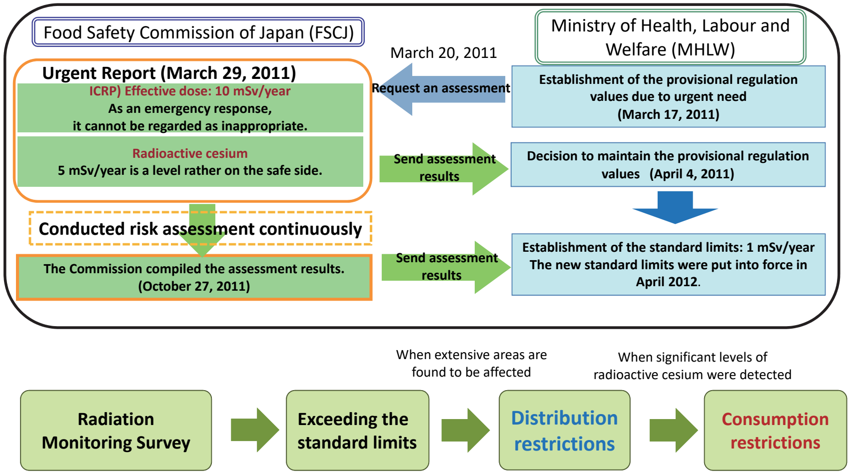
Measures for Radioactive Materials in Foods

Setting of Standard Limits for Radioactive Materials in Foods and Distribution/Consumption Restrictions



Prepared based on the FSCJ's briefing material "Health Effects of Radioactive Materials in Foods" and the MHLW's "Measures for and Current Status of Radioactive Materials in Foods"

Generally, health effects caused by consumption of hazardous materials in foods are assessed by the Food Safety Commission of Japan (FSCT), a risk assessment organization, which implements science-based risk assessments in an objective, neutral and fair manner. Based on the FSCJ's risk assessment, risk management organizations, such as the Ministry of Health, Labour and Welfare (MHLW) and the Ministry of Agriculture, Forestry and Fisheries (MAFF), formulate and implement risk management policies by establishing regulation values for each type of food.

However, under an emergency situation immediately after the accident at Tokyo Electric Power Company (TEPCO)'s Fukushima Daiichi NPS, on March 17, 2011, the MHLW set the guideline values given by the Nuclear Safety Commission as the provisional regulation values for radioactive materials in foods. Then, the FSCJ held a total of five meetings, compiled the "Urgent Report on Radioactive Materials," and sent it to the MHLW on March 29, 2011. Based on this Urgent Report, the ministry decided to maintain the provisional regulation values as an interim measure.

In October 2011, the FSCJ notified the MHLW of the results of the risk assessment, and the MHLW reviewed the provisional regulation values and reduced the intervention level from 5 mSv/year to 1 mSv/year in order to further ensure security and safety considering the potential long-term effects of radiation exposure, in particular, radionuclides with relatively long half-lives. The new regulation was adopted on April 1, 2012.

Local governments conduct inspections of radioactive materials in foods based on their respective plans formulated in line with the guideline established by the Nuclear Emergency Response Headquarters. When any item with radioactivity concentration exceeding the standard values is found through an inspection, the relevant item is collected and disposed of. When extensive areas are found to be affected, the Director General of the Nuclear Emergency Response Headquarters (Prime Minister) issues distribution restrictions by designating the regions and the items.

When significant levels of radioactive materials are detected from a food item, consumption restrictions are promptly issued irrespective of the number of inspected samples of that item.

(Prepared based on the website of the Government's Public Relations Office (http://www.gov-online.go.jp/useful/article/201204/3.html, in Japanese) and the "Concepts of Inspection Planning and Establishment and Cancellation of Items and Areas to which Restriction of Distribution and/or Consumption of Foods Concerned Applies" (March 24, 2017), Nuclear Emergency Response Headquarters)

Included in this reference material on March 31, 2013
Updated on February 28, 2018

Measures for Radioactive Materials in Foods

Publication of the Inspection Results Concerning Radioactive Materials in Foods

The national government proposes food items to be inspected and inspection frequencies, and respective prefectural governments formulate their inspection plans and carry out inspections accordingly.

Inspection results are publicized by the Ministry of Health, Labour and Welfare and respective local governments.

"Measures for Radioactive Materials in Foods," Ministry of Health, Labour and Welfare
http://www.mhlw.go.jp/shinsai_jouhou/shokuhin.html (in Japanese)

Database of radioactive substances in food:
http://www.radioactivity-db.info/ (in Japanese)

In response to the accident at Tokyo Electric Power Company (TEPCO)'s Fukushima Daiichi NPS on March 11, 2011, the provisional regulation values concerning radioactive materials were established on March 17, 2011, based on the Food Sanitation Act (Act No. 233 of 1947). Then, the "Concepts of Inspection Planning and Establishment and Cancellation of Items and Areas to which Restriction of Distribution and/or Consumption of Foods Concerned Applies" was compiled on April 4.

The "Concepts of Inspection Planning and Establishment and Cancellation of Items and Areas to which Restriction of Distribution and/or Consumption of Foods Concerned Applies" has been revised in light of the inspection results and accumulated knowledge on countermeasures to reduce radioactive materials (the latest revision was made on March 24, 2017).

Inspection results and information on distribution restrictions and consumption restrictions are positively publicized through websites of the national government and local governments.

Included in this reference material on February 28, 2018

Measures for Radioactive Materials in Foods

Standard Limits Applied from April 2012

○ Immediately after the accident, foods in conformity to the provisional regulation values were generally assessed to have no ill effects and their safety was guaranteed. However, the annual dose limit was reduced to 1 mSv from 5 mSv, which had been permitted under the provisional regulation values, and current standard limits were set based thereon from the perspective of further ensuring security and safety of foods.

○Provisional regulation values for radioactive cesium*1

Category	Regulation value
Drinking water	200
Milk and dairy products	200
Vegetables	500
Cereals	
Meat, eggs, fish and others	

*1 The regulation values were set also taking into consideration radioactive strontium.

