



CANADIAN NUCLEAR WORKERS' COUNCIL

Radiation Basics

Key Points

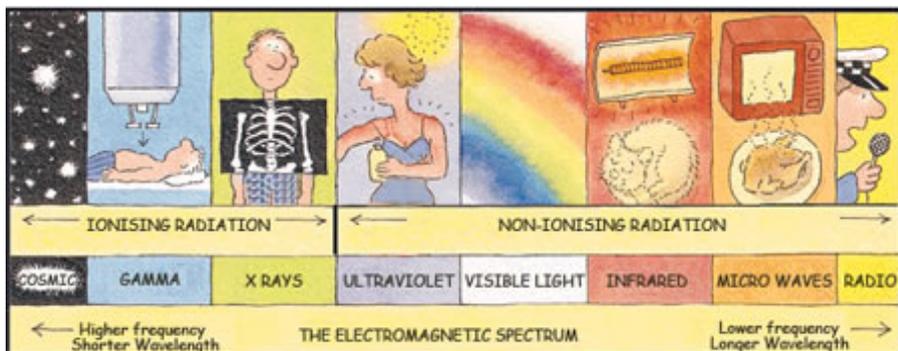
- People are exposed to natural and human-made sources of radiation every day.
- More than 60 naturally occurring radioactive materials, such as radon gas, are found in soil, water and air. Terrestrial and cosmic radiation on average represent about 80% of a person's annual dose of background radiation.
- Human-made radiation sources include medical devices like X-ray machines, and nuclear power plants. Canadians receive more than 100 times more radiation naturally through the food we eat than from Canada's nuclear power plants.
- Scientists have developed many beneficial uses of radiation to help global challenges including food safety, disease diagnosis and treatment, and safety testing.
- Exposure risk is determined by 3 factors—distance from the source, the amount of exposure, and the level of shielding.
- The Canadian Nuclear Safety Commission, an independent agency, regulates nuclear energy and materials to protect the health and safety and security of Canadians and the environment.

What is Radiation?

Radiation is a type of energy that comes from a source and travels through material or space in the form of waves or particles. All of us are exposed to small doses of radiation from the sun, food we eat, rocks and soil, from the people around us, air flights, medical procedures and dental x-rays.

Radiation is classified as ionizing or non-ionizing. Ionizing radiation has sufficient energy to remove electrons from atoms or molecules while non-ionizing radiation only has enough energy to move or vibrate atoms but not remove electrons. Radiation that can be seen by people includes sound, light and heat. Other types can only be observed indirectly—microwaves, radio waves and ionizing radiation. Ionizing radiation is a type of energy released by atoms that travel in the form of electromagnetic waves—gamma or X-rays, or particles—neutrons, beta or alpha.

The Electromagnetic Spectrum



The Energy Spectrum
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Measuring Radiation

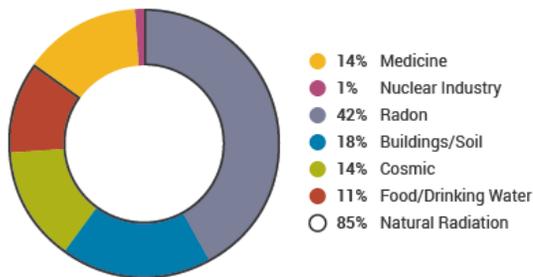
There are different ways to measure radiation, for example a Geiger counter can count alpha, beta and gamma radiation. As different types of radiation have different biological effects, ionizing radiation is commonly measured in units called millisieverts (mSv).

Background radiation is the normal level of radiation at any given location. World-wide natural background radiation averages about 2.4 mSv/year. According to the World Health Organization, on average 80% of the annual dose of background radiation a person receives is from naturally occurring terrestrial and cosmic radiation sources. Due to geological differences, exposure in certain areas can be over 200 times higher than the global average. By comparison, Canadians are naturally exposed to about 1.8 mSv/year on average.

The low doses people receive naturally and from medical procedures present little risk to human health. However, high doses that only occur in extreme circumstances that are received in a short period of time can be dangerous.

Radiation Sources

Sources of Radiation



Source: World Nuclear Association, Nuclear Radiation & Health Effects, July 2016

Regulation

Multiple layers of protection are in place between nuclear operations and employees and the public. International oversight is provided by the International Atomic Energy Agency. The Canadian Nuclear Safety Commission has the mandate in Canada to monitor and regulate the use of nuclear energy and materials. Canada's nuclear industry is one of the most highly regulated industries in the world.

More Information:

- Health Canada: www.hc-sc.gc.ca/
- World Health Organization: www.who.int
- Canadian Nuclear Safety Commission: www.nuclearsafety.gc.ca
- Canadian Nuclear Association: www.cna.ca
- Radiation Safety Institute of Canada www.radiationsafety.ca
- World Nuclear Association: www.world-nuclear.org/