoted in many cities to check for heart disease."(Mercola, 20 June 01)

"Just about everyone by now knows that X-rays can increase your risk of developing cancer." (Mercola, 20 June 01) " [All X-rays] need to be used with extreme caution, if at all, **especially if the patient is a young child as they are particularly susceptible to the damage of radiation**." (Joseph Mercola, M.D., "CT Scan Radiation Risk Even Concerns Conservative FDA Officials," Mercola.com., 30 May 2001).

If you still think you should have a CT scan check-up, and bring the kids, too, Dr. Mercola recommends "an outstanding comprehensive analysis of this area," Radiation from Medical Procedures in the Pathogenesis of Cancer and Ischemic Heart Disease, by John W. Gofman, M.D., Ph.D. (Mercola, 20 June 01)

Radiation from Medical Procedures in the Pathogenesis of Cancer and Ischemic [Coronary] Heart Disease by John W. Gofman, M.D., Ph.D.

John W. Gofman, M.D., Ph.D., Professor Emeritus, Molecular and Cell Biology at the University of California at Berkeley is a nuclear physicist and a medical doctor. Dr. Gofman proposes two hypotheses in his definitive text on the dangers of X-Rays:

- Hypothesis-1: Medical radiation is a highly important cause (probably the principal cause) of cancer mortality in the United States during the Twentieth Century. Medical radiation means, primarily, exposure by X-rays (including fluoroscopy and CT scans).
- Hypothesis-2: Medical radiation, received even at very low and moderate doses, is an important cause of death from Ischemic Heart Disease; the probable mechanism is radiation-induction of mutations in the coronary arteries, resulting in dysfunctional clones (mini-tumors) of smooth muscle cells.

In his conclusion, Dr. Gofman says, "Since its introduction . . ., medical radiation has become a necessary co-actor in most fatal cases of Cancer and Ischemic Heart Disease (IHD)." (John W. Gofman, M.D., Ph.D., Radiation from Medical Procedures in the Pathogenesis of Cancer and Ischemic Heart Disease: Dose-Response Studies with Physicians per 100,000 Population (San Francisco: Committee for Nuclear Responsibility) 1999.<http://www.ratical.org/radiation/CNR/RMP/execsummP.html>

> The evidence in this monograph has major implications for prevention of Cancer and IHD. This monograph points to demonstrations, by others, of proven ways to reduce dose-levels of nontherapeutic medical radiation by 50% or considerably more, without eliminating a single diagnostic or interventional radiologic procedure and without degrading the information provided by medical

radiation. Reduction of exposure to medical radiation can and will reduce mortality rates from both Cancer and Ischemic Heart Disease.(Gofman, p. 17)

The finding, that radiation from medical procedures is a major cause of both Cancer and Ischemic Heart Disease, does *not* argue against the use of X-rays, CT scans, fluoroscopy, and radioisotopes in diagnostic and interventional radiology [e.g. during surgery]. Such uses also make very *positive* contributions to health. We deeply respect those contributions, and the men and women who achieve them. (Gofman, p. 32)

But no one honors the x-ray by treating it casually or by failing to acknowledge that it is a uniquely potent mutagen. One honors the X-ray by taking it seriously. While doses from diagnostic and interventional radiology are very low *relative to doses used for cancer therapy*, diagnostic and interventional X-ray doses today are far from negligible. The widely used CT scans, and the common diagnostic examinations which use fluoroscopy, and interventional fluoroscopy (e.g., during surgery), deliver some of the largest nontherapeutic doses of X-rays. In 1993, the United Nations Scientific Committee on the Effects of Atomic Radiation warned, appropriately, in its Annual Report:

"Although the doses from diagnostic X-ray examinations are generally relatively low, the magnitude of the practice makes for a significant radiological impact."(UNSCEAR 1993, p.228/40). (Gofman, p. 32)

Do Not Be Misguided Regarding Medical *Therapeutic* Procedures Involving Ionizing Radiation.

Radioactive Bursts to Keep Your Arteries Open???????