○Present standard limits concerning radioactive cesium*2

Category	Standard limit
Drinking water	10
Milk	50
General foods	100
Infant foods	50

(Unit: Bq/kg)

*2 The standard limits were set also taking into consideration radioactive strontium, plutonium, etc.

Prepared based on the Ministry of Health, Labour and Welfare's website, "Measures for Radioactive Materials in Foods"

Even based on the provisional regulation values applied up to March 2012, safety of foods in conformity thereto was guaranteed in terms of the effects on human health. However, from the perspective of further ensuring the security and safety of foods, the current standard limits were established and have been applied since April 1, 2012.

First of all, the provisional regulation values were based on the premise that the annual radiation dose from foods does not exceed 5 mSv.

The present standard limits are based on the idea that the annual radiation dose from foods should not exceed 1 mSv. Additionally, foods were classified into five categories for the provisional regulation values, but were newly classified into four for the present standard limits. The standard limit for drinking water was set at 10 Bq/kg. The standard limit for milk, which children generally drink a lot of, was reduced to 50 Bq/kg. Additionally, a new category, "infant foods," was made for ensuring safety for infants and the standard limit therefor was set at 50 Bq/kg, the same as that for milk. The standard limit for other general foods is 100 Bq/kg. All foods other than infant foods were categorized as general foods based on the idea to minimize gaps in additional doses caused by differences in individuals' eating habits. The present standard limits are easier to understand for the general public and are also consistent with international views.

(Related to p.44 of Vol. 2, "Food Categories [Reference]," and p.47 of Vol. 2, "Approach for the Establishment of the Standard Limits ◆ Grounds for the Standard Limits")

Included in this reference material on March 31, 2013
Updated on January 18, 2016

Measures for Radioactive Materials in Foods

Food Categories [Reference]

● Basic idea

Drinking water, infant foods and milk, for which special consideration is required, are separately classified into three different categories, while the others are all classified into a single category as general foods. In this manner, all foods and drinks are classified into four categories.

Food category	Reasons to establish the limits	Range of foods
Drinking water	1. Water is essential for human life and there is no substitution for water, and its consumption is large. 2. WHO's guidance level for radioactive cesium in drinking water is 10Bq/kg. 3. Strict management is possible for radioactive materials in tap water.	○ Drinking water, water used for cooking and tea drinks, which is a substitute for water
Infant foods	○ The Food Safety Commission pointed out that "the susceptibility to radiation may be higher in childhood than in adulthood."	○ Foods approved to be labeled as "fit for infants" based on Article 26, paragraph (1) of the Health Promotion Act (Act No. 103 of 2002) ○ Foods and drinks sold as intended for infants
Milk	1. Children consume a lot. 2. The Food Safety Commission pointed out that "the susceptibility to radiation may be higher in childhood than in adulthood."	○ Milk (cow milk, low-fat milk, processed milk, etc.) and milk drinks specified in the Ministerial Order concerning the Ingredient Standards for Milk and Dairy Products (Order of the Ministry of Health and Welfare No. 52 of 1951)
General foods	For the following grounds, foods other than given above are categorized as "general foods." 1. Can minimize the influence of individual differences in eating habits (deviation of the foods to be consumed) 2. Easy to understand for the general public 3. Consistent with international views, such as those of the Codex Alimentarius Commission	○ Foods other than given above

Prepared based on the Ministry of Health, Labour and Welfare's website, "Measures for Radioactive Materials in Foods" 厚生労働省 Ministry of Health, Labour and Welfare

Standard limits concerning radioactive materials in foods are established respectively for the four food categories.

For "drinking water," the standard limit was set at 10 Bq/kg due to the following three grounds: (i) Water is essential for human life and there is no substitution for water, and its consumption is large; (ii) WHO's guidance level for radioactive cesium in drinking water is 10Bq/kg; and (iii) Strict management is possible for radioactive materials in tap water (p.31 of Vol. 2, "Waterworks System").

For "milk," the standard limit was set at 50 Bq/kg because (i) children consume a lot and (ii) the Food Safety Commission pointed out that "the susceptibility to radiation may be higher in childhood than in adulthood."

For "infant foods," the standard limit is the same as that for milk at 50 Bq/kg as the Food Safety Commission pointed out that "the susceptibility to radiation may be higher in childhood than in adulthood."

As reasons to set the limit at 100 Bq/kg for "general foods," the following three points are cited: Setting the value in this manner (i) can minimize the influence of individual differences in eating habits (deviation of the foods to be consumed), and is (ii) easy to understand for the general public and (iii) consistent with international views, such as those of the Codex Alimentarius Commission (an intergovernmental body created for the purpose of protecting consumers' health and ensuring fair-trade practices in the food trade, etc. that establishes international standards for foods).

(Related to p.166 of Vol. 1, "Comparison of Regulation Values for Foods")

Included in this reference material on March 31, 2013
Updated on February 28, 2018

Measures for Radioactive Materials in Foods

Outline of the Results of the Food-related Health Risk Assessment

(Food Safety Commission of Japan (FSCJ), on October 27, 2011)

- **Potential effects of radiation are found when the lifetime additional effective cumulative dose exceeds around 100 mSv. However, radiation dose accumulated in ordinary daily life such as from natural radiation and X-ray exams, etc. is excluded.**

- **In one's lifetime, the susceptibility to radiation may be higher in childhood than in adulthood.(thyroid gland cancer and leukemia)**
  - Risks of leukemia increased in children under the age of five at the time of the accident. (Noshchenko et al. 2010; Data relating to the nuclear accident at Chernobyl)
  - Risks of thyroid gland cancer are higher for children younger at the time of radiation exposure. (Zablotska et al. 2011; Data relating to the nuclear accident at Chernobyl)

  << However, both data contain uncertain points in the estimation of radiation doses, etc. >>

- **It is difficult to identify health effects concerning radiation exposure below 100 mSv.**
  - Inaccuracy in estimation of the amount of exposure
  - Effects of radiation and effects caused by other factors are unlikely to be distinguished.
  - Study population for epidemiological data serving as grounds is not large enough.

