Toxicological Summary for: 1H-Benzotriazole

CAS: 95-14-7
Synonyms: 1,2,3-Benzotriazole, Benzotriazole, 1H-Benzo[d][1,2,3]triazole, 1H-1,2,3-benzotriazole

Note: 1H-benzotriazole is the surrogate for water guidance values for 5-methyl-1H-benzotriazole and Tolyltriazole (https://www.health.state.mn.us/communities/environment/risk/docs/guidance/gw/5mebtttr.pdf)

Acute Non-Cancer Health-Based Value (nHBV_{Acute}) Not Derived (Insufficient Data)

Short-term Non-Cancer Health-Based Value (nHBV_{Short-term}) = 20 \mu g/L

\[
(\text{Reference Dose, mg/kg-d}) \times (\text{Relative Source Contribution}) \times (\text{Conversion Factor})
\]

\[
(\text{Short-term Intake Rate, L/kg-d})
\]

\[
= (0.023 \text{ mg/kg-d}) \times (0.2)^* \times (1000 \mu g/mg)
\]

\[
(0.285 \text{ L/kg-d})^{**}
\]

= 16.1 rounded to 20 \mu g/L

**Intake Rate: MDH 2008, Section IV.E.1. and US EPA 2011, Exposure Factors Handbook, Tables 3-1 and 3-81

Reference Dose/Concentration: HED/Total UF = 6.9/300 = 0.023 mg/kg-d (SD rats)

Source of toxicity value: Determined by MDH in 2019

Point of Departure (POD): 30 mg/kg-d (administered dose NOAEL, JBRC, 2007)

Dose Adjustment Factor (DAF): 0.23, Body weight scaling, default (MDH 2017 and US EPA 2011)

Human Equivalent Dose (HED): POD x DAF = 30 mg/kg-d x 0.23 = 6.9 mg/kg-d

Total uncertainty factor (UF): 300

Uncertainty factor allocation: 3 for interspecies differences (for toxicodynamics), 10 for intraspecies variability, and 10 for database uncertainty due to the lack of reproductive/developmental studies of sufficient exposure duration

Critical effect(s): Reduced offspring body weight

Co-critical effect(s): None

Additivity endpoint(s): Developmental

1H-Benzotriazole - 1
Subchronic Non-Cancer Health-Based Value \((nHBV_{\text{subchronic}}) = nHBV_{\text{short-term}} = 20 \, \mu g/L\)

\[
(\text{Reference Dose, mg/kg-d}) \times (\text{Relative Source Contribution}) \times (\text{Conversion Factor}) \\
(\text{Subchronic Intake Rate, L/kg-d}) \\
= \left(\frac{0.017 \, \text{mg/kg-d}}{0.070 \, \text{L/kg-d}}\right) \times (0.2)^* \times (1000 \, \mu g/mg) \\
= 48.5 \text{ rounded to } 50 \, \mu g/L
\]


**Intake Rate: MDH 2008, Section IV.E.1. and US EPA 2011, Exposure Factors Handbook, Tables 3-1 and 3-81

Reference Dose/Concentration: HED/Total UF = 5.15/300 = 0.017 mg/kg-d (SD rats)

Source of toxicity value: Determined by MDH in 2019

Point of Departure (POD): 22.4 mg/kg-d (administered dose BMDL_{10\%}, JBRC, 2007)

Dose Adjustment Factor (DAF): 0.23, Body weight scaling, default (MDH 2017 and US EPA 2011)

Human Equivalent Dose (HED): POD x DAF = 22.4 mg/kg-d x 0.23 = 5.15 mg/kg-d

Total uncertainty factor (UF): 300

Uncertainty factor allocation: 3 for interspecies differences (for toxicodynamics), 10 for intraspecies variability, and 10 for database uncertainty due to the lack of adequate subchronic toxicity studies and lack of reproductive/developmental studies of sufficient exposure duration

Critical effect(s): Proximal tubule regeneration in kidney of female rats

Co-critical effect(s): None

Additivity endpoint(s): Renal (kidney) system

The Subchronic nHBV must be protective of the short-term exposures that occur within the subchronic period and therefore, the Subchronic nHBV is set equal to the Short-term nHBV of 20 \, \mu g/L. Additivity endpoints: Developmental

Chronic Non-Cancer Health-Based Value \((nHBV_{\text{chronic}}) = nHBV_{\text{short-term}} = 20 \, \mu g/L\)

\[
(\text{Reference Dose, mg/kg-d}) \times (\text{Relative Source Contribution}) \times (\text{Conversion Factor}) \\
(\text{Chronic Intake Rate, L/kg-d}) \\
= \left(\frac{0.017 \, \text{mg/kg-d}}{0.044 \, \text{L/kg-d}}\right)*** \times (0.2)^* \times (1000 \, \mu g/mg) \\
= 77.2 \text{ rounded to } 80 \, \mu g/L
\]


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**Intake Rate:** MDH 2008, Section IV.E.1. and US EPA 2011, Exposure Factors Handbook, Tables 3-1 and 3-81

*** The candidate Chronic RfD is significantly higher than the Subchronic RfD (0.017 mg/kg-d). Although, both identify kidney as the sensitive effect, the chronic study does not include information in the lower part of the dose-response range. Given the significant limitations of the chronic database, MDH has selected the Subchronic RfD as the final Chronic RfD.

The Chronic nHBV must be protective of the short-term exposures that occur within the chronic period and therefore, the Chronic nHBV is set equal to the Short-term nHBV of 20 µg/L. Additivity endpoints: Developmental

**Cancer Health-Based Value (cHBV) = Not Applicable**

| Cancer classification: | Not Classified |
| Slope factor (SF): | Not Applicable |
| Source of cancer slope factor (SF): | Not Applicable |
| Tumor site(s): | Not Applicable |

**Volatile:** Yes (low)

**Summary of Guidance Value History:**
No previous guidance has been developed for 1H-Benzotriazole.

**Summary of toxicity testing for health effects identified in the Health Standards Statute (144.0751):**
Even if testing for a specific health effect was not conducted for this chemical, information about that effect might be available from studies conducted for other purposes. MDH has considered the following information in developing health protective guidance.

<table>
<thead>
<tr>
<th>Tested for specific effect?</th>
<th>Endocrine</th>
<th>Immunotoxicity</th>
<th>Development</th>
<th>Reproductive</th>
<th>Neurotoxicity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Effects observed?</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

**Comments on extent of testing or effects:**

1 The short-term reference dose is based on developmental toxicity in offspring (decreased body weight). A lack reproductive/developmental studies of sufficient duration form a major part of the basis for the selection of a 10-fold database uncertainty factor.

2 Changes in reproductive organs were noted in a two-year study in males (prostate inflammation) and females (uterus/endometrium inflammation and cystic hyperplasia) at doses over 8,000 times higher than the short-term and subchronic reference doses. A lack of reproductive/developmental studies of sufficient duration form a major part of the basis for the selection of a 10-fold database uncertainty factor.
Resources Consulted During Review:


Japan Bioassay Research Center. (2007). *Combined Repeated Dose and Reproductive/Developmental Toxicity Screening Test of 1,2,3-Benzotriazole (CAS No. 95-14-7) by Oral Administration in Rats.* Retrieved from https://www.nite.go.jp/chem/jcheck//tempfile_list.action?tpk=12276&ppk=3121&kino u=100&type=ja


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