# Nitrate and Cancer

Several comprehensive reviews of the scientific literature, by impartial national and international government health agencies charged with setting safe drinking water standards, have all concluded that an association between nitrate in drinking water and cancer has not yet been established because the research data is inadequate and inconsistent.

**OEHHA (2018)**

"Overall, while many studies have reported associations between cancer and nitrate or nitrite in water or food, consistent findings have not been seen across different studies. Several studies identified associations with nitrates or nitrites from food but not water. Some studies found associations with drinking water nitrates. Some studies only identified associations in particular subgroups (e.g., low vitamin C, high red meat or processed meat consumption, low or high folate intake), but these findings need further investigation. Other studies used either ecologic or cross-sectional exposure data, or did not adequately address potential confounders, which are important limitations of these studies… In conclusion, while some of these studies provide suggestive evidence of an association between nitrates and/or nitrites in either drinking water or food and cancer, the database overall is inconsistent and adequate data on nitrates and cancer with which to establish Public Health Goals are currently not available. Further investigation of associations between nitrates and nitrites in drinking water and human cancer is warranted." Note: OEHHA's updated (2018) Public Health Goal for Nitrate is 45 mg/L (as nitrate).

Office of Environmental Health Hazard Assessment (OEHHA), Pesticide and Environmental Toxicology Branch. Public Health Goals: Nitrate and Nitrite in Drinking Water. May, 2018; pg. 41-42

**U.S. DEPT. OF HEALTH AND HUMAN SERVICES (2013)**

"Epidemiological investigations and human toxicological studies have not shown an unequivocal relationship between nitrate intake and the risk of cancer."

U.S. Dept. of Health and Human Services; Agency for Toxic Substances and Disease Registry. ATSDR Case Studies in Environmental Medicine: Nitrate/Nitrite Toxicity. Dec. 5, 2013; pg. 56.

**NATIONAL CANCER INSTITUTE (2018)**

"In summary, most adverse health effects related to drinking water nitrate are likely due to a combination of high nitrate ingestion and factors that increase endogenous nitrosation… To date, the number of well-designed studies of individual health outcomes is still too few to draw firm conclusions about risk from drinking water nitrate ingestion."

National Cancer Institute, Division of Cancer Epidemiology and Genetics. Drinking Water Nitrate and Human Health: An Updated Review. Int J Environ Res Public Health. July, 2018; 15(7) pp. 1557

**CENTER FOR DISEASE CONTROL (2016)**

"Researchers continue to explore if there are associations with long-term exposure to nitrate, including adverse reproductive effects and some cancers. The studies are not conclusive at this time and health standards are focused on protecting infants."

Center for Disease Control and Prevention. Nitrate and Your Health. Oct. 26, 2016

**U.S. EPA (2007)**

"The U.S. EPA concluded that there was conflicting evidence in the literature as to whether exposures to nitrate or nitrites are associated with cancer in adults and children."

U.S. EPA. Nitrates and Nitrites: TEACH Chemical Summary. May 22, 2007; pg. 1

**WORLD HEALTH ORGANIZATION (2016 & 2011)**

"Although numerous epidemiological studies have investigated the relationship between exposure to nitrate or nitrite in drinking-water and cancer occurrence, the weight of evidence does not clearly support an association between cancer and exposure to nitrate or nitrite per se. Overall, these studies found no clear association between nitrate or nitrite in drinking water and risk of cancer of the gastrointestinal tract, non-Hodgkin lymphoma, tumors of the central nervous system, urinary tract tumors, thyroid cancer, breast cancer or pancreatic cancer. Many of these studies lacked individual exposure data, information on cancer risk factors and information on nitrosation inhibitors and precursors. This conclusion is consistent with the conclusions by the International Agency for Research on Cancer (IARC) that there is inadequate evidence in humans for the carcinogenicity of nitrate per se from exposure in food or in drinking water."

World Health Organization. Nitrate and nitrite in drinking-water: Background document for development of WHO Guidelines for Drinking-water Quality. 2016; pg. 13

"Several reviews of epidemiological studies have been published; most of these studies are geographical correlation studies relating estimated nitrate intact to gastric cancer risk. The United States National Research Council found some suggestion of an association between high nitrate intake and gastric and/or esophageal cancer. However, individual exposure data were lacking, and several other plausible causes of gastric cancer were present. In a later review by the World Health Organization , some of the earlier associations appeared to be weakened following the introduction of individual exposure data or after adjustment for socioeconomic factors. No convincing evidence was found of an association between gastric cancer and the consumption of drinking-water in which nitrate concentrations of up to 45 mg/L were present. No firm evidence was found at higher levels either, but an association could not be excluded because of the inadequacy of the data available. More recent geographical correlation and occupational exposure studies also failed to demonstrate clear relationship between nitrate intake and gastric cancer risk, although these studies were well designed… For other types of cancer, there are no adequate data with which to establish any association with nitrite or nitrate intake."

World Health Organization. Nitrate and nitrite in drinking-water: Background document for development of WHO Guidelines for Drinking-water Quality. 2011; pg. 40-41