

This fact sheet answers the most frequently asked health questions (FAQs) about ionizing radiation. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this material may harm you. The effects of exposure to any hazardous material depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other radioactive materials are present.

**HIGHLIGHTS:** Ionizing radiation, like heat and light, is a form of energy. It includes particles and rays given off by radioactive material, stars, and high-voltage equipment. Most of it occurs naturally and some is produced by human activities. At very high doses, ionizing radiation can cause illness or death. Any dose could possibly cause cancer, after a several-year delay. It is not known how many of the 1,517 National Priorities List sites identified by the Environmental Protection Agency give off ionizing radiation above background levels.

## What is ionizing radiation?

(Pronounced ī'ə-nīz'īng rā'dē-ā'shən)

Ionizing radiation is any one of several types of particles and rays given off by radioactive material, high-voltage equipment, nuclear reactions, and stars. The types that are normally important to your health are alpha particles, beta particles, x rays, and gamma rays.

Alpha and beta particles are small, fast-moving bits of atoms that a radioactive atom gives off when it changes into another substance. X rays and gamma rays are types of electromagnetic radiation. These radiation particles and rays carry enough energy to knock out electrons from atoms and molecules (such as water, protein, and DNA) that they hit or pass near. This process is called ionization, which is why this radiation is called "ionizing radiation."

## What happens to ionizing radiation when it enters the environment?

Ionizing radiation, which travels as fast as the speed of light, hits atoms and molecules in its path and loses some of its energy with each hit. When all the energy is gone, there is essentially nothing left. Ionizing radiation does not make you radioactive - it just leaves some of its energy inside you or whatever else it hits.

When ionizing radiation from outer space hits the upper

atmosphere, it produces a shower of cosmic rays that constantly expose everything on earth. Some hit gases in the air and change them into radioactive material (such as tritium and carbon 14). Other radioactive materials are naturally part of the environment, such as the uranium that has been here since the earth was formed. Still other radioactive materials are made by industry for smoke detectors, medical tests, and other uses. These radioactive materials give off their ionizing radiation over time until all of the radioactive atoms have decayed.

Whenever radioactive material enters the environment, it behaves like other substances, getting into the air, water, soil, plants, and animals, while also giving off radiation.

Some ionizing radiation is made on demand, such as when doctors take x rays.

## How might I be exposed to ionizing radiation?

You are exposed to low levels of ionizing radiation from the sun, rocks, soil, natural sources in your body, fallout from past nuclear weapons tests, some consumer products, and radioactive materials released from hospitals and from nuclear and coal power plants.

You are exposed to more if you work as a pilot, flight attendant, astronaut, industrial and nuclear power plant worker, or x ray or medical personnel.

You receive additional exposure with each x ray exam and

