

Health Based Guidance Level for Perchlorate (ClO_4^-)



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1.0 INTRODUCTION

The objective of this report is to update a previously developed drinking water health-based guidance level (HBGL) for perchlorate (ClO_4^-).

Perchlorate is an oxidizing anion that originates as a contaminant in ground and surface waters from the dissolution of ammonium, potassium, magnesium, or sodium perchlorate salts. This HBGL applies to the perchlorate anion in water.

2.0 METHODOLOGY

HBGLs are developed by the ADHS, and represent concentrations of contaminants in drinking water that are protective of public health during long-term exposure. The ADHS uses health-based methodologies and assumptions that are consistent with risk assessment principles recommended by the United States Environmental Protection Agency (USEPA) to develop HBGLs.

The HBGL developed for perchlorate is specifically protective of childhood ingestion exposure. Exposure assumptions reflect childhood contact rates and body weight. The focus on children is protective of the higher daily intake rates by children and their lower body weight. The exposure duration was assumed to be 350 days/year for 6 years. Exposure doses are averaged over the period of exposure (6 years). The following equation and assumptions were used to develop the HBGL:

Equation 1 : Equation and assumptions

$$\text{HBGL}(\mu\text{g/L}) = \frac{[\text{HQ} \times \text{BW}_{\text{ch}} \times \text{AT}_{\text{nc}} \times \text{RfDo} \times \text{CF}]}{[\text{IR}_{\text{w}} \times \text{EF}_{\text{ing}} \times \text{ED}_{\text{ch}}]}$$

<u>Parameter</u>	<u>Definition (units)</u>	<u>Default</u>	<u>Reference</u>
HQ	Hazard Quotient, (unitless)	1	ADHS 1992
BW_{ch}	Body Weight, child (kg)	15	USEPA 1989
AT_{nc}	Averaging Time, noncancer (days)	2190	USEPA 1989
RfD_o	Oral Reference Dose (mg/kg-day)	0.0007	USEPA 2005 NAS 2005
CF	10^3 ($\mu\text{g}/\text{mg}$)	1000	--
IR_{w}	Ingestion Rate, child (L/day)	1	USEPA 1991
EF_{ing}	Exposure Frequency, ingestion (days/year)	350	USEPA 1991
ED_{ch}	Exposure Duration, child (years)	6	USEPA 1991

We used the reference dose (RfD) of 0.0007 mg/kg day (milligrams per kilogram of bodyweight per day) published by the USEPA and recommended by the National Academies of Sciences National Research Council to calculate the HBGL.

Perchlorate is currently not classified as to its carcinogenicity, and the USEPA has not developed a cancer slope factor for perchlorate. The HBGL is calculated based upon systemic toxicity.

3.0 RESULTS

The results of our analysis suggest that a concentration of perchlorate in drinking water of 11 µg/L is protective of the most sensitive population (children).

4.0 DISCUSSION

The ADHS had developed an HBGL for perchlorate of 14 µg/L in 2000. The 2000 HBGL was developed using the USEPA provisional RfD of 0.0009 mg/kg-day. This revised HBGL of 11 µg/L uses the RfD published by the USEPA of February 18, 2005 (0.0007 mg/kg-day). This new RfD was also recommended by the National Academy of Sciences, Committee to Assess the Health Implications of Perchlorate Ingestion in their January 2005 report.

This HBGL has a margin of safety. Concentrations of perchlorate in excess of 11 µg/L should not be considered a health threat. Rather, a more detailed analysis would be necessary in order to evaluate health risks from exposure to more than 11 µg/L of perchlorate in drinking water.

5.0 CONCLUSION

A concentration of perchlorate in drinking water of 11 µg/L is protective of human health with a margin of safety.

6.0 REFERENCES

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