

Algae Bloom



Tiny water plants capture the sun's energy and support the food web. Dissolved nitrogen can lead to sudden overabundance, which blocks sunlight to water, kills fish by using the water's oxygen, produces scum or odor, and in some cases, produces toxins.

Human Cancer



Cooking can convert nitrite ions from food preservatives to nitrosamines, which are known carcinogens. Bacon, in particular, because of its high cooking temperature can produce nitrosamines. Addition of ascorbic acid can prevent their formation.

Blue Baby Syndrome



Powdered formula mixed with tap water could contain nitrate.

An illness that occurs when a child drinks water containing a large amount of nitrates. The body's digestive system converts these to nitrites, changing oxyhemoglobin to methoglobin, which cannot carry oxygen. Mucous membranes turn blue, impairing functions.

Excess Water Weeds



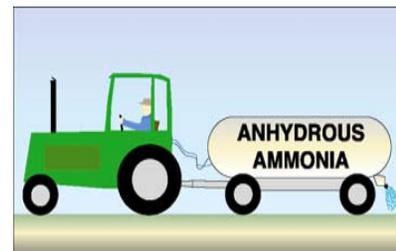
Dense beds of underwater plants occur in shallow nitrogen-enriched water. These plants block navigation, trap sediment, and cause unpleasant odors when they decay.

Young Animal Illness



High levels of nitrate in water lead to increased livestock and wildlife stillbirth rates, low birth weight, slow weight gain, and reduced vitality.

Agricultural Fertilizer



Living organisms use nitrogen to build proteins, enzymes, DNA, RNA, vitamins, and hormones. Most animals derive their nitrogen from plants, which convert simple compounds to more complex ones. Adding simple nitrogen compounds to soil increases plant growth.

Explosives and Munitions



Nitrogen is a major component in gunpowder, TNT (bombs and shells), and nitroglycerin (dynamite). Nitrogen has a triple bond ($N\equiv N$) which releases a great deal of energy when broken by chemical processes, including heat such as explosions or firing a gun.

Sterile Food Packing

Cream Whipper Chargers



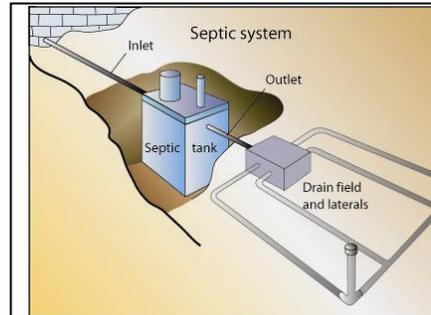
Oxygen allows bacterial growth and chemical breakdown of foods. Food is often vacuum-packed to remove oxygen or packed with nitrogen. N_2O is soluble in fats and used as a propellant for canned whipped cream.

Lawn Fertilizer



Nitrogen is a major nutrient for plant growth. Lawn fertilizer recommendations across the US are based on turf (lawn) research. The 16-4-8 shown on the bag is the percentage of nitrogen, phosphorous, and potassium in a 50 lb bag ($16\% * 50 \text{ lb} = 8 \text{ lb nitrogen}$).

Sewers and Septic Tanks



Human urine contains a large amount of ammonia. Soil bacteria oxidize ammonia to form nitrates. Leaking septic tanks or sewer systems release the wastes into the soil, ground water, and surface water systems.

Pet Waste



Dog, cat, and other domestic animal waste contains ammonia which is converted by bacteria into nitrates. If animal droppings are left on the ground, the nitrates and bacteria will enter the ground and pollute surface and ground water.

Bat Guano



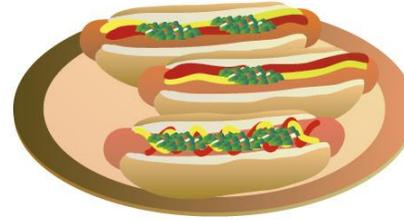
Many caves have large deposits of droppings (guano) from bats. This material is enriched in nitrogen and is used as fertilizer. Deposits in Mammoth Cave, Kentucky, were mined during the War of 1812 as saltpeter (potassium nitrate), an ingredient in black gunpowder.

Dentistry/Medicine



Nitrous oxide (N_2O), also known as "laughing gas," is a mild anesthetic used in dentistry. Nitric oxide (NO) is a short-lived gas that acts as a signaling molecule in the body for blood pressure. "Nitro" drugs like nitroglycerin lower blood pressure by increasing NO .

Meat Preservative



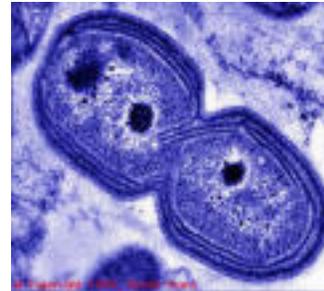
Sodium nitrite is a salt that prevents bacterial growth and botulism. When added to meat, the nitrite turns to nitric oxide and combines with myoglobin, the red pigment in meat, turning it the pink color of ham and hotdogs.

Lightning Strikes



The high temperatures and pressures that surround electric storms form nitric oxide (NO) and nitrogen dioxide (NO_2), which react with rain to form nitric acid (HNO_3). Nitrates formed by the interaction of nitric acid and soil provide nitrates for plant growth.

Soil Bacteria



Microbes in the ground conduct denitrification, a process that converts nitrates back to nitrogen gas. This process also produces nitrous oxide, which is a greenhouse gas contributing to global warming.

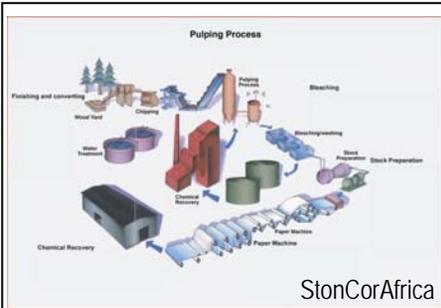
The Nitrogen Cycle

Plants

Animals

Humans

Paper Industry



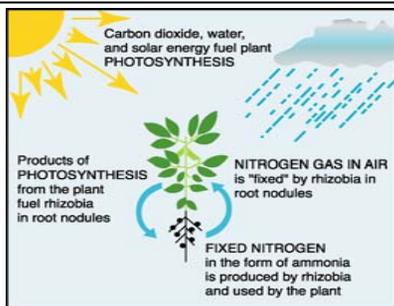
The pulp and paper industry processes wood with heat, pressure, and caustic solutions. Possible polluting byproducts include methanol, NO_x, carbon dioxide emissions, and ammonia and nitrates releases in wastewater. Current methods result in cleaner air and water.

Farm Animal Waste



Barnyards, dairies, and feedlots produce a lot of animal waste. Bacteria convert the ammonia in this waste to nitrates that enter the ground or surface water systems. Bacteria from animal waste is also a contaminant.

Legumes



Plants of this family (beans, peas, alfalfa) are able to use biological nitrogen fixation (BNF) to obtain nitrogen from the air for growth. N-fixing soil bacteria (rhizobia) in root nodules support plant growth and symbiotically receive sugars and carbohydrates in return.

Atmospheric Gas



Nitrogen gas makes up 78% of the Earth's atmosphere by volume. The Aurora Borealis is created when ions collide with gases such as nitrogen in the Earth's atmosphere.

Nitrogen Gas



Nitrate



Nitrite



Atmosphere

Water

Other Nitrogen Gases



Soils and Rocks

