The Public Health Service in radiological health / Department of Health, Education, and Welfare Public Health Service.

The PUBLIC HEALTH SERVICE in RADIOLOGICAL HEALTH

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

Public Health Service

"* * * Serious health problems may be created by undue radiation exposure and * * * every practical means should be adopted to limit such exposure both to the individual and to the population at large."

Excerpt from the *Report of the National Advisory Committee on Radiation*, 1959

Public Health Service Publication No. 887

FOREWORD

Mankind has always lived with radiation—from cosmic rays originating in outer space and from natural radioactivity in the environment. Any considerable increase in the average exposure of the individual to radiation received from multiplication of sources of ionizing radiation is a hazard to health.

More widespread use of medical and dental X-rays, fallout from nuclear weapons testing, and some aspects of nuclear energy production are examples of modern uses of radiation which increase the exposure of the U.S. population.

National, State, and local health agencies, with the support of all professional and industrial users of equipment and substances which produce this form of nuclear energy, are now engaged in an active program to develop an increased awareness of the dangers of excessive exposure and to assure that adequate protective measures are adopted.

The Division of Radiological Health, Public Health Service, is the focus of Federal activities in this overall effort. This booklet describes the mission and goals of the Division.

Donald R. Chadwick

M.D.

Chief,
Division of Radiological Health.

TO PROTECT AND IMPROVE THE NATION'S HEALTH . . .

THE PUBLIC HEALTH SERVICE

The Public Health Service has served the Nation continuously since 1798. As the principal health agency of the Federal Government, it does what is beyond the capacity or jurisdiction of communities and States to do alone. It reinforces and supplements the work of State and local health agencies and of professional health personnel by:

- Conducting and supporting laboratory, clinical, and epidemiological research on contemporary health problems;
- Encouraging and helping to finance the training of research scientists and workers in a number of health related disciplines;
- Providing medical and hospital care to certain groups of legal beneficiaries—principally seamen of the American Merchant Marine, the men and women of the U.S. Coast Guard, and the American and Alaskan Indians;
- Administering the Nation's interstate and foreign quarantine laws and regulations;
- Collecting and disseminating health data; and
- Helping States and communities to control disease and to improve health services.

Providing technical and financial support to States and communities in overcoming health hazards of air and water pollution, and radiation exposure or contamination. * * *

RADIATION AND PUBLIC HEALTH

The actual and potential benefits man may derive from the controlled use of ionizing radiation are manifold. In medicine, X-rays and isotopes have greatly improved the diagnosis and treatment of illness. Nuclear power, produced and controlled by reactors, may be the answer to dwindling supplies of coal and oil, and growing demands for more electricity in homes and factories. In the future, nuclear power may be used to excavate harbors, develop water sources, heat reservoirs, and mine low-grade ore. It is used now to heat and light cities, to propel submarines and merchant ships.

Radioactive isotopes, the byproducts of nuclear power production, have limitless beneficial uses. For example, they are used:

IN MEDICINE, to seek out hidden disease and injury through radioactive tracers, to treat cancer, to study heart disease, multiple sclerosis, arthritis, and virus infections, and as a tool in basic research;

IN INDUSTRY, for testing, from the wear and lubrication of piston rings to the action of detergents on fabrics, and for measurement to the finest degree with consistent accuracy; and

IN AGRICULTURE, to help scientists identify patterns of plant and animal growth and how pesticides and fertilizers work; to destroy agricultural pests; to increase farm productivity; and to develop better yielding plant varieties.

However, it must be assumed that whenever a very large number of people are exposed to any additional amount of radiation from any source, there is a risk of injury within the group.

PUBLIC HEALTH HAZARDS

Extensive studies have revealed that most of the ionizing radiation received by the population today, other than natural background radiation, stems from the use of X-rays by the health professions. Concerted effort is now being applied by these professions to reduce, as far as possible, the exposure of individuals undergoing X-ray diagnosis and treatment.

Most scientists believe that ionizing radiation is always damaging to some extent, even the smallest amount causing harm to living cells. Humans have some 100 million cells—each with a predetermined task to perform. Depending upon the amount of exposure, ionizing radiation may destroy cells or seriously impair function. In addition, it is known that:

Lung Cancer was found in men who worked over long periods of time mining pitchblende, a source of radium;

Bone Cancer developed in watchdial painters who unknowingly ingested radium;

Leukemia is on the increase among survivors of the atomic bombings in Hiroshima and Nagasaki;

Radiation can cause alterations, or "mutations" as they are called, *in the genes* of reproductive cells which determine the physical appearance and health of our children in future generations. These mutations (the great majority of which are harmful) are hereditary.

