

# NITRATE IN DRINKING WATER: A Public Health Concern for All Iowans Executive Summary



## INTRODUCTION

Elevated nitrate levels in Iowa's water have been a source of concern in the decades after the state was identified as a top contributor of nitrate and phosphorus pollution fueling the Dead Zone in the Gulf of Mexico. When the first edition of this paper was published in 2016, the issue of nitrate in drinking water was receiving heightened attention because of the Des Moines Water Works' lawsuit against three drainage districts in northwest Iowa. More recently, concerns over nitrate health risks have grown due to the consistently high concentrations of nitrate in Iowa's waters, as well as the 2023 report that Iowa has the second-highest rate of cancer incidence among U.S. states and is the only state in the nation with a rising cancer rate.

Blue baby syndrome, a serious and potentially fatal condition that can occur in infants who ingest water in formula containing high levels of nitrate, has long been acknowledged as a health threat. However, recent studies suggest other serious chronic health effects associated with long-term, low level (less than 5 mg/L) exposure to nitrate in drinking water. The 2024 Iowa Environmental Council (IEC) report "Nitrate in Drinking Water: A Public Health Concern for All Iowans" analyzes recent research findings that suggest associations between elevated levels of nitrate in drinking water and human health problems, and calls for action to protect our state's drinking water sources and public health.

## HEALTH RISKS POSED BY NITRATE IN DRINKING WATER

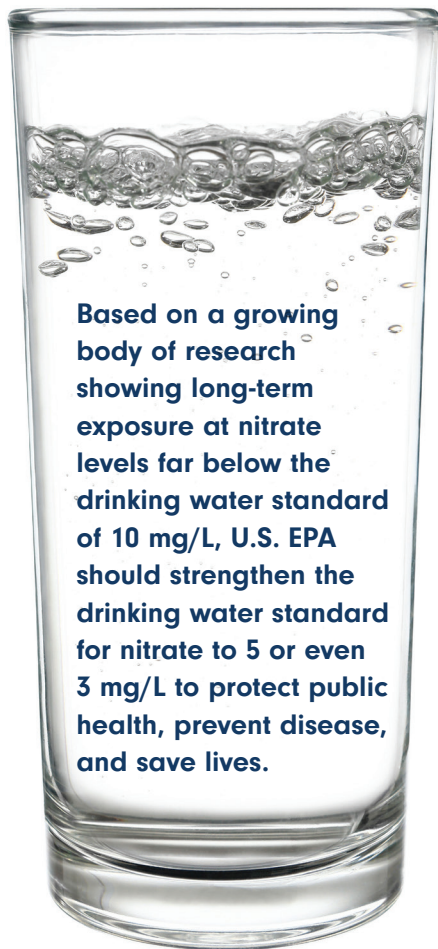
The federal nitrate (nitrate-N) drinking water standard of 10 milligrams per liter (mg/L) was established in 1962 to prevent methemoglobinemia, or blue baby syndrome, a life-threatening condition that decreases the blood's ability to carry vital oxygen through the body. Blue baby syndrome is rare – especially since establishment of the drinking water standard that regulates public water supplies.

However, an increasing number of scientific studies are making connections between long-term, low-level nitrate concentrations in drinking water and other health issues, including birth defects, cancers, thyroid disease, and other health concerns.

When nitrate is ingested, it is reduced within the body to nitrite, which is considered unsafe at much lower levels than nitrate. Nitrite is further reduced in the body to N-nitroso compounds, which are widely considered to cause cancer and contribute to a variety of health problems.

Iowans are particularly vulnerable to the potential health impacts from nitrate pollution because nitrate concentrations in Iowa's streams and groundwater rank among the highest in the U.S., even higher than elsewhere in the Corn Belt and Northern Great Plains. This presents a significant challenge for public drinking water systems that are legally required to provide water with nitrate-N concentrations at or below 10 mg/L. In addition, many Iowans rely on private wells that are unregulated and often untested. These Iowans are at a greater risk of ingesting elevated concentrations of nitrate or other regulated pollutants.

"Nitrate in Drinking Water: A Public Health Concern for All Iowans" summarizes peer-reviewed literature conducted by a wide variety of respected institutions in the United States and abroad, as well as reports from agencies and other information. Many of the studies referenced in the paper gathered detailed information on large cohorts, or study groups, followed over years or even decades. Such long-term research of human subjects is very challenging. Investigators must attempt to sort out many influences: exposure to nitrate and nitrite that comes not only from drinking water, but some foods, cigarette smoke, and drugs that contain nitrogen-based compounds. Much of the research suggests that nitrate consumption in drinking water is most problematic when combined with regular exposure to these other sources of nitrate and nitrite and/or other carcinogenic substances.



**Based on a growing body of research showing long-term exposure at nitrate levels far below the drinking water standard of 10 mg/L, U.S. EPA should strengthen the drinking water standard for nitrate to 5 or even 3 mg/L to protect public health, prevent disease, and save lives.**

## **This paper focuses on adverse health outcomes that multiple studies have significantly associated with nitrate intake from drinking water:**

**BIRTH DEFECTS:** Studies conducted in Iowa, Texas, Canada, and Australia found statistically significant links between elevated nitrate in drinking water and neural tube defects of the brain and spinal cord, including spina bifida, some oral cleft defects, and limb deficiencies.

**BLADDER CANCER:** Researchers who followed a large group of postmenopausal women in Iowa found an increased risk for bladder cancer as nitrate concentration in water supplies increased. Other likely influences, including exposure to nitrate and nitrite through diet and other sources, were also considered. Studies in Spain, Germany, and Taiwan reported similar findings.

**COLORECTAL CANCER:** Studies of colorectal cancer in Denmark, Spain, and Italy found positive associations between drinking water nitrate and colorectal cancer. High red meat intake and low vitamin C intake were factors associated with increased risk.

**OTHER CANCERS:** Studies in Iowa and around the world have found statistically significant links between nitrate in drinking water and childhood, ovarian, kidney, and thyroid cancers. More research is needed to confirm these findings.

## **TAKING ACTION**

While more research is needed to better determine the risks of nitrate exposure, the Iowa Environmental Council asserts that the health risks from nitrate in drinking water provide compelling evidence to act now to reduce pollution and improve water quality.

Drinking water treatment helps manage nitrate pollution, but it does not solve the problem. Preventing nitrate pollution at the source will require additional resources and policy change.

Solving Iowa's nitrate problems will require political will to take regulatory action. Iowa's Nutrient Reduction Strategy (NRS) offers science-based recommendations to prevent and mitigate nitrate and phosphorus pollution, but does not provide an actual strategy to implement the identified measures. It relies on voluntary action to reduce nutrient pollution from agricultural sources. Achieving the pollution reduction goals set forth in the NRS will not only require a robust implementation plan with clear timelines, it will require a transformation in agriculture that includes universal adoption of basic conservation practices, a statewide watershed approach, and enforceable accountability measures.

The Iowa Environmental Council applauds all those who are taking responsibility to help clean up our water, including farmers, landowners, businesses, agency leaders, and legislators, but additional participation and leadership is needed. We encourage all Iowans to join in this undertaking to benefit the health and well-being of our families, neighbors, and those downstream.

IEC first issued this paper in September 2016. In May 2024, IEC updated the paper to reflect more recent research on the risks of nitrate to human health.



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