

Breakdown of Natural Exposure Doses (Japanese)

Type of exposure	Breakdown of radiation sources	Effective dose (mSv/year)
External exposure	Cosmic rays	0.3
	Ground radiation	0.33
Internal exposure (inhalation)	Radon-222 (indoors and outdoors)	0.37
	Radon-220 (thoron) (indoors and outdoors)	0.09
	Smoking (Lead-210, Polonium-210, etc.)	0.006*
	Others (uranium, etc.)	0.006
Internal exposure (ingestion)	Mainly Lead-210 and Polonium-210	0.80
	Tritium	0.0000049
	Carbon-14	0.014
	Potassium-40	0.18
Exposure under special environments	Exposure due to hot springs or other subsurface environments	0.005
	Exposure due to the use of aircraft	0.008
Total		2.1

(*) Per capita effective doses; The average exposure dose for smokers is 0.040 mSv/y.

Source: Prepared based on "Environmental Radiation in Daily Life (Calculation of Natural Doses), ver. 3" (2020), Nuclear Safety Research Association

This table shows that the intake of Lead-210 and Polonium-210 through ingestion accounts for a significant portion of Japanese people's internal exposures. Lead-210 and Polonium-210 are created when Radon-222 in the air goes through the following process. They are deposited on the ground or settled in rivers and oceans and are taken into the human body through foods.

Radon-222 (half-life of approx. 3.8 days) → Polonium-218 (half-life of approx. 3 minutes) → Lead-214 (half-life of approx. 27 minutes) → Bismuth-214 (half-life of approx. 20 minutes) → Polonium-214 (half-life of approx. 1.6×10^{-4} sec.) → Lead-210 (half-life of approx. 22 years) → Bismuth-210 (half-life of approx. 5 days) → Polonium-210 (half-life of approx. 138 days)

One reason why Japanese people's exposure doses from foods are higher compared to the rest of the world is that their diets contain lots of fish, which is rich in Polonium-210. This accounts for Japanese people's large effective doses. Incidentally, analyses of Lead-210 and Polonium-210 in foods have rarely been conducted so often in foreign countries as in Japan and this is considered to be one of the factors of higher exposures to Lead-210 and Polonium-210 among Japanese compared with the global average.

On the other hand, exposure to Radon-222 and Radon-220 (thoron) is smaller among Japanese people, and this is considered to be due to the fact that traditional Japanese houses are well ventilated and Radon-222 and Radon-220 (thoron) that seep indoors from the ground are quickly diffused outside.

Internal exposure to Radon-222 and Radon-220 (thoron) through inhalation will be explained in "Internal Exposure to Radon and Thoron through Inhalation" on p.71 of Vol. 1.

Tritium has smaller effects on the human body compared with other nuclides and exposure doses due to natural tritium are relatively small (p.57 of Vol. 1, "Conversion Factors to Effective Doses").

Included in this reference material on March 31, 2013

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