

Understanding radiation...

Radiation is all around us; it has been a part of our environment since time began. Most radiation we are exposed to comes from natural sources.

Types of radiation. The term “radiation” is broad and includes light, heat and radio waves. It is most often used to mean “ionizing” radiation, which produces charged particles (‘ions’) in materials it strikes.

Alpha, beta, gamma, x-rays, and neutrons are types of ionizing radiation. Each has different characteristics.

- **Alpha Radiation** consists of positively charged particles. It is the least penetrating and will not pass through the outer layer of skin. A sheet of paper will stop alpha radiation.
- **Beta Radiation** consists of electrons and is more penetrating. A thin sheet of aluminum or plastic can keep it from passing through the outer layer of skin.
- **Gamma Radiation** is a form of electromagnetic waves, similar to light or radio waves. It is highly penetrating. Barriers of concrete or lead shielding are used to provide protection.
- **X-Ray** is the most familiar type of radiation. It is used extensively in medicine and industry. Like gamma rays, x-ray is electromagnetic radiation.
- **Neutron Radiation** occurs inside nuclear reactors and some special sources. It is very penetrating, but water is an effective shield.

Sources of radiation...

The average American receives about 360 units of radiation each year. These units are called *millirem* (mrem) and about 295 mrem comes from nature; the average person also gets about 65 mrem from man-made sources, primarily from beneficial medical radiation.

U.S. average

Annual radiation exposure...

Man-Made Sources

X-Rays	39
Nuclear medicine	14
Consumer products (TV, smoke detectors, etc.)	10
Other (including nuclear power)	2

Natural Sources

Radon	198
Our body	39
Sun	29
Earth	29
U.S. Average (mrem/year)	360

These figures show the most common radiation sources and how much we receive each year on average. This amount of exposure falls *well below* accepted limits for human beings.

No long-term ill effects to humans have been found at levels of 10,000 mrem per year. This level is well above that which most of us are exposed. The human body has the ability to repair minimal damage inflicted upon it. This is why exposure to low level radiation over a period of time produces no adverse effects. However, exposure to high radiation levels over short periods of time could result in health problems.

The Nuclear Regulatory Commission has established public radiation exposure limits. They recommend no more than 100 mrem of *additional* radiation exposure annually. Occupational doses (whole body) must remain less than 5,000 mrem *additional* annual exposure. “Additional” means from sources other than background and medical administration.

Many benefits result from the safe use of radiation and radioactive materials. Their application is essential in medicine, industry, agriculture, and other research areas that affect our daily lives.