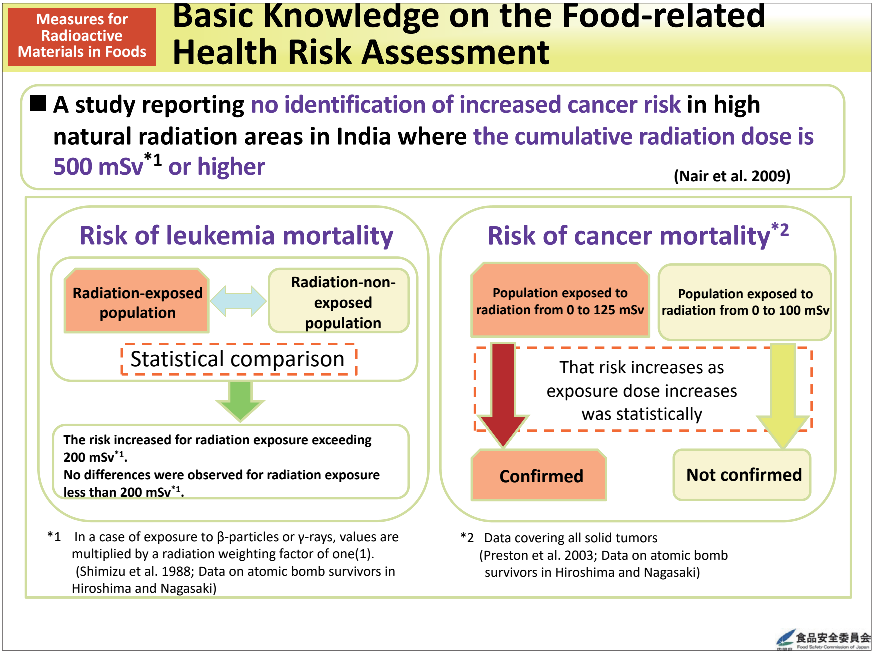
Based on currently available scientific knowledge, the FSCJ discussed additional radiation exposure through contaminated food consumption, and concluded that health effects could be found when the lifetime additional effective dose exceeds around 100 mSv, excluding radiation exposure from everyday life.

Although there are some unclear points in the estimation of radiation doses, etc., on the basis of findings of health effects after the accident at Chernobyl concerning risks of thyroid gland cancer and leukemia, it is likely that the susceptibility to radiation is higher in childhood than in adulthood (p.109 of Vol. 1, "Difference in Radiosensitivity by Age").

On the other hand, if any health effects may occur by exposure to radiation below 100 mSv, it would be very small. As effects of radiation and effects caused by other factors are unlikely to be clearly distinguished and the epidemiological data, due to the small study population, is insufficient to prove the health effects of additional exposure, such as a causal association with cancer, the FSCJ has concluded that it is difficult to identify health effects from the extra cumulative exposure to radiation doses below 100 mSv.

The lifetime additional effective cumulative dose of "around 100 mSv” is not a threshold meaning that radiation exposure below this level causes no health effects nor that radiation exposure above this level surely causes health effects. This is the dose value which risk management organizations should consider for appropriate management of foods.

Included in this reference material on March 31, 2013



This figure shows epidemiological data on which the Food-related Health Risk Assessment was based.

There was a study report that the increased cancer risk by radiation was not observed among persons exposed to radiation exceeding 500 mSv in total in areas in India where natural radiation doses are high (p.119 of Vol. 1, "Effects of Long-Term Low-Dose Exposure").

The data on atomic bomb survivors in Hiroshima and Nagasaki shows that the risk of leukemia mortality increased for the population exposed to radiation exceeding 200 mSv but that there was no statistically significant difference in the mortality risk between the populations exposed to radiation less than 200 mSv and not exposed to radiation (p.113 of Vol. 1, "Risks of Developing Leukemia").

Another report which analyzed the same data of atomic bomb survivors shows that for the population exposed to radiation from 0 to 125 mSv, it was statistically confirmed that the risk of cancer mortality increases as the exposure dose increases. However, for the population exposed to radiation from 0 to 100 mSv, no statistically significant difference was observed between radiation doses and the mortality risk. Based on these data, the result of the Food-related Health Risk Assessment was derived.

Included in this reference material on March 31, 2013

Measures for Radioactive Materials in Foods

Approach for the Establishment of the Standard Limits ◆ Grounds for the Standard Limits

Q. Why were the standard limits set based on the annual permissible dose of 1 mSv?

A. (i) They are in line with the international indicator based on scientific knowledge.

The Codex Alimentarius Commission, which establishes international specifications for foods, has set indicators so that the annual dose does not exceed 1 mSv.

Note) The International Commission on Radiological Protection (ICRP) considers that stricter requirements below 1 mSv/year would not achieve any significant additional dose reduction. Therefore, based on this, the Codex Alimentarius Commission specifies indicators.

(ii) They are intended to reduce radiation exposure as low as reasonably achievable.

Radiation monitoring surveys have shown considerable decreases over time in radioactivity concentrations measured in foods.

Prepared based on the Ministry of Health, Labour and Welfare's website, "Measures for Radioactive Materials in Foods" 厚生労働省 Ministry of Health, Labour and Welfare

The standard limits concerning radioactive materials in foods were set based on the annual permissible dose of 1 mSv, which is adopted by the Codex Alimentarius Commission that establishes international specifications for foods. Originally, the International Commission on Radiological Protection (ICRP) publicized the idea that stricter requirements below 1 mSv/year would not achieve any significant additional dose reduction. Based on this idea, the Codex Alimentarius Commission specifies indicators.

Additionally, the standard limits are based on the principle of ALARA (As Low As Reasonably Achievable) (p.161 of Vol. 1, "Optimization of Radiological Protection"). Radiation monitoring surveys have shown considerable decreases in radioactivity concentrations measured in many of the food samples. Therefore, it was found that the reduction of the standard limit for radioactive cesium concentrations in general foods to 100 Bq/kg would not cause any problem for the dietary patterns of the Japanese people.

