

【Effects of Radiation Exposure】

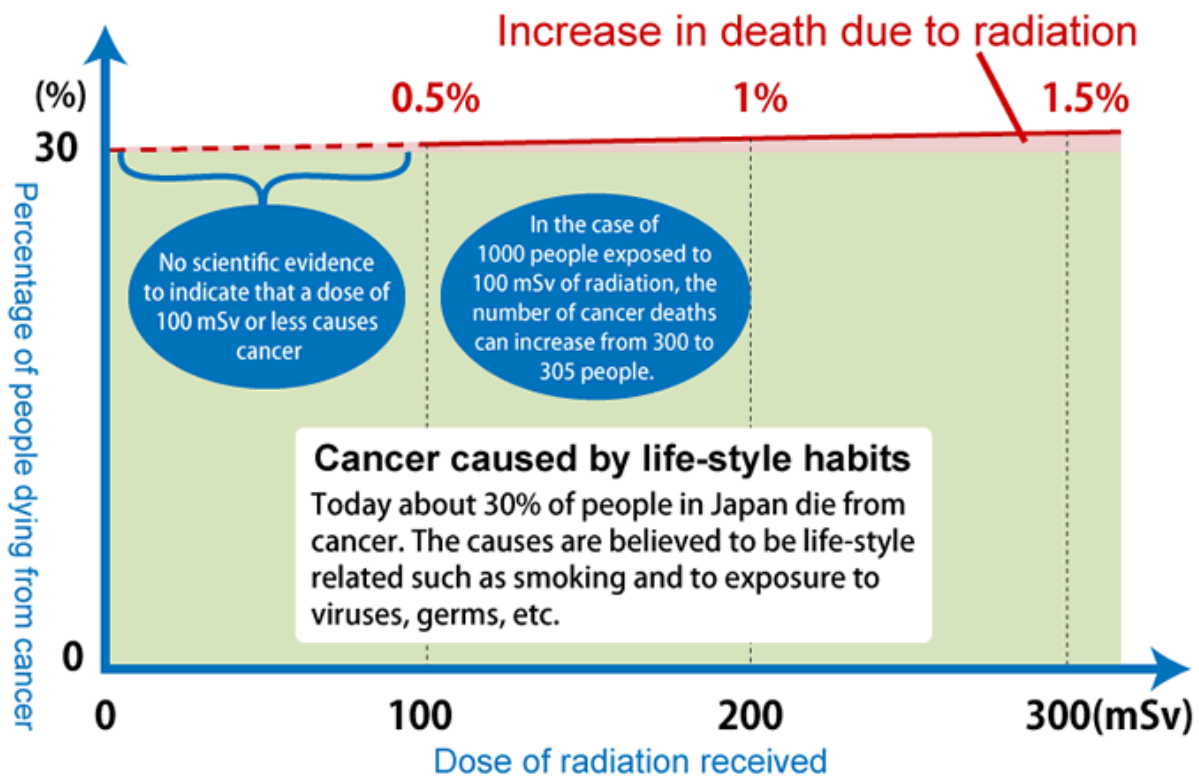
1. What kinds of effect do the radioactive materials in the atmosphere have on our bodies? Explain effects in relation to exposure doses and what 100 milli Sv (mSv) means.

Radioactive materials in the air may deposit on the earth's surfaces or on buildings and remain in the environment. In such cases, radiation exposure can come from gamma rays directly from the surface of the ground or via the ingestion of radioactive material in the air or the intake of radiation-contaminated water and agricultural products. Depending on the amount of radiation received (hereinafter called "dose"), the extent and influence of the radiation exposure may affect our health. Concerning long-term effects, it is thought that the higher the radiation exposure dose, the higher the risk of developing cancer several years or decades later.

Please look at the chart below. Cancer is thought to develop not only by radiation but also other factors such as diet, smoking, viruses and air pollution. In any given case, it cannot be determined whether the incidence of cancer can be attributed to radiation. Thus, to verify that cancer is caused by radiation, it is necessary to study a large number of people and prove that cancer incidences increase when higher doses of radiation are received. Based on data from atomic bomb survivors, it has been found that an effective dose of above 100 mSv (the total amount of radiation exposed to different organs, weighted to account for the radio sensitivity of each organ and including both external and internal exposure doses, if applicable) will increase the cancer death rate. However, there is no consistent study or clear evidence correlating the development of cancer with radiation exposure of 100 mSv or less. For the purpose of radiation protection, however, the ICRP takes a conservative stance by assuming that radiation doses below 100 mSv will also increase the cancer death rate as a function of radiation dose. However, it is important to note that the ICRP also stated that this assumption should only be used in view of radiation protection and is not appropriate for use in calculating cancer incidence in a group of people exposed to low doses of radiation.

