

Water Contaminant of the Month

Perchlorate, (Chemical Formula: ClO_4^-) is an inorganic anion with one chlorine atom and four oxygen atoms. It has a valence (electrical charge) of minus 1. It combines with numerous positive ions to form salts such as potassium perchlorate (KClO_4), ammonium perchlorate (NH_4ClO_4) and sodium perchlorate (NaClO_4), as well as perchloric acid (HClO_4). Perchlorate compounds are powerful oxidizers.

Many perchlorate salts are naturally occurring in the soil, especially in arid areas such as the southwestern US and Chile. It is also found naturally in water sources. Perchlorate is also manufactured for a variety of products. The most common is ammonium perchlorate, which is an oxidizer in explosives, fireworks, matches, vehicle airbag propellants, and solid rocket fuel. It has been found as a soil and ground water contaminant around some industrial sites, military bases and defense plants. EPA studies have detected perchlorate in public water supplies in 26 states. It has also been detected in some foods.

Potential health effects of perchlorate include interference with iodide uptake by the thyroid gland, which reduces thyroid hormone production and affects normal growth and metabolism. The US EPA does not regulate perchlorate at this time, but it is on the Contaminant Candidate List. The EPA has issued a Health Advisory Level (HAL) of 15 parts per billion (ppb) for perchlorate, and also recommends that infant formula be prepared with water containing 15 ppb perchlorate or less. In 2005 the National Academy of Sciences (NAS) recommended a perchlorate reference dose (RfD) of 0.7 micrograms per kilogram of body weight. The Food and Drug Administration has found that the average American consumes less than the NAS reference dose. Two states have established enforceable regulatory limits for perchlorate in public drinking water: California (6 ppb) and Massachusetts (2 ppb).

Treatment methods for the removal of perchlorate from water include point of use (POU) reverse osmosis (RO) filtration, which under National Sanitation Foundation Standard 58 must be able to reduce a perchlorate concentration of 130 ppb in raw water to 4 ppb or less in treated water. Additionally, activated carbon filtration, anion exchange and some types of distillers will reduce perchlorate concentrations in water, but industry standards have not been established for these devices.

(Source: *Water Technology* 32:6; June, 2009)