Experiments on animals have established that *radiation exposure accelerates the aging process.*

Therapeutic doses of *radiation delivered to the pelvic region of a pregnant woman can produce the death or abnormality of the unborn child.*

Radiation is capable of reducing fertility, the amount of loss being dependent upon the dose.

Irradiation of the eye has been shown to result in cataracts.

WHAT HAS BEEN DONE?

Since discovery of the X-ray and development of its use, the interest and attention given to radiation exposure by the Public Health Service has developed step by step, particularly with increases in applications of nuclear energy. Some of these activities involved:

1930 Investigation of radium poisoning of clock- and watch-dial painters;

1942 Study of radium and X-ray hazards in hospitals; cooperation with the Manhattan District on standards of human tolerance to radiation;

1945 Radiation safety of photofluorographic technicians; safe disposal of surplus radio-luminous instrument dials; research on radioactive carbon and fertility of rats after high level exposure;

1946 Animal experiments involving whole-body irradiation with X-ray and gamma rays, the biological effects of cyclotron-produced neutron radiation, and lead poisoning traced by radioisotopes;

1947 Radiant Energy Unit established by the Public Health Service in the Division of Industrial Hygiene to assist States in limiting health hazards from radioisotopes and industrial sources of radiation;

1948 Training courses in radiation monitoring instituted for State health personnel under cosponsorship of the Atomic Energy Commission and Public Health Service; studies in progress on biological effects of radiation;

1949 Radiation protection and control activities acceleration; Radiant Energy Unit becomes Radiological Health Branch, Division of Sanitary Engineering, Public Health Service;

1958 National Advisory Committee on Radiation, appointed by the Surgeon General, recommended creation of the Division of Radiological Health to fuse and expand Public Health Service efforts. The Surgeon General established this Division in 1958.

1959 Federal Radiation Council established by Presidential directive.

THE DIVISION OF RADIOLOGICAL HEALTH . . .

The mission of the Division of Radiological Health is:

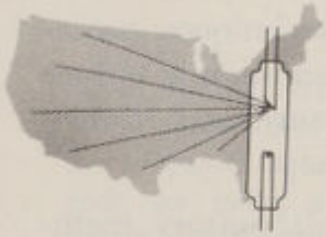
- To develop and evaluate the legal and administrative bases about which a national radiological health program should be formulated and conducted;
- To develop and operate a comprehensive program of radiological health within the Public Health Service in collaboration with other related programs of the Department of Health, Education, and Welfare;
- To gradually strengthen the role of the States and local communities in the field of radiological health;
- To develop public understanding and professional competence in the area of radiation protection and health effects;
- To develop a nationwide system of environmental radiation surveillance;
- To conduct a nationwide evaluation of the long-term effects of radiation;
- To bring about the evolution of standards for health protection; and
- To develop a basis for assessing the sociological benefits accruing to applications of radiation in relation to resulting health standards.

FUNCTIONALLY, THE DIVISION OF RADIOLOGICAL HEALTH:

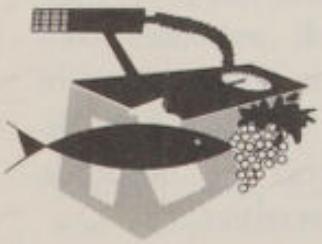
Conducts and develops research projects leading to the assessment of radiation exposure of the U.S. population and its effects on the public health;

Trains professional personnel to meet national, State, and local needs;

Joins other agencies of the Federal Government in special projects dealing with health aspects of radiation exposure;



Assists States and local health agencies in their development and operation of programs in radiological health; and



Operates surveillance networks to determine current levels of radiation in our environment—air, water, milk, and food.

*Conducts and develops research projects leading to the assessment of radiation exposure of the U.S. population and its effects on the public health * * **

A scientific basis for planning appropriate measures to assure protection of the U.S. population from harmful radiation exposure is the primary purpose of DRH research. Also, the research staff supplies a reservoir of readily available scentific knowledge in this field for consultation and the guidance of other units of DRH, the Public Health Service, and the States. Support is provided to State programs in the research aspects of exposure measurement, protection, and control.

