Australian Government
Australian Radiation Protection and Nuclear Safety Agency

Fact Sheet

Ionising Radiation and Health

Naturally occurring radioactivity is in the air we breathe, the food we eat and the buildings we live in.

What is natural background radiation?

Natural background radiation is the ionising radiation in the environment that all living species are exposed to every day. The largest source of radiation exposure comes from external exposure to natural radioactivity in rocks and soil (terrestrial radiation) and inhalation of radon gas that seeps from the ground into all buildings. There are also significant contributions from cosmic radiation and naturally occurring radioactivity in food and in the body.

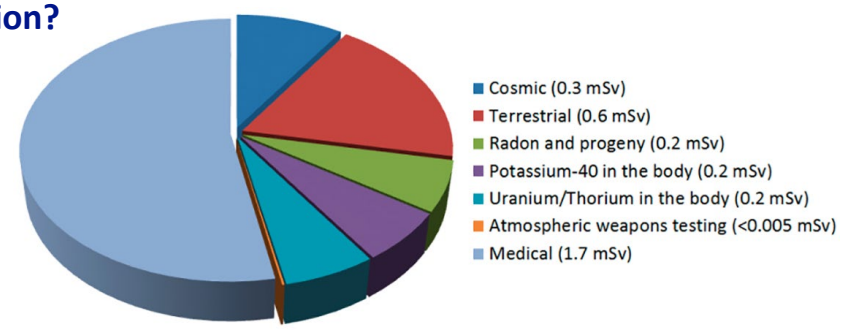

Figure 1: Average yearly radiation exposure in Australia

How much background radiation is there in Australia?

The amount of background radiation present depends on many factors, such as the type of soil and rock present, altitude, latitude and diet. The range of radiation exposure is highly variable, however on average Australians are exposed to 1.5 mSv each year from natural sources. This is about the same amount of radiation received from 75 chest X-rays.

What about artificial sources of radiation?

Sometimes artificial sources of radiation are also included as 'background' radiation. Medical diagnostic tests and treatments are the largest source of artificial (or man-made) radiation exposure in Australia. Figure 1 compares the average annual exposure to some of the different types of radiation in Australia.

Is artificial radiation more dangerous than natural radiation?

The damaging effects of ionising radiation come from the energy deposited in tissue by the radiation. Although different types of ionising radiation have different patterns of energy release and penetrating power, there is no general property that makes artificial ionising radiation different or more damaging than the ionising radiation that comes from natural radioactive material. This means that we can make direct comparisons between exposures from artificial sources of ionising radiation and those from natural sources.

Risk and potential health effects

Harmful tissue reactions (acute or deterministic effects) occur when doses are high (greater than about 500 mSv). These effects occur shortly after exposure (minutes to weeks) and can include sterility, skin burns and acute radiation syndrome. Death can occur at very high doses.

There have been many large scale studies worldwide of cancer risk in people arising from radiation exposure. The risk from exposure to high radiation doses is relatively well quantified, but for low radiation exposures the scientific evidence for increased health risk is more limited (see Figure 2 over). While there is a possible increased risk of cancer and hereditary effects at low radiation doses or for radiation delivered over a long period of time, these effects are not always detectable in scientific studies. However, their likelihood increases as dose increases.

619 Lower Plenty Road, Yallambie VIC 3085
Telephone: +61 3 9433 2211
Fax: + 61 3 9432 1835

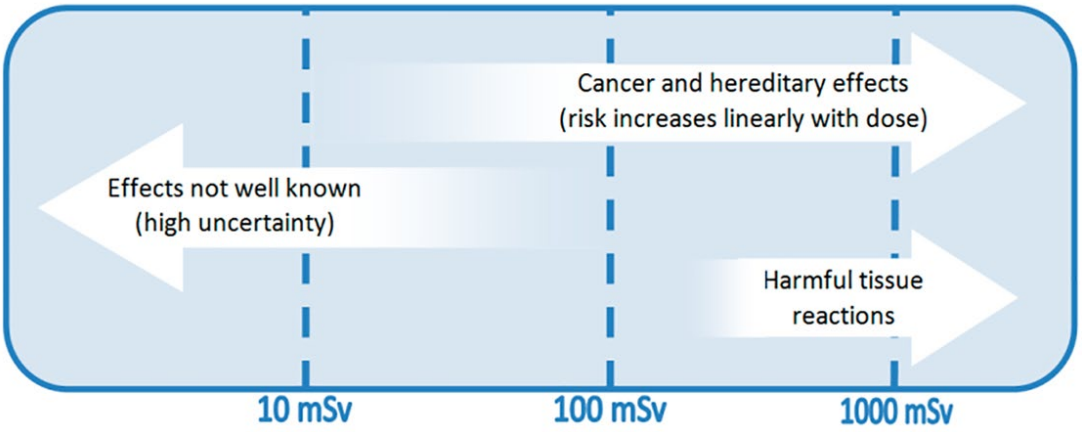

Figure 2: Radiation health effects at different exposure levels

Human's Exposure to Ionising Radiation	
Source of exposure	**Exposure (per year)**
One CT (computed tomography) scan to the chest	5 mSv
Cosmic radiation exposure of domestic airline pilot	2 mSv
Total natural radiation in australia	**1.5 mSv**
Australian uranium mining workers	1 mSv
One return flight from Melbourne to London a year	0.11 mSv
One chest X-ray (2 views) a year	0.06 mSv
Nuclear fallout (from atmospheric tests in the 1950s and 1960s)	0.02 mSv

World Average of Natural Background Ionising Radiation	
Source of Exposure	**Exposure (per year)**
Inhalation (radon gas)	0.2-10 mSv
External terrestrial	0.3-1 mSv
Ingestion	0.2-1 mSv
Cosmic radiation	0.3-1 mSv
Total natural	**1-13 mSv**

Health Effects of Ionising Radiation	
Dose Range	**Effects on human health (including unborn child)**
Up to 10 mSv	No direct evidence of human health effects
10 - 1 000 mSv	No early effects; increased incidence of certain cancers in exposed populations at higher doses
1 000 - 10 000 mSv	Radiation sickness (risk of death); increased incidence of certain cancers in exposed populations
Above 10 000 mSv	Fatal always