codex alimentarius commission

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

WORLD HEALTH ORGANIZATION

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Agenda Item 10(b) **CX/FAC 03/13**
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JOINT FAO/WHO FOOD STANDARDS PROGRAMME

CODEX COMMITTEE ON FOOD ADDITIVES AND CONTAMINANTS
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CONSIDERATION OF A REVISION OR AMENDMENTS TO THE GUIDELINE LEVELS FOR RADIONUCLIDES IN FOODS FOLLOWING ACCIDENTAL NUCLEAR CONTAMINATION FOR USE IN INTERNATIONAL TRADE (CAC/GL 5-1989), INCLUDING GUIDELINE LEVELS FOR RADIONUCLIDES FOR LONG-TERM USE

BACKGROUND

1. The 50th Session of the Executive Committee (June 2002) considered a request arising from the International Atomic Energy Agency (IAEA) to broaden the Guideline Levels for Radionuclides in Foods Following Accidental Nuclear Contamination for Use in International Trade (CAC/GL 5-1989) to other radionuclides and to consider the establishment of guideline levels for radionuclides for long-term use as new work (CX/EXEC 02/50/7, Annex 1). The Executive Committee decided not to approve the elaboration of the above documents on guideline levels at this stage and referred them to the CCFAC for consideration together with additional information from the IAEA regarding a possible approach to deriving new levels (ALINORM 03/3A, para. 67 and Appendix III).

ISSUES FOR CONSIDERATION

2. As indicated in the attached letter (see Annex I) from the IAEA Division of Radiation and Waste Safety, and as requested by the 50th Session of the Executive Committee, the CCFAC is invited to consider the following:

- whether or not the current levels contained in the Codex Guideline Levels for Radionuclides in Foods Following Accidental Nuclear Contamination for Use in International Trade (CAC/GL 5-1989) can be applied to long term situations or, if not, the values that would be appropriate for long term use.

- the broadening of the list of radionuclides contained in CAC/GL 5-1989 to include most of the radionuclides, including those of natural origin, that are currently listed in Schedule 1 of the International Basic Safety Standards for Protection against Ionizing Radiation and for the Safety of Radiation Sources (see Annex III).

3. Additional information on this subject has also been provided by the IAEA Division of Radiation and Waste Safety in Annex II (Derivation of the Codex Guidelines in Foods Following Nuclear Contamination).

ANNEX 1

LETTER FROM THE INTERNATIONAL ATOMIC ENERGY AGENCY

Vienna, 30 April 2002

Dear Mr. Randell,

During the 44th General Conference of the International Atomic Energy Agency (the Agency) in 2000, a resolution (GC(44)/RES/15) was passed which requested the Agency's Secretariat *"to develop, using the Agency's radiation protection advisory mechanisms and in collaboration with the competent organs of the United Nations and with the specialized agencies concerned, during the next two years and within available resources, radiological criteria for long-lived radionuclides in commodities, particularly foodstuffs and wood, and to submit them to the Board of Governors for its approval".*

In response to this resolution, the Agency is developing a Safety Guide entitled ***"Radionuclide Content in Commodities not requiring Regulation for Purposes of Radiation Protection".*** During the development of this document, a number of issues were raised concerning the derivation of guidance levels for radionuclides in foods that can be traded on the free market, most notably, during a recent Technical Meeting. These are as follows:

a) The guideline levels presented in the Codex Alimentarius (CAC/GL 5) are applicable for one year following a nuclear accident but may not be applicable to longer term situations. It was suggested that consideration should be given to whether the Codex Alimentarius levels can be applied to long term situations or, if not, the values that would be appropriate for long-term use.

b) The Codex Alimentarius guideline levels are for a very limited set of radionuclides. There is however the potential for other radionuclides to be present in foodstuffs. It was therefore suggested that the list should be broadened to include most of the radionuclides, including those of natural origin, that are currently listed in Schedule I of the International Basic Safety Standards for Protection against Ionizing Radiation and for the Safety of Radiation Sources, which have been co-sponsored by inter alia, FAO, WHO and the Agency.

In view of the obligation placed on the Agency by the afore-mentioned resolution, the issues raised during the Agency's subsequent response and the responsibilities of the Codex Alimentarius Commission, I am writing to request the Commission to consider guideline levels for radionuclides in foodstuffs for long-term use and also broadening the guidance levels as mentioned above. The Agency would be pleased to assist the Commission in this and is prepared to make available the results of preliminary work carried out by its Secretariat on the derivation of such levels.

Yours sincerely,

Abel J. Gonzalez
Director
Division of Radiation and Waste Safety

Annex II

DERIVATION OF THE CODEX GUIDELINES IN FOODS FOLLOWING NUCLEAR CONTAMINATION (Information Provided by the IAEA Division of Radiation and Waste Safety)

These Guidelines have been reconsidered for three reasons:

1. The International Commission on Radiological Protection has recommended a generic intervention exemption level of around 1 mSv for individual annual dose from radionuclides in major commodities[1].
2. The perceived threats of a war in which nuclear weapons are used and terrorist activity have increased so these possibilities must be considered in addition to accidental releases of radionuclides.
3. The earlier guidelines assumed a reference level of dose (5 mSv[2]) and were applicable only for one year following a nuclear accident. This is illogical because the nature of the 'nuclear accident' was not specified and there may be confusion in applying them to concurrent accidents. There is no radiological reason why the Guidelines should not be generally applicable and in practice they have been widely used.

