Background radiation

Background radiation, it is low level ionizing radiation that is produced all the time and comes from different natural or artificial (man-made) sources.

Man-made radiation is generated in a range of medical, commercial and industrial activities. The most familiar and, in national terms, the largest of these sources of exposure is medical X-rays.

Levels can vary greatly. People living in granite areas or on mineralized sands receive more terrestrial radiation than others, while people living or working at high altitudes receive more cosmic radiation. A lot of our natural exposure is due to radon, a gas which seeps from the earth's crust and is present in the air we breathe.

Natural radiation (non-medical radiation)

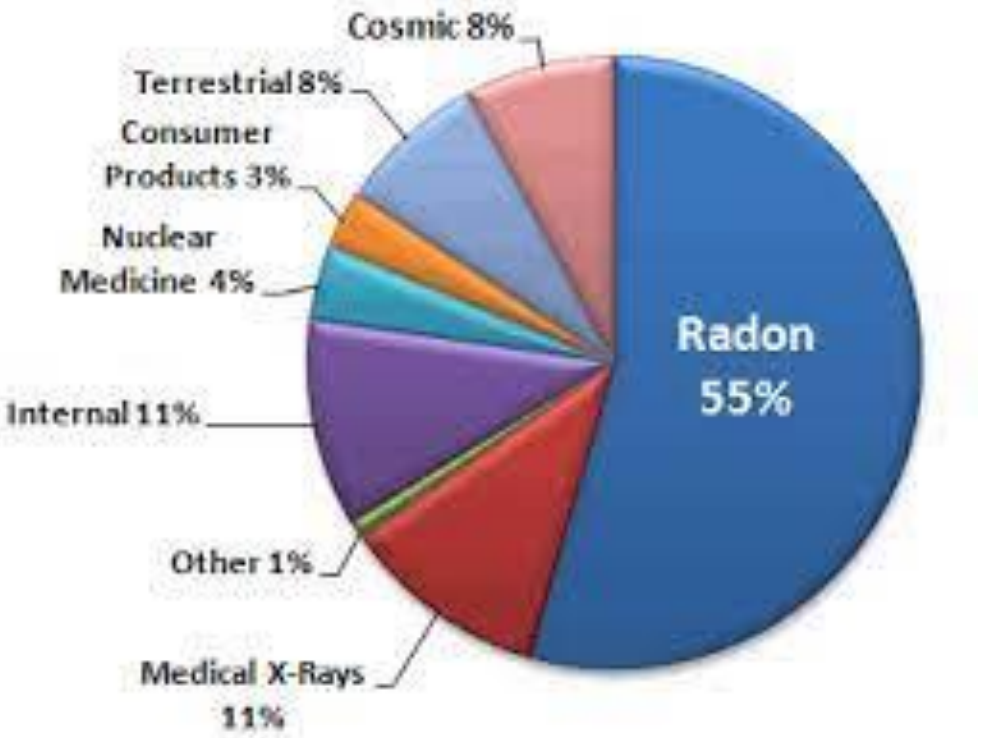
The main sources of natural radiation are the following :

► Terrestrial Radiation

- Soil
- Gas

► Cosmic Radiation

► Natural Radioactivity in the Body (internal radiation)



1. Terrestrial Radiation

When the earth was formed four billion years ago, it contained many radioactive isotopes. Since then, all the shorter lived radionuclides have decayed. Only those radionuclides with very long half-lives (100 million years or more) remain, along with the radionuclides formed from the decay of the long lived radionuclides .

These naturally-occurring radionuclides include isotopes of uranium and thorium and their decay products, such as radon. The presence of these radionuclides in the ground leads to both external gamma ray exposure and internal exposure from inhalation of radon and its progeny.

- **Soil :**

Natural radioactive material in rocks and soil account for about 8% of the

radiation dose a person typically receives in a year from all sources. The earth's crust contains small amounts of uranium, thorium, and radium as well as radioactive isotopes of several elements including potassium. The radiation dose comes from the gamma rays which are emitted from the rocks, soil, and some building materials (such as bricks and concrete).

- **Radon Gas:**

The Earth's crust contains small amounts of naturally radioactive materials such as uranium and thorium. Uranium and thorium decay to other radioactive atoms, including radium, which then decays to radon gas. Since radon is an inert (that is, chemically stable) gas, it moves from the soil ,where it is produced, and into the air. Radon is a natural part of the earth's atmosphere. The amount of uranium and radium in soil varies greatly with geographic location and soil type.

2. Cosmic Radiation

Cosmic rays are extremely energetic particles, primarily protons, which originate in the sun, outer space, other stars, and from violent cataclysms in the far reaches of space. Cosmic ray particles interact with the upper atmosphere of the earth and produce showers of lower energy particles .

Many of these lower energy particles are absorbed by the earth's atmosphere. The exposure of an individual to cosmic rays is greater at higher elevations than at sea level.

