CHAPTER 28
RADIATION CONTROL

BOARD OF HEALTH ROLE AT A GLANCE

- Be aware of radioactive materials in the community and request technical assistance in response to incidents involving the possession, handling, transportation, or the discovery of these materials.

- License, regulate and regularly monitor tanning parlor facilities for appropriate use of ultra-violet energy in commercial tanning machines.

- Refer requests for information by the community regarding the use of radioactive materials in machines used for diagnosis and treatment of diseases such as cancer, and refer complaints regarding the quality and safety of those machines.

OVERVIEW

Ionizing radiation comes from medical and dental x-ray machines, radiation therapy devices, nuclear reactors, and radioactive materials either naturally occurring (such as radium-226, used in medical therapy), or man-made (such as Cobalt-60, also used in medicine). Injury to living matter by ionizing radiation is the result of the transfer of energy to individual molecules in the region through which the radiation passes. The radiation can knock electrons out of atoms, creating electronically charged ions that can affect normal biological functions. Depending on which molecules are affected and how many living cells may repair themselves completely or partially, remain unaffected, or die, the exposed tissue or organism may survive with or without defects, or die. If a damaged cell is one that would normally grow, divide and multiply rapidly, such effects as abnormal growth or mutation may appear relatively quickly and affect the health of the organism.

Health effects caused by radiation are in general proportional to the amount of exposure (although a single intense dose may be more harmful than the same total exposure over a long period of time). Intense doses, 100 rems or more ("rem" is a unit for measuring the biological effects on a person from a dose of radiation), may cause acute effects, including those symptoms referred to as radiation sickness, whereas low level exposure increases the risk of various diseases, primarily cancer and cataracts, that may not appear for five to twenty years after exposure. The risk associated with a given level of exposure is usually described in epidemiologic terms, such as the tentative estimate by the National Academy of Sciences that a single exposure of one rad (a level of radiation roughly comparable to 35 to 40 simultaneous chest x-rays) to one million people would be expected to cause up to1,031 of them to have cancer (i.e. approximately one in a thousand). About one in three of these cases would be fatal. By comparison, about 62,500 fatal cancers affect each million people normally.

People in the United States are exposed to about 300 millirems of ionizing radiation from natural, background sources each year. (One rem equals 1,000 millirems.) On the average, people in the U.S. are exposed to about the same amount (100 millirems per year) from man-made sources. About 90 per cent of the average exposure from man-made sources comes from medical and dental x-rays and radioactive materials used for diagnosis and treatment of disease (such as radioactive "tracers" and radiation therapy used to treat cancer), while 10 percent comes from such sources as nuclear-weapons testing, nuclear-powered electric plants, industrial uses and consumer products. Patients who get large numbers of x-rays or undergo radiation therapy and workers in such occupations as mining of uranium and phosphates, radiation research, nuclear-power generation and x-ray technology may be exposed to radiation levels considerably higher than the average.

Non-ionizing radiation includes microwaves, lasers, light and radio waves, and involves photons whose lower energy prevents ionization from occurring in the absorbent materials. The primary biologic effect of non-ionizing radiation is thermal-the absorbing material's temperature rises. (This is the principle of the microwave oven.) Other possible non-thermal effects of exposure to non-ionizing radiation are not well substantiated by tests or epidemiologic data.

Radiation control programs seek to reduce both individual exposure to non-therapeutic radiation and overall exposure of the population, in order to minimize the risk of negative health effects. Equipment and facilities used for research, therapy, industrial use, military use and power generation must be properly designed and properly used to minimize exposure of workers and hazardous leakage of radioactive materials to the environment. Radiation control programs also regulate safety mechanisms and emergency plans so that accidental exposure can be minimized and treated.

Local officials should encourage health care providers and any local users of radioactive materials to comply with state and federal regulatory authorities and to be prepared to deal with accidents involving radioactive materials. Reducing unnecessary x-rays, ensuring that x-ray diagnostic and therapy equipment is in good condition, and having adequate safety and emergency provisions can be constructive local objectives.