Research projects now in progress and planned include:

- Development and application of methods to assess the total radiation exposure of the population—environmental, occupational, nonoccupational, medical, and dental;
- Development of a technical basis for relating exposure source to exposure dose;
- Development of methods and criteria for evaluating long-term health effects of radiation exposure;
- Development of techniques, procedures, or instrumentation to reduce unnecessary exposure and its biological significance;
- Development of laboratory methodology for the radionuclide analysis of environmental samples; and
- Support, both financial and technical, of research activities contributing to the knowledge of radiation effects, conducted by research departments of hospitals, colleges, and universities.

Trains professional personnel to meet national, State, and local needs * * *

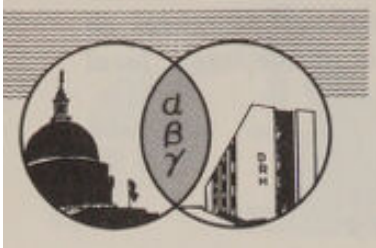
The shortage of people trained and experienced enough to staff effective radiological health services at Federal, State, and local levels is critical. To overcome this shortage, DRH supplies:

UNIVERSITY LIAISON AND FINANCIAL SUPPORT: Knowledge in radiological health requires instruction at colleges and universities in subjects new to the curriculums leading to undergraduate and graduate degrees in medicine, public health, and engineering. DRH works closely with faculty officials in an effort to encourage the rapid addition of radiation-related courses to the curriculums in these disciplines. Financial support is also given. In fiscal year 1961, grants totaling $500,000 were awarded to 15 universities by DRH for this purpose.

SHORT COURSES: Intensive 1- and 2-week training is given by DRH instructors on general and specific applications of techniques in radiation protection and control, and in the basic knowledge required for work in this field. Students at these courses, which are conducted at DRH laboratories, are State and local health department officers, and professional personnel from Federal agencies, industry, colleges and universities, and foreign countries.

TECHNICAL AIDS: Textbooks, course manuals, bulletins, exhibits, research papers, films, and slides are prepared and distributed by DRH. These materials are made available to augment radiological health training activities wherever such activities are conducted and under all auspices.

ADVANCED SCIENTIFIC TRAINING: Physicists, engineers, physicians, dentists, and other professional staff of the Public Health Service are given advanced training in radiological health subjects such as nuclear physics, radiobiology, radiochemistry, health physics, and nuclear engineering, at colleges and universities throughout the United States.



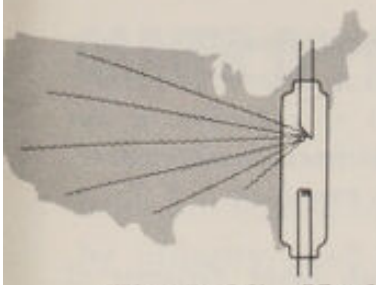
*Joins other agencies of the Federal Government in special projects dealing with health aspects of radiation exposure * * **

DRH works closely with all Federal agencies having responsibilities involving the production and use of radiation. Of primary importance is the development of uniform standards of permissible radiation exposure—or "Radiation Protection Guides"—for the general population and for workers in this field.

In 1959, the President established the Federal Radiation Council to advise him on radiation matters affecting health. Two reports have been prepared by the Council and accepted by the President as Federal policy in certain aspects of the protection of the health of the U.S. population from excessive radiation exposure. Members of the Council are the Secretary of Health, Education, and Welfare, who serves as chairman, the Chairman of the U.S. Atomic Energy Commission, the Secretary of Defense, the Secretary of Commerce, and the Secretary of Labor.

DRH specialists take an active part in the recommendations of the Federal Radiation Council and work closely with many expert groups in medical and physical science.

Division of Radiological Health staff participate in many defense and reactor projects where the public health may become involved. For example, it is responsible for off-site radiological safety programs carried out in conjunction with nuclear weapons testing in Nevada and the Pacific. Currently, a Medical Liaison Officers Network, operated by the Division, is available for nuclear emergencies in cooperation with the Atomic Eenergy Commission and Department of Defense.



