

Ammonia & Respiratory Health

High ammonia levels in barns can be detrimental to horses' respiratory health

Overview

Ammonia is a small molecule composed of nitrogen and hydrogen with a characteristic pungent and unpleasant odor. Ammonia comes from urea—a nitrogen-containing molecule—that is present in urine and feces. Horses excrete urea to eliminate excess nitrogen from their bodies. While urea itself is odorless and nontoxic, it is rapidly converted to ammonia once excreted. Ammonia, unlike urea, is extremely irritating to the mucous membranes that line the mouth, eyes, and respiratory tract.



Because horses often eat off the floor and lie down when stabled, they can be exposed to high ammonia levels that lead to airway disease.

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Ammonia Levels in Barns

Various studies have found that ammonia levels are highest near barn and stall floors.^{1,2} Since horses frequently eat off the floor, have their heads down, and/or lie down when stabled for long periods of time, they can therefore be exposed to high levels of ammonia. This is particularly true of foals. While the exact levels of ammonia that are detrimental to horses are unknown, veterinary researchers have shown that ammonia levels in an average horse stall can exceed 200 parts per million (ppm). For humans, the U. S. Occupational Safety and Health Administration (OSHA) has set a 15-minute exposure limit for gaseous ammonia levels of only 35 ppm.³ This means both horses and their owners can be exposed to very high and unhealthy amounts of ammonia in barns.

Ammonia and Airway Disease

Inflammatory airway disease (IAD) and recurrent airway obstruction (RAO), also known as heaves or recurrent airway disease (RAD), are very common conditions in horses. RAD is a chronic, debilitating

problem that is much like asthma in humans. IAD and RAD are known to be caused by inhaling allergens and/or irritants such as dust, molds, and... ammonia.

Ammonia inhalation, particularly at the high levels known to exist in stalls, on a daily basis results in inflammation and constriction (narrowing) of the airways and mucus accumulation.^{4,6} Initially horses with ammonia-induced airway disease have decreased stamina and athletic prowess and tend to cough during exercise. With time, affected horses have an increased respiratory effort even while at rest that progresses to difficulty breathing. Ultimately, a heave line will form—a groove in the external abdominal oblique muscle caused by the persistently increased respiratory effort. In severe cases, horses with RAD will lose weight because of the difficulty of eating while trying to breathe.⁴

Ammonia and Respiratory Disease in Foals

The negative effects of ammonia are widely believed to be more detrimental for foals than adult horses. Foals spend more time lying down than adult horses and are

therefore exposed to higher concentrations of ammonia for longer periods of time. If a foal has a respiratory tract infection, which is not uncommon in foals two to six months of age, ammonia inhalation can worsen the respiratory disease, and the foal can develop pneumonia.

Treatment

Close the doors to your medicine cabinet, because you are going to need elbow grease for this treatment regimen. Experts advise that environmental management is the single most important

factor in ammonia reduction within a stable and improvement of equine respiratory health in general. In particular, owners are encouraged to focus on the horse's "breathing zone," the two-foot sphere around the horse's nose from where he draws his breath.^{4,7} Ideally, horses with RAD are pastured 24 hours per day, or as much as possible. When continual turnout is not possible, the following steps are recommended:

- Remove manure and wet bedding often;
- Clean stalls and barn aisles while the horse is not occupying the stall or cross-tied nearby;
- Provide proper barn ventilation, such as slotted inlets at eaves that are open year-round, and avoid closing up a barn when possible;
- Apply an ammonia-eliminating or -absorbing compound to the stall to decrease levels of ammonia reaching the horse's airways;
- Consider testing stall ammonia levels to monitor changes in your horse's breathing zone; and
- Review types of bedding material available and methods of stall cleaning (mucking regime) to choose an option

that works best for you. For more on stall cleaning and air quality, see www.TheHorse.com/14865.

Use an ammonia-absorbing or neutralizing compound to reduce ammonia levels in your barn. A study published in the *Journal of Equine Veterinary Science* noted, "The reduction in ammonia concentration immediately after the AAC (ammonia-absorbing compound) application supports the efficacy of the product. By using ammonia-absorbing compounds and maintaining good management practices, ammonia levels in horse barns can be reduced."¹

Types of ammonia-absorbing compounds include:

Lime Lime-based products traditionally have been used in horse barns. However, these products do not absorb or neutralize the odor (they just cover it up for a little while), and some are actually caustic when wet. As a result, alternatives have been developed.

Natural Minerals The second class of products uses a mixture of minerals that typically include such ingredients as diatomaceous earth, clay, and natural minerals (e.g., zeolites). These products are

nontoxic and noncaustic, moisture-absorbing, and they trap ammonia.

Microbe-Containing Products This class of ammonia-neutralizing products contains microbes (microscopic organisms) that break down ammonia-forming molecules in urine and feces. Instead of just trapping the ammonia (like the mineral-based products), the microbes actually decrease the amount of ammonia that can be formed by the action of "bad" microbes present in fecal material and the environment. These products also are natural, safe, and noncaustic.

Don't Forget About the Trailer

High ammonia levels can build up in a horse trailer just as easily as in a stall. One research group found that horses exposed to high ammonia levels in a trailer (40-130 ppm) for 40 hours had several deleterious changes in their respiratory tracts, developed a cough, and had increased nasal secretions. The microscopic structure of the lining of the airways also was abnormal. Specifically, the cilia (finger-like projections that help clear debris from the airways) were abnormal or were shedding,

and the cells of the tissue lining the airways had degenerative changes.⁸ 🐾

KEY REFERENCES

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Further reading and free horse health e-newsletter: www.TheHorse.com/Air-Quality

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