Notice No. 0315 Article 4 of the Department of Food Safety
March 15, 2012

To: All the Prefectural Governors
All the Mayors in Cities with Public Health Centers
All the Mayors of Special Wards

Director-General, Department of Food Safety, Pharmaceutical and Food Safety Bureau,
Ministry of Health, Labour and Welfare

Testing Methods for Radioactive Substances in Food

The handling of radioactive substances in food has been notified by Notice No. 0315 Article 1 of the Department of Food Safety (hereinafter referred to as "the Notice") dated March 15, 2012.

The method for testing radioactive substances in food, which has been stipulated in Article 4-4 of the Notice to be provided separately, is provided in the Annex, so please be thoroughly informed of this and advise all parties concerned accordingly.

(Annex)

Method for testing radioactive cesium in food

1. Test substance: Radioactive cesium (Cs-134 and Cs-137)

2. Method

2.1 Pre-treatment of samples

Before the radioactivity measurement, food samples shall be pre-treated according to the method described in “Sample Pre-treatment for Gamma-Ray Spectrometry in Radiological Emergency”[Note 1] of MEXT's Radiation Measurement Method Series 24. The samples shall be taken from edible parts.

However, for food listed in the first column in Item 5 (2) “Samples” of Section A “General Compositional Standards for Food” of Part I “Food” of “Specifications and Standards for Food, Food Additives, etc.” (Ministry of Health and Welfare Notification No. 370, 1959), the samples shall be prepared according to the descriptions provided in the corresponding second column. For manufactured or processed food, intact samples are used in principle for the test (except for food that is tested in ready-to-drink states, such as tea leaves for drinking).

The samples shall be washed according to the attached Standard Operating Procedure for Sample Washing (Dirt Removal) for Test of Radioactive Substances in Food.

Prescribed volumes of samples shall be weighed and packed into the measurement vessels with the same dimension as the vessels used for calibration. Liquid samples shall be packed without pre-treatment, while solid samples shall be cut with scissors, cutters, knives, etc., and uniformly mixed before packing.

Measurement samples of tea leaves for drinking shall be prepared by infusing 10 g or more dried or manufactured tea leaves with 30 times their weight of hot water (90°C) for 60 seconds and filtering the resulting infusion with a 40-mesh filter, etc.

When testing dried mushrooms, dried vegetables, dried seaweeds, and dried fish and shellfish specified in the Notification, from the standpoint of reflecting the actually consumed state of food in the testing, in principle, the samples are ground, and water is added in an amount required for rehydrating the relevant dried food. The amount of water required for the rehydration is determined on the basis of the moisture content data (weight-change rate) of such food after rehydration, which are provided in the Standard Tables of Food Composition in Japan. Otherwise, data obtained from measurements using dry samples may be converted into rehydrated data according to the calculation provided in 2.3.

Note 1)The document describes precautions to be taken at delivery of samples, pre-treatment of samples, storage of samples, etc.

2.2 Measurement

2.2.1 Equipment/Instrument

Gamma-ray spectrometer based on germanium semiconductor detector: relative efficiency of the detector shall be 15% or higher. Cover the detector with a lead shield with a wall thickness of 10-15 cm.

Radiation source: Use commercially available mixed gamma-ray standard volume sources .

Measurement vessel.

2.2.2 Instrutment calibration

Calibration and spectrum analysis shall be conducted according to the method provided in “Gamma-ray Spectrometry using Germanium Semiconductor Detectors” of MEXT's Radiation Measurement Method Series 7 or an internationally accepted method.

Equipment other than gamma-ray spectrometers with germanium semiconductor detectors can also be used, as long as the measurement can be carried out under the conditions described in 2.2.3.

2.2.3 Measurement condition setting

Perform a measurement of volume radioactivity standard , etc., to estimate the measurement result X, and the standard deviation of measurement result originating in the counting error σ_Xt. Sample vessels and measurement time shall be set so that the value X/σ_X at the standard limit becomes 10 or larger. Perform another measurement of an empty vessel under the conditions set above to confirm that the detection limit is equal to or below 1/5 of the standard limit. Calculate the measurement result X, σ_X, and the detection limit according to the method described in “Gamma-ray Spectrometry using Germanium Semiconductor Detectors” of MEXT's Radiation Measurement Method Series 7 or an internationally accepted method.

2.2.4 Measurement of samples[Note 2]

Weigh an empty measurement vessel. Pack the sample into the vessel and weigh. Record the difference as the sample weight. Place the measurement vessel on the detector, and perform the measurement for the time set in 2.2.3. Analyze the obtained spectrum according to the method described in “Gamma-ray Spectrometry using Germanium Semiconductor Detectors” of MEXT's Radiation Measurement Method Series 7 or an internationally accepted method to obtain the radioactive cesium concentration X in the sample and the standard deviation of measurement result originating in the counting error σ_X .

Note 2) When measuring a solid sample, make sure that the liquid phase does not separate from the solid phase. Leave no void in the vessel when packing the sample, particularly at the vessel bottom close to the detector

2.3 Treatment of measurement results

When the measurement result is below the detection limit, confirm that the sum of detection limits of Cs-134 and Cs-137 are equal to or below 1/5 of the standard limit.

When the radioactive cesium concentration $X = X_{134} + X_{137}$ (wherein X_{134} and X_{137} are the measurement results for Cs-134 and Cs-137, respectively) falls within the range of 75%–125% of the standard limit, confirm that the standard deviations σ_{134} and σ_{137} originating in the counting errors for X_{134} and X_{137}, respectively, satisfy the relation: $\frac{X}{\sqrt{\sigma_{134}^2 + \sigma_{137}^2}} \geq 10$. Otherwise, extend the measurement time until the relation is satisfied.

