solid 1,2,3-trichlorobenzene (CAS 87-61-6, molecular weight 181.45) is used industrially as a dye carrier, an intermediate in chemical productions (especially herbicides), a degreasing agent, and a lubricant (CIS 1991). Trichlorobenzene congeners are not produced or widely used in Canada; however, approximately 2,600,000 t of trichlorobenzene are present in transformer dielectric fluids either in use or stored before disposal, and modest amounts (<2000 kg) were imported into Canada in 1992 for the maintenance of existing transformer dielectric fluid (E.D. Brien 1993, Environment Canada, Ottawa, pers. com.). The principle sources of environmental contamination are likely spillage of these dielectric fluids, and long-range transborder transport and deposition. Losses associated with the use of trichlorobenzenes as an industrial solvent, and via industrial effluents and landfill leachates are also expected. There is evidence of production of trichlorobenzenes from microbial degradation and plant metabolism of more highly chlorinated benzenes, but it is not considered to be a major source (Government of Canada 1993). There are no quantified estimates of source contributions for trichlorobenzenes in Canada (Government of Canada 1993).

1,2,3-Trichlorobenzene has been reported at low levels at various sites in the Great Lakes basin ranging from 0.005 to 30 µg·L⁻¹. Higher levels were reported in the early 1980s. More recently, maximum levels from the Niagara River at Niagara-on-the-Lake were reported to be 0.0006 µg·L⁻¹ (NRDIG 1990). As well, elevated concentrations have been found in the effluents from various municipal and industrial facilities in Ontario and Nova Scotia (Government of Canada 1993).

Levels of 1,2,3-trichlorobenzene in invertebrates and fish ranged from 0.1 to 29 µg·kg⁻¹ (ww). The values in the upper part of the range are for organisms collected in the lower Niagara River and its plume in Lake Ontario. Levels at other locations were in the lower part of the range or not detectable (Government of Canada 1993).

Mackay et al. (1992) have modelled the environmental fate of each of the chlorobenzenes using several versions of a fugacity-based model and available information. These modelling results indicate that chlorobenzene behaviour varies as a function of the degree of chlorination. The simplest model, Fugacity Level I, demonstrates that 1,2,3-trichlorobenzene tends to partition mainly into air, some into soil, and a small amount into water, because of its vapour pressure (28 Pa) and low water solubility (21 mg·L⁻¹). Level II modelling indicates that the primary removal processes for all chlorobenzenes are in air. For 1,2,3-trichlorobenzene, removal is mainly by advection (e.g., deposition, sedimentation) and chemical reaction. Photodegradation is slow, resulting in atmospheric half-lives of 2–6 weeks. In the aquatic environment, 1,2,3-trichlorobenzene is found mostly in organic phases (organisms, sediments) or associated with suspended/dissolved organic material rather than dissolved in the water phase (log octanol–water partition coefficient 4.1), with half-lives of 6–18 weeks in the water and 1.1–3.4 years in the sediment.

### Water Quality Guideline Derivation

The interim Canadian water quality guideline for 1,2,3-trichlorobenzene for the protection of freshwater life was developed based on the CCME protocol (CCME 1991). For more information, see the Canadian Environmental Protection Act (CEPA) assessment report and supporting document (Government of Canada 1993), and the supporting document (Environment Canada 1997).

### Freshwater Life

The lowest acute results for fish are a 96-h LC₅₀ of 340 µg·L⁻¹ for the guppy (P. reticulata) (van Hoogen and Opperhuizen 1988) and a 48-h LC₅₀ of 710 µg·L⁻¹ for rainbow trout (Oncorhynchus mykiss) (Calamari et al. 1992).

#### Table 1. Water quality guidelines for 1,2,3-trichlorobenzene for the protection of aquatic life (Environment Canada 1997).

<table>
<thead>
<tr>
<th>Aquatic life</th>
<th>Guideline value (µg·L⁻¹)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freshwater</td>
<td>8.0</td>
</tr>
<tr>
<td>Marine</td>
<td>NRG</td>
</tr>
</tbody>
</table>

Interim guideline.

No recommended guideline.
The interim water quality guideline for 1,2,3-trichlorobenzene (Calamari et al. 1983). Acute data for invertebrates consist of a 24-h IC$_{50}$ (immobilization) of 350 µg·L$^{-1}$ for Daphnia magna (Calamari et al. 1983), and a 48-h LC$_{50}$ of 1700 µg·L$^{-1}$ (NOEC of 340 µg·L$^{-1}$) for the midge (Chironomus riparius) (Roghair et al. 1994). A recent study with the midge (C. riparius) by van der Zandt et al. (1994) reported a 96-h LOEC at 200 and a 96-h NOEC at 18 µg·L$^{-1}$ based on some behavioural changes. Even though this study reports the lowest effects concentration, it was not used in the guideline derivation, as behavioural changes are not acceptable endpoints.

Chronic information for fish consists of a 28-d NOEC of 340 µg·L$^{-1}$ (NOEC of 340 µg·L$^{-1}$) for the midge (C. riparius) (Roghair et al. 1994). Calamari et al. (1983) reported a 96-h EC$_{50}$ of 900 µg·L$^{-1}$ for the alga Selenastrum capricornutum, based on growth inhibition, and a 3-h EC$_{50}$ of 2200 µg·L$^{-1}$, based on inhibition of photosynthesis. Sicko-Goad and Andresen (1993) showed that diatoms (Cyclotella meneghiniana, Melosira italica, Melosira varians, and Syndra filiformis) can be adversely affected by exposure to approximately 300 µg·L$^{-1}$ of 1,2,3-trichlorobenzene within 1–10 d. Reductions of 20–50% in the cell count has been observed for Melosira italica.

The interim water quality guideline for 1,2,3-trichlorobenzene for the protection of freshwater life is 8.0 µg·L$^{-1}$. It was derived by multiplying the LOEC of 80 µg·L$^{-1}$ (Roghair et al. 1994) for the most sensitive organism to 1,2,3-trichlorobenzene, D. magna, by a safety factor of 0.1 (CCME 1991).

**Marine Life**

Insufficient information exists to derive a marine interim guideline for 1,2,3-trichlorobenzene.

Heitmuller et al. (1981) reported a 96-h LC$_{50}$ of 2 100 µg·L$^{-1}$ for sheepshead minnows (Cyprinodon aggregata). Mortimer and Connell (1994) reported a 96-h LC$_{50}$ of 570 µg·L$^{-1}$ for the sand crab (Portunus pelagicus), and Abernethy et al. (1988) reported a 24-h LC$_{50}$ of 2 340 µg·L$^{-1}$ for Artemia nauplii. Mortimer and Connell (1995) reported growth rate reductions of 10% and 50% after 40-d exposures of 53.5 µg·L$^{-1}$ (the lowest effect level) and 172.9 µg·L$^{-1}$, respectively, for the sand crab P. pelagicus.

**References**


Reference listing:


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