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TECHNICAL BULLETIN

HEALTH EFFECTS INFORMATION

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ENVIRONMENTAL TOXICOLOGY SECTION
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AMMONIA

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Oregon Department of Human Services
Environmental Toxicology Section
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SYNONYMS

There are no common synonyms for ammonia, but other related forms in water solution are ammonium ion and ammonium salts. Water test reports generally are based upon ammonium nitrogen.

USES

Ammonia and its ionized form, ammonium, are naturally occurring organic compounds that are formed during decomposition of proteins, manure wastes and urine wastes, and from other nitrogen-containing compounds. Ammonia gas is most commonly encountered where animals, chickens or birds are confined in large numbers, and it is responsible for the sharp odor associated with soiled diapers and diaper pails. Ammonia gas is also used commonly in industry.

Ammonia and ammonium compounds are excellent sources of plant nitrogen, and are present in most fertilizers, whether natural or synthetic fertilizer formulations. Ammonia solutions are also very effective for cleaning hard surfaces. Household cleaners such as glass, floor and counter cleaners are often ammonia-based.

Ammonia gas is used as a refrigerant gas. It is also used extensively in chemical and pharmaceutical manufacturing.

Some drinking water treatment processes add small amounts, generally less than 0.4 mg/l (ppm) of ammonia to water to increase and extend the disinfecting ability of chlorine.

WHAT HAPPENS TO AMMONIA IN THE ENVIRONMENT

Ammonia is very soluble in water. It is removed from the air by rainfall and readily enters soil where it is absorbed by plants in manufacturing proteins. Excessive ammonia in water or soil is lethal to plants. Because of its solubility, excessive soil ammonia may penetrate into deeper soils and eventually reach groundwater. In some soils part of the ammonia may be converted to nitrites and nitrates before or after it reaches groundwater.

HOW CAN AMMONIA ENTER AND LEAVE MY BODY

Everyone is exposed to low levels of ammonia every day. Small amounts are

present in air, water and foods. It is estimated that the average daily intake of ammonia for adults via foods and beverages is 18 milligrams. Since ammonia is a normal breakdown product of proteins, ammonia is produced within our bodies when proteins are digested and utilized by the body. Excess ammonia is excreted from the body in urine.

HOW IS AMMONIA HARMFUL TO HEALTH

Ammonia in air is an irritant and causes burning of the eyes, nose, throat and lungs. At levels in air greater than 100 ppm it can cause serious injury to such tissues. Ammonia is toxic to some fish and other aquatic organisms at concentrations below 1 mg/l (ppm) in water. Human beings and higher animals are less sensitive to ammonia in water, but long-term ingestion of water containing more than 1 mg/l (ppm) ammonia may be damaging to internal organ systems. Solutions having concentrations greater than 1000 mg/l (ppm) can cause severe burns and scarring of sensitive skin and mucous membranes. Household cleaning solutions usually contain between 3% and 30% ammonia, and pose severe hazard if ingested. As little as one teaspoonful of 10% ammonia solution can be lethal. Splashing into eyes can cause temporary or permanent blindness.

DRINKING WATER STANDARDS

Ammonia is rarely found in unpolluted surface water or well water, but water contaminated with sewage, animal wastes or fertilizer runoff may contain elevated levels. The US Environmental Protection Agency (USEPA) has not established a maximum contaminant level (MCL) for ammonia in drinking water. Environmental limits for ammonia in surface water in the US range from 0.25 to 32.5 mg/l (ppm).

The National Academy of Science recommends, and many European nations have adopted, a drinking water standard of 0.5 mg/l (ppm). In 1990 the US EPA issued a lifetime exposure advisory of 30 mg/l (ppm) for ammonia.

CAN AMMONIA BE REMOVED FROM WATER

For ammonia problems affecting individual households or systems serving fewer than four households, it may be most advantageous to obtain drinking water and water for food preparation from a source known to be safe, rather than trying to remove the ammonia. Because of the almost unlimited solubility of ammonia and

ammonium salts in water, ammonia is not readily removed from water by conventional treatment systems. It cannot be filtered or precipitated in any way. Heating will drive off some of the free ammonia, but will not remove the dissolved or ionized forms. Ammonia may be removed by ion exchange, distillation or reverse osmosis, but such systems can be expensive to purchase and to operate. They require careful design, sampling and maintenance to ensure effectiveness. If a treatment system is considered, it should be certified by the National Sanitation Foundation (NSF) for ammonia removal.

For additional advice and information call the Drinking Water Section of the Oregon Department of Human Services. (See cover sheet for telephone numbers.)