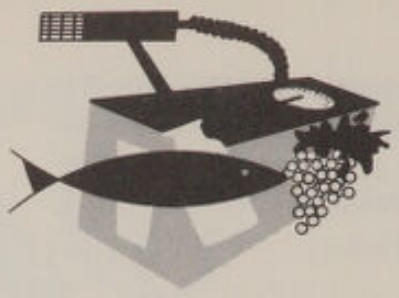
Assists States and local health agencies in their development and operation of programs in radiological health * * *

The Public Health Service makes grants to States to help support health services.

The programs in health services are administered by the States. The Public Health Service gives assistance, upon request, in areas beyond the resources of local governments. Radiological health will undoubtedly assume an increasing importance in the work of State and local governments in the years ahead. Radiation protection and control is an outstanding example of a need for cooperative effort at the national and local level.

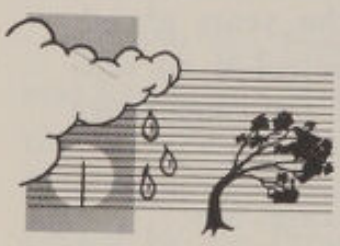
Examples of DRH-State liaison are:

- A State-by-State inventory of existing programs in radiological health to assess and evaluate available resources in radiation protection and control;
- Assistance in the development of legislation for the use of States which will permit regulation and control of radiation sources;
- Technical consultative services on health aspects of the location of large-scale nuclear energy installations within States;
- Assignment of DRH consultants on a full-time basis to State health departments to stimulate participation in radiation protection and control programs and assist in their development;
- Technical assistance in surveys of existing medical and dental X-ray units to reduce unnecessary exposure from defective or improperly controlled equipment; and
- Radiochemical laboratory services to State health agencies for the analysis of environmental samples.



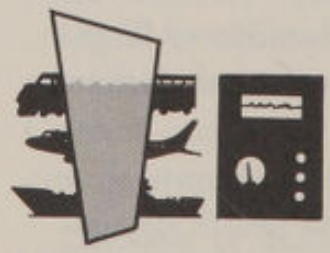
Operates surveillance networks to determine current levels of radiation in our environment—air, water, milk, and food * * *

Working in cooperation with other divisions of the Public Health Service and State and local health departments, the Division of Radiological Health collects and analyzes, on a continuing basis, environmental samples from about 100 different localities in the United States. To facilitate rapid handling of these samples, DRH laboratories are located at Las Vegas, Nev., at Montgomery, Ala., and at Rockville, Md.



DRH has operated a nationwide Radiation Surveillance Network since 1956 to measure fallout resulting from nuclear weapons testing immediately, and to inform State health departments of significant findings.

DRH assays the total diet of selected population groups for radioactivity. This program, which is newly established, may be expanded to determine radioactivity in the individual foods we eat, as well as the total diet of the U.S. population.



PHS analyzes water samples collected from water supplies used on trains, airplanes, and other public carriers, and surface water samples collected from about 86 stations located on our major waterways.

DRH analyzes milk consumed by the public for concentrations of radionuclides of concern to public health.

RADIOLOGICAL HEALTH DATA, a monthly periodical published by DRH, presents the results of the analyses of these environmental samples. Also included in this publication are data compiled by other Federal and State agencies.

CAREER OPPORTUNITIES

People trained in scientific and professional fields are needed by the Public Health Service, by industry, and by State and local health agencies.

Radiological health has a direct basis in physics, biology, and chemistry as well as engineering and medicine. Work assignments, therefore, are often interdisciplinary, depending upon the training, proved ability, and specific interest of the individual.

Typical assignments in public health agencies for various scientific disciplines are:

PROFESSIONAL PUBLIC HEALTH PERSONNEL:

Physicians, engineers, and others with public health experience guide and evaluate Federal-State radiological health programs and develop methods in radiation exposure assessment, radiation protection and control, and personnel training.

BIOLOGISTS AND RADIOBIOLOGISTS:

Research into the ecologic and metabolic fate of radionuclides in the environment including uptake of radionuclides in the human diet and research leading to a better understanding of the damaging biological effects of ionizing radiation require the special knowledge of biologists and radiobiologists.

CHEMISTS:

A broad range of analytical services performed by chemists are contributing to a fuller understanding of the interaction of radioelements in a physical or biological environment. For example, the development

and use of chemical analyses techniques are needed in surveillance programs to assess radionuclides in air, water, and milk and other foods.

ENGINEERS:

Protection and control programs commonly require engineering skills in their design and implementation. *Sanitary Engineers* are needed to accomplish safe handling, assessment, and disposal of radioactive materials. *Nuclear Engineers* are needed in the review and assessment of radiation hazards related to the operation of reactors.

