

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^-). The ADHS had previously developed an HBGL for perchlorate in March 1999 based upon adult exposure assumptions. This revised HBGL is specifically protective of childhood exposure.

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 the perchlorate anion 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

$$\text{HBGL} (\mu\text{g/L}) = \frac{HQ \times BW_{ch} \times AT_{nc} \times RfD_o \times CF}{IR_w \times EF_{ing} \times ED_{ch}}$$

<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	Provisional Oral Reference Dose (mg/kg-day)	0.0009	USEPA, 1998
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 provisional USEPA reference dose (RfD) of 0.0009 mg/kg-day published by the USEPA in December of 1998 to develop the HBGL.(USEPA, 1998). Perchlorate is currently not

classified by the USEPA 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 anion in drinking water of 14 µg/L is protective of the most sensitive population (children).

4.0 DISCUSSION

The ADHS had developed an HBGL for perchlorate of 31.5 µg/L in March 1999. The March 1999 HBGL was developed using adult exposure assumptions. This revised HBGL of 14 µg/L is specifically protective of childhood exposure, and takes into account children's higher contaminant intake rates per body weight.

This HBGL has a margin of safety. Concentrations of perchlorate in excess of 14 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 14 µg/L of perchlorate in drinking water.

The USEPA and others are currently conducting and evaluating a number of toxicological and epidemiological studies regarding the toxicology and effects of ammonium perchlorate. As additional data become available, the USEPA may revise the current provisional reference dose for ammonium perchlorate. If the USEPA revises the provisional RfD, the ADHS will update this HBGL.

5.0 CONCLUSION

A concentration of perchlorate in drinking water of 14 µg/L is protective of human health with a margin of safety.

6.0 REFERENCES

ADHS. 1992. *Human Health-based Guidance Levels for the Ingestion of Contaminants in Drinking Water and Soil*. Office of Risk Assessment and Investigations. Phoenix, AZ. June, 1992.

USEPA. 1989. *Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A)*. Office of Emergency and Remedial Response, Washington, DC.

USEPA. 1991. *Human Health Evaluation Manual, Supplemental Guidance: Standard Default Exposure Factors*. Publication 9285.6-03. Office of Emergency and Remedial Response, Washington, DC. NTIS PB91-921314.

USEPA. 1998. *Perchlorate Environmental Contamination: Toxicological Review and Risk Characterization Based Upon Emerging Information*. USEPA. December 31, 1998.