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Updated on January 18, 2016

Measures for Radioactive Materials in Foods

Radionuclides Taken into Consideration

Q. Why are the standard limits set only for radioactive cesium?

○ **The standard limits were set in consideration of all radionuclides whose half-life is one year or longer out of the radionuclides that are supposed to have been released due to the accident at Tokyo Electric Power Company (TEPCO)'s Fukushima Daiichi NPS based on the assessment by the Nuclear and Industrial Safety Agency.**

Regulated radionuclides	(Physical) half-life
Cesium 134	2.1 years
Cesium 137	30 years

Strontium 90	29 years
Plutonium	14 years -
Ruthenium 106	374 days

* The standard limits are not set for radioactive iodine, which has a half-life as short as 8 days and is no longer detected, nor for uranium that exists within the premises of TEPCO's Fukushima Daiichi NPS at the same level as naturally occurring uranium.

○ **However, as measurements of radionuclides other than radioactive cesium take time, the standard limits are not set for each of them but are calculated and set so that the total dose from other radionuclides does not exceed 1 mSv if only the standard limits for radioactive cesium are met.**

* The maximum doses from radionuclides other than radioactive cesium that people may receive from foods can be calculated by age bracket based on such data as radioactivity concentrations in soil and easiness of transition of radioactive materials from soil to agricultural products. For example, for people aged 19 years or over, doses from radionuclides other than radioactive cesium account for approx. 12% of the total.

A. While also taking into consideration effects of other radionuclides in calculation, cesium that accounts for the largest percentage and is most easily measured is used as the indicator.

Prepared based on the Ministry of Health, Labour and Welfare's website, "Measures for Radioactive Materials in Foods" 厚生労働省 Ministry of Health, Labour and Welfare

This figure shows the grounds why the standard limits are set only for radioactive cesium out of diverse radioactive materials.

All radionuclides whose half-life is one year or longer are taken into consideration, out of the radionuclides that are supposed to have been released due to the accident at TEPCO's Fukushima Daiichi NPS. Radionuclides shown in the table above, such as strontium 90, plutonium, and ruthenium 106, are taken into account in calculation, in addition to radioactive cesium. However, as the standard limits are intended for long-term regulations of radioactive materials in foods, radionuclides with a short half-life are not covered. For example, the standard limits are not set for radioactive iodine. Even if measurements are conducted for these other radionuclides by setting specific standard limits for each of them, it takes time to obtain measurement results. On the other hand, it is easy to measure radioactive cesium. Therefore, the standard limits are calculated and set so that the total dose from other radionuclides does not exceed 1 mSv if only the standard limits for radioactive cesium are met.

Specifically, effects of the radionuclides shown in the table above, such as radioactive cesium, strontium 90 and plutonium, were ascertained through surveys of soil, etc. For example, assuming the entirety of the effects caused by the consumption of foods containing radioactive materials released from TEPCO's Fukushima Daiichi NPS as 100, the effects of radioactive cesium account for around 88 in the case of people aged 19 years or over. On the other hand, the effects of the other radionuclides were found to account for around 12. In this manner, the standard limits were established also taking into consideration the effects of radionuclides other than radioactive cesium.

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Measures for Radioactive Materials in Foods

Approach for the Calculation of the Standard Limits (1/2)

How was the standard limit figured out to be 100 Bq/kg for general foods based on the annual permissible dose of 1 mSv?

1. Preconditions for calculation

- **For drinking water, the standard limit is set to be 10 Bq/kg in line with the WHO's guidance level.**

  → The annual permissible dose allocated to general foods is approx. 0.9 mSv (0.88 to 0.92 mSv/y), which is obtained by subtracting that for drinking water (approx. 0.1 mSv/y) from the total annual permissible dose of 1 mSv.

- **Domestically-produced foods are assumed to account for 50% of all distributed foods.**

  * The standard limits are calculated on the assumption that domestically-produced foods contain radioactive materials at levels close to the maximum permissible limit.

2. Conversion from radioactivity concentrations (Bq) to radiation doses (mSv)

Radiation dose (mSv) = **Radioactivity concentration** (Bq/kg) × **Amount of consumption** (kg) × **Effective dose coefficient** (mSv/Bq)

Under the preconditions mentioned in 1. above, the maximum limit for radioactive materials in 1 kg of general foods is calculated so that doses from general foods do not exceed the annual permissible dose for general foods.

(e.g.) < In the case of males aged between 13 and 18 >

0.88 mSv = X (Bq/kg) × 374 kg (50% of the annual consumption of foods) × 0.0000181 (mSv/Bq) (effective dose coefficient in consideration of the effects of all covered radionuclides)

X = 120 (Bq/kg) (rounded off to three digits)

* For adults, the effective dose coefficient for Cs-134 is 0.000019 and that for Cs-137 is 0.000013. The effective dose coefficient thus differs by radionuclide. Therefore, based on respective radionuclides' concentration ratios in foods, the effective dose coefficient in consideration of the effects of all covered radionuclides was used for the calculation of the maximum limits.
* Concentration ratios change over time as each radionuclide has a different half-life. Therefore, the coefficient on the safest side over the coming 100 years was adopted.
* The above explanation is just the outline. For more detailed calculation methods, refer to the reference material of the Pharmaceutical Affairs and Food Sanitation Council.

Prepared based on the Ministry of Health, Labour and Welfare's website, "Measures for Radioactive Materials in Foods" 厚生労働省 Ministry of Health, Labour and Welfare

This figure shows the approach for the calculation of the standard limits, explaining the relation between the annual additional dose limit (1 mSv) and the standard limit for general foods (100 Bq/kg).

First, the annual permissible dose allocated to general foods is assumed to be 0.88 to 0.92 mSv by subtracting approx. 0.1 mSv permitted for drinking water from the total annual permissible dose of 1 mSv. Next, domestically-produced foods and imported foods are assumed to account for 50% each of all distributed foods. Then, in the case of males aged between 13 and 18, it is assumed that 374 kg of foods or 50% of the total annual consumption per person (approx. 748 kg) is domestically produced. The effective dose coefficient in consideration of the effects of all covered radionuclides (0.0000181 mSv/Bq) is to be used for calculation.

Then, the calculation formula is as follows.

0.88 mSv = (Radioactivity concentration: Bq/kg) × 374 kg × 0.0000181 (mSv/Bq)

(Radioactivity concentration: Bq/kg) = 120 Bq/kg

If radioactivity concentrations in general foods do not exceed 120 Bq/kg, the annual additional dose will be within 0.88 mSv.