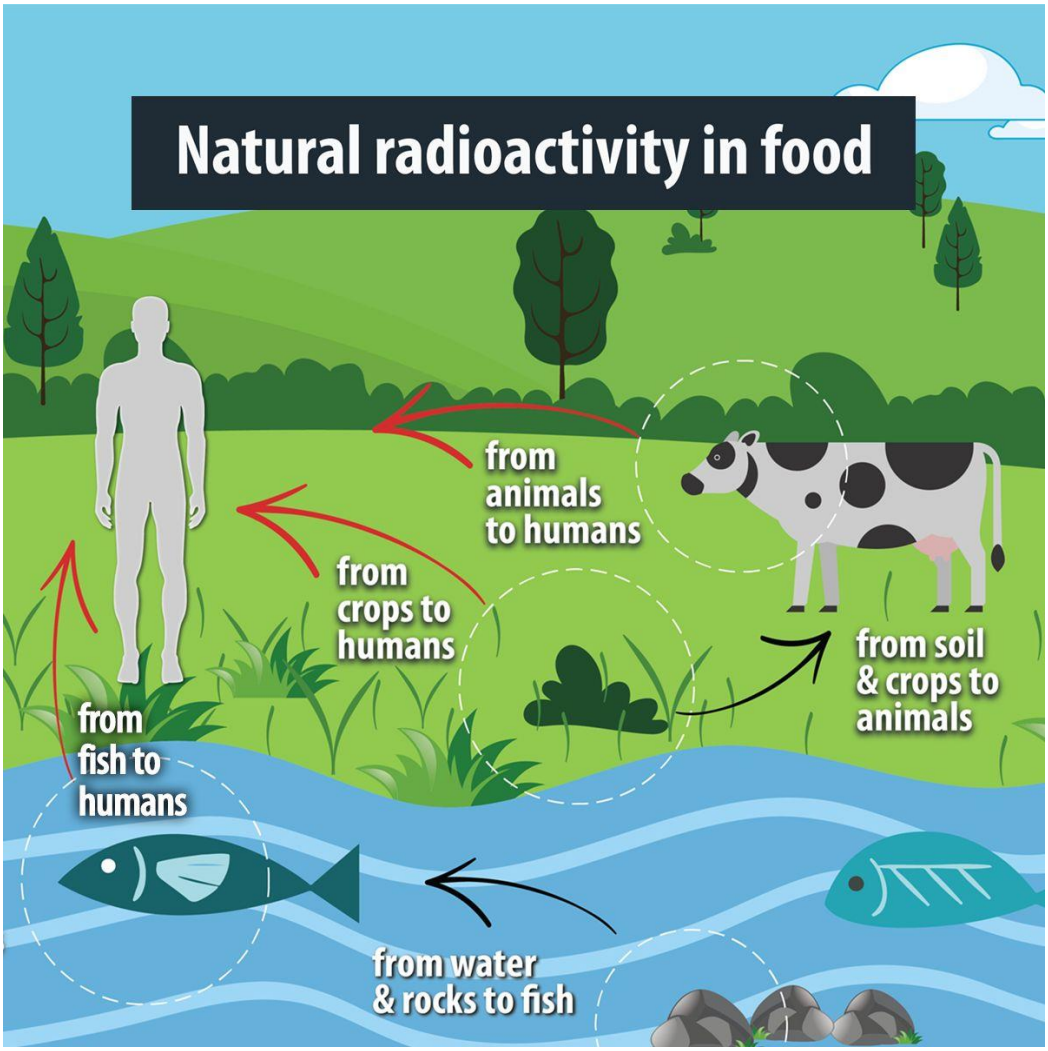
3. Natural Radioactivity in the Body

Some foods contain small amounts of radioactive elements. Food can gain this radioactivity in a few ways:

- **Uptake:** roots of plants take in radionuclides from the soil.
- **Deposition:** radioactive particles in the air settle onto crops.
- **Bioaccumulation:** radionuclides accumulate in animals that ingest plants, feed, or water containing radioactive material.

The most well-known examples of naturally-occurring radionuclides in foods are bananas and Brazil nuts. Bananas have naturally high-levels of potassium and a small fraction of all potassium is radioactive. Each banana can emit (0.1 micro Sieverts) of radiation. This is a very small amount of radiation. Examples of the radionuclides are: tritium (^{3}H), carbon-14 (^{14}C), and potassium-40 (^{40}K).

In the case of a radiological event, there may be situations in which an animal ingests materials that contain radioactivity. For example, if radioactive materials are found in water, some fish may ingest them, which, in turn, could be eaten by a human as part of their diet.



Artificial (Man – made) radiation

We are also exposed to ionizing radiation from man-made sources, mostly through medical procedures. Besides medical applications, extremely small amounts of man-made background radiation are received from consumer products and facilities using radioactive material, including research and teaching institutions, nuclear reactors and their supporting facilities such as uranium mills and fuel preparation plants ,and facilities involved in nuclear weapons production. Radiation is also used in cancer treatments, where precisely targeted radiation destroys diseased cells without killing nearby healthy cells.

Radioactive Fallout

Nuclear weapons derive their explosive power from the uncontrolled radioactive break-up of plutonium and uranium. This yields a large number of radioactive daughter products that are blown high into the atmosphere and are carried around the earth.

The Tobacco

People who smoke receive additional radiation from radionuclides in tobacco smoke. Tobacco in cigarettes contains lead210. Lead210 is a naturally occurring radionuclide that precipitates out of the atmosphere and deposits on the leaves of tobacco. When the tobacco is inhaled, the smoker receives a dose from the inhaled lead-210 as well as polonium-210. Lead-210 is deposited on the surfaces of bones and polonium-210 is deposited in the liver, kidney and spleen.