HEALTH EFFECTS

of Nitrate in Drinking Water

WHAT IS METHEMOGLOBINEMIA?

- Nitrate can affect our body's ability to absorb oxygen from the blood.
- Bottle-fed **babies under six months** of age and **people with certain gastrointestinal conditions** are at the **highest risk of getting methemoglobinemia.**
- This illness can cause the skin to turn a bluish color and can result in serious illness or even death.

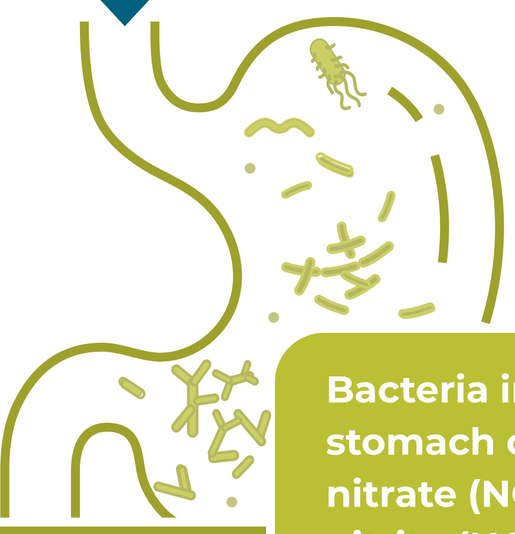
IMMEDIATE (ACUTE) HEALTH EFFECTS

- The Safe Drinking Water Act (SDWA) set the **maximum contaminant level (MCL) for nitrate in drinking water at 10 milligrams per liter** based on the acute risk of methemoglobinemia, or blue-baby syndrome, in infants.

Nitrate Impairs Blood Oxygen Delivery

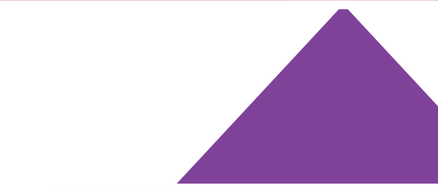
Nitrate toxicity is due to its conversion to nitrite in the body

Ingestion of water with nitrate (NO_3-) levels above 10 mg/L

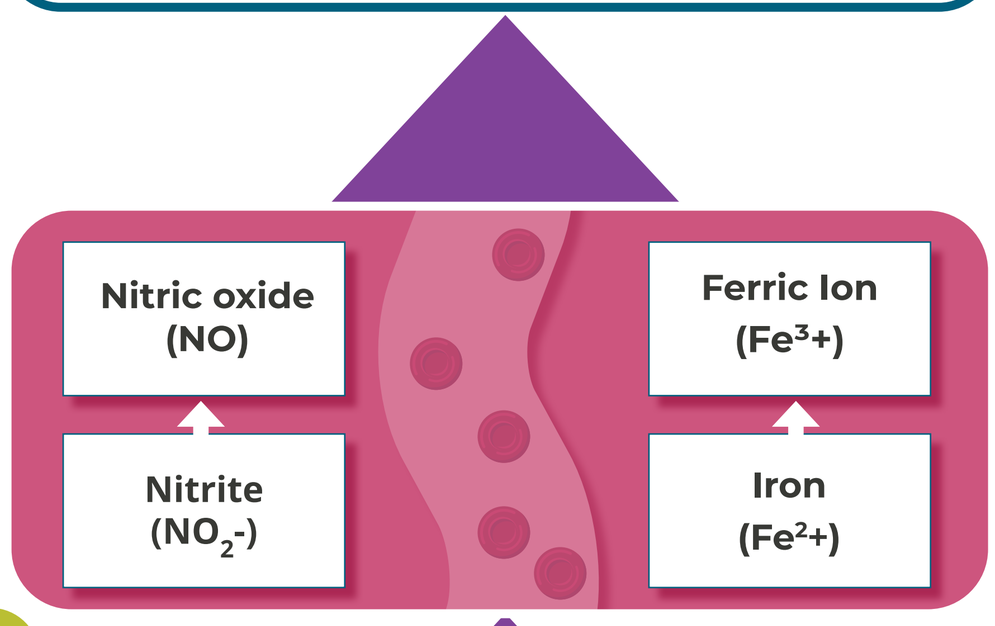


Bacteria in the stomach convert nitrate (NO_3-) to nitrite (NO_2-)

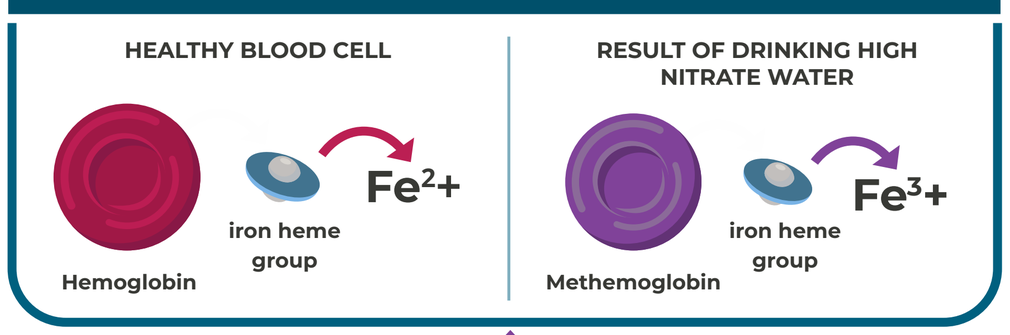
Infants and adults with gastric diseases are more likely to have high stomach pH levels that support growth of bacteria that can convert nitrate.



Nitrite reacts with the iron in hemoglobin, creating methemoglobin



Fe^{3+} is free iron which is toxic. Oxygen cannot bind to Fe^{3+} resulting in Methemoglobinemia (MetHb)



LONG-TERM (CHRONIC) HEALTH EFFECTS

- EPA is reviewing research on other health effects of nitrate in drinking water in addition to methemoglobinemia. This could lead to changes to nitrate regulations in the future.
- Recent research links nitrate in drinking water to thyroid disease, neural tube defects, and certain cancers (Ward et. al, 2018).

DID YOU KNOW?

Boiling water does not remove nitrate. Boiling actually concentrates nitrate in water, making it more harmful to drink

You should not cook with water that has nitrate above the MCL

Since nitrate does not easily absorb through the skin, you may use water with nitrate levels above the MCL for bathing, laundry, and washing dishes

U.S. EPA. (2023). Protocol for the Nitrate and Nitrite IRIS Assessment (Oral) (Preliminary Assessment Materials). U.S. Environmental Protection Agency, Washington, DC, EPA/635/R-23/337.

Ward, M., Jones, R., Brender, J., de Kok, T., Weyer, P., Nolan, B., Villanueva, C., & van Breda, S. (2018). Drinking Water Nitrate and Human Health: An Updated Review. International Journal of Environmental Research and Public Health, 15(7), 1557.

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