DEPARTMENT OF HEALTH & HUMAN SERVICES

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STATEMENT ON

LOW LEVEL IONIZING RADIATION

BY

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BEFORE

THE SUBCOMMITTEE ON INVESTIGATIONS AND OVERSIGHT

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16. Abstract (Limit: 200 words) This testimony presented before the Subcommittee on Investigations and Oversight of the Committee on Science and Technology concerned the possibility that research in any or all of the epidemiologic modalities would be valuable at current levels of exposure to radioactive agents. NIOSH recently studied kidney damage in 39 uranium processors. These workers ground uranium ore and processed it to a yellow cake which is a feedstock for uranium enrichment facilities. The findings suggested that the workers had sustained some damage. This study suggests two types of research. First, a reassessment is called for of the methods now in use to test for kidney damage in uranium workers and second, the frequency with which uranium workers undergo urine tests for uranium (7440611) should be examined. Chromosomal analysis also offers potential usefulness in the area of radiation damage. Such studies can be evaluated as a means to assess the adequacy of current radiation standards. The usefulness of epidemiologic studies also must not be underestimated. The choice of a particular study depends on the feasibility and on the potential usefulness of the information in preventing further harm to workers.

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My name is Dr. William Halperin. I am Chief of the Industrywide Studies Branch of the Division of Surveillance, Hazard Evaluations and Field Studies of the National Institute for Occupational Safety and Health (NIOSH), a component of the Centers for Disease Control (CDC). I am a physician and an epidemiologist. I received a Masters of Public Health and a Medical Degree from Harvard in 1971 and 1973. I trained in internal medicine at Harvard from 1973 through 1975. I then joined the CDC's Epidemic Intelligence Service, and after completing a preventive medicine residency, I moved to NIOSH in 1978.

The Industrywide Studies Branch of NIOSH, which I head, draws on occupational physicians, epidemiologists, and industrial hygienists to conduct a variety of medical and epidemiologic studies. Several of these studies concern worker exposure to radioactive elements. It is from the perspective of a generalist without specialized training in radiation but with responsibility for several pertinent studies on health effects of the workplace that I address this Subcommittee.

Prevention of occupational disease depends on a continuum of preventive practices. The first means of prevention of occupational disease is the premarket testing of industrial agents before they enter commerce in order to identify a hazard before workers are exposed. Laboratory animals and other test systems such as the Ames Test are used to evaluate new chemicals before they are used in industry. Premarket testing is mandated by the Toxic Substances Control Act (TOSCA). The second means of prevention is substitution of hazardous agents with nonhazardous alternates. An example might be the replacement of asbestos in many commercial products. Asbestos which causes lung cancer and lung disease can often be replaced with another insulating material that has been shown to be less toxic. When hazardous agents must be present, we then depend on adequate engineering design of process so that exposure is limited to levels regulated by the Occupational Safety and Health Administration (OSHA) or recommended by voluntary groups such as the American Conference of Governmental Industrial Hygienists (ACGIH).

Industrial hygienists, whether working for companies, unions, or government, test or monitor the workplace environment for hazardous agents. Environmental monitoring is used to insure the effectiveness of engineering controls already in place and to target parts of the workplace that need improved control of hazardous agents. We can sometimes measure the level of hazardous agents in the blood or urine of the worker as another gauge of the adequacy of the control of exposure. In addition, we can screen or medically examine workers for disease with the aim of detecting disease in an earlier and more treatable stage or to use in combination with exposure information to pinpoint risky chemicals or processes. As a further measure of defining occupational illness, we can analyze data such as death certificates, in order to gauge the long-term health consequences of occupational exposures.

The Committee's question to me is whether research in any or all of the epidemiologic modalities would be valuable at current levels of exposure to radioactive agents.