The test results shall be recorded to 2 significant figures. In cases where the results are below the detection limit, record the test result with the detection limit, e.g., as <20 Bq/kg.

Food that is generally consumed in rehydrated states, such as dried mushrooms, dried vegetables, dried seaweeds, and dried fish and shellfish specified in the Notification, shall be, in principle, tested according to the above-mentioned method. If they are tested in dry states, the measurement results shall be converted into rehydrated state, based on the moisture content data (weight-change rate) of such food after rehydration, which are provided in the Standard Tables of Food Composition in Japan.

3. Quality control of test results

1) Perform daily background measurements to confirm that the background does not exceed the normal range.

2) Perform daily blank measurements using a blank vessel to confirm that the analysis system is free of radioactive surface contamination.

3) Perform periodicallycalibration using volume radioactivity standard.

4) Check the energy scale stability daily

5) When packing the sample into the measurement vessel, make sure that no void is left, particularly in areas around the detector.

6) Avoid radioactive surface contamination of the analysis system by the samples or cross-contamination among different samples. Take appropriate measures to prevent contamination of the detection parts, e.g., by covering the detectors with polyethylene bags, preventing the samples from contacting the outside of measurement vessels, etc.

7) When repeating measurements using the same measurement vessel, take appropriate measures to prevent contamination of the vessel, e.g., by placing polyethylene bags inside the vessel and packing the samples into the bags.

8) Take appropriate measures to prevent mixing up of the samples.

(Attachment)

Standard Operating Procedure for Sample Washing (Dirt Removal) for Tests of Radioactive Substances in Food

1. Samples to be washed:

Vegetables: Non-heading leafy vegetables, heading leafy vegetables, flowerhead brassicas, root vegetables, etc.

Note: Individual items under each category are provided under “item” in the Annex table.

2. Instrument, tools, etc., used:

Disposable gloves, knife, scissors, bowl or tray, strainer, and paper towels

Note: Use new disposable gloves and paper towels for each sample.

3. Washing method:

Parts to be washed are provided under “parts to be washed” in the Annex table. Washing shall be performed according to the procedures specified under “Washing method” in the Annex table. Details of the procedures are described below. Wash the samples to remove dirt, and visually confirm that the samples are clean enough to be eaten or cooked. Except for samples washed through procedure 2, gently wipe moisture off the washed samples with dry paper towels. Then, after following any special instructions given in the Annex table, perform the tests using the washed samples.

Note: When a substantial amount of dirt is attached to the samples, remove the dirt before bringing the samples into the laboratory and washing them.

<Details of the washing procedures specified in the Annex>

Procedure 1: Rinse the samples for about 20 seconds under running tap water.

Procedure 2: Gently wipe the surface of the samples with paper towels wet with tap water.

4. Notes:

Take appropriate measures to separate the samples from each other to prevent cross-contamination. Wash instrument, tools, etc., after washing each sample to prevent cross-contamination.

(Annex)

1. Category	2. Item	3. Parts to be washed	4. Washing method
Non-heading leafy vegetables	Japanese mustard spinach (*Komatsuna*)	Remove roots and decayed leaves	Procedure 1
	Garland chrysanthemum		
	Qing-geng-cai		
	Potherb mustard (*Mizuna*)		
	Leaf lettuce (red)		
	Other non-heading leafy vegetables*		
	Spinach	Remove root hair and decayed leaves	
Heading leafy vegetables	Cabbage	Remove decayed outer leaves and cores	Procedure 1
	Chinese cabbage		
	Lettuce		
Root vegetables	Turnip root	Remove root hair	Procedure 1
	Japanese radish root		
	Lotus root		
Flowerhead brassicas	Broccoli	Remove leaves	Procedure 1
	Cauliflower		
Umbelliferous vegetables	Japanese honeywort (*Mitsuba*)	Remove roots and decayed leaves	Procedure 1
	Celery		
	Parsley		
Solanaceous vegetables	Bell pepper	Whole fruit (note: after washing, remove calyxes before testing)	Procedure 1
	Tomato		
	Cherry tomato	Remove calyxes	
	Eggplant		
Liliaceous vegetables	Spring onion	Remove inedible outer skin and root hair	Procedure 1
	Allium fistulosum L. var. caespitosum (*Wakegi*)		
	Shallot	Remove outer skin and root hair	
	Chinese chive	Remove root	
	Asparagus	Stems	
Cucurbitaceous vegetables	Cucumber	Remove calyxes	Procedure 1
	Zucchini		
	Watermelon		
Lamiaceae Vegetables	Perilla (green leaf)	Whole leaves	Procedure 1
Mushrooms	Shiitake	Remove the hard lower parts	Procedure 2

*Other non-heading leafy vegetables: *Aburana* , *Chijirena* , *Kousaitai* , *Kukitachina* , *Kaburena* , *Shinobufuyuna* , *Santousai* , *Bekana* , non-heading Chinese cabbage, *Bok choy* , *Tah tsai,* leaf mustard, *Katsuona* , mustard green, *Taisai* , butterhead lettuce, non-heading lettuce (romaine lettuce, etc.), *Fudanso* , rapeseed (bud), *Saishin* , *Asparana* , *Kairan* , *Tsubomina* , *Mizukakena* , kale, *Shirona* , *Sendai-yukina* , *Senpousai* , *Nozawana* , *Benrina* , *Yamagata midorina* , *Wasabina* , sanchu asian lettuce, brussels sprouts, hosta montana, Japanese horseradish, Japanese horseradish (leaf), watercress, eruca sativa (Rocket), shepherd's purse, iceplant, Japanese radish (leaf), Japanese butterbur scape, etc.