



Your Information
Source on Food
Safety and Farming

Special Report

Facts, information and updates on food safety issues.

Scientific Summary Document on Perchlorate

Prepared by Nancy E. Nagle, Ph.D. and Marilyn L. Duman, M.S.

for the Alliance for Food and Farming

Updated: March 2005

This summary is specifically focused on the health related aspects of the perchlorate issue and possible impacts on consumers as understood today.

General Findings:

The National Academy of Science was charged with a complete review of all of the available scientific evidence to be used in setting national standards for drinking water. The Committee found that daily ingestion of perchlorate of up to 0.0007 milligrams per kilogram of body weight (about 24.5 parts per billion) can occur without adversely affecting the health of even the most sensitive populations. Based on these findings, the Environmental Protection Agency has revised its official perchlorate reference dose for drinking water from one ppb to the 24.5 ppb level.

The NAS Committee also reiterated that the only effect of perchlorate on humans is the “inhibition of thyroid iodide uptake.” There is no evidence that perchlorate causes new thyroid disorders, thyroid nodules, thyroid tumors or carcinomas.

Perchlorate is a relatively well-studied chemical due its pharmacological uses. The relatively low levels found in some wells and public water systems are unlikely to cause adverse effects in humans. According to the research reviewed, perchlorate is not a carcinogen, does not accumulate in the body and is excreted within hours. The effects on the thyroid appear to be not significant in an iodine sufficient population.

Background:

Perchlorate (ClO_4) is an ion similar in size to iodide. Perchlorate is a competitive inhibitor of iodine absorption, and has resulted in the pharmacological use of perchlorate to treat hyperthyroidism in the 1950's-1960's. This factor has resulted in extensive research on perchlorate chemistry and metabolism. These studies on the health effects of perchlorate have shown that perchlorate is not metabolized in humans and does not accumulate in human tissue.

The primary mechanism of action for perchlorate is as an inhibitor of iodine uptake. Most Americans have an iodine rich diet and thus a surplus of iodide in the thyroid. Scientists

are most concerned with potential for harm to special subgroups - iodine deficient individuals, pregnant women and newborn infants. The thyroid can maintain normal thyroid hormone levels unless the iodide supply is very low or iodine uptake is decreased for a prolonged period.

Until March of 1997, the detection limit for perchlorate in drinking water was 400 µg/L (ppb). At that time the California Department of Health Services (DHS) developed a more sensitive analytical procedure using ion chromatography and achieved a detection limit in the range of 4-5 ppb. This more sensitive test has resulted in the detection of perchlorate in some water supplies.

It is important to recognize that there are adverse effects associated with both too much and too little iodine in the diet. As with most dietary factors there is a range where they function properly and either too much or too little can lead to disease. Using this definition there is no iodine deficiency in the general population, but it does not preclude the possibility that some women of childbearing age are not getting the optimal daily amount of iodine. Perchlorate is relatively inert at physiological conditions and does not appear to be metabolized to mutagenic or clastogenic metabolites in humans as well as in test animals.