Therefore, the standard limit for general foods (100 Bq/kg), which is lower than 120 Bq/kg, is the value set on the safe side to guarantee safety.

Included in this reference material on March 31, 2013

Updated on January 18, 2016

Measures for Radioactive Materials in Foods

Approach for the Calculation of the Standard Limits (2/2)

3. Calculation of the upper limits by age bracket

Intervention level: 1 mSv/y

Age brackets are divided more finely than for the provisional regulation values

Subtract permissible dose for drinking water (approx. 0.1 mSv)

Permissible dose to be allocated to general foods (approx. 0.9 mSv) determined

The upper limit is calculated in consideration of **the amount of consumption** and **the conversion factor (effective dose coefficient)** by age bracket.

* **Effects of radionuclides other than cesium** are also taken into account.

Age bracket	Gender	Upper limit (Bq/kg)
Under 1 year old	Total average	460
1 to 6 years old	Male	310
	Female	320
7 to 12 years old	Male	190
	Female	210
13 to 18 years old	Male	**120**
	Female	150
19 years old or older	Male	130
	Female	160
Pregnant women	Female	160
Minimum value		**120**

Standard limit 100 Bq/kg

The standard limit is set based on the strictest upper limit (the minimum value) out of those for all age brackets.

- **The standard limit results in reflecting requirements for all age brackets.**
- **The standard limit secures an extra margin of safety from the upper limit especially for infants.**

4. Standard limits for milk and infant foods

These categories are established in consideration of young children. Therefore, the standard limits should be stricter so that consumption of these foods would not cause any harmful effects even if all of them contain radioactive materials up to the upper limits.

→**The standard limits for milk and infant foods are both set to be 50 Bq/kg**, namely half of the 100 Bq/kg for general foods.

Prepared based on the Ministry of Health, Labour and Welfare's website, "Measures for Radioactive Materials in Foods" 厚生労働省

The idea of figuring out dose limits for each age bracket underlies the basic approach for setting the standard limits.

The annual permissible dose allocated to general foods is approx. 0.9 mSv, subtracting that for drinking water from the total.

The table above shows upper limits (Bq/kg) by age bracket calculated based on the annual consumption and the effective dose coefficient for each age bracket.

As a result, the strictest upper limit was found to be 120 Bq/kg for males aged between 13 and 18.

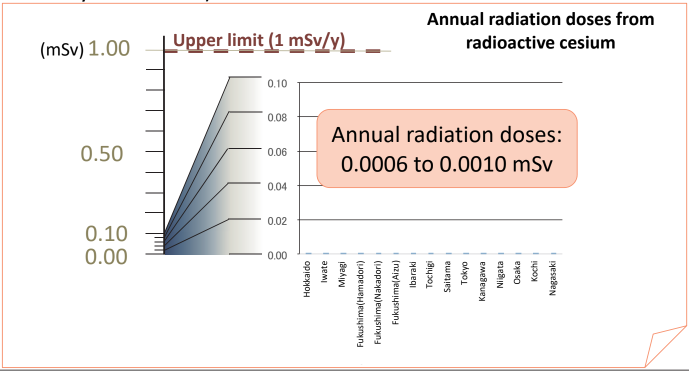
In order to ensure safety for all age brackets, the standard limit was set to be 100 Bq/kg on the safe side, below the strictest upper limit of 120 Bq/kg.

Included in this reference material on March 31, 2013
Updated on January 18, 2016

Measures for Radioactive Materials in Foods

Survey of Distributed Foods (Market Basket Survey)

- **A survey was conducted by purchasing foods distributed nationwide and precisely measuring radioactive cesium contained therein.**
  Foods were purchased based on average food consumption by region (based on the National Health and Nutrition Survey) and purchased foods were mixed for measurement.
  - ◆Purchased foods were simply cooked in line with ordinary dietary circumstances and measurement was conducted.
  - ◆Regarding fresh foods, those produced in the relevant region or the neighboring areas were chosen if possible.
- **Based on the measurement results, radiation doses that people would intake from foods in a year were calculated (surveyed in February and March 2017).**



Measured effective doses were 1% or lower of 1 mSv/y, based on which the standard limits were established.

Prepared based on the Ministry of Health, Labour and Welfare's website, "Measures for Radioactive Materials in Foods" 厚生労働省

From February to March 2017, the Ministry of Health, Labour and Welfare conducted a survey by purchasing distributed foods in 15 areas across Japan and measuring radioactive cesium contained therein to estimate annual radiation doses received from radioactive cesium in foods.

Annual radiation doses received from radioactive cesium in foods were estimated to be 0.0006 to 0.0010 mSv, 1% or lower of the annual permissible dose of 1 mSv/y, based on which the standard limits were established. Thus, annual radiation doses were confirmed to be extremely small.

Market basket survey:
One of the survey methods for estimating daily consumption of various chemical substances
(Source: Ministry of Health, Labour and Welfare's website: http://www.mhlw.go.jp/shinsai_jouhou/market_basket.html, in Japanese)

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Measures for Radioactive Materials in Foods

Prefectures and Food Items to be Inspected (Items for which Cultivation/Feeding Management is Difficult and Log-grown Mushrooms)

Food items for which cultivation/feeding management is difficult and relevant prefectures to be inspected

		Aomori	Iwate	Akita	Miyagi	Yamagata	Fukushima	Ibaraki	Tochigi	Gunma	Chiba	Saitama	Tokyo	Kanagawa	Niigata	Yamanashi	Nagano	Shizuoka
Items with radioactivity concentrations exceeding the standard limits	Wild mushrooms and wild plants	□	●	□	◎	◎	◎	●	◎	◎	●	□	□	□	◎	◎	◎	◎
	Wild bird and animal meat	□	◎	□	◎	●	◎	◎	◎	◎	●	□	□	□	●	□	□	□
Items with radioactivity concentrations exceeding half of the standard limits but not exceeding the standard limits	Wild mushrooms and wild plants	□	□	●	●	□	●	□	●	□	□	□	□	□	□	□	□	□
	Honey	—	—	—	—	—	●	—	—	—	—	—	—	—	—	—	—	—
Marine fish		—	□	—	□	—	◎	◎	×	×	◎	×	—	—	—	×	×	—
Inland water fish		—	◎	—	◎	—	◎	◎	◎	◎	◎	—	—	—	—	—	—	—

