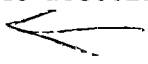


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16. Abstract (Limit: 200 words) This statement concerned the efforts of NIOSH to protect workers against the hazardous effects of radiation exposure, particularly radiation induced carcinogenesis. Data were gathered concerning hazards from radon daughter products among uranium mining and milling operations including the increased incidence of lung cancer. Technical assistance has been provided by NIOSH in addressing problems from radiation generating equipment. Exposures of airport personnel working with baggage x-ray inspection units were deemed to be well below the OSHA exposure standard and the radiation hazard to these workers was classified as minimal. An epidemiologic study was initiated of workers on nuclear propulsion ships and other workers at the Portsmouth Naval Shipyard. In the area of nonionizing radiation NIOSH has undertaken efforts to study radiofrequency and microwave, ultraviolet, infrared, laser, optical, noise and ultrasonic radiation. Workers were potentially exposed to radiofrequency and microwave radiation from a large number of devices including radio and radar transmitters, industrial dryers, heat sealing and curing equipment and certain medical research devices. Hazards from exposure to ultraviolet radiation included eye and skin damage, hyperpigmentation and skin cancers. Infrared radiation has been associated with development of cataracts and other eye damage. Those subject to optical radiation included welders and keyboard operators using video display terminals. Short term training sessions were offered by NIOSH to assist workers in understanding the hazards associated with various types of radiation to which they may be exposed at the work place. 					
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Statement of
Edward J. Baier, Deputy Director
National Institute for Occupational Safety and Health
Center for Disease Control
Department of Health, Education, and Welfare

Before the
Subcommittee on Environment, Energy, and Natural Resources
House Committee on Government Operations

April 19, 1978

Mr. Chairman and Members of the Subcommittee:

I am Edward J. Baier, Deputy Director of the National Institute for Occupational Safety and Health (NIOSH). Accompanying me today is Dr. Richard F. Boggs, Assistant Director for External Coordination in the Division of Criteria Documentation and Standards Development.

NIOSH was established by the Occupational Safety and Health Act of 1970 (P.L. 91-596). Prior to 1970, the predecessor organizations of NIOSH operated under the general research authorities of the Public Health Service Act. Following passage of the Act, NIOSH was given specific responsibility to develop recommended standards for exposure to a broad range of occupational hazards, including ionizing and non-ionizing radiation. A Radiation Section was established in NIOSH in 1972.

NIOSH also has responsibility to recommend standards for control of toxic materials and harmful physical agents in coal and other mines under the Federal Mine Safety and Health Amendments Act of 1977 (P.L. 95-164). Under the two safety and health acts NIOSH has several vital functions related to protecting workers from workplace hazards, including ionizing and non-ionizing radiation. These include the conduct of research programs, the performance of hazard evaluations, field studies, morbidity and mortality studies, the development of recommended standards, and the provision of technical assistance.

The development of criteria documents as a basis for standards for the occupational exposure to chemical and physical hazards is a continuing activity of NIOSH. These criteria documents are prepared for the purpose of recommending occupational health and safety standards to the

Occupational Safety and Health Administration (OSHA) and recommending health standards for mines to the Mine Safety and Health Administration (MSHA). Both of these agencies within the Department of Labor are responsible for setting and enforcing standards to protect workers. It is the goal of the Institute to identify the health effects produced by a substance or process and to recommend methods to evaluate and control the hazard. Before the documents are transmitted they undergo extensive internal and external review by management and trade associations, organized labor, academia, State and Federal agencies, and professional societies.

More than 85 criteria documents recommending standards for occupational exposure have been transmitted to OSHA, including documents on hot environments, noise, and ultraviolet radiation. Documents involving consideration of worker radiation exposure planned for completion during fiscal years 78-81 include radiofrequency (RF) and microwave radiation, infrared radiation, and ultrasonic radiation. The RF/microwave criteria document will be completed during 1979. The preparation of this document will formally begin in May of this year, and because of the parallel interests of EPA with regard to the potential environmental exposures, we hope to work closely with them during its development. In addition, criteria documents are being developed this year for welding and brazing processes, and foundry processes, both of which have radiation exposure aspects. The RF/microwave criteria document will be completed during 1979.

NIOSH is working with the Mine Safety and Health Administration to establish priorities for recommended health standards to protect miners.

IONIZING RADIATION

One of NIOSH's major efforts mandated by Congress is the study of industrial carcinogens. NIOSH has completed a three volume report summarizing the current knowledge of radiation-induced carcinogenesis. The information will assist Federal and State agencies in estimating the potential carcinogenicity of the various types of ionizing and non-ionizing radiation and will help to update the National Academy of Sciences 1972 summary report entitled, "The Biological Effects of Ionizing Radiation" (BEIR Report).