"The prestigious New England Journal of Medicine published a study that showed a dose of radiation can help keep heart arteries wide and clear after artery-clearing angioplasty. ... Fortunately, the system used in the study is not approved for use in the United States [--yet]." A "rise in blood clots was linked to an increased rate of heart attacks, which was more than twice as high in radiation-treated patients. The study was funded by Cordis, the New Jersey-based manufacturer of the technology."

Several of the researchers have served as consultants or received funding from companies involved in the development of radiotherapy. (NEJM 2001;344:243-256, 295-299.)

Dr. Joseph Mercola comments: "This is the most ridiculous and idiotic study I have ever seen published in a real journal. It is almost unbelievable that this was even considered for a trial, let alone published."

"This is an important issue as more than 500,000 angioplasties are performed every year in the US and blockages occur in one-third within six months."

"There are a number of illustrative and very interesting points in this study."

First, "the study was funded by the device's manufacturer." Secondly, "all the investigators were paid consultants for the manufacturer."

"Do you think there might have been the slightest bit of bias in this study? The follow-up was only for nine months and even in that limited time there was a doubling of the heart attack rate due to an increase in blood clots."

"The gamma-radiation used in this device takes the form of photons and penetrates well beyond 10 mm. This will absolutely increase the person's risk of developing a future cancer."

"The answer to prevention of the artery blockages is to follow the diet and exercise. One also needs to consider factors like homocysteine."

"If the blockage becomes more severe it would be wise to consider EDTA chelation which has helped tens of thousands of patients. It is not a magic bullet, but it is far more effective than bypass as it addresses all the miles of blood vessels in the body, not just the two inches of arteries on the heart."

"The dangerous issue here is that the Food and Drug Administration granted approval for two devices to deliver this radiation. Given this approval, it is possible that there will be widespread dissemination of this technique before its safety and efficacy have been established."

"Just remember, . . . this therapy is utter nonsense and should be avoided like the plague. It has no place in the management of this problem." (Joseph Mercola, M.D., "Radioactive Bursts To Keep Your Arteries Open???????" Mercola.com, 4 Feb 2001, <http://www.mercola.com/2001/feb/4/radiation_arteries.htm.>)

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by Gary Null, PhD
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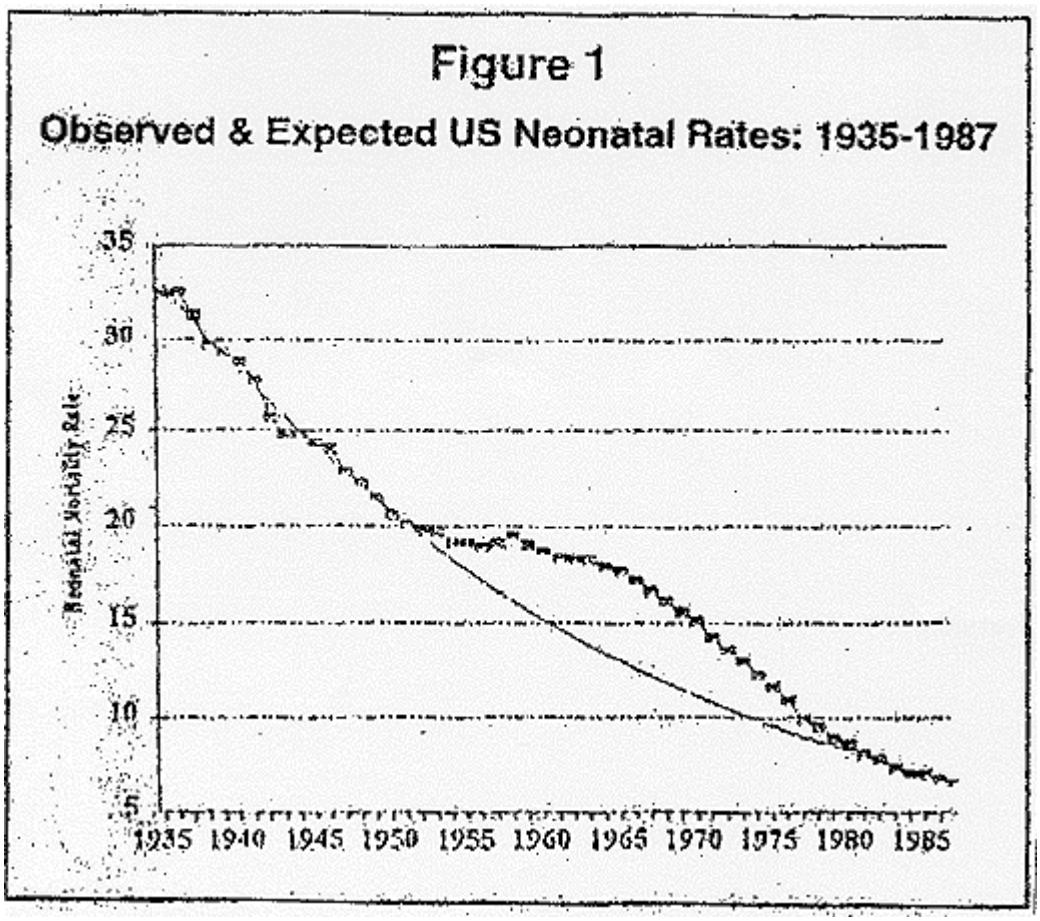