Log-grown mushrooms to be inspected and relevant prefectures to be inspected

	Aomori	Iwate	Akita	Miyagi	Yamagata	Fukushima	Ibaraki	Tochigi	Gunma	Chiba	Saitama	Tokyo	Kanagawa	Niigata	Yamanashi	Nagano	Shizuoka
Log-grown mushrooms	▲	●	▲	●	▲	●	●	●	●	●	▲	▲	▲	▲	▲	▲	▲

Classification based on inspection results for the latest one year (from April 1, 2016, to February 28, 2017)

◎:Items wherein radioactivity concentrations exceeding the standard limits were detected (for fishery products, those wherein radioactivity concentrations exceeding half of the standard limits were detected)

●:Items wherein radioactivity concentrations exceeding half of the standard limits were detected (excluding those wherein radioactivity concentrations exceeding the standard limits were detected)

□:Items requiring inspections in consideration of the difficulties in management (wild mushrooms and wild plants), the mobility (wild bird and animal meat), or the status of distribution restrictions (marine fish)

▲ : Items requiring cultivation management and monitoring based on the influence of radioactive materials on materials used for production

—:Items that are not classified by relevant prefectures as those requiring inspections based on inspection results for the latest one year

×:Nothing applicable

Prepared based on the Ministry of Health, Labour and Welfare's website, "Measures for Radioactive Materials in Foods"

In FY2016, more than five years after the accident at Tokyo Electric Power Company (TEPCO)'s Fukushima Daiichi NPS, radioactivity concentrations had decreased as a whole and food items with radioactivity concentrations exceeding the standard limits had become limited. Therefore, the national government reviewed inspection methods to make them more reasonable and efficient by reconsidering prefectures to be inspected, while ascertaining opinions of consumers and other related parties.

Based on the results of such review, inspections were streamlined centered on items whose cultivation/feeding is manageable to enhance efficiency. At the same time, as inspection results had been accumulated, the approach for deciding prefectures and items to be inspected and lifting distribution restrictions was reviewed and inspection targets are as shown in the table above as of FY2017.

With regard to items for which cultivation/feeding management is difficult, prefectures where inspections need to be continued are specified for each item in consideration of the difficulties in management therefor.

With regard to log-grown mushrooms, prefectures where inspections need to be continued are also specified considering the influence of radioactive materials on materials used for production.

Included in this reference material on February 28, 2018

Measures for Radioactive Materials in Foods

Prefectures and Food Items to be Inspected (Items whose Cultivation/Feeding is Manageable (excl. Log-grown Mushrooms))

Food items whose cultivation/feeding is manageable (excl. log-grown mushrooms) and relevant prefectures to be inspected

		Iwate	Miyagi	Fukushima	Tochigi
Items with radioactivity concentrations exceeding half of the standard limits but not exceeding the standard limits	Vegetables	–	–	●	–
	Fruits	–	–	●	–
	Beans	–	–	●	–
	Meat	–	●	●	–
Rice		–	–	■	–
Soybeans		–	–	■	–
Buckwheat		■	–	–	–

* Items requiring continued monitoring as being significantly affected by feeding management (milk and beef meat) are inspected in Iwate, Miyagi, Fukushima, Tochigi and Gunma Prefectures.

Classification based on inspection results for the latest one year (from April 1, 2016, to February 28, 2017)

● :Items wherein radioactivity concentrations exceeding half of the standard limits were detected (excluding those wherein radioactivity concentrations exceeding the standard limits were detected)

■ :Items that are classified as inspection targets in the Appendix

– :Items that are not classified by relevant prefectures as those requiring inspections based on inspection results for the latest one year

Prepared based on the Ministry of Health, Labour and Welfare's website, "Measures for Radioactive Materials in Foods" 厚生労働省

With regard to items whose cultivation/feeding is manageable (excluding log-grown mushrooms), prefectures where inspections need to be continued are specified for each item based on inspection results for the latest three years, such as prefectures where items with radioactive cesium exceeding half of the standard limits were detected.

In other prefectures, inspections are to be conducted as needed.

Included in this reference material on February 28, 2018

Measures for Radioactive Materials in Foods

Concepts of Inspection Planning and Establishment and Cancellation of Items and Areas to which Restriction of Distribution and/or Consumption of Foods Concerned Applies

	Local governments marked with ◎ and ● (those marked with ■ and ▲ should conduct inspections correspondingly)	
	Municipalities (exceeding half of the standard limits)	Other municipalities
Exceeding half of the standard limits	3 or more samples	1 or more samples*1
Beef meat	Once every three months for each farm household*2	
Milk	Periodically for each cooler station*3	
Inland water fish Marine fish	Periodically*4	

*1: It is permissible to divide a prefecture into multiple zones across municipalities and conduct inspections for three or more samples in each of those zones.
*2: For farm households whose feeding management has been recognized as appropriate by the relevant local government, it would suffice to conduct inspections once every 12 months or so.
*3: This does not apply in cases where the relevant local government recognizes appropriate feeding management and there are no areas subject to distribution restrictions for raw milk and where inspection results for the latest three years are all below half of the standard limits.
*4: Inspections of marine fish by Iwate Prefecture are to be conducted in consideration of the past inspection results.