For the past decade, NIOSH and its predecessor organizations have been gathering, analyzing, and publishing epidemiologic data on the hazards to workers from radon daughter products present in the uranium mining and milling operations. It was this work which first identified the lung cancer problems among uranium miners. This research on uranium miners was also instrumental in developing field methods for measuring radon daughters, procedures for engineering controls, and medical monitoring procedures for the diagnosis of lung cancer. At this time a cohort of miners exposed to low concentrations of radon daughters is still being followed to identify if there is an excess lung cancer risk in this specific group.

NIOSH has provided technical assistance in addressing problems from radiation-generating equipment. For example, because of employee concern for the possibility of excessive ionizing radiation exposure, the Federal Aviation Administration (FAA) and the Air Transport Association (ATA) requested NIOSH to evaluate the potential radiation hazards to airport

personnel working with baggage X-ray inspection units. NIOSH concluded that the doses received by airport personnel were well below the OSHA exposure standard and that the radiation hazard was minimal.

In 1976 NIOSH investigated the industrial use of ionizing radiation sources not regulated by the Nuclear Regulatory Commission. The report of this investigation was used by States in planning radiation protection programs.

NIOSH is initiating an epidemiologic study of workers on nuclear propulsion ships and other workers at the Portsmouth Naval Shipyard. The study will attempt to evaluate the workers' exposure to low-level radiation and to other possible health hazards to determine whether there is increased incidence of cancer among the workers and if this is associated with radiation or other exposures. If appropriate, the study may be expanded to other shipyards involved with nuclear propulsion ships.

NON-IONIZING RADIATION

A large part of the NIOSH radiation effort is in the non-ionizing radiation area. Our efforts include programs on radiofrequency and microwave, ultraviolet, infrared, laser, optical, noise and ultrasonic radiation.

Radiofrequency (RF) and Microwave Radiation

Workers are potentially exposed to radiofrequency (RF) and microwave radiation from a large number of sources and devices, including a large number of radio and radar transmitters, industrial dryers, heat sealing and curing equipment, and certain medical research devices. In preparation for our development of the criteria document for occupational exposure to RF

and microwave radiation. NIOSH updated an extensive bibliography of world literature of the bioeffects of RF and microwave radiation.

Recent observations raise the question of the possibility of cancer induction by TACAN radar, which is used extensively for tactical air navigation. NIOSH was requested to investigate the work hazards associated with TACAN operation and repair procedures at Department of Defense facilities after two TACAN repairmen had been diagnosed as having carcinoma of the pancreas. At none of the three survey sites did the present levels of microwave or X-radiation exceed the current OSHA guidelines. NIOSH has initiated a retrospective epidemiologic study to determine whether TACAN system repairmen exhibit an increased incidence of cancer of the pancreas, as well as carcinomas of other body sites.

NIOSH became aware of several problem areas in the radiofrequency radiation band (specifically 10-300 MHz) in 1972. Employers often were unaware that they were using RF radiation in their facilities. This may have resulted from the fact that the industrial uses of RF generators were not widely publicized and little information was available on their uses. This is a reason why estimates of workers exposed to RF and microwave radiation vary from as few as 50,000 to as many as 21 million. Another problem identified was that there were no survey instruments available with which near-field measurements (from 10 to 300 MHz) could be made in the field. In addition, little information was available on the biological effects at the radiofrequencies used in industry.

The National Bureau of Standards (NBS) laboratory in Boulder, Colorado, has developed, under interagency agreement with NIOSH,

RF-detection equipment capable of measuring the electric and magnetic components in the near-field of the RF (10-300 MHz). These frequencies represent the worker exposure situations we have studied. A unique RF exposure and calibration facility capable of simulating near-field exposure conditions was also developed for NIOSH by NBS. This facility has been used to evaluate commercial monitoring instrumentation which manufacturers claim to be usable from 10 to 300 MHz. Accurate measurement equipment and instrumentation and standard survey techniques are essential for the monitoring and enforcement of RF and microwave exposure levels.

In a NIOSH field study 75 percent of the sources used for RF sealing and heating were found to exceed the present American National Standards Institute (ANSI) occupational exposure standard for RF radiation. A majority of the workers around this equipment were women of child-bearing age. Because recent literature indicates that exposure of pregnant animals to RF radiation may harm the fetus, we have initiated animal studies designed to determine threshold levels for teratogenic effects from RF exposure.

Ultraviolet (UV) Radiation

NIOSH transmitted a criteria document on UV radiation to the Department of Labor in 1972. In addition to a recommended occupational exposure standard, the document addressed environmental data, bio-effects, quantitative measurements, and protection and control measures.