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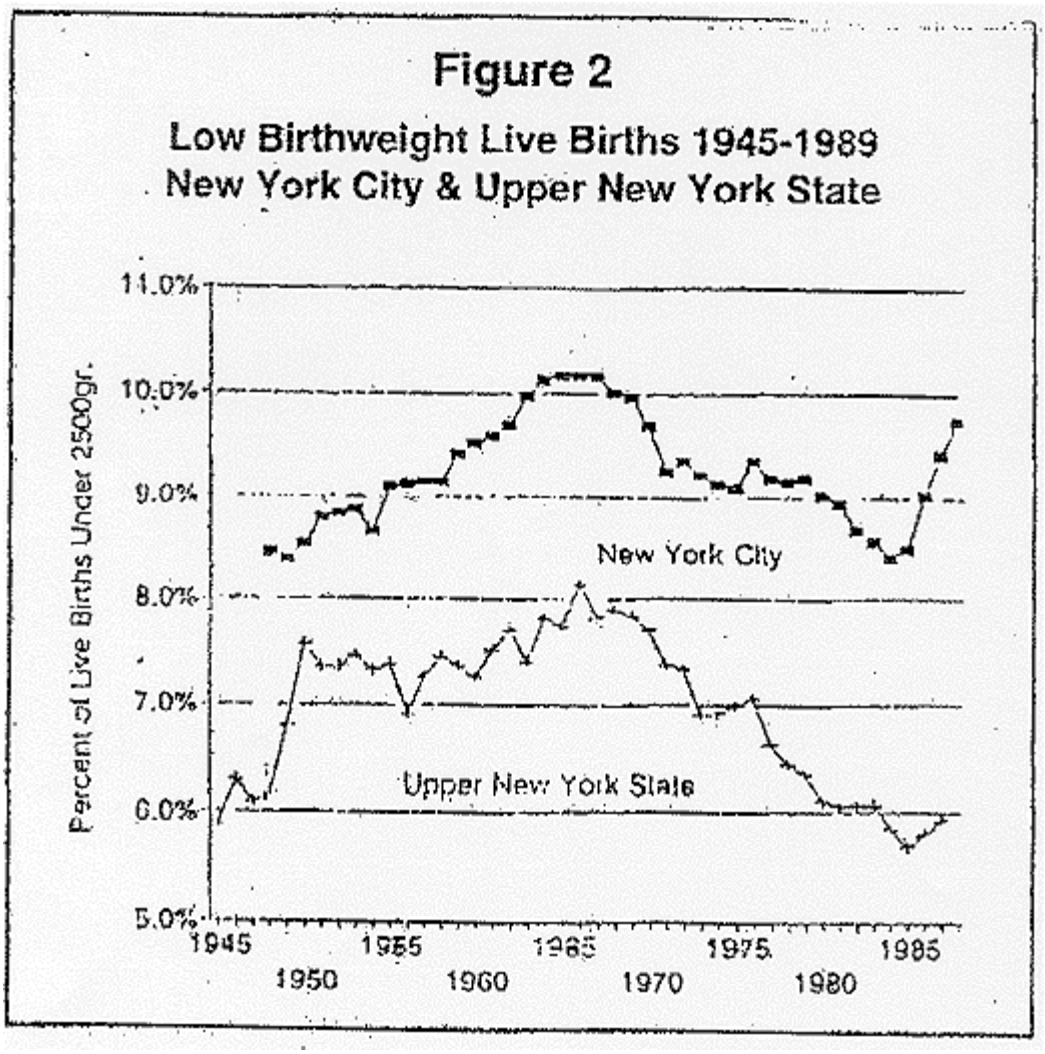

