

CALVING EASE

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Ammonia is Bad for Calves

In his resource on dairy calves, “Newborn Housing for Dairy Calves,” (<http://www.ansci.cornell.edu/prodairy/>) Kurt Gooch summarizes the environmental needs of preweaned calves as: “1. A clean, dry, and comfortable resting area; 2. Adequate ventilation; and 3. Good access to feed and water.” This newsletter explores how our management of calf housing to meet these needs can influence the exposure of calves to ammonia. But, before we do that, let us answer the question, “Why is ammonia gas harmful to calves?”

Why is ammonia gas harmful?

Why is ammonia bad for calves? First, ammonia gas is especially harmful for a calf’s defenses in the windpipe or trachea. Tiny hair-like fingers, cilia, line the trachea. Their job is to push foreign materials the calf inhaled back up and out of the trachea. That way, “junk” that includes pathogens does not end up causing infections in the lungs.

This ciliary transport system consists of many, many of these cilia. Each one moves in a beat pattern, up and back down. These beat patterns are coordinated in what we could observe as wave activity. Thus, the cilia via a wave action lift both solids and liquids up and out of the trachea. It can be an effective defense against respiratory infections.

But, if bad guys appear, the system can break down. Some viruses, especially PI3 and BRSV, destroy cilia. Even in the absence of these viruses, **persistent exposure to relatively low ammonia levels weakens this defense system. This allows pathogens to enter the lower respiratory tissues.** Both the beat pattern of individual cilia and their coordinated wave activity are disrupted. In this weakened state, the ciliary transport system can no longer “sweep” pathogens up and out of the trachea.

Why is ammonia bad for calves? For the second part of the answer, we must ask, “What is the risk for respiratory infection in calves?” Two environmental factors insure near certain exposure of calves to pneumonia-causing bacteria. One factor is a calf’s exposure to her dam. Adult bovines are essentially pathogen factories. When the dam licks off her calf, she does an effective job of inoculating her with many viruses, bacteria and parasites.

The other environmental factor exposing calves to bacteria that cause pneumonia is the high concentration of cows near and in calving facilities. Thus, it is rare that even neonatal calves are totally free of bacteria that cause pneumonia. These bacteria are so common we often think of them as “normal” residents of calve’s upper respiratory tract. For this reason, **any time the ciliary transport system is weakened, calves are at high risk for bacterial respiratory illness.**

How can I reduce ammonia exposure?

The most effective way to reduce ammonia exposure is to not generate the gas. But, in calf housing, we may have positive conditions for microbial activity. Urine provides both liquid and nutrients. Calves warm the soiled bedding. And, the bedding materials often provide a favorable pH environment.

How, then, can we slow down this manure decomposition? First, the dryer the conditions, the lower the rate of bacterial growth and ammonia release. Second, the lower the oxygen supply for the bacteria, the lower the ammonia release rate. Third, since manure (mixture of feces and urine) on the coat of a warm animal generates ammonia rapidly, the cleaner the calves, the lower the ammonia release.

All these factors add up to clean dry bedding. What is “dry?” Kneel on the bedding. If your knees get wet, it is not dry enough to slow down ammonia production. Plenty of bedding keeps conditions dry. Strike one against ammonia! Plenty of bedding creates anaerobic (low oxygen) conditions unfavorable for microbial growth. Strike two! Plenty of bedding promotes clean calves. Strike three! Ammonia-causing bacteria strike out.

Also, providing adequate air exchange through good ventilation will help remove ammonia rich air. By the way, if you wear contact lenses, consider wearing regular glasses to prevent eye injury in high ammonia concentration work sites.

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