The UV portion of the spectrum can produce eye and skin damage. Acute UV exposure causes transient corneal damage (photokeratitis) and reddening of the skin. Prolonged exposure to UV radiation results in

hyperpigmentation and skin cancers. Another less common effect of ultraviolet radiation on normal skin is that the victim develops freckling, depigmentation, precancerous tumors, basal and squamous cell cancers, and malignant melanomas. Welding arcs, certain sun tanning lamps, and industrial lamps and dryers can emit large amounts of UV radiation and produce these effects in workers.

The following areas were identified in the UV criteria document as requiring further research: the development of a portable survey instrument for evaluating UV hazards according to the recommended standard, and the evaluation of potential ocular hazards in the near-UV range (i.e., in the wavelength range of 315-400 nanometers (nm)).

Portable UV Monitors have been developed and are presently undergoing testing and evaluation. The National Bureau of Standards (NBS) cooperated in developing a UV transfer standard and in establishing at NIOSH a UV calibration facility. Research to determine UV thresholds for ocular effects (cataracts) in the 300-400 nm range has been completed and the results have been published.

Recently published UV bioeffects data are now being reviewed to determine whether there is a need to update the recommended standard for UV radiation.

Infrared Radiation (IR)

Although the near-infrared portion of the spectrum has been implicated in skin effects and in the development of cataracts, threshold levels have not been established as a function of wavelength. NIOSH has initiated animal studies to assess eye damage resulting from exposure to

near-infrared radiation. These data be used to assist in the development of an occupational exposure standard. Recently NIOSH staff assisted the World Health Organization in writing an infrared radiation occupational guideline.

Lasers

As early as fiscal year 68 we surveyed over 2,100 lasers in 200 occupational establishments in three states, Massachusetts, New Jersey, and California. The protocol included a review of the company safety program and a "walk-through" survey of the laser operating area. The safety and engineering control procedures were found to be marginal or inadequate for 40 percent of the lasers in use.

In fiscal year 75 NIOSH was requested by OSHA to categorize lasers into one of five hazard classes specified in a draft OSHA proposed standard for exposure to lasers. The report was compiled with the assistance of the U.S. Army Environmental Hygiene Agency and was published in 1976. The compendium contains technical data on 2,500 laser devices manufactured after 1963.

Optical Radiation

Additional NIOSH projects involve an integrated approach to evaluating optical radiation hazards. This includes the ultraviolet (UV), visible, and infrared (IR) spectral regions. We have recently completed a study in conjunction with the American Welding Society to examine hazards of the welding process. Optical radiation measurements have been made by NIOSH and the U.S. Army Environmental Hygiene Agency on the most common welding processes. We are also preparing a report on whether transparent welding

curtains surrounding the welder protect co-workers from harmful levels of optical radiation. At the request of the Newspaper Guild, we performed surveys to measure the radiation emissions from the cathode ray tube (CRT) of video display terminals (VDT) used in a newspaper composition room where two young employees developed bilateral cataracts. The levels of optical and RF radiation measured were several orders of magnitude below existing occupational exposure guidelines, and it has not been possible to establish that the cataracts are related to radiation emissions from these terminals. The NIOSH report on this survey was recently published.

Surveys of high pressure mercury vapor lamps were performed at the request of the Food and Drug Administration to evaluate potential employee hazards. UV measurements showed that intact lamps present no hazard, but lamps operating with a broken outer envelope emit hazardous levels of UV radiation.

NIOSH has developed a calibration and testing facility to assist in evaluating optical radiation hazards. This facility contains several standard sources and detectors for the calibration of laboratory and field instruments. We have also initiated a quality assurance program to perform long-term studies on the stability, accuracy, and reproducibility of the instruments.

NIOSH's Testing and Certification Branch in Morgantown, West Virginia, is currently evaluating industrial hygiene monitoring instruments and personal protective equipment, including welder's filter plates, that will protect workers from optical radiation exposure.

RADIATION TRAINING AND SUPPORT SERVICES

Various NIOSH Divisions provide support and training functions in the radiation field. NIOSH has been responsible for the calibration of instrumentation used by the OSHA Compliance Officers in inspections of the workplace. The Maintenance and Calibration Laboratory has also established calibration procedures and techniques for ionizing radiation and microwave survey instruments. These instruments are routinely calibrated on a twelve month cycle. A radiofrequency (RF) radiation (10-300 MHz) calibration facility has been developed at the NIOSH laboratory in Cincinnati.

NIOSH presents short-term training courses in occupational safety and health as part of its responsibilities for manpower development. The courses provide the health professional with an overview of industrial hygiene and safety, as well as specialized training to broaden the background of the practicing professional. Two of the specialty courses address the safety and health problems associated with ionizing and non-ionizing radiations. These courses are available to any Federal or State agency and other interested groups.

Mr. Chairman, this concludes our overview of NIOSH's involvement in the occupational aspects of radiation health effects and worker protection. If you have any questions, Dr. Boggs and I will be glad to try to answer them.