

**CORRECTIONAL
DENTAL
ASSOCIATES
RADIATION SAFETY**

Reviewed 11/1/2014

CORRECTIONAL DENTAL ASSOCIATES

RADIATION SAFETY

STANDARDS AND RECOMMENDATIONS

OSHA has a standard for ionizing radiation (29 CFR 1910.96) that is intended to protect those workers not covered by the Nuclear Regulatory Commission (NRC) in 10 CFR 20. Several other agencies also have the authority to set and enforce standards and other measures to protect workers from radiation exposure (see Table 5-4). The National Council on Radiation Protection and Measurements (NCRP) was created by Congress in part to collect, analyze, develop, and disseminate information and recommendations about radiation measurements, quantities, and units. In 1971, the NCRP recommended maximum permissible dose equivalents of ionizing radiation during occupational exposure (NCRP 1975). The annual permissible dose for total body exposure is 5 rem per year, with 3 rem permitted within a 13-week period. The basic goals of the NCRP radiation dose limits are to prevent injuries such as cataracts and erythema and to reduce the probability of cancer. An exposure equivalent to 5 rem per year for the whole body or for certain organ systems is believed to permit a lifetime occupational exposure without reaching an injurious level. Specific limitations exist for dosages to various parts of the body such as the head, arms, hands, and trunk. In addition, the dose limit for the fetus of an occupationally exposed woman is 0.5 rem for the entire gestation period (NCRP 1977).

Radiation workers in hospitals receive an annual average dose of radiation that ranges from 260 to 540 mrem. Twelve percent of dental personnel had an average annual exposure of 41 mrem, and 98% had exposures of less than 500 mrem (0.5 rem) (National Research Council 1980).

Under the Federal Food, Drug, and Cosmetic Act and other laws, the U.S. Food and Drug Administration (FDA) has the authority to regulate the manufacture and distribution of radiopharmaceuticals and medical devices containing radioactive materials. FDA shares this authority with the Nuclear Regulatory Commission (NRC), which has similar powers when the drugs or devices contain materials governed by the Atomic Energy Act. The two agencies have worked together in the development of regulations. The FDA's National Center for Devices and Radiological Health sets basic performance standards for x-ray machines and other radiation emitting electronic products manufactured after 1974. The standards ensure that the products emit the smallest amount of radiation consonant with effective operation.

FDA also issues recommendations for the use of x-ray machines and other radiation emitters, conducts education programs, and assists the States with their activities. Title 10 of the Code of Federal Regulations contains the NRC rules on isotope sources (10 CFR Parts 20 and 34) and Title 21 for the FDA regulations on x-ray machines (21 CFR Parts 1,000 and 1,050). Many States have executed agreements with the Federal Government to assume responsibility for regulation of radiation sources in their States.

The JCAHO requires that a professional health physicist be available on the staff or as a consultant in any hospital with radiology equipment (JCAH 1979).

EXPOSURE CONTROL METHODS

The amount of protection needed for a particular source of x-rays or gamma rays depends on the energy of the radiation and the length of time it will be in use (Parmeggiani 1983). The chief methods for reducing doses from external x-rays and gamma rays are to limit the time of exposure, increase the distance from source of exposure, shield the source with protective material, and avoid unnecessary exposures. Improved equipment, knowledge, and reduced exposures have greatly reduced the risk for radiation workers.

PROTECTIVE EQUIPMENT

No part of the body should be directly exposed to radiation. If there is a danger of exposing a body part, appropriate protection must be used. Lead aprons, gloves, and goggles should be worn by workers located in the direct field or in areas where radiation levels from scattering are high. All protective equipment should be checked annually for cracks in the lead and other signs of deterioration.

GENERAL CONTROL MEASURES FOR RADIATION EXPOSURE

The following measures should be taken to reduce occupational radiation exposure:

- Properly mark any rooms housing radiation sources: allow only authorized personnel in the area.
- Maintain effective contamination control boundaries around all sources.
- Locate x-ray controls to prevent the unintentional energizing of the unit.
- Check all x-ray machines before each use to ensure that the secondary radiation cones and filters are in place.
- Check all protective equipment annually for cracks in the lead.
- Prevent radiation exposure of pregnant workers.

Guidelines for general dental radiographic procedures are as follows (NCRP 1976):

- Only patients are allowed in unshielded areas when x-rays are generated.
- All x-ray technicians must be inside a shielded booth or behind a protective screen.
- Avoid using any person to hold or restrain a patient undergoing diagnostic radiology. If such restraint is necessary, efforts should be made to limit the number of times any worker performs this duty. A family member should be used if possible. Any such assistant should be provided with a protective apron and gloves and positioned to minimize direct exposure to the x-ray beam.
- When dental x-ray machines are used, the operator should be located at least 6 feet from the patient.

See attached information regarding personal monitoring, x-ray registration and inspection.