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Annex 2. Tables of guideline values

The following tables present a summary of guideline values for microorganisms and chemicals in drinking-water. Individual values should not be used directly from the tables. The guideline values must be used and interpreted in conjunction with the information contained in the text and in Volume 2, *Health criteria and other supporting information.*

Table A2.1. Bacteriological quality of drinking-water[a]

Organisms	Guideline value
All water intended for drinking	
E. coli or thermotolerant coliform bacteria[b,c]	Must not be detectable in any 100-ml sample
Treated water entering the distribution system	
E. coli or thermotolerant coliform bacteria[b]	Must not be detectable in any 100-ml sample
Total coliform bacteria	Must not be detectable in any 100-ml sample
Treated water in the distribution system	
E. coli or thermotolerant coliform bacteria[b]	Must not be detectable in any 100-ml sample
Total coliform bacteria	Must not be detectable in any 100-ml sample. In the case of large supplies, where sufficient samples are examined, must not be present in 95% of samples taken throughout any 12-month period

[a] Immediate investigative action must betaken if either *E. coli* or total coliform bacteria are detected. The minimum action in the case of total coliform bacteria is repeat sampling; if these bacteria are detected in the repeat sample, the cause must be determined by immediate further investigation.

[b] Although *E. coli* is the more precise indicator of faecal pollution, the count of thermotolerant coliform bacteria is an acceptable alternative. If necessary, proper confirmatory tests must be carried out. Total coliform bacteria are not acceptable indicators of the sanitary quality of rural water supplies, particularly in tropical areas where many bacteria of no sanitary significance occur in almost all untreated supplies.

[c] It is recognized that, in the great majority of rural water supplies in developing countries, faecal contamination is widespread. Under these conditions, the national surveillance agency should set medium-term targets for the progressive improvement of water supplies, as recommended in Volume 3 of *Guidelines for drinking-water quality.*

Table A2.2. Chemicals of health significance in drinking-water

A. Inorganic constituents

	Guideline value (mg/litre)	Remarks
antimony	0.005 (P)[a]	
arsenic	0.01[b] (P)	For excess skin cancer risk of 6×10^{-4}
barium	0.7	
beryllium		NAD[c]
boron	0.3	
cadmium	0.003	
chromium	0.05 (P)	
copper	2 (P)	ATO[d]
cyanide	0.07	
fluoride	1.5	Climatic conditions, volume of water consumed, and intake from other sources should be considered when setting national standards
lead	0.01	It is recognized that not all water will meet the guideline value immediately; meanwhile, all other recommended measures to reduce the total exposure to lead should be implemented
manganese	0.5 (P)	ATO
mercury (total)	0.001	
molybdenum	0.07	
nickel	0.02	
nitrate (as NO_3^-)	50	The sum of the ratio of the concentration of each to its respective guideline value should not exceed 1
nitrite (as NO_2^-)	3 (P)	The sum of the ratio of the concentration of each to its respective guideline value should not exceed 1
selenium	0.01	
uranium		NAD

B. Organic constituents

	Guideline value (µg/litre)	Remarks
Chlorinated alkanes		
carbon tetrachloride	2	
dichloromethane	20	
1,1-dichloroethane		NAD
1,2-dichloroethane	30[b]	for excess risk of 10^{-5}
1,1,1-trichloroethane	2000 (P)	
Chlorinated ethenes		
vinyl chloride	5[b]	for excess risk of 10^{-5}
1,1-dichloroethene	30	
1,2-dichloroethene	50	
trichloroethene	70 (P)	
tetrachloroethene	40	
Aromatic hydrocarbons		
benzene	10[b]	for excess risk of 10^{-5}
toluene	700	ATO
xylenes	500	ATO
ethylbenzene	300	ATO
styrene	20	ATO
benzo[*a*]pyrene	0.7[b]	for excess risk of 10^{-5}
Chlorinated benzenes		
monochlorobenzene	300	ATO
1,2-dichlorobenzene	1000	ATO
1,3-dichlorobenzene		NAD
1,4-dichlorobenzene	300	ATO
trichlorobenzenes (total)	20	ATO
Miscellaneous		
di(2-ethylhexyl)adipate	80	
di(2-ethylhexyl)phthalate	8	
acrylamide	0.5[b]	for excess risk of 10^{-5}
epichlorohydrin	0.4 (P)	
hexachlorobutadiene	0.6	
edetic acid (EDTA)	200 (P)	
nitrilotriacetic acid	200	
dialkyltins		NAD
tributyltin oxide	2	