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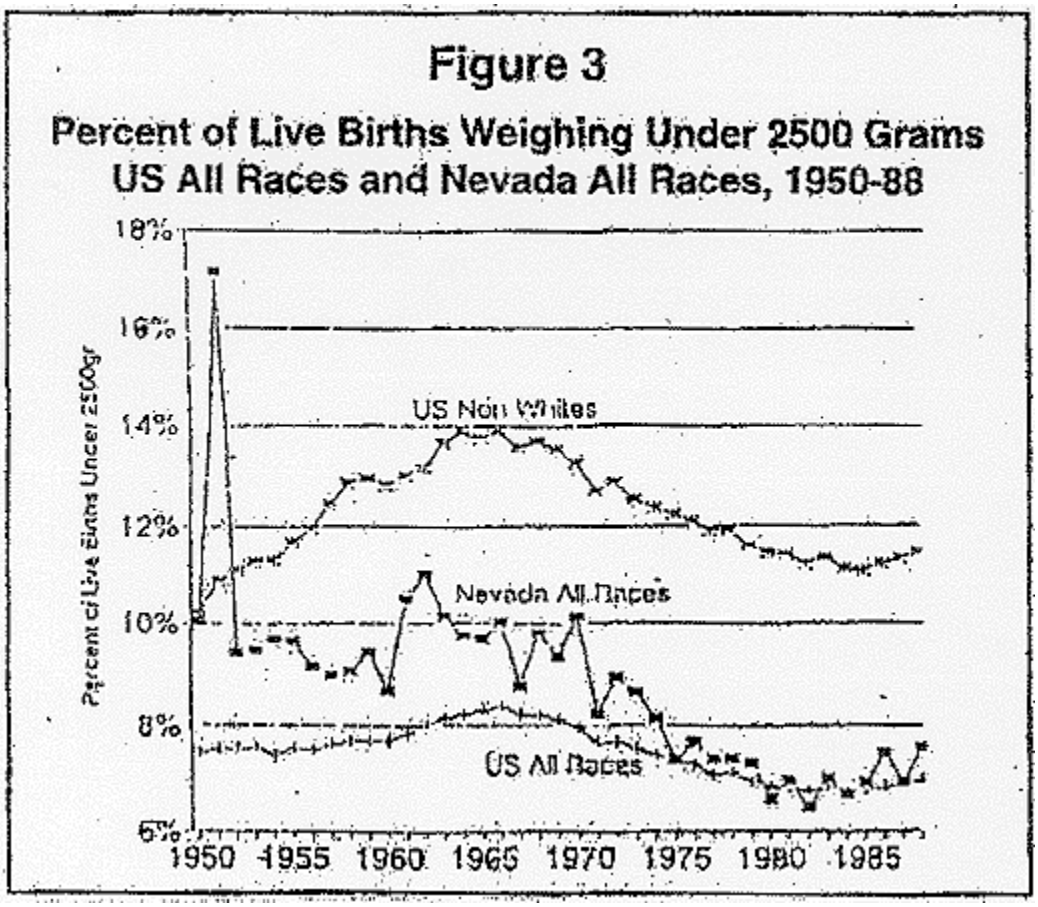

