GUIDELINE LEVELS FOR RADIONUCLIDES IN FOODS FOLLOWING ACCIDENTAL NUCLEAR CONTAMINATION FOR USE IN INTERNATIONAL TRADE

CAC/GL 5-1989 [1]

FOODS DESTINED FOR GENERAL CONSUMPTION

Dose per unit intake factor (Sv/Bq)	Representative radionuclides	Level (Bq/kg)
10^{-6}	^{241}Am, ^{239}Pu	10
10^{-7}	^{90}Sr	100
10^{-8}	^{131}I, ^{134}Cs, ^{137}Cs	1000

MILK AND INFANT FOODS

Dose per unit intake factor (Sv/Bq)	Representative radionuclides	Level (Bq/kg)
10^{-6}	^{241}Am, ^{239}Pu	1
10^{-7}	^{131}I, ^{90}Sr	100
10^{-8}	^{134}Cs, ^{137}Cs	1000

Notes:

These levels are designed to be applied only to radionuclides contaminating food moving in international trade following an accident and not to naturally occurring radionuclides which have always been present in the diet. The Guideline Levels remain applicable for one year following a nuclear accident. By an accident is meant a situation where the uncontrolled release of radionuclides to the environment results in the contamination of food offered in international trade.

As the proposed levels have extensive conservative assumptions built-in, there is no need to add contributions between dose per unit intake groups, and each of the three groups should be treated independently. However, the activity of the accidentally contaminating radionuclides within a dose per unit intake group should be added together if more than one radionuclide is present. Thus the 1000 Bq/kg level for the 10^{-8} Sv/Bq dose per unit intake group is the total of all contaminants assigned to that group. For example, following a power reactor accident, ^{134}Cs and ^{137}Cs could be contaminants of food, and the 1000 Bq/kg refers to the summed activity of both these radionuclides.

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[1] The Codex Alimentarius Commission at its 18th Session (Geneva 1989) adopted Guideline Levels for Radionuclides in Foods Following Accidental Nuclear Contamination. The Guideline Levels which are in this publication remain applicable for one year following a nuclear accident.

The Commission also adopted, as an interim measure, the following definition of Guideline Level:

"Guideline Levels are intended for use in regulating foods moving in international trade. When the Guideline Levels are exceeded, governments should decide whether and under what circumstances, the food should be distributed within their territory or jurisdiction."

These levels are intended to be applied to food prepared for consumption. They would be unnecessarily restrictive if applied to dried or concentrated foods prior to dilution or reconstitution.

Both FAO and WHO have called attention in the expert meeting reports to special consideration which might apply to certain classes of food which are consumed in small quantities, such as spices. Some of the foods grown in the areas affected by the Chernobyl accident fall-out contained very high levels of radionuclides following the accident. Because they represent a very small percentage of total diets and hence would be very small additions to the total dose, application of the Guideline Levels to products of this type may be unnecessarily restrictive. FAO and WHO are aware that policies vary at present in different countries regarding such classes of food.

APPENDIX

DERIVATION OF THE CODEX GUIDELINES IN FOODS FOLLOWING ACCIDENTAL NUCLEAR CONTAMINATION

The approach taken by WHO and FAO in recommending the Guideline Levels to the Codex Alimentarius Commission assumes a reference level of dose (5 mSv), a total average food consumption rate, a dose per unit intake factor for various radionuclides and a pattern of food consumption, and calculates the levels by the following formula:

$$\text{Level} = \frac{\text{RLD}}{\text{m x d}}$$

where: RLD = Reference Level of Dose (Sv)
m = mass of food consumed (kg)
d = dose per unit intake factor (Sv/Bq)

Controlling radionuclide contamination of foods moving in international trade requires simple, uniform and easily applied values. This approach is one that can be uniformly applied by government authorities and yet one that achieves a level of public health protection to individuals that is considered more than adequate in the event of a nuclear accident.

In making these joint FAO/WHO recommendations the following assumptions were made in calculating the levels:

1. 5 mSv was adopted as the reference level of dose for an accident. This value, for most radionuclides, is the committed effective dose equivalent resulting from ingestion in the first year after an accident. Owing to the extremely conservative assumptions adopted, it is most unlikely that the application of the following levels will result in a dose to an individual greater than a small fraction of 1 mSv.

2. 550 kg of food is consumed in a year, all of which is contaminated.

3. Dose per unit intake factors for the radionuclides of concern (^{131}I, ^{137}Cs, ^{134}Cs ^{90}Sr, ^{239}Pu) can be conveniently divided into three classes and applied to the general population:

   (a) those with a dose per unit intake of 10^{-6} Sv/Bq such as ^{239}Pu and other actinides;

   (b) those with a dose per unit intake factor of 10^{-7} Sv/Bq such as ^{90}Sr and other beta emitters; and

   (c) those with a dose per unit intake factor of 10^{-8} Sv/Bq such as ^{134}Cs, ^{137}Cs, ^{131}I.

For infant foods and milk a dose per unit intake factor of 10^{-5} Sv/Bq was used instead of the 10^{-6} Sv/Bq value and ^{131}I was assigned to the 10^{-7} Sv/Bq class of radionuclides.

Applying these assumptions to the above formula, the level for the general population for the radionuclides in the 10^{-8} Sv/Bq group is:

$$\frac{5 \times 10^{-3}}{550 \times 10^{-8}} = 909 \text{ Bq/kg}$$

which can then be rounded 1000 Bq/kg. For the actinides this value of 10 Bq/kg, as the dose per unit intake factor is 100 times larger, and for the radionuclides in the 10^{-7} Sv/Bq class (such as ^{90}Sr), it is 100 Bq/kg.

It is recognized that the sensitivity of infants may pose a problem if the dose conversion factor for the general population were applied to them indiscriminately. WHO, in its document Derived Intervention Levels for Radionuclides in Food, [2] proposed separate guidelines for infants. The values were based on an infant consumption of milk of 275 L/y and the specific dose conversion factors for infants for ^{90}Sr, ^{131}I, ^{137}Cs.

The resulting WHO Guideline values were:

^{90}Sr	160 Bq/L
^{131}I*	1600 Bq/L
^{137}Cs	1800 Bq/L

* The value for ^{131}I was based on a dose of 50 mSv to the thyroid and a mean life of ingested ^{131}I of 11.5 days.

However, the dose per unit intake factors for infants ingesting alpha-emitting actinides have recently been revised upward and as a prudent measure, a dose per unit intake factor of 10^{-5} Sv/Bq for these radionuclides was applied to infants consuming milk and infant foods.

To reflect the infants' sensitivity, ^{131}I was assigned a dose per unit intake factor of 10^{-7} Sv/Bq, putting it in the same class as ^{90}Sr.

For infant foods and milk the application of these dose per unit intake factors result in a level of 1 Bq/kg for the alpha emitters of the actinide series and any other radionuclide with a dose unit intake factor of 10^{-5} Sv/Bq, and 100 Bq/kg for ^{90}Sr and ^{131}I or any other radionuclides assigned a dose per unit intake of 10^{-7} Sv/Bq.

By infant foods is meant a food prepared specifically for consumption by infants in the first year of life. Such foods are packaged and identified as being for this purpose.

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[2] DERIVED INTERVENTION LEVELS FOR RADIONUCLIDES IN FOOD. Guidelines for application after widespread radioactive contamination resulting from a major radiation accident. WHO, Geneva, 1988.