(For marks, ◎, ● ■ and ▲, refer to p.52 and p.53 of Vol. 2, "Prefectures and Food Items to be Inspected")

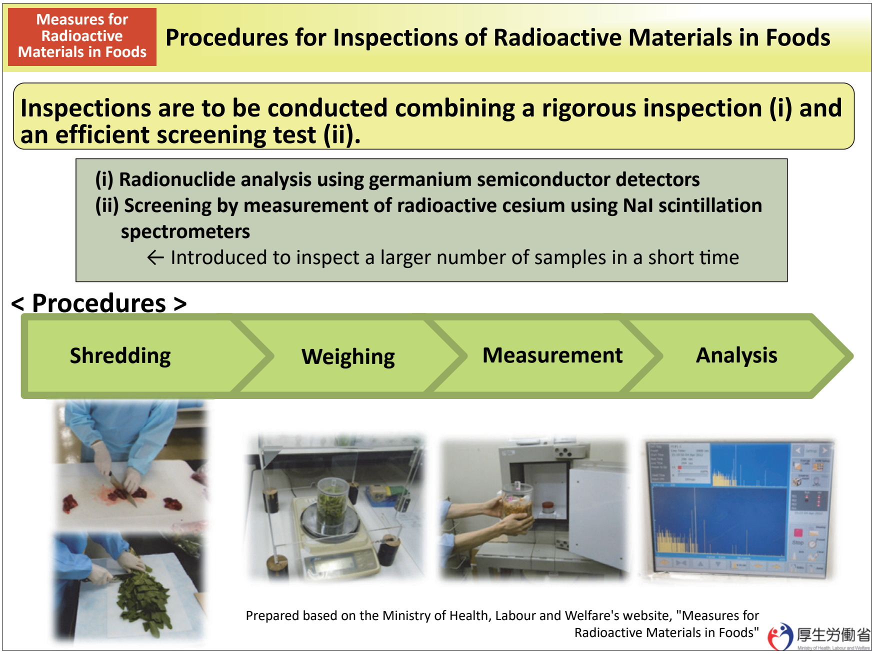
Prepared based on the Ministry of Health, Labour and Welfare's website, "Measures for Radioactive Materials in Foods" 厚生労働省

This table shows the required number of samples and frequencies of inspections for local governments whose inspections detected radioactive cesium concentrations exceeding the standard limits (those marked with ◎) and local governments whose inspections detected radioactive cesium concentrations exceeding half of the standard limits (those marked with ●).

The "Concepts of Inspection Planning and Establishment and Cancellation of Items and Areas to which Restriction of Distribution and/or Consumption of Foods Concerned Applies" (March 24, 2017) by the Nuclear Emergency Response Headquarters specifies as follows.

"Regarding local governments that have detected radioactive cesium concentrations exceeding half of the standard limits in any food under this food classification since April 2016, inspections should be conducted for three or more samples for each municipality in the areas where radioactive cesium concentrations exceeding half of the standard limits were detected (marked with ◎ in the table). In other areas (marked with ○ in the table), inspections should be conducted for one or more samples for each municipality (it is permissible to divide a prefecture into multiple zones across municipalities and conduct inspections for three or more samples in each of those zones).

Included in this reference material on March 31, 2013
Updated on February 28, 2018



This figure shows procedures for inspections of radioactive materials in foods.

There are two ways to inspect foods, i.e., a rigorous inspection and an efficient screening test.

As a rigorous inspection, radionuclide analysis is conducted using a germanium semiconductor detector. After shredding a food sample, its weight is measured accurately. Then, the shredded sample is put in a prescribed container. The container is set in a detector, which is structured like a box covered with a thick layer of lead, and the amount of radioactive cesium is measured. Lastly, measurement results are analyzed.

For an efficient screening test, a NaI (TI) scintillation spectrometer is used. A NaI scintillation spectrometer is inferior to a germanium semiconductor detector in terms of measurement accuracy, but can shorten the time required for inspections and is less expensive. If the measurement using a NaI scintillation spectrometer suggests the existence of radioactive cesium exceeding the standard limits, an inspection is conducted again using a germanium semiconductor detector.

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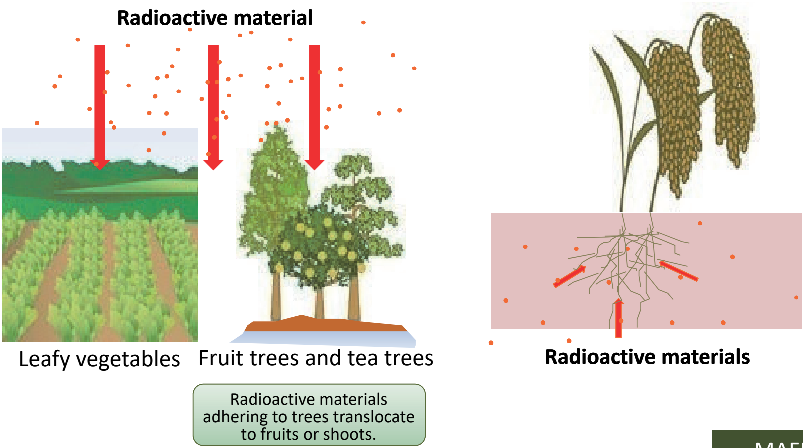
Updated on March 31, 2017

Measures for Radioactive Materials in Foods

Contamination Routes for Agricultural Products

Direct contamination due to radionuclide fallout (immediately after the accident)

Radioactive materials that fell onto soil are absorbed into crops from the roots.



Prepared based on the "Responses at Farmland" by the Ministry of Agriculture, Forestry and Fisheries (MAFF)

MAFF

Contamination routes due to radioactive fallout are roughly divided into three.

(i) The figure on the left shows the route of how radioactive fallout directly adheres to crops. High radioactivity concentrations were often detected in leafy vegetables that were grown in the fields at the time of the accident. This is considered to be due to direct contamination.

(ii) The figure in the center shows the route of how radioactive materials that adhered to fruit trees and tea trees immediately after the accident penetrate into trees and translocate* to fruits and tea shoots.

(iii) The figure on the right shows the route of how radioactive materials that fell onto soil are absorbed into crops from the roots. Contamination of crops planted after the accident is considered to have followed this route.

* Translocation: Phenomenon wherein nutrients absorbed in a plant or metabolites produced by photosynthesis are transported from one tissue to another tissue

(Related to p.171 of Vol. 1, "Transfer to Plants")

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Updated on March 31, 2017

Measures for Radioactive Materials in Foods

Measures for Reducing Transfer of Radioactive Materials to Crops (1/5) - Decontamination of Farmland -

Stripping of topsoil (Topsoil removal)

Scrape away the topsoil to remove radioactive materials which remain in shallow depth

Inversion tillage

Replace topsoil with subsoil, thereby reducing radioactivity concentrations in the soil layer where plants take root

Prepared based on the "Responses at Farmland" by the Ministry of Agriculture, Forestry and Fisheries (MAFF)

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Radioactive materials that were released into the air and fell onto uncultivated farmland stay on topsoil.