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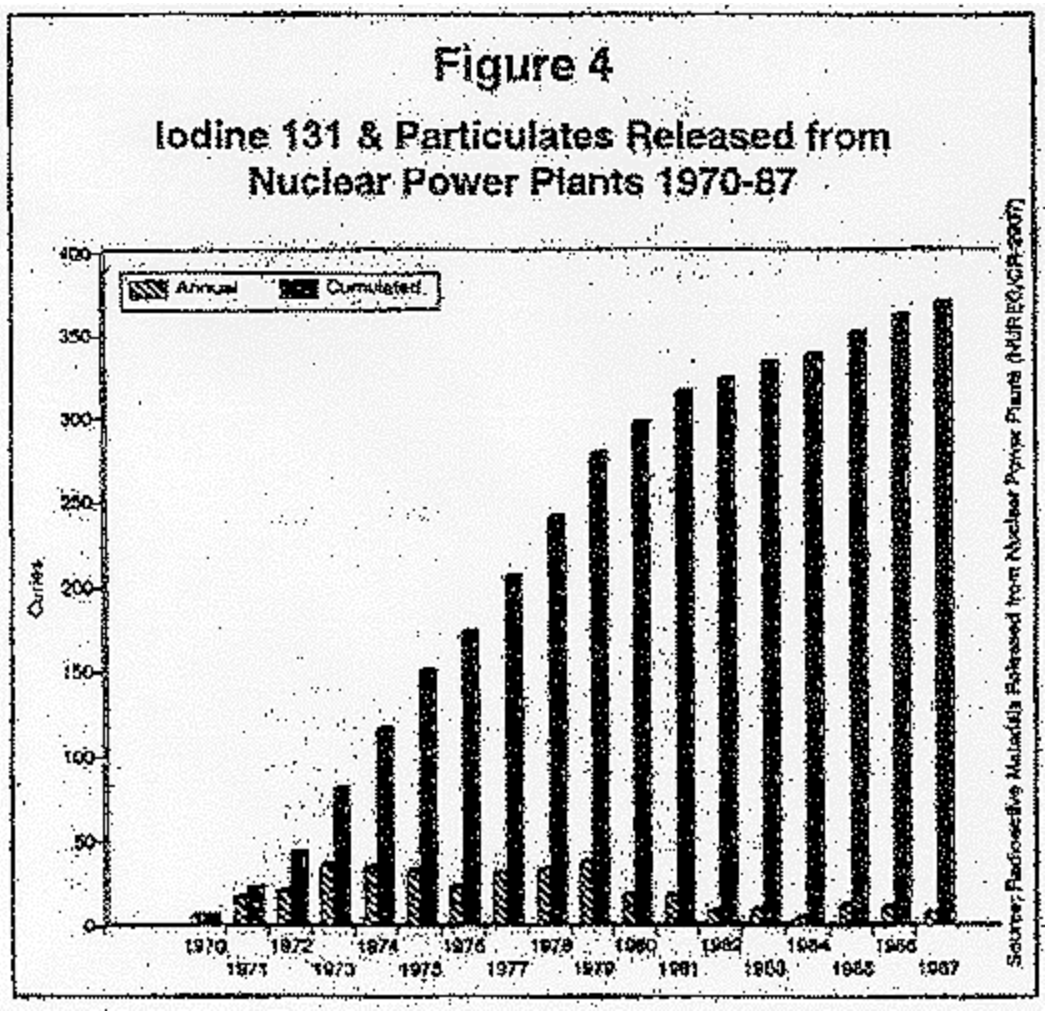