The Guideline Levels recommended to the Codex Alimentarius Commission were calculated using the following formula:

Level = RLD/(m x df x d)

Where: RLD = Reference Level of Dose

m = mass of food consumed (kg)

df = dilution factor

d = dose per unit intake coefficient (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 making these recommendations the following assumptions were made in calculating the levels:

1. the reference level of dose adopted was 1 mSv per year in accordance with the most recent recommendations of the International Commission on Radiological Protection;
2. 550 kg of food is consumed per year by an adult;
3. 275 kg of milk is consumed per year, by an infant;
4. 20% of the diet is of imported food[3], all of which is contaminated; this gives a dilution factor of 0.2.
5. Dose per unit intake coefficients for the radionuclides of concern can be conveniently divided into two classes and applied to the general population:

   a) those with dose per unit intake coefficient of 10^{-7} Sv/Bq such as ^{239}Pu and other actinides

   b) those with dose per unit intake coefficient of 10^{-8} Sv/Bq such as ^{90}Sr, ^{131}I, ^{134}Cs and ^{137}Cs.

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1 [ICRP-82] International Commission on Radiological Protection. Principles for the Protection of the Public in Situations of Prolonged Exposure. Annals of the ICRP, V. 29, No 1-2 (1999).

2 WHO (World Health Organization). 1989. Derived intervention levels for radionuclides in food. Guidelines for application after widespread radioactive contamination of resulting from a major radiation accident, Geneve.

3 On a global basis just over 13% of the per caput supply of food was traded internationally in 1999 (FAO Food Balance Sheet). The highest level of imported food was over 15% in Europe so this figure has been rounded up to the next decade to give 20%.

As in the 1989 Guidelines, dose per unit intake coefficients for the radionuclides in milk and infant foods were divided into three classes. The sensitivity of infants was taken into account by increasing the dose per unit intake value for alpha-emitting nuclides to 10^{-6} Sv/Bq and assigning ^{90}Sr, ^{131}I to the 10^{-7} Bq/kg class.

These assumptions are extremely conservative and it is most unlikely that the application of the Guideline Levels will result in an annual dose to an individual greater than a small fraction of 1mSv. This is confirmed by experience since the promulgation of the 1989 Guidelines.

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

$1 \times 10^{-3}/(550 \times 0.2 \times 10^{-8)} = 909$ Bq/kg

which can be rounded to 1000 Bq/kg. Corresponding values for the 10^{-6} and 10^{-7} mSv/Bq classes are 10 Bq/kg and 100 Bq/kg.

For infant foods and milk, the Guideline levels are 10 Bq/kg for the alpha emitters of the actinide series and any other radionuclide with a dose per unit intake coefficient of 10^{-6} Sv/Bq and 100 Bq/kg for ^{90}Sr, ^{131}I and any other radionuclides with a dose per unit intake coefficient of 10^{-7} Sv/Bq.

Infant foods are those prepared specifically for consumption by infants less than one year old. Such foods are packaged and identified as being for this purpose.

Annex III

List of radionuclides included in Schedule 1 of the International Basic Safety Standards for Protection against Ionizing Radiation and for the Safety of Radiation Sources (SS-115), IAEA, 1996

H-3
Be-7
C-14
O-15
F-18
Na-22
Na-24
Si-31
P-32
P-33
S-35
Cl-36
Cl-38
Ar-37
Ar-41
K-40
K-42
K-43
Ca-45
Ca-47
Sc-46
Sc-47
Sc-48
V-48
Cr-51
Mn-51
Mn-52
Mn-52m
Mn-53
Mn-54
Mn-56
Fe-52
Fe-55
Fe-59
Co-55
Co-56
Co-57
Co-58
Co-5 8m
Co-60
Co-60m
Co-61
Co-62m
Ni-59
Ni-63
Ni-65
Cu-64
Zn-65
Zn-69
Zn-69m
Ga-72
Ge-71
As-73
As-74
As-76
As-77
Se-75
Br-82
Kr-74
Kr-76
Kr-77
Kr-79
Kr-81
Kr-83m
Kr-85
Kr-85m
Kr-87
Kr-88
Rb-86
Sr-85
Sr-85m
Sr-87m
Sr-89
Sr-90a
Sr-91
Sr-92
Y-90
Y-91
Y-91m
Y-92
Y-93
Zr-93a
Zr-95
Zr-97a
Nb-93m
Nb-94
Nb-95
Nb-97
Nb-98
Mo-90
Mo-93
Mo-99

