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Ammonia Beware

That pungent barn smell is a sign your horse is breathing a hazardous chemical.

Story & Photos by Tracy Williams

It is the hallmark scent of barns the world over, a foul stench that strikes you upon entrance... and occasionally nearly knocks you down. Even in carefully cleaned stalls, traces of odor remain, and many barn owners consider it an unchangeable facet of the equine industry. But the source of odors stems from the breakdown of equine waste, which produces ammonia – a noxious gas that could contribute to reduced performance and overall decreased health of your beloved stall resident.

What is Ammonia?

Ammonia is a caustic and highly flammable gas, yet it is used commercially as a cleaning agent, refrigerant, fertilizer component and in the production of plastics and explosives. In addition, ammonia is an important cog in the nitrogen cycle; nitrogen rotates from the air to the soil and is taken up by plants, which return it to its gaseous form. It is here that equines play their role. Horses expel excess dietary protein (what is not metabolized during digestion) through their urine in the form of urea, which enters the soil to be absorbed by plants. In evolutionary tradition, the wild horse is no longer affected as it roams freely away from urine-soaked areas, but the modern domesticated horse is often stall-bound and can suffer effects. Here, when urine floods the stall, it can seep into cracked stall mats, drains or deep bedding, and in these dark, quiet places, anaerobic bacteria feed on the nutrients in urea and produce ammonia, which rises to be inhaled by you and your horse.



Foals are at higher risk for ammonia exposure because they spend so much time on or near the stall floor.

Hazards of Ammonia

According to the U.S. Department of Labor's Occupational Safety and Health Administration, ammonia is a toxic, reactive and highly hazardous chemical. Their recommendations warn that concentrations of greater than 50 ppm can cause serious harm to human beings. Even in the cleanest barns, ammonia levels in equine stalls exist well above this concentration.



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Furthermore, the North Carolina Department of Health and Human Services warns that humans exposed to ammonia can suffer chronic inflammation of airways, airway hyperactivity, and chronic irritation of eye membranes

If human exposure to ammonia is dangerous, how much more for the horse who breathes it in higher doses for sustained periods? Although acute toxicity for horses is unlikely, problems crop up from long-term, low-level exposure, according to the International Veterinary Information Service. Researchers M.S. Davis and W.M. Foster released a paper indicating that as little as 10 ppm for 5 to 7 weeks can cause dysfunction of the horse's mucus membranes, which decreases immune response and makes the horse susceptible to other pathogens.



Research has shown that ammonia exposure increases airway inflammation, which compromises racing performance.

If a horse's health is affected, eventually performance will be as well. In 2001, Michigan State University's Equine Pulmonary Laboratory released a study, which found that stabled young horses during training suffer respiratory distress compared to young horses that are pastured during training. The researchers studied two groups of horses, examining their airways monthly for signs of inflammation. The first group was stalled for three months, while the other remained on pasture, and then the groups were switched. The researchers found a significant increase in respiratory inflammation in the stalled horses that decreased when the horses were put on pasture. "We conclude that stabling is associated with inflammation of both the upper and lower airway of young horses," they wrote. While dust and mold in feed could have an impact, ammonia definitely plays an important role, and respiratory distress can harm athletic ability and decrease performance levels.

Susan J. Holcombe, PhD, also at the Equine Pulmonary Laboratory, released a paper on the causes of airway inflammation in horses, noting that ammonia is linked to mucus accumulation in the equine airway. Furthermore, Holcombe stated that mucus accumulation is positively correlated with poor racing performance.

Ammonia's effects are exacerbated in foals, according to Frederick Harper, PhD and extension horse specialist for the University of Tennessee. According to Harper, approximately 15 percent of all foals suffer a severe respiratory disease before they are one year old, although most occur between 2 to 6 months. Since foals spend a great deal of time on or near the stall floor, ammonia exposure is heightened. In addition, young foals have immature respiratory systems, so they are increasingly susceptible to disease, according to Harper. This makes ammonia reduction all the more crucial.



Limit stall time as much as possible, which will allow your horse to breathe plenty of fresh air – and not noxious chemicals.

Combating Ammonia

While ammonia's effects are clearly harmful, its presence is not a necessary part of your barn's environment. There are several steps you can take to reduce ammonia exposure for your horse even if it cannot be completely eradicated from your barn.

1. Consult an equine nutritionist.

Stop ammonia at the source! While protein is important, an equine nutritionist can help you form a diet specific to your horse's needs and eliminate unnecessary protein, which contributes to excess urine production. Additionally, including yucca schidigera in your horse's diet will also help prevent the absorption of ammonia in the horse's hindgut.

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2. Limit stall time.

Let your horse roam the outdoors as much as possible – even in the cold winter months. A warm, sealed barn may seem cozy, but it really encourages bacteria growth and ammonia production. Not only will fresh air eliminate ammonia exposure, but plenty of grazing and free movement will only enhance your horse's quality of life.

3. Ventilate.

For many horse owners, total pasture time is not an option, but when you must stall your horse, provide adequate ventilation. Proper air flow through your barn will provide your horse with fresh air, distribute air evenly, regulate temperature and moisture levels and help to remove odors and gases.

4. Clean stalls regularly.

Remove urine and wet bedding daily from your horse's stall and strip the stall about once a week. If possible, remove your horse from the stall while you clean because ammonia will be stirred up by the cleaning process.

5. Choose absorbent bedding and an ammonia neutralizing agent.

Research has shown absorbent bedding helps to decrease ammonia levels. In addition, consider mixing a quality neutralizing product with the bedding to help absorb ammonia. Choose a product that doesn't merely mask the odors but eliminates them by actually absorbing ammonia molecules. (see sidebars for more information)

6. Eliminate areas where urine pools.

Karen Hayes, author of *The Perfect Stall*, recommends using interlocking or seamless stall mats and sealing them to prevent urine escaping through the cracks. Bedding, mixed with a quality neutralizing product, can then be applied on top of the mats for an ideal stall.

If your barn reeks of ammonia, don't despair! With a few changes in your management strategies, it is possible to reduce and even eliminate the harmful effects of ammonia on your horse's health and performance.

The Question of Hydrated Lime

Traditionally in the horse industry, hydrated lime has been used to treat and freshen equine stalls to prevent ammonia levels from rising and adversely affecting you and your horse. However, according to the National Lime Association, hydrated lime can also be a hazardous substance and warrants careful use. According to the Association, hydrated lime can cause severe irritation and burning to the eyes – including permanent damage if untreated – irritation and burns to unprotected skin, and irritation to the respiratory system. In light of this, horse owners must be extremely careful when applying hydrated lime and might do well to find an alternative method to treat stalls.

Natural Minerals: An Alternative to Hydrated Lime

Because of the potentially hazardous effects of hydrated lime, manufacturers are now producing improved ammonia-absorbing products made up of all-natural ingredients. These products, such as Sweet PDZ, Stable Boy, and Stall Dry, are composed of substances like diatomaceous earth, clay, and natural minerals, such as zeolites, that are non-toxic and won't irritate your horse's mucus membranes or respiratory system. These products, especially diatomaceous earth and clay, are considered highly moisture-absorbent, and the minerals trap ammonia within tiny channels in their structure, eliminating odors and noxious chemicals from the stall and the air.

Furthermore, these products, especially those that are zeolite-based, make excellent composting materials and fertilizer components. Ammonium molecules replace part of the mineral structure, allowing the ammonia to retain its nutrient value and become a slow-release fertilizer, which will prevent crop burn caused by excess nitrogen.

Research has shown these products to be highly effective in ammonia and moisture absorption, and their all-natural content makes them an excellent alternative to hydrated lime.

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