Potential Health Hazards of Radiation

FACT SHEET

This fact sheet explains the potential health hazards associated with the radioactive decay of uranium and other radioactive elements found in ore and mill tailings.

Background

During World War II and the Cold War, the federal government developed and operated industrial facilities for the research, production, and testing of nuclear weapons, as well as other scientific and engineering research. These processes left a legacy of radioactive and chemical waste, environmental contamination, and hazardous facilities and materials at well over 100 sites. Some of these sites processed uranium and vanadium, and upon closure, left behind millions of cubic yards of mill tailings on the sites and throughout the nearby communities. The U.S. Department of Energy (DOE) administers the cleanup of these areas to minimize the risks to the public and environment from exposure to the tailings and the radon gas they produce.

Definition

Radiation is *energy* emitted by unstable (radioactive) atoms. Unstable atoms contain extra energy that is released as invisible particles or waves as the atoms change, or decay, into more stable forms. Particles and waves are referred to as radiation and their emission is called radioactivity.

Sources of Radiation

People are exposed to radiation from natural and man-made sources.

On earth, natural sources of radiation exist in rocks, soil, air, and water. Other sources of natural radiation are the sun and outer space. Everyone, no matter where they live, is subjected to natural or "background" radiation. Natural radiation accounts for approximately 82 percent of the total exposure that the average person receives during a lifetime.

The largest contributor to natural radiation doses is radon, a colorless, odorless gas produced by the radioactive decay of radium. Radium is found in uranium ore and mill tailings, which are a fine, sandy material that contain much of the radioactivity that was present in the unprocessed ore.

Man-made sources of radiation, most notably from medical uses and consumer products, contribute to the remaining radiation dose that individuals receive. A few household products, including smoke detectors, microwave ovens, and televisions, emit small amounts of radiation. For most people, the benefits from using such products far outweigh the radiation risks. Man-made radiation accounts for approximately 18 percent of the total exposure that the average person receives during a lifetime.

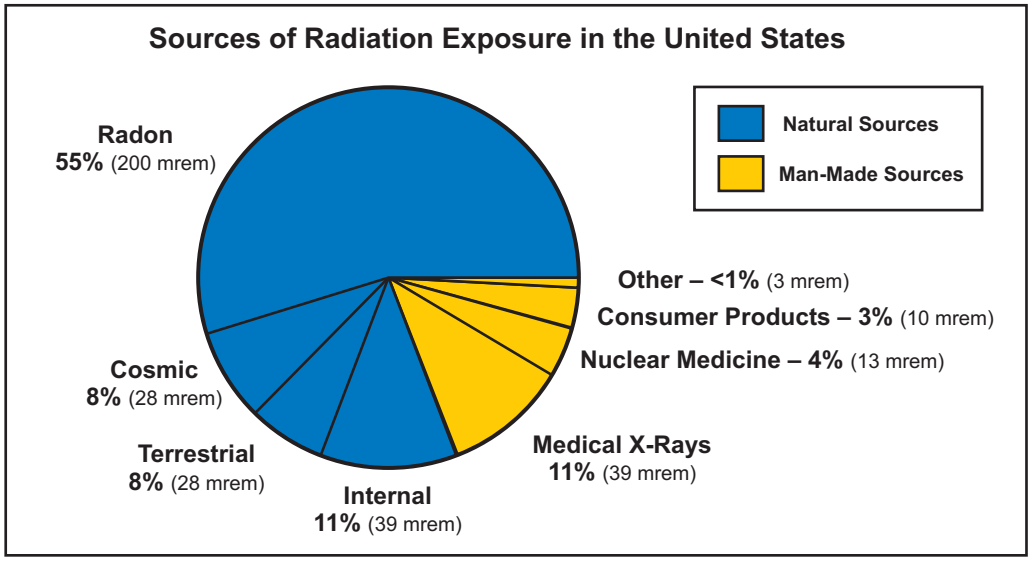
Radiation Dose

Radiation is measured in various units. Individuals who have been exposed to radiation have received a radiation dose. A radiation dose is the amount of radiation or energy absorbed and is often measured in "rem" or "millirem." A millirem (mrem) is one-thousandth of a rem. Rem measures the ability of the specific type of radiation to do biological damage to human tissue. The average chest x-ray, for example, delivers a dose of about 20 mrem to a patient.

In the United States, the average annual radiation dose to people from natural and man-made radiation sources is about 360 mrem; however, this dose will vary in different parts of the country depending on the radiation source.

Types of Radiation

Radiation that has enough energy to damage cells in human tissue is called ionizing radiation. There are three basic types of ionizing radiation. Large, slow-moving alpha particles are easily stopped by a sheet of paper or the skin. Smaller, faster beta particles pass through paper or skin but can be stopped with a thin shield, such as a sheet of aluminum foil. Stopping gamma radiation (which travels at the speed of light) takes a thick shield of steel, lead, or concrete. X-rays and cosmic rays are examples of gamma radiation. All three of these types of radiation are emitted by radioactive elements found in uranium ore and mill tailings.



Health Risk of Mill Tailings

The primary health concern is a potential increase in the risk of cancer from inhalation of radon and direct exposure to gamma radiation in the mill tailings. Both radon and gamma radiation are generated in the tailings piles, as well as in other contaminated soils and materials on the millsite, the properties bordering the millsite, and homes and businesses where tailings and ore contamination are found.

Radon gas is produced by the radioactive decay of radium in tailings. If radon gas is inhaled during a long period of time, it can cause damage to lung tissue, increasing the risk of lung cancer. Concentrations of radon gas in homes and businesses is of particular concern. Because radon is a gas, it can easily enter structures through cracks in foundations and seeps around pipes. Radon is more likely to collect in higher concentrations inside buildings than in soil. Gamma radiation can penetrate the entire body, damaging cells and potentially resulting in other types of cancer.

Radiation, however, is not alone in its cancer-producing potential. In fact, an average of 2,000 people in every 10,000 die from some form of cancer. If all 10,000 people received 1 rem each, statistics show that four additional persons would die of cancer. However, it would be impossible to determine which of the 2,004 cancer deaths was caused by the radiation.

Cleanup is designed to reduce public exposure to the types of radiation emitted by radioactive elements found in uranium ore and mill tailings and to protect both human health and the environment now and in the future.