



# Ionizing Radiation Sources

## Radioactivity

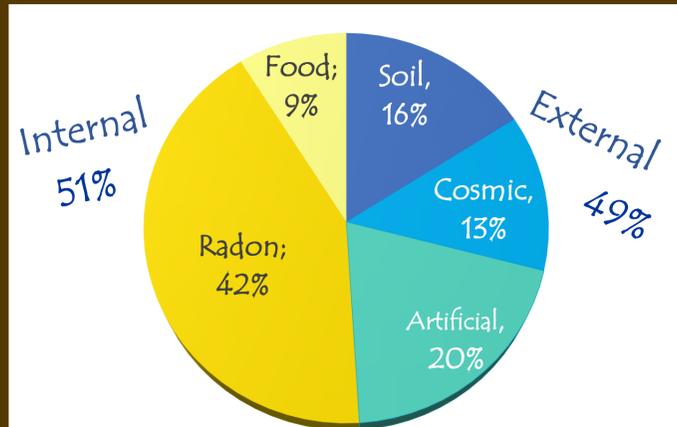
Radioactivity is a part of our Earth - it has existed all along. Naturally occurring radioactive materials are present in its crust, the floors and walls of our homes, schools, or offices and in the food we eat and drink. There are radioactive gases in the air we breathe. Our own bodies - muscles, bones, and tissue - contain naturally occurring radioactive elements. The global average annual effective dose per person is about 2.4 mSv and ranges from about 1 to more than 10 mSv depending on where people live.

## Natural background

Over 60 radionuclides (radioactive elements) can be found in nature. Radionuclides are found naturally in air, water and soil.

Every day, we ingest and inhale radionuclides in our air, food and the water. Natural radioactivity is common in the rocks and soil that make up our planet, in water and oceans, and in our building materials and homes.

## Distribution of radiation exposure



**!** Radiation in the environment may irradiate our body from the outside—externally. Or we may inhale the substances in air, swallow them in food and then they irradiate us from inside—internally.

## Natural Radioactivity in Food

Food	<sup>40</sup> K pCi/kg	<sup>226</sup> Ra pCi/kg
Banana	3,520	1
Brazil Nuts	5,600	1,000-7,000
Carrot	3,400	0.6-2
White Potatoes	3,400	1-2.5
Beer	390	---
Red Meat	3,000	0.5
Lima Bean raw	4,640	2-5
Drinking water	---	0-0.17

When we eat food, we receive radiation dose. The main contributor to this dose is potassium-40 (K-40) which is present in all foods.

Curie [Ci]: Is the activity of 1 gram of the radium isotope <sup>226</sup>Ra. 1 Ci = 3.7×10<sup>10</sup> Bq = 37 GBq

**!** Radiation doses from cosmic radiation are greater at higher altitudes and those who fly regularly receive an additional dose.

## Cosmic radiation

Cosmic radiation permeates all of space, the source being primarily outside of our solar system. The radiation is in many forms, from high speed heavy particles to high energy photons and muons. The upper atmosphere interacts with many of the cosmic radiations, and produces radioactive nuclides. The Earth is continuously bombarded by high energy radiation from either the Sun (solar radiation) or from outside the solar system (galactic radiation).

## Soil

Everything in and on the Earth contains primordial radionuclides. These extremely long-lived radionuclides found in the ground have been emitting radiation since before the Earth took its current shape.

## Radon

More than the half of the natural dose exposure (1.26 mSv/year) of the public comes from <sup>222</sup>Rn. Radon is a naturally occurring radioactive gas produced from the uranium that is present in all rocks and soils. Radon enters buildings from the ground and can build up to unacceptable levels. Exposure to radon increases the risk of lung cancer and is responsible for about 20,000 lung cancer deaths in the European Union each year.

BME, D. Tatai-Szabó, C. Pesznyak