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RADIATION INFORMATION FOR PCOM EMPLOYEES

1.0 Introduction

X-ray machines and other sources of radiation are used for the diagnosis and treatment of diseases. Employees who work in radiology, nuclear medicine, radiation oncology, and some laboratories are specifically trained in the operation of radiation machines and the handling of radioactive materials and sources. Other workers may work around radiation sources, and may be indirectly exposed to radiation during performance of their normal duties. At PCOM, these employees are "allied workers" and may belong to housekeeping, maintenance, security, shipping/receiving, and clerical departments.

Radiation is a general term used to describe a bundle of energy in the form of electromagnetic waves moving through space. Radio waves, microwaves, ultraviolet waves, x-rays, gamma waves, and visible light are all forms of electromagnetic waves. All electromagnetic radiation travels at the speed of light. Among all the electromagnetic radiations, only light is visible to the human eye. All other electromagnetic radiations cannot be seen and special instruments are required to detect their presence.

The term radiation is also used to describe very fast moving particles, such as electrons and neutrons. These particles are found in the atom, which is the smallest part of any material. The term "radioactivity" is the spontaneous emission of alpha, beta or electromagnetic gamma radiations as a consequence of changes in certain types of atoms. Gamma radiation is referred to as penetrating radiation, which is useful in modern medicine for the diagnosis and treatment of diseases. At PCOM, radioactive materials are used only for research purposes. Because radiation can damage living tissues, precautions must be taken when using and working around it.

This booklet is designed to inform all personnel about the nature of radiation, its use at PCOM, and methods of radiation protection. While the potential exposure to allied workers from radiation is very low with a very minimal hazard, all radiation exposure should be kept to a minimum. Further information can be obtained from the PCOM Radiation Safety Office.

2.0 Radiation

The amount of radioactivity present in a material decreases over time as a result of radioactive "decay". The period of time that it takes for a material to lose one half of its radioactivity is called its half-life. The half-life for different radioactive materials varies from fractions of a second to thousands of years. Radioactive materials are potential sources of contamination (radioactivity in places where it is not supposed to be), which can cause radiation exposure.

Some radiation is present naturally in the environment everywhere and is called "background" radiation. We are all exposed to these sources of radiation, which are usually in small quantities.

External sources of background radiation include: cosmic radiation, which comes from the sun and other sources in space, and terrestrial radiation, which arises from radioactive sources found in the earth and in some building materials. We receive more external radiation exposure from cosmic radiation when we climb mountains and fly in airplanes than when we are at ground level.

Internal sources of background radiation include naturally occurring radioactive materials. We are born with some of them, some are deposited in our bodies from the food and water we eat and drink, and from the air we breathe. Radon, a naturally occurring radioactive gas, is present in many locations and exposes our lungs and bodies. The presence of this and other natural, internal sources in our bodies results in a small radiation dose.

In addition to the natural sources of radiation, there are also man-made sources of radiation to which we may be exposed. In the United States, the largest source of radiation exposure to a person is from medical procedures. Sources of radiation in medicine include x-ray machines and radioactive materials used in the diagnosis and treatment of disease.

At PCOM, radioactive materials that are used for research purposes are mainly liquids. Radioactive materials continually emit radiation and, unlike the x-ray machine, cannot be turned off. Because these materials are a potential source of contamination, they are used and stored in special areas. These areas must be locked when unattended.

3.0 Radiation Protection Methods

Radiation protection is employed to protect against contamination from radioactive materials and sources. The most effective methods of radiation protection are to:

- minimize time
- maximize distance
- maximize shielding

As the time spent in a radiation field increases, the radiation dose received also increases. Therefore, it is best to minimize the time spent in any radiation area. If working in and around radiation areas is part of a person's assigned duties, the person's work efforts should be organized and well planned in advance to limit the work time in the radiation area.

As the distance from a radiation source increases, the radiation exposure decreases rapidly. Doubling the distance between a person and the radiation source reduces the radiation exposure to as little as one-fourth (¼) of the original exposure. It is good practice to keep as much distance between you and the radiation source as is reasonably possible.

Material that absorbs radiation is a shield. The thicker the shielding, the more the radiation exposure decreases. Lead is a material commonly used for shielding gamma rays. Lead bricks, lead vials, and various other tools are used to reduce radiation exposure.

Contamination is the undesirable presence of radioactivity, such as a liquid spill on the floor, or on clothing. It is a potential hazard whenever unsealed radioactive materials are present. Avoid contaminating an area since it can spread radioactivity to outside areas, including cars and homes, and can result in accidental ingestion or inhalation of radioactive materials. Prevent contamination by using the same precautions followed when handling infectious agents, and biological and chemical substances. Wear rubber gloves and protective clothing. In the case of accidental spillage of radioactivity by an allied worker, the PCOM Radiation Safety Office should be notified immediately. All persons not involved in the spill should vacate the area. The movement of all personnel potentially contaminated will be confined to prevent the spread.

Remember, radioactivity or contamination cannot be seen. Do not eat, drink, smoke, or apply cosmetics in any radiation area. This reduces the possibility of the accidental ingestion or inhalation of radioactive materials.

4.0 Radiation Areas

The previously described protection methods are effective only when radiation areas are known. At PCOM, areas or rooms where radioactive materials are used or stored are required to be posted with **CAUTION RADIOACTIVE MATERIALS** signs.

Refrigerators where radioactive materials are stored are required to be posted with **CAUTION RADIOACTIVE MATERIALS** signs.

Sinks that are used for discharge of radioactive materials into the sanitary sewage system are required to be labeled with **CAUTION RADIOACTIVE MATERIALS** signs.

Containers of radioactive materials must be labeled with a **CAUTION RADIOACTIVE MATERIALS** label.

If it is unclear as to whether or not an area is a radiation area, contact the PCOM Radiation Safety Office.

5.0 Specific Instructions for PCOM Employees

Housekeeping personnel

- Recognize radiation areas in your work environment.
- Get permission and instructions from the PCOM Radiation Safety Office before cleaning any spill in a radiation area.
- Do not clean counter tops, hoods, refrigerators, or sinks in radiation areas unless specially requested and instructed by the area supervisor or the PCOM Radiation Safety Office.
- Do not remove trash or other items from rooms posted with radiation signs, unless specifically instructed by the PCOM Radiation Safety Office.

Maintenance personnel

- Recognize radiation areas in your work environment.
- Obtain permission before working in an area that is in or adjacent to a radiation area.
- Be aware of hood, sinks, drains, refrigerators, and storage areas used for radioactive materials or sources.

Security personnel

- All security personnel should be aware of the location of all radiation areas, and be able to recognize packages containing radioactive materials.

Shipping/receiving

- All shipping/receiving personnel should be able to recognize packages containing radioactive materials.

Clerical personnel

- Recognize restricted areas in your work environment.
- Refrain from eating, drinking, applying cosmetics, and smoking in areas where radioactive materials are used.
- Prohibit food or soft drink storage in refrigerators used for the storage of radioactive materials.

Prepared by the PCOM Radiation Safety Office

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