A Study of Recent Rises in Leukemia and Other Mortality Rates in Oregon Following Radioactive Releases from the Trojan Nuclear Plant

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A recent sharp rise in leukemia deaths, cancer deaths and other adverse effects on human health in Oregon appears to be linked to the release of radioactivity from the Trojan Nuclear Plant 35 miles northwest of Portland following leakages from damaged fuel rods that occurred in late 1981 and early 1982.

An analysis of the Oregon Vital Statistics and the official reports of the Nuclear Regulatory Commission indicate that following the rise in the reported releases of radioactive fission products into the environment, deaths due to leukemia increased 70% in Portland between 1980 and 1988. For Oregon as a whole the leukemia mortality rate rose only 31% while it declined 2.7% for the entire nation during this period, according to a study by a New York health research organization.

The link to the releases from the Trojan plant is strengthened by a similar rise of leukemia incidence around the Pilgrim Nuclear Plant near Plymouth, Massachusetts, recently reported by the Massachusetts Health Department, which had comparable releases of radioactive iodine and bone-seeking fission products into the air and water in 1981-82. In both cases, the leukemia rates decreased with distance away from the plant, as would be expected if they are associated with radioactive emissions from

damaged fuel rods such as iodine-131 and strontium-90.

In the case of northwest Oregon, for counties with a population large enough to have recorded at least five leukemia deaths per year in 1980, the change in the reported death rate was greatest in the City of Portland and in Multnomah County, followed by Washington County directly south of Columbia County where the reactor is located, which showed a rise of 20% . In sharp contrast, the more distant suburban and rural counties to the south in the Willamette Valley actually showed declines in leukemia mortality as did the U.S. as a whole, but even greater in magnitude. For example, Clackamas County south of Portland declined by 18%, and Yamhill County by 59%.

It is important to note that ordinary toxic chemicals cannot be a significant factor in this recent rise in leukemia in the Portland area since there is no industrial area in Columbia or Multnomah County that is among the 400 industrial areas in the nation which generate most of the toxic chemical wastes.

For Oregon as a whole, the number of leukemia deaths rose from a low of 183 in 1980 to 253 in 1988, a highly statistically significant increase by more than three times the normally expected random fluctuation, likely to occur by chance less than once in a thousand cases. The link to radioactive fission products in the milk and diet is supported by measurements of higher strontium-90 levels in the milk near the Trojan reactor which decrease with distance away from the plant, together with recent studies at the University of Utah by Dr. Victor Archer and his co-workers linking the levels of strontium-90 in milk measured at different distances from the Nevadato test-site to leukemia mortality rates across the United States.

Still further support for a linkage to radioactive releases from the Trojan Reactor in Columbia County is the fact that for Oregon as a whole total cancer rates rose 20% from 175.7 per 100,000 population in 1980 to

211.6 by 1988. If the 1988 cancer mortality rate had remained the same as in 1980, there would have been 987 fewer cancer deaths in Oregon in 1988. A plateau in the cancer mortality rate had in fact occurred in Oregon for the period 1970-74 just before the Trojan reactor went on line in 1975 according to the Oregon Vital Statistics Reports, after which a new period of cancer mortality rises began that rose more rapidly after the 1981-82 fuel failure.

Since leukemia is known to be a more sensitive indicator of radiation effects than all cancers combined, the fact that the leukemia mortality rose more strongly than that for all cancers further supports a causal relationship between the published releases from the Trojan plant and the mortality rises. Furthermore, the fact that the peak in leukemia mortality occurred some six to seven years after the release of the radioactivity due to the fuel failure further strengthens the link to radioactive discharges from the plant since such a delay corresponds to the known delay between radiation exposure and the peak of mortality as seen for the survivors of the atomic bombs as well as for the individuals exposed downwind from the Nevada test-site in the most recent University of Utah reports.

It is also highly significant that the greatest rise in cancer mortality among all the 36 counties of Oregon for the years 1980 to 1988 took place in Columbia County where the reactor is located, increasing from 148.7 to 222.8 deaths per hundred thousand poulation, a rise of 50% compared with 20% for the state as a whole. By 1988, rural Clatsop County adjacent to Columbia County to the west had risen 30% to reach a high of 279.4 cancer deaths per hundred thousand population.

The finding of such highly statistically significant increases in leukemia and cancer mortality despite the fact that the releases were far below those permitted by the operating license of the plant and existing government radiation standards may be understood as follows.The existing permissible discharges and the resulting permissible radiation doses were calculated on

the assumption that there is a simple straight-line or linear relation between the dose to the body and the increase in the risk of cancer. Using this assumption, the standards for small doses were arrived at using the data obtained at the high doses received by the A-bomb survivors by drawing a straight-line all the way down to zero dose.