The fact is that about 30% of Japanese people die from cancer. According to an ICRP estimate, supposing that 1,000 people have been exposed to 100 mSv of radiation, the death rate due to cancer would be predicted to rise from 300 people to 330 people. The 100 mSv mentioned above refers not to an annual exposure dose but an accumulated dose received to date, excluding radiation from the natural environment (an annual average dose of 1.5 mSv for people in Japan).

Increase in cancer and leukemia due to radiation



2. I live in the Tokyo metropolitan area. Is it better to avoid going out? I understand the radiation level is going up. Is it safe?

Radiation levels observed in the Tokyo metropolitan area have been very low until today from the time the accident occurred. Unless the accident expands in the future, there is no problem with leading a normal life. Ten or a hundred times higher amounts of radiation sounds abnormal, but the fact is that it is still not hazardous to our health. It is reported that radiation levels observed in Tokyo and in the Tochigi, Gunma, Saitama, Chiba, Kanagawa, Yamanashi and Shizuoka prefectures were between 9:00am and 5:00pm on March 15, with 1 micro Sv per hour as the highest recorded. If you continue to live in an environment with this level of radiation for one month, the total radiation dose will reach 0.7 mSv (slightly above the level of radiation received from taking a stomach X ray), and this level is not hazardous to our health. Moreover, this level of radiation is not likely to continue. The Tokyo metropolitan government announced that it was below 0.1 micro Sv on April 6, which is less than one-tenth the peak on March 15.

3. I live in the Tokyo metropolitan area. I got wet in the rain a few days after the nuclear accident. Am I OK?

Rain is thought to contain radioactive materials released from the accident, but the amount is insignificant.

Based on the calculation from the reported radioactive concentration in the air, the amount of radioactive materials is not at a level hazardous to your health even if it attaches to your skin. You don't have to worry.

4. I am pregnant. Am I going to be affected by radiation?

It is fine for pregnant women to take the same measures as others do. It is thought that exposure doses of 100mSv or less do not affect unborn children (deformation, mental retardation, etc.) . As for other effects (adult or childhood cancer), the effect caused by a low level of radiation dose that residents are likely to receive in the present situation is thought to be much less than that of other factors associated with our life-style habits. Thus, you do not need to be overly worried. Stable iodine is a medicine. You have to be careful when taking this medicine because side effects such as allergic reactions may occur. Don't take potassium iodide on your own judgment. Don't drink commercially available products containing iodine such as isodine (gargle mouthwash) or antiseptic solutions. For more information about precautions for expectant mothers, please refer to the Health Ministry's webpage.

For the health of expectant mothers, new mothers and babies"

<http://www.mhlw.go.jp/stf/houdou/2r98520000014uzs-img/2r98520000014v1g.pdf>

※To be accurate, the radiation dose of unborn children should be indicated as "100 milli gray or less" but we use Sievert (Sv) as this unit is commonly used in the media.

【Contamination screening and decontamination】

5. What kinds of action should be taken to decontaminate radioactive materials?
Can they be accomplished at home?

Decontamination means removing radioactive materials adhering to clothes, hair, skin, etc. Washing your clothes, taking a bath, washing your body and shampooing your hair can remove radioactive materials or decontaminate. So, decontamination can be performed at home. Water, hot or cold, that has been used for bathing or laundering can be drained off as usual.

6. I am a resident of a mandatory evacuation area or an indoor sheltering area. What should I do with the clothes I was wearing when leaving the area, or when radioactivity was detected on my clothes in a screening test?

At present, levels of radiation harmful to health have not been detected on the evacuees' clothing. You can wash clothes as usual and keep them on.

7. I wish to take a radiation exposure measurement (contamination screening). Can I ?

The media reported that 8,000 people had been checked at the Sousou Healthcare Center in the downtown area of Minamisouma city near the Fukushima Daiichi Nuclear plant and none was found to require decontamination (March 29 Newspaper). The National Institute of Radiological Sciences conducted radiation measurements on more than 1,300 people working at the Fukushima Daiichi nuclear plant and other places, but we have not found anyone exceeding the level required for decontamination procedures.

Based on these facts, contamination screening does not seem to be necessary for people except for those still staying in the mandatory evacuation area. If you are living in Fukushima prefecture and worry, please come to one of the 10 facilities for exposure measurement (contamination screening) in the prefecture after checking the status of the facilities on the website given below.