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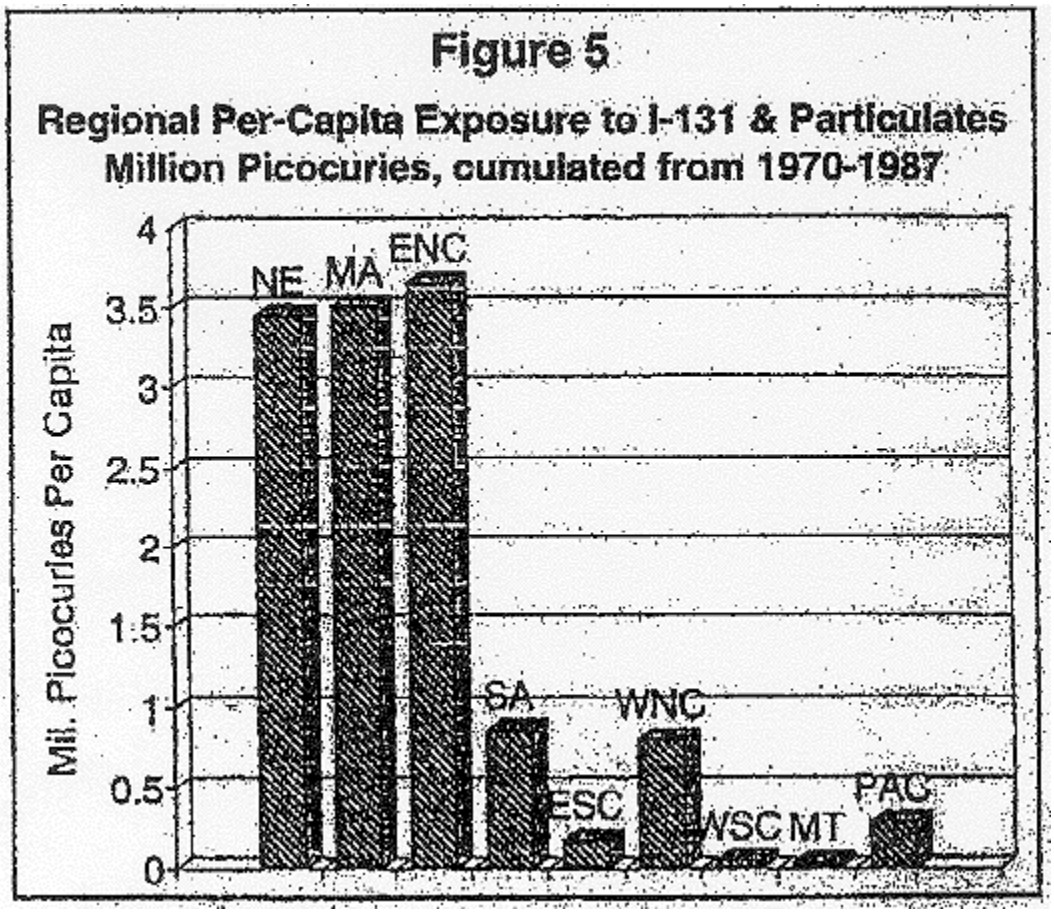

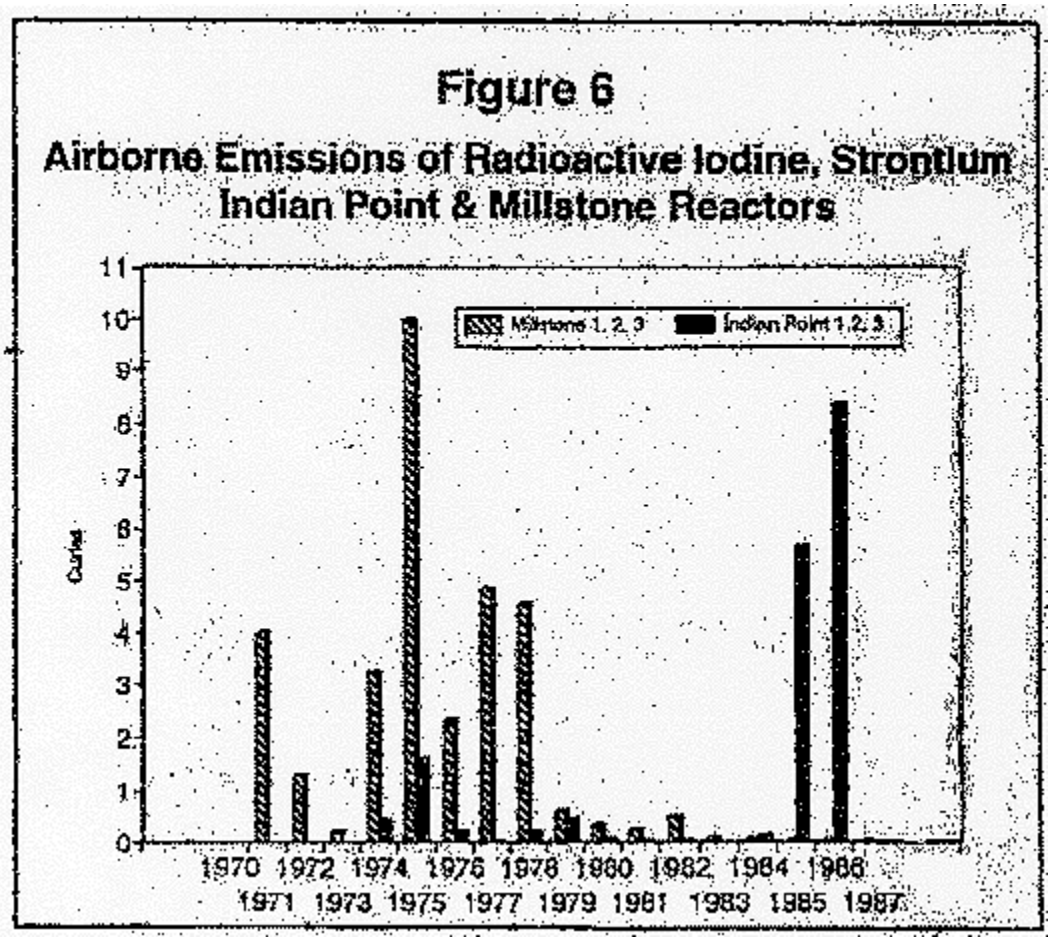
Figure 6
Airborne Emissions of Radioactive Iodine, Strontium
Indian Point & Millstone Reactors
Millstone 1, 2, 3
Indian Point 1, 2, 3
Curies
0
1
2
3
4
5
6
7
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1970 1972 1974 1976 1978 1980 1982 1984 1986
1971 1973 1975 1977 1979 1981 1983 1985 1987