BOARD OF HEALTH RESPONSIBILITIES

Contact the Radiation Control Program with questions, comments or technical assistance on the following issues:

- radon in homes and schools;
- T.V. towers;
- high tension lines;
- medical, dental and industrial x-ray devices;
- microwave ovens;
- smoke detectors;
- radiation in trash; radiation transportation incidents;
- found radiation sources;
- nuclear power plants issues;
- The Nuclear Incident Advisory Team (NIAT) calls (617-727-9710);
- lasers; and
- all radiation issues.

- **Tanning Parlors**. In 1990, an Act was passed by the legislature for regulating tanning

facilities. This Act amends M.G.L. c. 111 by adding sections 207-214. This Act allows boards of health to set requirements and grant licenses for tanning parlors within their jurisdictions. Draft regulations for adoption by local towns have been developed by the Radiation Control Program and are available in either hard copy or computer disk. The legislation allows towns to collect fees for the implementation of these regulations. The Radiation Control Program is available for training and technical guidance in this area.

STATE RESPONSIBILITIES

Under M.G.L. c. 111, the Department of Public Health (DPH) has the authority to make rules and regulations concerning the transportation, storage, packaging, sale, distribution, production, and disposal of radioactive materials and machines which emit ionizing radiation. M.G.L. c. 111 §5M specifies "The Department of Public Health shall approve, modify or disapprove all proposed rules and regulations of political subdivisions of the Commonwealth in so far as they pertain to the health aspects of ionizing radiation and no such rules and regulations which do not have the approval of the department shall be adopted."

- **Nuclear Incident Advisory Team (NIAT)**. The Nuclear Incident Advisory Team is the action arm of DPH concerned with radiation protection. The NIAT was developed in the early 1960's by DPH in cooperation with the Massachusetts Commission on Atomic Energy, Department of Public Safety, Department of Labor and Workforce Development, and the New England Chapter of the Health Physics Society. The Team consists of members (DPH employees) and consulting experts in various fields associated with radioactive materials and are drawn from private, state and federal institutions, and industry. The NIAT is composed of fourteen principal members and a number of advisory/consultants.

  The NIAT is on call 24 hours per day, seven days per week, and is accessible either through their office telephone line (617) 727-9710, or the Massachusetts State Police telephone line (617) 566-4500 x237. The NIAT responds to accidents and incidents, upon request, involving the possession, handling, transportation and/or uncovering of radioactive material. The NIAT's purpose is to assist local and other state officials in handling radiation accidents and incidents. The NIAT members are equipped with state vehicles with two-way radio communication, radiation detection instruments, as well as materials for cordoning off areas, securing radioactive materials and decontaminating surfaces requiring same. The NIAT averages two or three calls per month with the majority of these occurring at Logan Airport and/or sanitary landfills and trash-to-energy disposal facilities.

- **Mammography**. Within DPH, the Radiation Control Program enforces regulations (105 CMR 127.000) that provide for the licensing of all facilities within the Commonwealth, whether stationary or mobile, that offer breast cancer screening or diagnosis through mammography, including those which are a part of a clinic or a hospital, a health maintenance organization, a radiology practice, or office of a physician, or other entity.

  In 1992, the Massachusetts Legislature enacted Chapter 132, An Act Establishing Mammography Standards and Providing for the Licensing of Mammography Facilities. This Act requires DPH to establish a licensing and inspection program at mammography facilities to insure that all mammography performed in the Commonwealth meets

uniform standards of quality, and the x-ray machines used to produce the mammograms are operated in a safe and efficacious manner.

- **Radiologic Technologist Licensing.** In 1989, the Radiation Control Program began implementing the Radiologic Technologist Licensing Act. Under this procedure only Massachusetts licensed radiologic technologists may perform the duties of an x-ray technologist in the Commonwealth. Licenses are issued every two years and licensed radiologic technologists must display a copy of their license at the facility at which they are employed. Any questions received should be directed to the Radiation Control Program.