<http://www.pref.fukushima.jp/j/>

If you have been in an area within 3 km away from the Fukushima Daiichi Plant, or working on the site of the power plant, and have not yet taken a screening, please take a screening test in Fukushima or contact the health consulting desk of NIRS in Chiba.

8. Is it safe to receive an evacuee from Fukushima prefecture?

You may ask this question, concerned about potential risk of radiation exposure, but there is no problem at all. As explained under section 7., no one was found to need decontamination. Receiving evacuees from Fukushima will not affect your health. Please welcome them warm-heartedly. We'd ask you to take a calm and sensible attitude about the protection of evacuees from Fukushima without discrimination when they are received in the evacuation facilities, receive care in a hospital, move to an apartment, find a job, lead school life, etc.

【Water for drinking and daily routines】

9. It is reported that water at the Kanamachi purification center in Tokyo contained 210 becquerel per liter of radioactive iodine on March 22. Is it safe for adults to drink tap water? Is it ok to use it for cooking?

There is no need to worry about the influence on adult health. Water at the Kanamachi purification center later confirmed a lower concentration of radioactive iodine, showing an undetected level (20 Bq/L or less) on April 6. Japan's legal safety limit with respect to radioactive iodine is 300 Bq per a liter of water. This standard is determined when the dose of radiation received by the thyroid gland remains at 50 mSv per year or less even when water containing radioactive iodine continues being ingested for a long time.

Suppose that an adult continues to drink 2 liters of water containing 300 Bq/L iodine every day for one month, an unrealistic assumption indeed. In this case, the total exposure dose is estimated to be about 400 micro Sv based on calculation. This value is one fourth of the quantity of the radiation which a average person receives in one year from natural background radiation. So, you need not be concerned about the influence on your health. Using tap water for cooking does not have any harmful effect on your health.

The safety standard is set to minimize potential impact on health, based on the assumption that tap water is used for cooking.

10. May I use water in the above-mentioned case to have a shower, gargle, brush my teeth, etc.?

There are no negative effects on health even if you use tap water directly for purposes other than drinking and cooking.

(For reference) <http://www.mhlw.go.jp/stf/houdou/2r98520000014tr1-img/2r98520000015k18.pdf>

11. I have heard that radioactive substance has been detected in tap water, but I drank it without knowing it. Am I all right?

It is not harmful for your health to drink tap water for a short period of time.

12. Is it true that radioactive iodine disappears when water is boiled? Is a water purification device effective for filtering?

It is believed that radioactive iodine does not boil away, rather it may condense after water evaporates in some cases. Please refer to the April 6 information on NIRS's website about removing iodine 131 from tap water.

【Food】

13. The media are reporting that food has been contaminated by radiation. Are there any precautions we should take when eating vegetables and other foods?

Radioactive substances detected on vegetables are only present on the surface. Rinsing thoroughly, boiling (dispose of cooking liquid) and peeling skin or outer leaves off from vegetables can reduce the degree of contamination.

14. Is it safe to eat fish or meat selling in the market?

The safety limits with respect to radioactive iodine and cesium are set for meat and fish like vegetables. There is no need to worry about fish and meat available in the market.

15. Are vegetables used for school-provided lunch safe?

If radioactive material is detected at a level above the regulated limit, the shipment of vegetables will be banned. Please rest assured.

16. I am still worried even when radioactive substances detected in vegetables are within the regulated range of safety.

Is there any effect on pregnant women or on children?

Please refer to the comments of the following societies.

Japan Radiological Society <http://www.radiology.jp/modules/news/article.php?storyid=912>

Japan Society of Obstetrics and Gynecology http://www.jsog.or.jp/news/pdf/announce_20110324.pdf

【Potassium iodine and Iodine】

17. How should I take potassium iodine?

Potassium iodine should be taken only on medical doctor's prescription.

Potassium iodine administered before, or immediately after, intake of radioactive iodine can block or reduce the accumulation of radioactive iodine in the thyroid.

Potassium iodine may cause adverse side effects such as allergy.

It is effective only after the uptake of radioactive iodine and not effective for external exposure or other radioactive nuclides.

Therefore, the necessity of taking remedial action should be determined from a medical point of view taking into consideration the estimated radiation exposure from emitted radioactive iodine in the environment.

18. How does radioactive iodine affect the body once it has been ingested?

Radioactive iodine enters the body through breathing or through the intake of contaminated food and will be absorbed in the blood.. 10-30 % of radioactive iodine in the blood accumulate in the thyroid gland and the ratio depends on the intake of iodine which is not radioactive.

