

SAFE FARM

Promoting Agricultural Health and Safety



Play it safe with anhydrous ammonia

Despite attention in recent years to laws regarding its transport, application, and storage, anhydrous ammonia remains a serious health risk for Iowa farmers. Iowans injured in events involving anhydrous ammonia required hospitalization for burns, loss of eyesight, and respiratory problems.

This publication will look at common ways Iowans are exposed to anhydrous ammonia and how to avoid these situations, its properties and first aid treatment, as well as Iowa regulations regarding its transport.

Exposure

Exposure to anhydrous ammonia can happen suddenly and is almost always unexpected, including these situations:

- During its transfer from the nurse tank to the applicator. Anhydrous ammonia can escape from the transfer hose or valves that connect the hose to the nurse tank or applicator. Farm operators must always follow procedures for making and breaking connections because the fertilizer is under extreme pressure.
- When equipment fails. Malfunctions of valves, the quick coupler that connects the nurse tank to toolbar, and gauges cause dangerous situations that could spray anhydrous ammonia in any direction with a force greater than that of a fire hydrant. Hoses exposed to sunlight, constant rubbing, or those that are stretched are subject to failure.
- During transportation or application in the field. A loose or broken hitch can cause the anhydrous hose to simply pull apart. Always use safety chains and a locking hitch pin when transporting the nurse tank.

Chemical properties

Anhydrous ammonia is a hygroscopic compound, which means that it seeks water from the nearest source, including the human body. This attraction places the eyes, lungs, and skin at greatest risk because of their high moisture content. Caustic burns result when the anhydrous ammonia dissolves into body tissue.

Most deaths from anhydrous ammonia are caused by severe damage to the throat and lungs from a direct blast to the face. When large amounts are inhaled, the throat swells shut and victims suffocate. Exposure to vapors or liquid also can cause blindness.

An additional concern is the low boiling point of anhydrous ammonia. The chemical freezes on contact at room temperature. It will cause burns similar to, but more severe than, those caused by dry ice.

Under normal temperature and air pressure, anhydrous ammonia is a colorless gas. However, anhydrous ammonia is used and transported under pressure as a liquid. All equipment used for applying or transferring liquid anhydrous ammonia must be designed for use under high pressure to avoid ruptures or breaks.

Anhydrous ammonia has a distinct odor, which humans can detect in concentrations as small as 5 parts per million (ppm). When used in fertilizer, anhydrous ammonia has a concentration of about 1,000,000 ppm. Brief exposure to concentrations of 2,500 to 6,500 ppm can result in death.

Anhydrous ammonia safety

How much do you know?

Test your skill with this quick quiz.

1. The effects of anhydrous ammonia exposure to humans can be best described as a:
 - a) poison.
 - b) antiseptic.
 - c) corrosive agent.
 - d) cleaner.
2. Anhydrous ammonia is a hygroscopic compound, which means it seeks out moisture. True or false?
3. During spring weather and under normal atmospheric pressure, anhydrous ammonia is a liquid. True or false?
4. Contact lenses offer some eye protection from anhydrous ammonia exposure. True or false?
5. What liquid can you use for first aid treatment in anhydrous ammonia exposure?
 - a) orange juice
 - b) water
 - c) cold coffee

See answers on back.

First aid

The best ways to reduce risk of serious injury from anhydrous ammonia exposure are to wear protective equipment and to know what to do in an emergency.

Always wear ventless goggles or a full-face shield, rubber gloves with a long cuff that can be rolled to catch drips, and a long-sleeved shirt. Non-rubber gloves made of ammonia-proof materials also are acceptable. Never wear contact lenses around anhydrous ammonia because the lenses collect the chemical and intensify caustic effects.

Always carry a personal water supply in a squeeze bottle to use for instant first aid. The bottle should contain 6 to 8 ounces of clean water and be within arm's reach at all times. At least 5 gallons of water should be accessible within several seconds.

The best first aid treatment for anhydrous ammonia exposure is water—large amounts of it. Flush all exposed areas with water for at least 15 minutes.

If the nose or throat is exposed, flood the area repeatedly for 15 minutes, being careful not to choke the victim. Even a brief or mild exposure to the eyes requires irrigation for a minimum of 15 minutes. Remember to flush underneath eyelids.

Always begin flushing immediately. This reduces injuries, caused as soon as anhydrous ammonia contacts skin or clothes. If water is not immediately available, use any non-toxic liquid such as cold coffee. Orange juice and other mildly acidic liquids will help neutralize the chemical. Water from a nearby farm pond also can be used until other water supplies are available.

Even with proper first aid, seek medical help as soon as possible. Explain the source of the injury so that medical

providers will not apply oils or ointments. This treatment intensifies damage from burns.

If you find someone in a continuous stream of anhydrous ammonia, do not attempt rescue without proper equipment. Rescuers must wear a self-contained breathing apparatus (SCBA) and protective clothing.

Always take care in removing a victim's clothing. Clothes could be frozen to the skin and removal could cause additional injury.

Regulations

Iowa Code restricts towing of anhydrous ammonia nurse tanks to not more than three vehicles (including the truck or tractor) for a maximum length of 60 feet. The Code also requires safety chains and that the vehicle operator stop at all railroad crossings.

You also must display the slow-moving vehicle (SMV) emblem if you're traveling at speeds less than 35 miles per hour. At higher speeds, remove or cover the emblem. In Iowa, speed limits are determined by the rating marked on the nurse tank tires.

It's important to understand the dangers of anhydrous ammonia. Operators should know and understand all procedures, usually provided by the chemical dealer, before they begin anhydrous ammonia application. Better yet, operators may want to consider hiring a professional to perform this dangerous job.

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For more information

Other ISU Extension and Outreach publications may help you develop guidelines for working with animals, or address other related issues. Go to <https://store.extension.iastate.edu>.

- For more detail about regulations regarding transportation, contact the Iowa Department of Transportation Motor Vehicle Enforcement Division by calling 1-800-925-6469.
- For information regarding the chemical properties of anhydrous ammonia, contact the Centers for Disease Control at 1-800-232-4636 or on the web at www.cdc.gov/niosh/topics/ammonia.

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Tractor safety

What can you do?

You can reduce your risk of exposure and reduce injuries in these ways:

- Always keep 5 gallons of clean water in your supply tank and carry a small squeeze bottle.
- Understand first aid treatment and practice what you would do in an emergency.
- Wear ventless goggles, rubber gloves, and a long-sleeved shirt when working with anhydrous ammonia.
- Regularly inspect equipment and have worn hoses and valves replaced.
- Never allow bystanders in the area where anhydrous ammonia is being transferred or applied.
- Review instructions before coupling and uncoupling lines.

Answers to quiz:

1-c; 2-True; 3-False; 4-False; 5-a, b, and c.

SAFE FARM

Safe Farm is an Iowa State University Extension and Outreach project helping to make Iowa farms a safer place to work and live.

For more safety information, check the web at www.abe.iastate.edu.