- **Electromagnetic Radiation Sources**. The Radiation Control Program administers regulations on radio frequency (radio and T.V. broadcasters, cellular telephone), microwaves (radar, data communication links, and microwave ovens), lasers, and ultra-violet energy (commercial tanning facilities). Further information on these regulations can be obtained from the Radiation Control Program.

- **NIAT "Dump Calls"**. A number of local and regional trash collection and disposal facilities, especially the trash-to-energy type of facilities, have installed radiation detection devices so as to prevent the illegal disposal of radioactive materials. Many of these facilities have received training and technical guidance from the Radiation Control Program and in the cases that the radiation monitors alarm as trucks are passing by these monitors, the facilities have developed procedures for not accepting the truckload of trash and returning it to the community or the facility from which it originated. In some instances, a BOH may become involved in being notified that this trash is being returned to their community and the radioactive material in the trash that set off the detectors must be isolated and attempts made to identify its source. The NIAT members, upon notification of these events, serve as advisors to the trash disposal company and to local officials.

- **Advisory Council on Radiation Protection (ACRP)**. The ACRP consists of the Commissioners of Public Health, Labor and Workforce Development, Public Safety, and Administration, the Personnel Administrator, the Director of Civil Defense, and sixpersons to be appointed by the governor. Two of the six people must be doctors of medicine or dentistry and be specialists in the field of ionizing radiation injuries. One person must have training or experience in radiology, one in radiation or health physics, one in radiation law, and one in nuclear engineering or in the industrial application of ionizing radiation.

  The Council considers and makes recommendations to the governor, the general court, and the various departments of the executive branch as to the development, growth and status of all substances and apparatus capable of emitting ionizing radiation within the Commonwealth. The ACRP can be contacted through the Radiation Control Program.

- **New England Compact on Radiological Health Protection**. The Compact allows the six New England states to assist each other in all areas of radiological health by the exchange of information, equipment, and personnel if needed. Enabling legislation to enter into the Compact was enacted in each of the six New England states. (See M.G.L. c.

111 §1-10.)

- **Department of Labor and Workforce Development (formerly the Department of Labor and Industries)**. The Radiation Control Program of DPH has assumed all responsibilities since February 1995 of DLWFD for the protection of the health and safety of employees against ionizing radiation in any place of employment in the Commonwealth (441 CMR 3.00).
- Control use of ionizing radiation in medical, dental, educational and research facilities.
- Control use of non-ionizing radiation, especially microwaves, R.F., communication towers and lasers (lasers must be registered with DPH). (See M.G.L. C. 111 §5L.)
- Conduct environmental radiation surveillance studies, especially around nuclear power stations. (See M.G.L. c. 111 §5K.)
- Act as the lead agency for the assessment of accidents and incidents involving radiation.
- Radiologic technologist licensing.
- Regulate use of radioactive materials (medical, industrial, academia and commercial).

FEDERAL RESPONSIBILITIES

- **Department of Health and Human Services** (formerly Health, Education, and Welfare) must establish and carry out an electronic product radiation control program designed to protect the public health and safety from electronic product radiation (Ch. 42, Sec. 263D, Federal Code Annotated).
- **Nuclear Regulatory Commission** regulates licensing and use of radioactive isotopes in industry. They also conduct periodic inspections of industries using radioactive isotopes.

The Commission licenses and regulates by-products of nuclear reactors, such as those used in power plants, hospitals, educational institutions and industry. Massachusetts became the 30th agreement state as of March 27, 1997.

Environmental Protection Agency sets standards for public exposure to radiation.

For More Information Contact:

DPH, Radiation Control Program
(617)727-6214

NIAT
(617) 727-9710

Environmental Protection Agency
1-800-424-8802