

the likely proximal carcinogenic agent. As a consequence of the clear evidence of carcinogenicity, there have been few studies of other possible toxicity end-points.

There is also ample evidence that NDMA is genotoxic both in vivo and in vitro. Activation by liver microsomal S9 fractions is necessary for a positive in vitro result. The recent observation that human S9 fractions are much more active in promoting genotoxicity in the Ames test than rat S9 fractions suggests that humans may be especially sensitive to the carcinogenicity of NDMA.

Although there have been several case-control studies and one cohort study of NDMA in humans, none of them can be used to derive a quantitative risk of cancer. The results are supportive of the assumption that NDMA consumption is positively associated with either gastric or colorectal cancer. However, none of the studies focused on drinking-water as the route of exposure; instead, they used estimations of total dietary intake of NDMA.

Organotins

The group of chemicals known as the organotins is composed of a large number of compounds with differing properties and applications. Uses for the mono- and di-substituted compounds include as heat stabilizers in plastics, including PVC and chlorinated PVC (CPVC) water pipes. The tri-substituted compounds have been widely used as biocides and as antifouling agents in paint.

Reason for not establishing a guideline value	TBT, TPT, DBT and DOT occur in drinking-water or drinking-water sources at concentrations well below those of health concern
	Establishing a guideline value for MMT, DMT and DMTC is unnecessary because their use as stabilizers in PVC and CPVC is normally controlled by product specifications
	For other organotins, available data inadequate to permit derivation of health-based guideline values
Health-based value*	Sum of TBT, TPT, DBT and DOT: 1.5 µg/l (equivalent to approximately 0.6 µg/l tin)
Occurrence	Concentrations in drinking-water from PVC pipes are usually below a few hundred nanograms. However, many organotins have been detected as contaminants in environmental waters, including fresh waters that are possible drinking-water sources; the concentrations were mostly between the detection limits and hundreds of nanograms per litre.
TDI	Sum of TBT, TPT, DBT and DOT: 0.25 µg/kg bw (0.1 µg/kg bw as tin) derived by applying an uncertainty factor of 100 to account for interspecies (10) and intraspecies (10) variation to the NOAEL for tributyltin oxide (the reference organotin), based on chronic immunotoxicity studies in rats
Limit of detection	24–51 pg as tin for six organotin compounds (chlorides of DMT, DBT, TMT, TBT, DPT and TPT) by ICP-MS; 0.2–0.4 ng/l for DBT, TBT, DPT and TPT; and 2 ng/l for MPT, by derivatization–liquid extraction followed by GC and MS

Prevention and treatment	<p>The effectiveness of water treatment appears to be significantly different for different compounds. For example, conventional water treatment (coagulation, sedimentation, filtration) has been shown to be effective in removing TBT in shipyard waters under optimal conditions, whereas it was ineffective in removing DPT and TPT. In contrast, advanced treatment processes were effective in removing these compounds but ineffective in removing other organotin compounds. However, available data and quantification information are still limited.</p> <p>Where the organotins originate from plastic service water pipes and fittings, particularly monoalkyltins and dialkyltins in PVC and CPVC pipes and fittings, the most important means of control is by product specifications through an appropriate certification scheme.</p>
Health-based value derivation	<ul style="list-style-type: none"> • allocation to water 20% of TDI • weight 60 kg adult • consumption 2 litres/day
Assessment date	2020
Principal reference	WHO (2020) <i>Organotins in drinking-water</i>

DBT, dibutyltin; DMT, dimethyltin; DMTC, dimethyltin dichloride; DOT, di-n-octyltin; DPT, diphenyltin; MMT, monomethyltin; MPT, monophenyltin; TBT, tributyltin; TMT, trimethyltin; TPT, triphenyltin

* When a formal guideline value is not established, a “health-based value” may be determined in order to provide guidance to Member States when there is reason for local concern. Establishing a formal guideline value for such substances may encourage Member States to incorporate a value into their national standards when this may be unnecessary.

Reliable lifetime TDI values for monomethyltin, dimethyltin and dimethyltin dichloride could not be derived because of a lack of long-term studies with systematic experimental data. However, there is no need to establish a guideline value for these organotins because their use as stabilizers in PVC and CPVC is normally controlled by product specifications. The data available are insufficient to permit the proposal of guideline or health-based values for other organotins, including trimethyltin, tetrabutyltin, mono-n-octyltin, tetraoctyltin, monophenyltin, diphenyltin and tetraphenyltin.

Parathion

Parathion (CAS No. 56-38-2) is a non-systemic insecticide that is used in many countries throughout the world. It is used as a fumigant and acaricide and as a pre-harvest soil and foliage treatment on a wide variety of crops, both outdoors and in greenhouses. Parathion released to the environment will adsorb strongly to the top layer of soil and is not likely to leach significantly. Parathion disappears from surface waters in about a week. The general population is not usually exposed to parathion from air or water. Parathion residues in food are the main source of exposure.

Reason for not establishing a guideline value	Occurs in drinking-water at concentrations well below those of health concern
Assessment date	2003
Principal references	FAO/WHO (1996) <i>Pesticide residues in food—1995 evaluations</i> WHO (2004) <i>Parathion in drinking-water</i>