Therefore, at farmland where high radioactivity concentrations are detected, the topsoil is scraped away to remove radioactive materials which remain in shallow depth.

In the meantime, at farmland where detected radioactivity concentrations are relatively low, topsoil is replaced with subsoil (inversion tillage) to reduce radioactivity concentrations in the soil layer where plants take root.

In this manner, efforts have been made to reduce radiation doses released from farmland and inhibit growing crops from absorbing radioactive materials.

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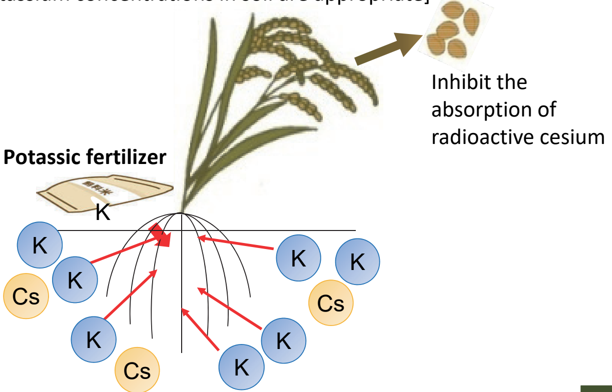
Measures for Radioactive Materials in Foods

Measures for Reducing Transfer of Radioactive Materials to Crops (2/5)
- Measures to Inhibit Radioactive Cesium Absorption through Potassic Fertilization -

- **In paddy fields where detected radioactive cesium concentrations in brown rice are higher, potassium concentrations in soil tend to be lower.**
- **Potassium in soil has similar chemical characteristics as cesium and proper use of potassic fertilizer can inhibit growing crops from absorbing cesium.**

[When potassium concentrations in soil are appropriate]



Prepared based on the "Inspection Results Concerning Radioactive Materials in Foods" by the Ministry of Agriculture, Forestry and Fisheries (MAFF)

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It is known that crops, such as rice, absorb more radioactive cesium when potassium concentrations in soil are lower.

Potassium and cesium have similar chemical characteristics, and when the soil contains sufficient potassium, less cesium is absorbed into crops.

Therefore, at farmland where potassium concentrations in soil are low, a sufficient amount of potassic fertilizer is applied to increase potassium concentrations above a certain level to inhibit absorption of radioactive cesium into crops.

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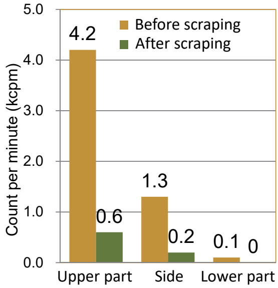
Measures for Reducing Transfer of Radioactive Materials to Crops (3/5) - Washing of Fruit Trees and Removal of Bark -

Wash off radioactive cesium adhering to trees with high-pressure water and scrape away bark to reduce radioactive cesium concentrations

High-pressure washing of a persimmon tree

Scraping of bark from a pear tree

Scraping of bark from major branches of a pear tree and radiation doses



Prepared based on the "Inspection Results Concerning Radioactive Materials in Foods" by the Ministry of Agriculture, Forestry and Fisheries (MAFF)

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In order to prevent translocation of radioactive materials from fruit trees to fruits, trees are washed with high-pressure water and bark is scraped off from trees to remove adhering radioactive materials.

In the case of pear trees, there is data that radiation doses from major branches are reduced by nearly 90% by scraping off the bark.

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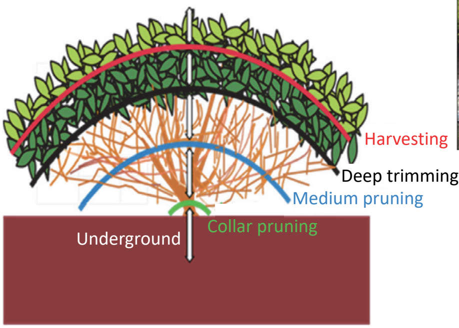
Measures for Radioactive Materials in Foods

Measures for Reducing Transfer of Radioactive Materials to Crops (4/5) - Pruning of Tea Trees -

Reduce transfer of radioactive cesium from leaves and trees to new leaves by pruning and deep trimming



Prepared based on the "Inspection Results Concerning Radioactive Materials in Foods" by the Ministry of Agriculture, Forestry and Fisheries (MAFF)

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In the case of tea trees, in order to prevent transfer of radioactive materials from the surface of leaves to new leaves, leaves and branches are trimmed or pruned deeper than usual to remove contaminated parts.

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Measures for Radioactive Materials in Foods

Measures for Reducing Transfer of Radioactive Materials to Crops (5/5) - Management of Fertilizers, etc. -

- In order to prevent farmland soil from being contaminated with radioactive cesium, the reference value of 400 Bq/kg in fertilizers, soil amendments and soils for cultivation was set.(*)
- Several local governments and other organizations have conducted inspections and imposed a voluntary ban or other measures for reduction of radioactive cesium on fertilizers and materials in which radioactive cesium concentration exceeded the reference value.

* The reference value was set so as not to exceed the normal range of radioactive cesium concentration in soil before the accident at Tokyo Electric Power Company (TEPCO)'s Fukushima Daiichi NPS, even with continuous application of these agricultural materials for long periods.

Prepared based on the "Responses at Farmland" by the Ministry of Agriculture, Forestry and Fisheries (MAFF)

MAFF

Regarding materials used for agricultural production, such as fertilizers, soil amendments and soils for cultivation, the reference value of 400 Bq/kg was set in order to prevent expansion of contamination of farmland soil by use of materials contaminated with radioactive cesium.

Several local governments and other organizations have monitored radioactive cesium concentration in these materials, and provide guidance to ensure that materials containing radioactive cesium exceeding the reference value should not be used at farmland.

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