

Fact Sheet Date: March 12, 1998

**NEW YORK STATE
- HUMAN HEALTH FACT SHEET -**

**Ambient Water Quality Value for
Protection of Sources of Potable Water**

SUBSTANCE: Nickel

CAS REGISTRY NUMBER: Not Applicable

AMBIENT WATER QUALITY VALUE: 100 micrograms/liter (100 ug/L)

BASIS: Non-Oncogenic Effects

INTRODUCTION

The physical, chemical and toxicological properties of nickel have been reviewed (ATSDR, 1993; NYS DOH, 1989; US EPA, 1987, 1990, 1991, 1995a). Nickel is an essential trace element in animals and may be an essential element in humans (ATSDR, 1993). The following ambient water quality values were derived using these and other references and the procedures outlined in 6 NYCRR 702.2 through 702.7.

SPECIFIC MCL AND PRINCIPAL ORGANIC CONTAMINANT CLASS (702.3)

Nickel does not have a Specific MCL (maximum contaminant level) as defined in 6 NYCRR 700.1 and is not in a principal organic contaminant class as defined in 6 NYCRR 700.1. Therefore, a water quality value cannot be derived under 6 NYCRR 702.3.

ONCOGENIC EFFECTS (702.4)

Oncogenic effects have not been observed after oral exposure to metallic nickel or some soluble nickel compounds (ATSDR, 1993; NYS DOH, 1989; US EPA, 1995a). The available data are inadequate to evaluate the oncogenic potential of ingested nickel compounds generally found in water (i.e., soluble nickel compounds) (US EPA, 1990, 1992). However, an increased incidence of respiratory tract cancer in nickel workers and lung tumors in animals are associated with long-term inhalation exposure to insoluble nickel compounds

(NYS DOH, 1989).

NON-ONCOGENIC EFFECTS (702.5)

Ingested nickel (as soluble nickel compounds) causes decreased body weight and liver weight, cellular degeneration in liver and kidneys, low blood hemoglobin and damages the reproductive and immune systems in laboratory animals (ATSDR, 1993; NYS DOH, 1989; US EPA, 1987, 1990, 1992). In 1987, the U.S. EPA established an oral reference dose (equivalent to an acceptable daily intake) for nickel of 20 micrograms per kilogram per day (20 ug/kg/day, rounded from the calculated value of 16.6 ug/kg/day) (Exhibit 1, taken from US EPA, 1995a), using procedures consistent with those outlined in paragraphs (a) and (b) of 6 NYCRR 702.5. This reference dose was derived by application of a 300-fold uncertainty factor to a no-observed-effect level of 5 milligrams per kilogram per day (5 mg/kg/day) for decreased body weights and organ weights in rats exposed to nickel (as a soluble nickel compound) via food for two years (Ambrose et al., 1976). An uncertainty factor of 300 was used to account for human variability, differences between animals and humans and inadequacies in the reproduction studies. A value of 100 ug/L (rounded from the calculated value of 140 ug/L) was derived by the U.S. EPA (1990, 1995c), using procedures consistent with those outlined in paragraph (e) of 6 NYCRR 702.5 and allowing 20% of the calculated acceptable daily intake (i.e., 20 ug/kg/day) to come from drinking water (6 NYCRR 702.5(c)).

CHEMICAL CORRELATION (702.7)

Deriving value based on chemical correlation is not applicable to nickel.

OTHER STANDARDS AND GUIDELINES

Under the Safe Drinking Water Act, the federal maximum contaminant level goal (MCLG) and MCL for nickel were both 100 ug/L (rounded from 140 ug/L) (US EPA, 1990, 1992), assuming a 70-kg adults drinks 2 L/day and allocating 20% of the U.S. EPA reference dose (20 ug/kg/day) to drinking water. However, the U.S. EPA has vacated and remanded those standards based on procedural errors during rule-making and has issued an updated lifetime health advisory of 100 ug/L, which is based on the same reference dose as the remanded MCL (US EPA, 1995b,c).

The World Health Organization (WHO) calculated a tolerable daily intake of 5 ug/kg/day for nickel by applying an uncertainty factor of 1,000 to a no-observed-adverse-effect level of 5 mg/kg/day for altered organ-to-body weight ratios in a chronic dietary study in rats. An uncertainty factor of 1,000 was used to account for human variability, differences between animals and humans, the lack of adequate studies on long-term exposure and reproductive effects, lack of data on carcinogenicity by the oral route, and a much higher intestinal absorption when taken on an empty stomach in drinking water than when taken with food. The WHO derived a guideline value of 20 ug/L (rounded from the calculated

value of 15 ug/L), assuming a 60-kg adult drinks 2 L/day and allocating 10% of the tolerable daily intake to drinking water (WHO, 1993).

SELECTION OF VALUE

According to 6 NYCRR 702.2(b), the selected ambient water quality value shall be the most stringent of the values derived using the procedures found in 6 NYCRR 702.3 through 702.7. This value is 100 ug/L (based on non-oncogenic effects) and is the value selected as the water quality value for nickel.

REFERENCES

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ATSDR (Agency for Toxic Substances and Disease Registry). 1993. Toxicological Profile for Nickel. Atlanta, GA: U.S. Department of Health and Human Services, U.S. Public Health Service.

6 NYCRR (New York State Codes, Rules and Regulations). Water Quality Regulations, Surface Water and Groundwater Classifications and Standards: Title 6 NYCRR, Chapter X, Parts 700 - 705. Albany, NY: New York State Department of Environmental Conservation.

10 NYCRR (New York State Codes, Rules and Regulations). Public Water Systems: Title 10 NYCRR, Chapter 1, State Sanitary Code, Subpart 5-1. Albany, NY: New York State Department of Health, Bureau of Public Water Supply Protection.

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SEARCH STRATEGY: ON-LINE TOXICOLOGIC DATABASE

Toxline (1981 to June, 1995) was searched linking the keywords "nickel" and "toxicity."

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