MATHEMATICIANS AND STATISTICIANS:

Data from research and surveillance projects demand the special skills of mathematicians and statisticians in study designs, analysis, and interpretation. These skills are required in tests of hypotheses and development of mathematical models, epidemiological studies, and trends of significance to public health research.

PHYSICIANS AND OTHER MEDICAL PERSONNEL:

Specialists trained in nuclear medicine and radiology can make important contributions to the assessment and pathology of radiation exposure, the development of safe practices in the clinical use of ionizing radiation, and in treatment procedures for radiation injury. Skills are required in such specialized areas as tissue culture, comparative pathology, and in studies of radioactivity uptake in biological systems.

VETERINARIANS:

Contributions in animal studies to determine exposure dose relationships associated with long-term chronic effects accomplished by veterinarians, have importance in establishing safe exposure level guides.

PHYSICISTS:

Safety and control measures for reducing radiation exposure to personnel using radionuclides and radiation-generating equipment are developed under the guidance of physicists. Their knowledge and experience are also needed in the development of instruments and methods for precise measurement of low-level radiation in the environment. *Health Physicists* and *Radiological Physicists* are needed to direct inspection and control activities related to X-ray and radionuclide sources.

OTHER PROFESSIONAL NEEDS:

Limited numbers of people trained in the following disciplines are also required:

Pharmacology

Geology

Computer Systems Analysis and Programming

Technical Writing and Editing

PUBLIC HEALTH SERVICE ASSIGNMENTS

Qualified applicants are appointed to the Public Health Service from two personnel systems—the Commissioned Corps and the Federal Civil Service. Both systems afford opportunities for promotion, based upon length of service and individual performance, and for advanced academic training. Liberal retirement income, direct or prepaid hospital and medical care, and other benefits are also established. Individually, each personnel system has the following features:

THE PUBLIC HEALTH SERVICE COMMISSIONED CORPS

• Public Health Service Commissioned Officers are a part of the Federal Government's only commissioned service in which all officers are engaged in the medical, public health, and scientific fields.

• Ranks and pay are comparable to those of commissioned officers in the military service.

• Full-time active duty service with the Public Health Service Commissioned Corps discharges military obligations under Selective Service.

• The Corps consists of Regular and Reserve officers. Regular officers receive career appointments from the President, with the consent of the Senate. Reserve officers are appointed by the President for an indefinite period. Promotions to higher ranks are based upon years of service and professional education and experience, with provision for special promotions and periodic pay increases commensurate with length of service.

• Leave for 30 days annually is granted with pay. Sick leave is granted when needed and for the time required.

• Income tax payments apply to basic salary only.

• Retirement and survivors benefits are comparable to those received by other commissioned officers of the United States. Retirement in most cases follows 30 years of service, or at age 64. Under certain conditions, however, officers may retire after 20 years of service.

• In addition, officers are eligible for benefits under the Social Security program.

QUALIFICATIONS:

Applicants for Commissioned Corps appointments must be:

(1) Citizens of the United States;

(2) Eighteen years of age or older;

(3) Graduated with a baccalaureate degree or advanced degree from an accredited college or university;

(4) Able to pass a physical examination and a competitive written and oral examination.

THE FEDERAL CIVIL SERVICE

• Civil Service positions with the Public Health Service, in the pattern for all Federal agencies, are filled by candidates who have qualified in examinations for specific professional categories. The names of qualified candidates are maintained on registers pending appointment.

• Salary increases are granted upon completion of each 12 months of satisfactory service in grades below GS–11; 18 months in grades GS–11 and above.

• Life insurance and health benefits are available to all Civil Service employees, for which the Federal Government contributes part of the cost.

• Liberal retirement plans are in effect, based upon length of service and the highest grade attained.

QUALIFICATIONS:

Applicants for Civil Service appointments must be:

(1) Citizens of the United States;

(2) Eighteen years of age;

(3) In good health;

(4) Graduates of an accredited college or university, for most professional assignments, with either a bachelor's or advanced degree.

Additional information on either career opportunities or the programs of the Division of Radiological Health may be obtained by addressing an inquiry to:

Chief,

Division of Radiological Health

Public Health Service

U.S. Department of Health, Education, and Welfare

Washington 25, D.C.

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