However, a growing number of laboratory studies and the follow-up of individuals exposed to radiation carried out in recent years have shown that the straight-line relationship assumed when the present standards were set does not apply for low doses of radiation received over extended periods of time, such as from internally deposited strontium-90. Thus, Stokke and co-workers found already in 1968 that bone-marrow cell damage increases much more rapidly at very low doses of a few millirads and then flattens out at higher doses. As a result, the previously assumed linear relationship on the basis of which the risk of very small doses was calculated from the data at high doses turns out to have underestimated the effect of small radiation doses by some 100 to 1000 times.

The present study found that the relation between the dose received from the announced releases of the Trojan plant and the increased incidence of cancer is in fact concave downward or "logarithmic" in form and not linear, rising rapidly for small doses and flattening out to a slowly rising curve for the higher reported doses.

This result is in agreement with the concave downward form of the relation between dose and cancer risk observed for the case of workers at the Hanford nuclear weapons facility by Kneale, Stewart and Mancuso in 1981. Such a "superlinear" shape of the dose-response relation is in agreement with the findings of Dr. Abram Petkau that protracted doses produce indirect chemical damage to cell-membranes primarily via the production of unstable molecules or free radicals that are much more efficiently produced at low dose rates than at the high intensity exposures

to gamma rays or medical X-rays, which involve mainly direct damage to the DNA in the cell nucleus and which is very effectively repaired. As a result a curvilinear dose-response relation is found to hold at low doses that produces effects hundreds of times greater than arrived at by extrapolation from high doses.

In this connection, it is important to note that a recent study of cancer incidence in a ten-mile area around the Three Mile Island nuclear plant by Hatch and her co-workers at Columbia University showed a similar concave downward form of the dose-response relationship for all cancers combined, though it could not establish a statistically convincing case for a link of leukemia to the radiation released during the accident because of the small size of the population studied compared with the present study.

Still further support for an unexpectedly serious effect of low doses of radiation released from the Trojan plant comes from the fact that deaths from all causes combined during the period of 1978-86 corrected for the differences in the age-distribution as calculated by the Oregon Center for Health Statistics were highest in the Oregon counties directly downwind to the east, and then declined with increasing distance away along the Columbia and Willamette Valleys. A similar pattern was found for the number of infants born below normal weight as well as for infants born with birth defects, effects that are long known to be caused by radiation.

The Oregon statistics also show that after a decade-long decline, deaths due to asthma rose, beginning at the time the releases of radioactive gases from the Trojan Nuclear Plant began in 1976, with a sharp peak following the massive fuel damage in 1981-82 . From a low of only 18 deaths in 1976, the deaths due to asthma rose to 33 by 1983, and to 74 by 1985, or to a rate of 27.7 per million, nearly 7 times the present national average of 4.2.

The increase in infants born with birth-defects provide another example of the serious nature of the health effects related to the operation of the

Trojan plant. Between the four years of 1971 to 1974 just before the Trojan reactor first began operations in late 1975 and the four years of 1983 to 1986 after the large increase in radioactive releases from the damaged fuel-rods, the number of infants born with birth-defects in Columbia County where the reactor is located rose sharply from 8 to 31 cases. In the two rural Oregon counties of Columbia and Clatsop nearest to the plant combined, the incidence of birth defects rose from 26 to 56 cases, a statistically highly significant increase of 115% . This may be compared with Oregon as a whole, for which the number rose from 1316 to 1817, a large increase of 501 infants born with congenital defects, but in relative terms by only 36%, consistent with the greater distance from the reactor for the average person living in the state.

Taking into account the changes in the number of live births, the rate of congenital defects reported on birth certificates per 1000 live births rose 250% in Columbia, 91% in the two counties of Columbia and Clatsop nearest the reactor combined, and only 12% for Oregon as a whole in this period, showing the geographical pattern expected for an effect that spreads from the stack of the plant and declines with distance away.

The link of these serious health effects to radioactive fission products produced by nuclear reactors is further strengthened by the finding of a similar increase in deaths and underweight births accompanied by birth defects following the arrival of fallout from the Soviet reactor accident at Chernobyl in the U.S. during the month of May 1986. As documented in official reports by the Oregon Department of Human Resources, the EPA and the Department of Energy, the Pacific Coast states received the highest amount of radioactive iodine-131 in their milk and water of any area in the U.S. due to heavy rains that brought down most of the fallout. This exposure to fallout radiation was followed by a further rise of asthma deaths from the 52 cases recorded in 1986 when the fallout arrived to 81 by 1988. This

rise from 18 cases just before the reactor began to release radioactive gases to 81 deaths by 1988 is similar to that observed in other urban areas such as New York and Chicago, but much larger in relative terms, consistent with the much closer proximity of the Trojan plant to the largest population centers and the sources of milk and other food products known to be the most important factors from our experience with bomb fallout.

