Meeting

Statement on the derivation of a health-based guidance value for boron – First Draft

This is a paper for discussion. This does not represent the views of the Committee and should not be cited.

Introduction

1. The UK Health Security Agency (UKHSA) advises the Drinking Water Inspectorate (DWI) on potential health risks from chemicals in drinking water. Following EU exit, the DWI is reviewing the regulatory standards for some chemicals in drinking water, including boron. UKHSA is seeking advice from the Committee on Toxicity of Chemicals in Food, Consumer Products and the Environment (COT) with respect to an appropriate health-based guidance value (HBGV) for boron.

2. A discussion paper examining the toxicity studies on boron which underpin the evaluations by different authoritative bodies was presented and discussed at the September 2025 meeting (TOX/2025/31). A first draft statement summarising the Committee's conclusions is attached as Annex 1 to this paper.

3. At the September 2025 meeting, the Committee requested an updated search for any human epidemiological evidence at exposures relevant to drinking water, which is described below. In addition, an updated version of the table summarising the authoritative body evaluations providing further detail on the endpoints of concern and the nature of the point of departure (POD); this is provided in Table 1 below.

4. Following the September 2025 meeting, a literature search was conducted to identify epidemiological data on boron, including occupational exposure cases. There was limited human epidemiological evidence, with two studies identified, at levels of boron exposure expected from drinking water, where the UK regulatory limit is 1 mg/L. In a study in Northern France, Yazbeck et

al. (2005) reported that in areas with boron concentrations in water above 0.3 mg/L showed a higher birth rate, a lower mortality rate and no difference in sex ratio compared to the reference geographic zone and French general population. Igra et al. (2016) considered a mother-child cohort in northern Argentina where drinking water exposures ranged from 0.377-10.929 mg/L. High serum boron concentrations were associated with reduced birth length and reduced birth weight. Co-exposure to lithium and caesium were controlled for in the analyses, and urinary arsenic, blood lead and cadmium, and serum selenium were tested but not included as they only marginally affected the results.

5. A study conducted in Turkey (Col & Col, 2003) reported no obvious human adverse effects following relatively high environmental exposure to boron. Two other papers considered reproductive and developmental effects following environmental and occupational boron exposures and did not report any effects (Duydu and Basaran, 2023; Scialli et al., 2010). To note Duydu and Basaran (2023) considered the Igra et a. (2016) study and considered the combined exposures to boron, arsenic, caesium and lithium, as well as high altitude limit the potential to attribute the findings relating to infant length and birth weight to boron.

6. Overall, this literature search suggests that the limited available human evidence indicates that adverse effects are unlikely from boron exposures at UK drinking water concentrations.

Questions for the Committee

7. The Committee is asked to consider:

i. Does the Committee have any views on the available human epidemiological evidence?

ii. Does the Committee have any comments on the general structure and content of this draft statement?

Secretariat

November 2025

References

Col, M. and Col, C., 2003. Environmental boron contamination in waters of Hisarcik area in the Kutahya Province of Turkey. Food and Chemical Toxicology,

41, pp.1417-1420.

Duydu, Y. and Basaran, N., 2023. Effects of boron exposure on human reproduction and development. Current Opinion in Toxicology, 34, 100403.

Igra, A.M., Harari, F., Lu, Y., Casimiro, E., and Vahter, M. 2016. Boron exposure through drinking water during pregnancy and birth size. Environment International, 95, pp.54-60.

Scialli, A.R., Bonde, J.P., Bruske-Hohlfeld, I., Culver, B.D., Li, Y. and Sullivan, F.M., 2010. An overview of male reproductive studies of boron with an emphasis on studies of highly exposed Chinese workers. Reproductive Toxicology, 29, pp.10-24.

Yazbeck, C., Kloppmann, W., Cottier, R., Sahuquillo, J., Debotte, G., and Huel, G., 2005. Health impact evaluation of boron in drinking water: a geographical risk assessment in Northern France. Environmental Geochemistry and Health, 27, pp.419-427.

Table 1: Comparison of NOAEL/BMDLs, uncertainty factors and HBGV values from different authoritative bodies.

Authority	Reference	Type of study	Chemical	Species	Endpoint	NOAEL (mg/kg bw/day)	BMDL05 (mg/kg bw/day)	Uncerta factor
COT (1995)	Price et al. 1996	Repeat-dose	Boric acid	Sprague-Dawley rats	Decreased fetal body weight.	10	N/A	100
ECETOC (1995)	Heindel et al., 1992	Repeat-dose	Boric acid	Sprague-Dawley rats	Testicular effects.	9.6	N/A	30
EVM (2003)	Price et al. 1996	Repeat-dose	Boric acid	Sprague-Dawley rats	Decreased fetal body weight.	9.6	N/A	60

WHO (2009)	Price et al. 1996	Repeat-dose	Boric acid	Sprague-Dawley rats	Decreased fetal body weight.	N/A	10.3	60
ATSDR (2010)	Price et al. 1996	Repeat-dose	Boric acid	Sprague-Dawley rats	Decreased fetal body weight.	N/A	10.3	66
EFSA (2013)	Price et al. 1996	Repeat-dose	Boric acid	Sprague-Dawley rats	Decreased fetal body weight.	9.6	N/A	60
Health Canada (2023)	Weir and Fisher, 1972	Multi-genera-tional	Boric acid	Beagle dogs	Decreased testicular weight.	N/A	2.90	300
Health Canada (2023)	Price et al. 1996	Repeat-dose	Boric acid	Sprague-Dawley rats	Decreased fetal body weight.	N/A	10.6	60