Radioactive iodine in the thyroid gland doesn't remain there for your entire lifetime, rather it will be gradually eliminated from the body.

Radioactive iodine changes to other elements and the radioactivity decreases by half in approximately 8 days.

On the 80th day, the radioactivity will be less than a 1/1000, and can hardly be detected.

19. I live in Tokyo and hope to work as a volunteer in Fukushima.

Can I get potassium iodine since I am worried about the radiation exposure?

Potassium iodine should only be prescribed by doctors and should not be prescribed for such a purpose. At this point, it is unnecessary to take potassium iodine unless you work in the Fukushima daiichi nuclear power plant.

20. Is there any replacement for stable iodine?

I've heard that potassium is effective. How about eating banana which is rich in potassium?

Currently, there is no replacement for stable iodine. The chemical nature of potassium is different from iodine and so it is not a replacement for stable iodine.

21. I am allergic to iodine. Can't I take potassium iodine? Can I take it if I reduce the dosage?

You can't take potassium iodine if you are allergic to iodine. Even a small amount of iodine may trigger an allergic reaction.

22. I have been diagnosed with chronic thyroiditis and not taken any medical treatment other than checkups.

Will the radioactive iodine emitted from the nuclear power plant have a bad influence on my health?

There are no special instructions other than observing the restrictions on food and water intake.

23. I am a patient with hyperthyroidism under treatment. Does the local tap water detected as containing radioactive iodine have a bad influence on my health?

In terms of the level of radiation and the density of iodine, the current level is not so high as to have an influence on your condition.

24. I have dried the bedding in the sun about 4 hours. Can I use the bedding even though I have undergone thyroidal surgery?

You need not be worried about the effects of radioactive iodine in the air, there are no problems with using the bedding.

【About the media reports】

25. Please explain the meaning of the numerical values reported by the media

100,000cpm (From the shoe of an evacuee at FUTABA evacuation center)

Assuming that this was measured with the GM survey meter commonly used for radiation measurement, the contamination level at the surface is 400 Bq/cm².

The calculated values, however, would vary depending on the types of measuring instrument because of differences in detectable surface areas and device efficiency.

If the nuclide was assumed to be iodine 131 and attached to the skin, the absorbed dose rate of the skin is as follows:

Since the conversion factor is 1319 (nGy/h) / (Bq/cm²) for the skin surface (70 micro m in depth), the absorbed dose rate will be 0.53 (milli Gy (mGy)/h) .

This rate would be even smaller if a decontamination procedure were performed on the skin.

1015 micro Sv (μSv) (The air dose rate as of the afternoon of March 12th measured at the main gate of the Fukushima Nuclear Plant)

If you stay there for one hour, your radiation dose is 1015 micro Sv (μSv) or 1.015 milli Sv (mSv).

The radiation dose limit per year for the general public including nuclear power plants is regulated at 1 milli Sv/year. (1 mSv/year) Going over this amount, however, does not necessarily lead to the development of negative health effects.

We are exposed to radiation in the natural environment at 2.4 milli Sv (mSv) in a year. There are some areas in the world with a dose level as high as 10 milli Sv (mSv) in the natural environment.

26. According to a news report, traces of plutonium were detected in the soil at the Fukushima daiichi nuclear power plant. Do they have a negative health effect?

Plutonium doesn't exist in nature. But nowadays, the tiny amounts of plutonium naturally exist in the soil as a result of the nuclear tests performed in the atmosphere from 1950's to 1960's and ended in 1980's.

Plutonium has accumulated and still detectable in the soil.

The detected plutonium is a very small amount, and it is almost the same level as that commonly detected. There is no negative health effect at this point.

Plutonium doesn't vaporize unlike other radioactive substances like cesium and radioactive iodine.

The range of pollution at both seashores and landmasses should be carefully investigated in years to come.

27. How about the radiation safety standards for health in Japan compared to those of other countries'?

The safety standards in Japan were established at the advice of the International Commission on Radiological Protection and it is the same or rather more stringent than those of international institutions'.

【Basic fact】

28. Measurement unit

Sv (Sievert): Unit to show the degree of effect when the human body is exposed to radiation

Bq (Becquerel): Unit to show radioactivity. 1 Bq means one radioactive disintegration per second.

Gy (Gray): the dose of radiation energy absorbed in the substance hit by radiation. 1 Gy means that 1 Joule of energy is absorbed in a substance of 1 Kg.