
ENVIRONMENTAL Fact Sheet



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Sodium: Health Information Summary

Sodium is a naturally occurring element found in water, soil, and plants. Sodium chloride or salt is the sodium compound that is most often used in chemical and industrial applications. Because sodium dissolves readily in water, high levels can accumulate when it is released to the environment. The use of sodium compounds for road deicing and also its build up in treated sewage contributes to elevated sodium concentrations in water. High levels of sodium in groundwater can also be an indicator of discharge from water softeners or movement of contamination from septic systems or landfills.

Sodium is essential to health with an estimated adult daily requirement of 500 milligrams (mg). Most of a person's sodium consumption comes from the food supply. The Food and Drug Administration has estimated that American adults consume between 4,000 and 6,000 mg of sodium daily in their diet. Approximately 75 percent of the sodium in the diet is from sodium added during food manufacturing and processing and 15 percent from salt added by the consumer.

Sensitive individuals can begin to detect sodium in water at a concentration of about 30 milligrams per liter of water (mg/l), but higher concentrations are required for detection by the majority of the population. For example, the World Health Organization (WHO) has a guideline of 200 mg/l for sodium in water based on taste. Water temperature and other dissolved minerals affect the ability to recognize sodium in water. Additionally, the sensitivity of taste buds to sodium declines with age.

Health Effects

Absorption/Metabolism

Sodium is completely absorbed after ingestion. Infants and young children are more sensitive than adults to high sodium because their immature kidneys are unable to control the levels in the body as are adults. Those with impaired kidney function are also a more sensitive population for the same reason. Older adults may be considered more sensitive to some of sodium's effects because blood pressure tends to rise with age and heart-related illness is more common.

Short-Term (Acute) Effects

Very high concentrations of sodium accidentally given to formula-fed infants have caused a few deaths. The estimated level in the formula was about 50,000 mg/l. Similar fatal sodium overdoses seldom occur in other age groups because of the recognition of the extreme salty taste

at high concentrations. For example, seawater has a sodium content of about 30,000 mg/l. Effects seen from overdoses in infants and adults include nausea, vomiting, stomach ulcers and inflammation, dehydration of organs, convulsions, confusion, and coma.

Long-term (Chronic) Effects

High sodium intake over many years has been linked to increases in blood pressure and as a significant contributor to high blood pressure. High blood pressure is associated with an increased risk of heart disease, stroke, and congestive heart failure. Because high blood pressure is often the result of a combination of factors including nutrition, stress, amount of exercise, and body weight, it has not been possible for researchers to determine any type of precise numerical relationship between sodium intake and blood pressure increases.

Carcinogenic (cancer-causing) Effects

There is no evidence that sodium by itself is a carcinogen. However, results of a few animal studies suggest the high sodium intake could increase the incidence of stomach cancer resulting from other cancer causing substances.

Reproductive/Developmental Effects

Very high doses of sodium have caused reproductive and developmental effects in rats including reduced pregnancy rates and increased blood pressure and mortality in offspring. However, the effects seen in the offspring were only in a rat species bred to be sensitive to acquiring high blood pressure. The same study conducted with two “normal” species had no effect on the offspring.

Health Standards and Criteria

There is no enforceable federal drinking water standard for sodium. The EPA has made the decision not to develop a drinking water standard because water is usually only a minor source of sodium exposure and sodium in water is easily recognized by taste, which would cause most individuals to drink less from a contaminated source.

There are some guidelines for sodium in water. For those who need to follow a sodium-restricted diet of no more than 500 mg of sodium daily, the recommended guideline for sodium in drinking water is 20 mg/l. A diet consisting solely of foods with no salt added is expected to provide about 440 mg of additional sodium daily due to its natural occurrence in food. For those not on sodium-restricted diets, the EPA has recommended trying to maintain sodium in drinking water to no higher than the 30 to 60 mg/l range within which most individuals would not detect its taste.

The National Research Council (NRC) and some Health Organizations recommend keeping dietary intake for sodium at no more than 2,400 mg/day to minimize the risk of it contributing to high blood pressure. At the NRC recommended total intake level, 60 mg/l of sodium in drinking water would contribute about five percent of the daily sodium intake. There is also a drinking water guideline for chloride of 250 mg/l based on the salty taste that it can impart to water.

Suggested Reading and References

Casarett and Doull's Toxicology: The Basic Science of Poisons, Sixth Edition. Klaassen, C.D., ed. McGraw-Hill Publishing Co., Inc., New York, 2001.

Drinking Water Advisory: Consumer Acceptability Advice and Health Effects Analysis on Sodium. U.S. EPA, Office of Water. February, 2003.

Contaminant Candidate List Regulatory Determination Support Document for Sodium. U.S. EPA, Office of Water. July, 2003.

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