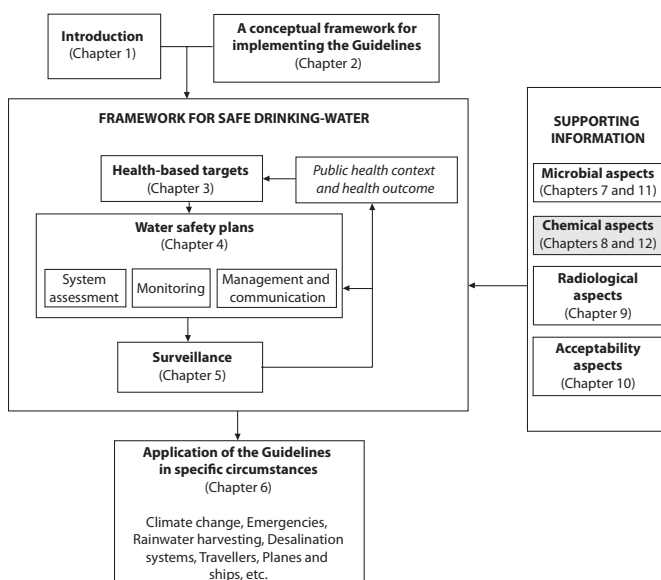


12

Chemical fact sheets

The background documents referred to in this chapter (as the principal reference for each fact sheet) may be found on the Water, Sanitation, Hygiene and Health web site at http://www.who.int/water_sanitation_health/dwq/chemicals/en/index.html. A complete list of references cited in this chapter, including the background documents for each chemical, is provided in Annex 2.



12.1 Chemical contaminants in drinking-water

Acrylamide

Residual acrylamide monomer occurs in polyacrylamide coagulants used in the treatment of drinking-water. In general, the maximum authorized dose of polymer is 1 mg/l. At a monomer content of 0.05%, this corresponds to a maximum theoretical concentration of 0.5 µg/l of the monomer in water. Practical concentrations may be lower by a factor of 2–3. This applies to the anionic and non-ionic polyacrylamides, but residual levels from cationic polyacrylamides may be higher. Polyacrylamides are also used as grouting agents in the construction of drinking-water reservoirs and wells. Human exposure is much greater from food than from drinking-water, owing to the formation of acrylamide in foods (e.g. breads, fried and roasted foods) cooked at high temperatures.

GUIDELINES FOR DRINKING-WATER QUALITY

Guideline value	0.0005 mg/l (0.5 µg/l)
Occurrence	Concentrations up to a few micrograms per litre occasionally detected in tap water
Basis of guideline value derivation	Combined mammary, thyroid and uterine tumours observed in female rats in a drinking-water study, and using the linearized multistage model
Limit of detection	0.032 µg/l by gas chromatography (GC); 0.2 µg/l by high-performance liquid chromatography (HPLC); 10 µg/l by HPLC with ultraviolet (UV) detection
Treatment performance	Conventional treatment processes do not remove acrylamide. Acrylamide concentrations in drinking-water are usually controlled by limiting either the acrylamide content of polyacrylamide flocculants or the dose used, or both. Advances in analytical techniques are also beginning to allow control by direct measurement (see background document).
Additional comments	Every effort should be made to limit free acrylamide monomer in polyacrylamide used for water treatment, and water suppliers should also make every effort to ensure that residual acrylamide in drinking-water is kept as low as is technically feasible. In particular, if acrylamide is controlled by limiting the amount dosed, overdosing should always be avoided.
Assessment date	2011
Principal references	FAO/WHO (2011) <i>Evaluation of certain contaminants in food</i> WHO (2011) <i>Acrylamide in drinking-water</i>

Following ingestion, acrylamide is readily absorbed from the gastrointestinal tract and widely distributed in body fluids. Acrylamide can cross the placenta. It is neurotoxic, affects germ cells and impairs reproductive function. In mutagenicity assays, acrylamide was negative in the Ames test but induced gene mutations in mammalian cells and chromosomal aberrations in vitro and in vivo. In a long-term carcinogenicity study in rats exposed via drinking-water, acrylamide induced scrotal, thyroid and adrenal tumours in males and mammary, thyroid and uterine tumours in females. The International Agency for Research on Cancer (IARC) has placed acrylamide in Group 2A (probably carcinogenic to humans). The Joint Food and Agriculture Organization of the United Nations (FAO)/World Health Organization (WHO) Expert Committee on Food Additives (JECFA) has recently noted concerns regarding the carcinogenicity and neurotoxicity of acrylamide and concluded that dietary exposure should be reduced to as low a level as technically achievable. Recent data have shown that exposure to acrylamide from cooked food is much higher than previously thought. As it is difficult to control the intake of acrylamide from food, it is very important that the acrylamide content of polyacrylamide used as a coagulant aid in water treatment, the most important source of drinking-water contamination by acrylamide, be as low as possible and that polyacrylamide not be overdosed in an attempt to take a shortcut to improving coagulation.

Alachlor

Alachlor (Chemical Abstracts Service [CAS] No. 15972-60-8) is a pre-emergence and post-emergence herbicide used to control annual grasses and many broad-leaved weeds