The sharp rise in asthma deaths and illness among young children that now affects some 9.9 million people in the U.S. has caused great concern among specialists in the field because the reason for this rise is not understood, as recently discussed in an editorial in the Journal of the American Medical Association by two Portland area physicians. The present study suggests that it may be related to the releases from nuclear reactors which went into operation in many parts of the nation at about the same time as the Trojan reactor near Portland, since a similar epidemic of asthma deaths occurred in many countries around the world a few years after the height of atmospheric bomb fallout in the mid-1960's produced high levels of radioactive fission products in the milk and diet.

In the course of the examination of recent mortality trends in Oregon, it was found that those individuals born during the height of atmospheric bomb-testing between the mid-50's and 60's, whose immune systems were damaged by strontium-90 irradiating their bone-marrow during early development, showed a much larger increase in mortality rates following the radioactive releases from the Trojan reactor than older individuals born before the nuclear age began. Thus, the mortality due to all causes combined rose 10.1% for individuals in the age-group 25-44, but only 6.6% for those over 44 between the years 1982 and 1988. This implies that young persons born since the onset of releases from the large nuclear plants in the mid-70's are also likely to be born with impaired immune systems, and therefore will probably join the ranks of young adults with rising rather

than declining mortality rates in the next decade. It may also help to explain the particularly sharp rise in asthma deaths among young children in urban areas whose diet is affected by the fission products released from these plants through the milk that is often transported over great distances by modern refrigerated trucks from distant counties located near nuclear reactors, as in the cases of Portland, Chicago, New York and Washington.

The radiaoactive contamination of the air, the milk and the food produced by the Chernobyl accident has also been linked to large rises in total deaths, and infant mortality across the entire U.S. during the summer of 1986 in direct relation to the measured amount of iodine-131 in the milk, as published by the authors of the present study in January 1989 in a journal of the American Chemical Society. Similar effects of the low doses from distant Chernobyl fallout on the incidence of congenital defects and deaths of infants have since been seen not only in the Soviet Union but as far away as Germany, Finland, Hungary and Turkey as recently published in the British medical journal "Lancet".

The same Chernobyl fallout that came down in Oregon was also shown to have produced a sharp decline in the number of newly born birds in the Point Reyes Bird Observatory near San Francisco and other areas on the West Coast where rainfalls occurred at the time that the Chernobyl fallout cloud reached the U.S., as reported by Dr. David DeSante in 1987 in the journal "Condor". This finding independently supports the unexpectedly serious threat of low levels of nuclear radiation released into the environment not only to humans but to all forms of life.

It should be noted that the Health Division of the Oregon Department of Human Resources on whose data the present study is based has repeatedly drawn attention to the recent increases in cancer and total mortality rates in recent years. As stated in the opening paragraph of the section on mortality of the 1988 Vital Statistics Report: "For the fourth straight year,

the death rate was higher in Oregon than in the nation (883.0). The Oregon rates for the five individual leading causes of death worsened over the previous year compared to the nation as a whole." The present report provides a possible reason for this disturbing trend that must be considered in the absence of any alternative explanation.

The present study also implies that if the radioactive discharges into the environment were to end, one would expect a rapid decline in the incidence of birth defects, immature births, and infant deaths within a matter of only a few years, followed by a renewed decline in the total mortality rate that began in the early 1970's after the end of large-scale bomb tests in the Pacific and Nevada. Within a few more years leukemia and cancer mortality should also begin a decline, together with chronic obstructive lung disease deaths, which the 1988 Oregon Vital Statistics Report singles out as having increased the most since 1980, especially for women whose death rate had risen 79.6% due to this cause alone.

The authors of the study, Dr. Jay M. Gould of the New York based Radiation and Public Health Project and Dr. Ernest J. Sternglass, Professor Emeritus of Radiology at the University of Pittsburgh School of Medicine will present their findings in Portland on Thursday, October 25th.
Dr. Gould is an author of "Deadly Deceit: Low Level Radiation, High Level Cover-Up" just published by Four Walls Eight Windows, New York. Dr. Sternglass is the author of "Secret Fallout: Low Level Radiation from Hiroshima to Three Mile Island" published by McGraw-Hill in 1981.
The authors may be reached in New York for further information at the following telephone numbers: (212)-580-1231 for Dr. Gould and (212)-362-1334 for Dr. Sternglass. Details of the methodology, tables, charts, and further information on sources of all data are given in the Technical Appendix.

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