I will draw on current activities at NIOSH to exemplify how a spectrum of studies could be useful. We recently studied kidney damage in uranium processors. Our study cost less than $20,000 and one person-year of professional time. We studied 39 workers at a uranium mill who grind uranium ore and process it to yellow cake, a complex mixture of uranium diuranates, which is a feedstock for uranium enrichment plants. We aimed our study at detecting kidney damage because the current standard for uranium exposure is based on the presumption that the kidney is the most sensitive organ affected by uranium exposure. Prior to 1979, when a new uranium mill was constructed, records show that the levels of uranium content of the workers' urine were frequently above permissible levels. In a field study conducted at the plant site, we collected samples of blood and urine and took personal medical histories. Rather than just study protein in the urine, we looked at beta-2-microglobulin, a small protein. Beta-2-microglobulin leaks from the kidneys of workers exposed to some heavy metals. In addition, we looked for leakage of amino acids, the small building blocks of protein. We believe our results, which I stress do need confirmation in another mill, suggest that by using this sensitive marker of kidney damage not now being used in uranium workers, that the uranium mill workers' kidneys have sustained some damage. Prior to this small study there never had been an occupational survey of uranium exposed workers using modern, sensitive indicators of kidney damage.

This survey should stimulate two types of research. First, we should reassess the methods now in use to test for kidney damage in uranium workers. Secondly, we should ask how common it is that workers in our nuclear industries have tests like the urine test for uranium that show that they have more than accepted levels of exposure to radioactive elements. To draw a parallel from the control of infectious diseases, in an effort to control polio our efforts must be divided between developing an adequate vaccine and insuring its use. To prevent occupational disease we must not only try to gauge a safe standard by doing research, but also we must adequately monitor the workplace to insure that exposures are being kept within the established levels of safety.

Another type of experimental test that offers potential is chromosomal analysis. To do this kind of research blood samples are collected and cultured. Chromosomes or the genetic material from cells are examined in detail to identify ones that are broken. Several populations with excess risk of cancer, such as benzene-exposed workers, have been shown to have excess levels of broken chromosomes in blood cells. Even though chromosomal breakage does not tell us the disease future for the individual, a workforce with increased genetic damage may be at increased risk for occurrence of cancer. Cancer and chromosomal damage both reflect the adverse biologic activity of radiation. If we could control occupational chemical or radiation exposure, so as to minimize or eliminate chromosomal damage, the possibility of cancer occurring should probably be decreased as well.

In essence chromosomal studies should be evaluated as a means to assess the adequacy of current radiation standards. NIOSH has proposed a chromosomal study in a nuclear shipyard. This proposal is currently being reviewed by the National Academy of Sciences (NAS). Several hundred workers would be involved in donating blood samples. I stress that a chromosomal study presupposes that a radiation or chemical hazard that causes genetic damage also could cause increased cancer risks, and that control of radiation exposure to levels with minimal genetic damage could possibly reduce cancer risk.

In describing several medical epidemiologic approaches to studying workers exposed to nuclear agents I do not by any means wish to minimize the value of classical epidemiologic studies of mortality. These studies have been exceptionally successful in the past. For instance, beginning in 1952 NIOSH and its predecessor agencies have studied the mortality experience of thousands of uranium miners exposed in the mines to radioactive agents known as radon daughters. Radon daughters are the radioactive disintegration products of radon gas. Our studies have shown uranium miners exposed to radon daughter to be at five times excess risk of lung cancer. This type of mortality study, if well designed and conducted, is a keystone to our understanding the risks of radiation. For instance, there is a real possibility that a mortality study of uranium miners who in the past were exposed to what is now the current permissible exposure standard would shed considerable light on the adequacy of this standard. NIOSH is currently reexamining the data we now have on this population to see if such a study is feasible.

In summary, I hope that I have presented a range of possibilities for potential occupational studies in the radiation field. These investigations could range from epidemiologic studies of mortality, through medical epidemiologic studies of pathology such as kidney damage and abnormal chromosomes, to studies of engineering controls such as those which could be designed in ventilation systems. In essence, the choice of a particular study depends on its feasibility and on its potential payoff in preventing ill health.

Thank you. I will be pleased to respond to any questions you may have.