

## Tributyl Phosphate (TBP) and Water

Tributyl phosphate (TBP) is an industrial chemical with many uses as a plasticizer, anti-foaming agent, a flame-retardant component of aircraft hydraulic fluid, and solvent for rare metal extraction and purification. TBP is a colorless, odorless liquid at room temperature.

Minnesotans are not likely to experience health effects from the levels of TBP found in food or drinking water.

The Minnesota Department of Health (MDH) Risk Assessment Unit evaluates health risks for contaminants in drinking water and develops health-based guidance values for groundwater. The toxicological summary for TBP can be found at the MDH Human Health-Based Water Guidance Table website.<sup>1</sup> MDH works in collaboration with the Minnesota Pollution Control Agency (MPCA) and the Minnesota Department of Agriculture (MDA) to understand the occurrence and environmental effects of these contaminants.

### TBP in Minnesota Waters

TBP is only rarely detected in Minnesota source water and drinking water, and the only known detections were more than twenty years ago and were far below the MDH guidance value. TBP has been detected more frequently in lakes, rivers, and groundwater not used for drinking water, with detections less than 1 µg/L. The exception to this is groundwater in and near landfills, where TBP has been detected at levels up to 13 µg/L. One microgram per liter (µg/L) is the same as one part per billion (ppb).

### MDH Guidance Value

Based on available information, MDH developed a guidance value of 4 µg/L (or ppb) for TBP in drinking water. MDH does not use health-based guidance values to regulate water quality, but they may be useful for situations where federal regulations do not exist. MDH develops guidance values to protect people who are most highly exposed and people who are most sensitive to the potentially harmful effects of a contaminant, including pregnant people, fetuses, infants, and children. A person drinking water at or below the guidance value would be at little or no risk for harmful health effects.

### Potential Health Effects

In animal studies, oral exposure to TBP has effects on the urinary, liver, and nervous systems and causes developmental toxicity, such as decreased birth weight and skeletal abnormalities. TBP exposure through diet causes liver and bladder cancers in animals.<sup>2</sup> People with questions about their personal risk of health impacts from TBP exposure should consult with their physician.

Information on TBP toxicity in humans is limited and primarily focused on inhalation in occupational settings. The available data suggest acute inhalation exposures to TBP may cause nausea, headache, and irritation to the skin, eyes and respiratory tract in humans. No human-based data are available on the effects of TBP following ingestion.<sup>3</sup>

## Potential Exposure to TBP

Almost everyone is exposed to small amounts of TBP. For most Minnesotans, nearly all TBP exposure comes from the diet.<sup>2</sup> TBP has been detected in food products at very low levels since 1982, but exposure levels are far below the level that MDH has determined to be without health risk, even for sensitive populations. Exposure can occur through ingestion of house dust, with infants and toddlers most highly exposed. For infants, exposure to TBP may also occur via breastmilk.<sup>3</sup> Exposures from dust and breastmilk are well below MDH's level of health concern.

## TBP in the Environment

In surface water, TBP biodegrades over a period of weeks to months. It moves easily from surface water to the atmosphere, where it breaks down quickly. TBP may also move from water to suspended particles and sediment.

In groundwater, TBP is moderately mobile, and may be transported away from its original location in the flow of groundwater.

## References

1. Minnesota Department of Health (MDH). (January 2025). Human Health-Based Water Guidance Table. "Toxicological Summary for: TBP."  
<https://www.health.state.mn.us/communities/environment/risk/docs/guidance/gw/pfoa2024.pdf>.
2. Agency for Toxic Substances and Disease Registry (ATSDR). (September 2012). Toxicological Profile for Phosphate Ester Flame Retardants.  
<https://www.atsdr.cdc.gov/toxprofiles/tp202.pdf>.
3. Zhang, Q., Wang, Y., Lou, J. et al. Infant Exposure and Risk Assessment of Organophosphorus Flame Retardants in Human Breast Milk from The Southeast City, China. *Expo Health* 16, 279–289 (2024). <https://doi.org/10.1007/s12403-023-00552-1>.

Minnesota Department of Health  
Health Risk Assessment Unit  
PO Box 64975, St. Paul MN 55164  
651-201-4899  
[health.risk@state.mn.us](mailto:health.risk@state.mn.us)  
[www.health.state.mn.us](http://www.health.state.mn.us)



February 2025

*To obtain this information in a different format, call: 651-201-4899.*