Mo-101
Tc-96
Tc-96m
Tc-97
Tc-97m
Tc-99
Tc-99m
Ru-97
Ru-103
Ru-105
Ru-106a
Rh-103m
Rh-105
Pd-103
Pd-109
Ag-105
Ag-llOm
Ag-111
Cd-109
Cd-115
Cd-115m
In-111
In- 11 3m
In- 114m
In- 11 5m
Sn-113
Sn-125
Sb-122
Sb-124
Sb-125
Te-123m
Te-125m
Te-127
Te-127m
Te-129
Te-129m
Te-131
Te-131m
Te-132
Te-133
Te-133m
Te-134
1-123
1-125
1-126
1-129
1-130
1-131
1-132
1-133
1-134
1-135
Xe-13lm
Xe-133
Xe-135
Cs-129
Cs-131
Cs-132
Cs-134m
Cs-134
Cs-135
Cs-136
Cs-137a
Cs-138
Ba-131
Ba-140a
La- 140
Ce-139
Ce-141
Ce-143
Ce-144a
Pr-142
Pr-143
Nd-147
Nd-149
Pm-147
Pm-149
Sm-151
Sm-153
Eu-152
Eu-152m
Eu-154
Eu-155
Gd-153
Gd-159
Tb-160
Dy-165
Dy-166
Ho- 166
Er-169
Er-171
Tm-170
Tm-171
Yb-175
Lu-177
Hf-181
Ta-182
W-181
W-185
W-187
Re- 186
Re- 188
Os-185
Os-191
Os-191m
Os-193
Ir-190
Ir-192

Ir-194
Pt-191
Pt-193m
Pt-197
Pt-197m
Au-198
Au-199
Hg-197
Hg-197m
Hg-203
Tl-200
Tl-201
Tl-202
Tl-204
Pb-203
Pb-210a
Pb-212a
Bi-206
Bi-207
Bi-210
Bi-212a
Po-203
Po-205
Po-207
Po-210
At-211
Rn-220a
Rn-222a
Ra-223a
Ra-224a
Ra-225
Ra-226a
Ra-227
Ra-228a
Ac-228
Th-226a
Th-227
Th-228a
Th-229a
Th-230
Th-231
Th-nat
(incl. Th-232)
Th-234a
Pa-230
Pa-231
Pa-233
U-2308
U-231
U-232a
U-233
U-234
U-2353
U-236
U-237
U-2383
U-nat
U-239
U-240
U-2403
Np-237a
Np-239
Np-240
Pu-234
Pu-235
Pu-236
Pu-237
Pu-238
Pu-239
Pu-240
Pu-241
Pu-242
Pu-243
Pu-244
Am-241
Am-242
Am-242ma
Am-243a
Cm-242
Cm-243
Cm-244
Cm-245
Cm-246
Cm-247
Cm-248
Bk-249
Cf-246
Cf-248
Cf-249
Cf-250
Cf-251
Cf-252
Cf-253
Cf-254
Es-253
Es-254
Es-254m
Fm-254
Fm-255

Parent nuclides and their progeny included in secular equilibrium are listed in the following:

Sr-90	Y-90
Zr-93	Nb-93m
Zr-97	Nb-97
Ru-106	Rh-106
Cs-137	Ba-137m
Ce-134	La- 134
Ce-144	Pr-144
Ba-140	La- 140
Bi-212	Tl-208 (0.36), Po-212 (0.64)
Pb-210	Bi-210, Po-210
Pb-212	Bi-212, Tl-208
Rn-220	Po-216
Rn-222	Po-218, Pb-214 (0.36), Po-212 (0.64) , Bi-214, Po-214
Ra-223	Rn-219, Po-215, Pb-211, Bi-211, Tl-207
Ra-224	Rn-220, Po-216, Pb-212, Bi-212, Tl-208 (0.36), Po-212 (0.64)
Ra-226	Rn-222, Po-218, Pb-214, Bi-214, Po-214, Pb-210, Bi-210, Po-210
Ra-228	Ac-228
Th-226	Ra-222, Rn-218, Po-214
Th-228	Ra-224, Rn-220, Po-216, Pb-212, Bi-212, Tl-208 (0.36), Po-212 (0.64)
Th-229	Ra-225, Ac-225, Fr-221, At-217, Bi-213, Po-213, Pb-209
Th-nat	Ra-228, Ac-228, Th-228, Ra-224, Rn-220, Po-216, Pb-212, Bi-212, Tl-208 (0.36), Po-212 (0.64)
Th-234	Pa-234m
U-230	Th-226, Ra-222, Rn-218, Po-214
U-232	Th-228, Ra-224, Rn-220, Po-216, Pb-212, Bi-212, Tl-208 (0.36), Po-212 (0.64)
U-235	Th-231
U-238	Th-234, Pa-234m
U-nat	Th-234, Pa-234m, U-234, Th-230, Ra-226, Rn-222, Po-218, Pb-214, Bi-214, Po-214, Pb-210, Bi-210, Po-210
U-240	Np-240m
Np-237	Pa-233
Am-242m	Am-242
Am-243	Np-239