C. Pesticides

	Guideline value (µg/litre)	Remarks
alachlor	20[b]	for excess risk of 10^{-5}
aldicarb	10	
aldrin/dieldrin	0.03	
atrazine	2	
bentazone	30	
carbofuran	5	
chlordane	0.2	
chlorotoluron	30	
DDT	2	
1,2-dibromo-3-chloropropane	1[b]	for excess risk of 10^{-5}
2,4-D	30	
1,2-dichloropropane	20 (P)	
1,3-dichloropropane		NAD
1,3-dichloropropene	20[b]	for excess risk of 10^{-5}
ethylene dibromide		NAD
heptachlor and heptachlor epoxide	0.03	
hexachlorobenzene	1[b]	for excess risk of 10^{-5}
isoproturon	9	
lindane	2	
MCPA	2	
methoxychlor	20	
metolachlor	10	
molinate	6	
pendimethalin	20	
pentachlorophenol	9 (P)	
permethrin	20	
propanil	20	
pyridate	100	
simazine	2	
trifluralin	20	
chlorophenoxy herbicides other than 2,4-D and MCPA		
2,4-DB	90	
dichlorprop	100	
fenoprop	9	
MCPB		NAD
mecoprop	10	
2,4,5-T	9	

D. Disinfectants and disinfectant by-products

Disinfectants	Guideline value (mg/litre)	Remarks
monochloramine	3	
di- and trichloramine chlorine	5	NAD ATO. For effective disinfection there should be a residual concentration of free chlorine of $\geq$ 0.5 mg/litre after at least 30 minutes contact time at pH < 8.0
chlorine dioxide		A guideline value has not been established because of the rapid breakdown of chlorine dioxide and because the chlorite guideline value is adequately protective for potential toxicity from chlorine dioxide
iodine		NAD

Disinfectant by-products	Guideline value (µg/litre)	Remarks
bromate	25[b] (P)	for 7×10^{-5} excess risk
chlorate		NAD
chlorite	200 (P)	
chlorophenols		
2-chlorophenol		NAD
2,4-dichlorophenol		NAD
2,4,6-trichlorophenol	200[b]	for excess risk of 10^{-5}, ATO
formaldehyde	900	
MX		NAD
trihalomethanes		The sum of the ratio of the concentration of each to its respective guideline value should not exceed 1
bromoform	100	
dibromochloromethane	100	
bromodichloromethane	60[b]	for excess risk of 10^{-5}
chloroform	200[b]	for excess risk of 10^{-5}
chlorinated acetic acids		
monochloroacetic acid		NAD
dichloroacetic acid	50 (P)	
trichloroacetic acid	100 (P)	
chloral hydrate (trichloroacetaldehyde)	10 (P)	
chloroacetone		NAD
halogenated acetonitriles		
dichloroacetonitrile	90 (P)	
dibromoacetonitrile	100 (P)	
bromochloroacetonitrile		NAD
trichloroacetonitrile	1 (P)	
cyanogen chloride (as CN)	70	
chloropicrin		NAD

[a] (P) - Provisional guideline value. This term is used for constituents for which there is some evidence of a potential hazard but where the available information on health effects is limited; or where an uncertainty factor greater than 1000 has been used in the derivation of the

tolerable daily intake (TDI). Provisional guideline values are also recommended: (1) for substances for which the calculated guideline value would be below the practical quantification level, or below the level that can be achieved through practical treatment methods; or (2) where disinfection is likely to result in the guideline value being exceeded.

[b] For substances that are considered to be carcinogenic, the guideline value is the concentration in drinking-water associated with an excess lifetime cancer risk of 10^{-5} (one additional cancer per 100 000 of the population ingesting drinking-water containing the substance at the guideline value for 70 years). Concentrations associated with estimated excess lifetime cancer risks of 10^{-4} and 10^{-6} can be calculated by multiplying and dividing, respectively, the guideline value by 10.