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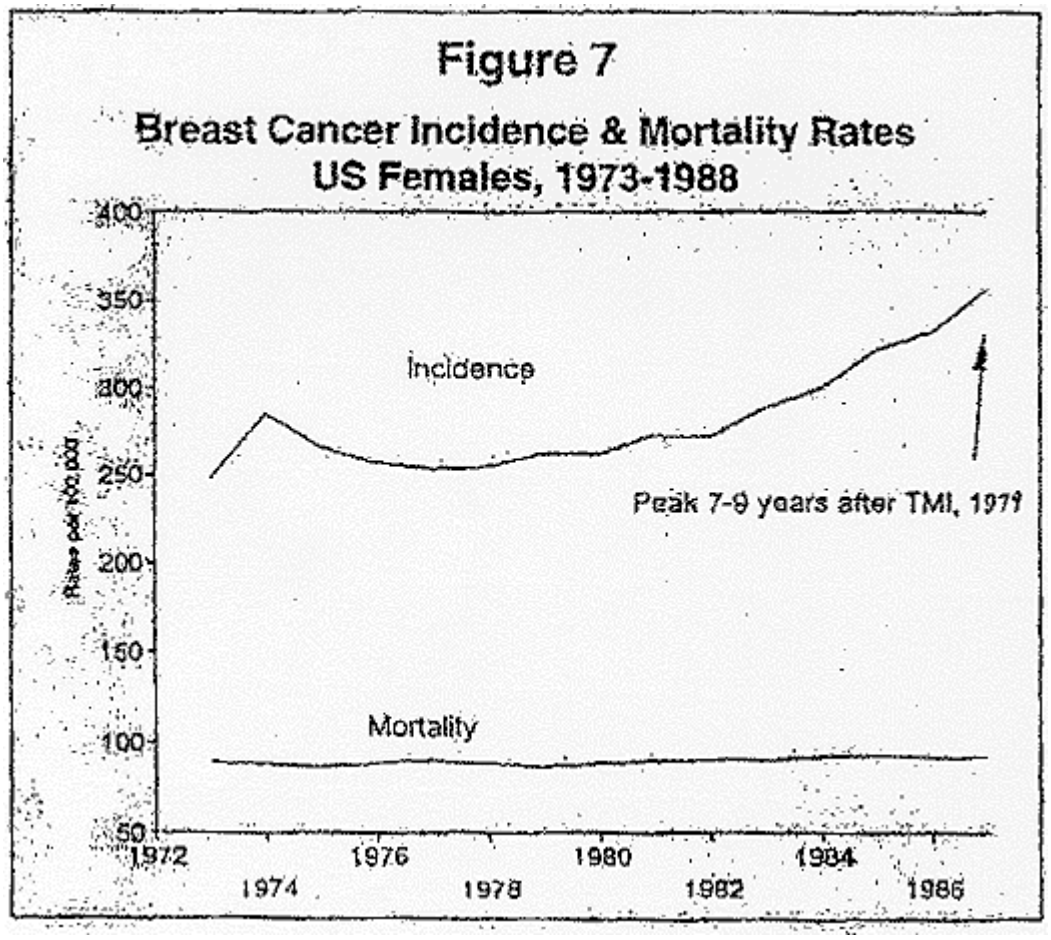