In cases in which the concentration associated with an excess lifetime cancer risk of 10^{-5} is not feasible as a result of inadequate analytical or treatment technology, a provisional guideline value is recommended at a practicable level and the estimated associated excess lifetime cancer risk presented.

It should be emphasized that the guideline values for carcinogenic substances have been computed from hypothetical mathematical models that cannot be verified experimentally and that the values should be interpreted differently than TDI-based values because of the lack of precision of the models. At best, these values must be regarded as rough estimates of cancer risk. However, the models used are conservative and probably err on the side of caution. Moderate short-term exposure to levels exceeding the guideline value for carcinogens does not significantly affect the risk.

[c] NAD - No adequate data to permit recommendation of a health-based guideline value.

[d] ATO - Concentrations of the substance at or below the health-based guideline value may affect the appearance, taste, or odour of the water.

Table A2.3. Chemicals not of health significance at concentrations normally found in drinking-water

Chemical	Remarks
asbestos	U
silver	U
tin	U

U - It is unnecessary to recommend a health-based guideline value for these compounds because they are not hazardous to human health at concentrations normally found in drinking-water.

Table A2.4. Radioactive constituents of drinking-water

	Screening value (Bq/litre)	Remarks
gross alpha activity	0.1	If a screening value is exceeded, more detailed radionuclide analysis is necessary.
gross beta activity	1	Higher values do not necessarily imply that the water is unsuitable for human consumption

Table A2.5. Substances and parameters in drinking-water that may give rise to complaints from consumers

	Levels likely to give rise to consumer complaints[a]	Reasons for consumer complaints
Physical parameters		
colour	15 TCU[b]	appearance
taste and odour	-	should be acceptable
temperature	-	should be acceptable
turbidity	5 NTU[c]	appearance; for effective terminal disinfection, median turbidity ≤ 1 NTU, single sample ≤ 5 NTU
Inorganic constituents		
aluminium	0.2 mg/l	depositions, discoloration
ammonia	1.5 mg/l	odour and taste
chloride	250 mg/l	taste, corrosion
copper	1 mg/l	staining of laundry and sanitary ware (health-based provisional guideline value 2 mg/litre)
hardness	-	high hardness: scale deposition, scum formation low hardness: possible corrosion
hydrogen sulfide	0.05 mg/l	odour and taste
iron	0.3 mg/l	staining of laundry and sanitary ware
manganese	0.1 mg/l	staining of laundry and sanitary ware (health-based provisional guideline value 0.5 mg/litre)
dissolved oxygen	-	indirect effects
PH	-	low pH: corrosion high pH: taste, soapy feel preferably < 8.0 for effective disinfection with chlorine
sodium	200 mg/l	taste
sulfate	250 mg/l	taste, corrosion
total dissolved solids	1000 mg/l	taste
zinc	3 mg/l	appearance, taste
Organic constituents		
toluene	24-170 µg/l	odour, taste (health-based guideline value 700 µg/l)
xylene	20-1800 µg/l	odour, taste (health-based guideline value 500 µg/l)
ethylbenzene	2-200 µg/l	odour, taste (health-based guideline value 300 µg/l)
styrene	4-2600 µg/l	odour, taste (health-based guideline value 20 µg/l)
monochlorobenzene	10-120 µg/l	odour, taste (health-based guideline value 300 µg/l)
1,2-dichlorobenzene	1-10 µg/l	odour, taste (health-based guideline value 1000 µg/l)
1,4-dichlorobenzene	0.3-30 µg/l	odour, taste (health-based guideline value 300 µg/l)
trichlorobenzenes (total)	5-50 µg/l	odour, taste (health-based guideline value 20 µg/l)
synthetic detergents	-	foaming, taste, odour
Disinfectants and disinfectant by-products		
chlorine	600-1000 µg/l	taste and odour (health-based guideline value 5 mg/l)
chlorophenols		
2-chlorophenol	0.1-10 µg/l	taste, odour
2,4-dichlorophenol	0.3-40 µg/l	taste, odour
2,4,6-trichlorophenol	2-300 µg/l	taste, odour (health-based guideline value 200 µg/l)

[a] The levels indicated are not precise numbers. Problems may occur at lower or higher values according to local circumstances. A range of taste and odour threshold concentrations is given for organic constituents.

[b] TCU, true colour unit.

[c] NTU, nephelometric turbidity unit.

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