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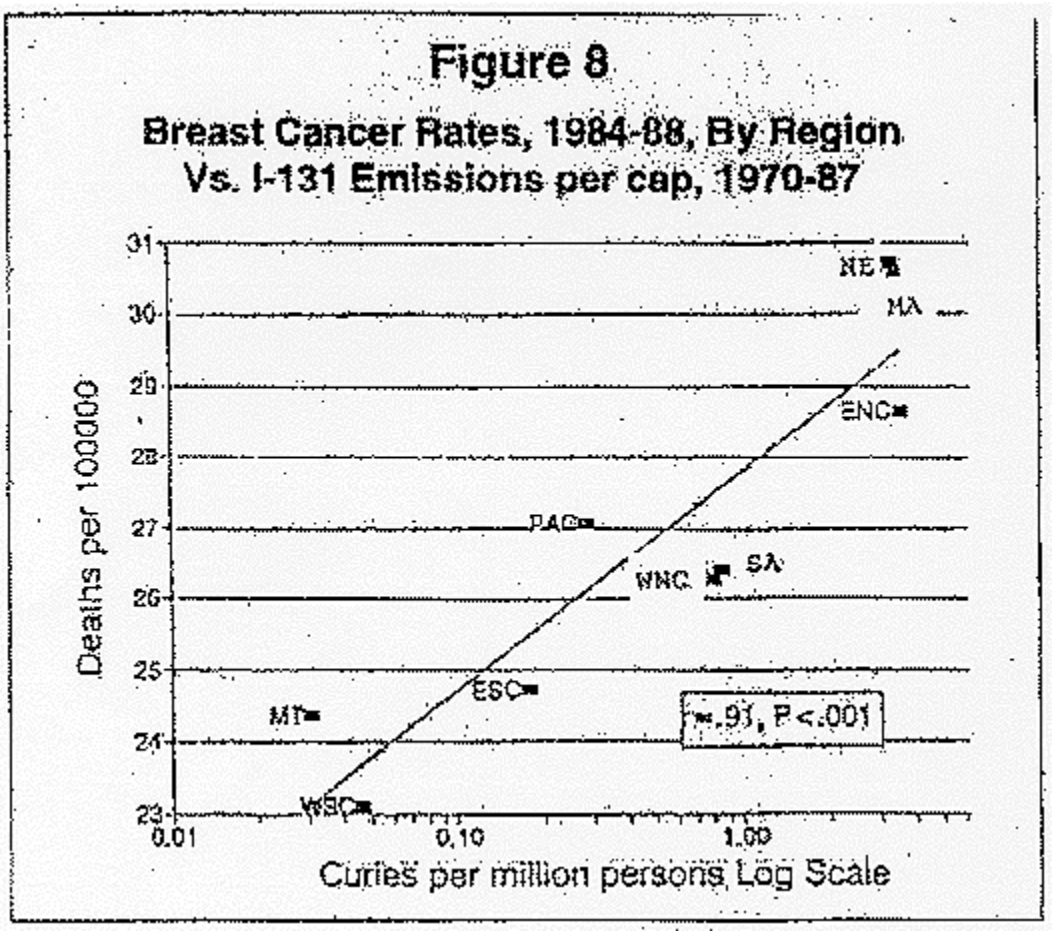

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