

Calfhood Pneumonia: When Is It Related To Ventilation And When Is It Something Different?



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Calfhood pneumonia can be frustrating to deal with. Understanding where the problem originates is the first step in creating a plan to combat it. Most cases of calfhood pneumonia can be placed into one of two broad categories: environmental causes vs. contagious

causes. Another way to look at these categories would be: pneumonia cases caused by poor air quality vs. pneumonia cases caused by something other than air quality/ventilation.

Calfhood pneumonia is a complex, multifactorial disease that is rarely ever attributed to one factor. In the same way that spokes help a wheel keep its round shape when under a stress load, calves have six main “spokes” that help keep them healthy when subjected to stress. Those spokes are:

1. Colostrum
2. Calories
3. Bedding
4. Air Quality/Ventilation
5. Vaccination
6. Sanitation

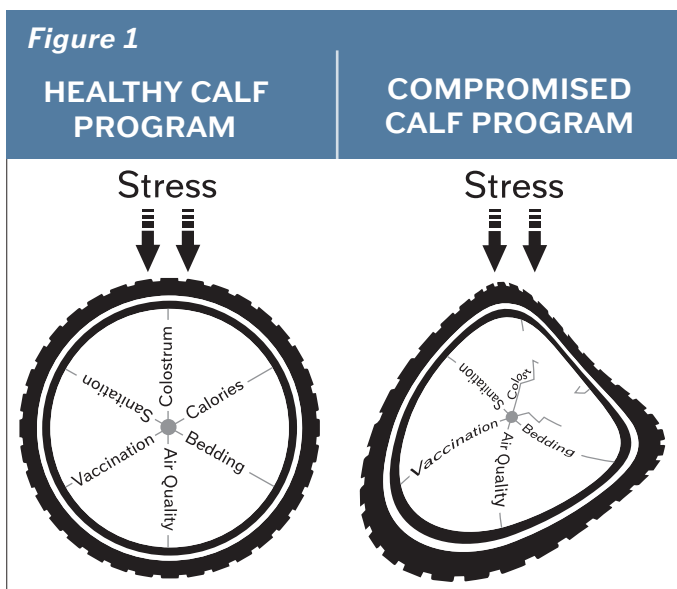
Each of the six “spokes” listed in Figure 1 are intertwined in a complex manner that helps keep calves healthy. Although ventilation and air quality are commonly implicated when discussing calfhood pneumonia, it is important to remember there are other factors that impact a calf’s respiratory health.

Environmental Pneumonia Cases ARE Typically Related To Air Quality And Ventilation

Poor ventilation in calf housing is the main environmental risk factor predisposing calves to respiratory disease.¹ Cases of environmental pneumonia are by definition related to poor air quality and inadequate ventilation. Conventional wisdom would suggest that calves breathing in poor quality air would be inhaling large amounts of bacterial pathogens like *Pasteurella multocida*, *Mannheimia haemolytica* and *Histophilus somni*; and it’s the inhalation of these pathogens that cause disease. While this line of thinking logically makes sense, it is actually incorrect. The bacterial causes in most cases of environmental pneumonia do not actually come from the environment at all, they come from the calf itself.

Did you know that most healthy calves have *Pasteurella*, *Mannheimia* and *Histophilus* living in the upper part of their respiratory tract? According to Bradford Smith, “*Mannheimia haemolytica*, *Pasteurella multocida* and *Histophilus somni* are normal inhabitants of the nasal pharyngeal mucosa, but not the lung, and are considered “opportunistic pathogens.”² Healthy calves carry these pneumonia causing pathogens around in their nasopharynx (back of their throat) every day. While these bacteria may attempt to migrate down into the lung tissue, a healthy lung lining and strong immune system will keep these invaders at bay.

Poor air quality is defined as air that is high in contaminants such as: noxious gasses (ammonia), particulates (dust), humidity and microorganisms.



For calf barns, target ammonia levels less than 10 ppm and humidity levels between 50% and 80%.²

When these airborne contaminants are inhaled by calves in excessive levels, they act as an irritant to the lining of the respiratory system. Over time, exposure to these airborne irritants begins to damage the lining of the respiratory tract while simultaneously burdening the immune system. In the presence of poor air quality, normal flora like *Pasteurella*, *Mannheimia* and *Histophilus* can migrate down from the nasopharynx into the lung field that now has a compromised defense system, enabling pathogens to set up an infection and cause respiratory disease.

Calves housed in barns with individual pens can have a higher percentage of environmental pneumonia cases because many popular commercially available individual pens have solid plastic sides with mostly solid fronts and backs. While this style of penning reduces calf to calf contact which helps prevent contagious pathogen spread, it can restrict airflow inside the calf pen itself.

Environmental pneumonia cases can occur as a result of poor or inadequate ventilation and usually follow the pattern outlined in **Figure 2**.

Figure 2

HOW ENVIRONMENTAL CAUSES OF PNEUMONIA CAN CAUSE RESPIRATORY DISEASE IN CALVES

Inadequate ventilation

- ➔ Buildup of airborne contaminants such as noxious gasses, particulate and microorganisms
- ➔ Over time these airborne contaminants irritate and damage the lining of the lung while simultaneously compromising the immune system
- ➔ Normal flora such as *Pasteurella*, *Mannheimia* and *Histophilus* migrate unchecked into a damaged lung field
- ➔ **Respiratory disease occurs**

If your farm is routinely dealing with calfhood pneumonia cases caused by *Pasteurella*, *Mannheimia* or *Histophilus*, revisit the 6 major spokes that make up the calf wheel of health paying particular attention to the air quality and ventilation system evaluation. A simple fogging test can tell you a lot about airflow throughout the barn (**Figure 3**).

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Figure 3

SIMPLE FOGGING TEST SHOWS AIRFLOW THROUGHOUT BARN



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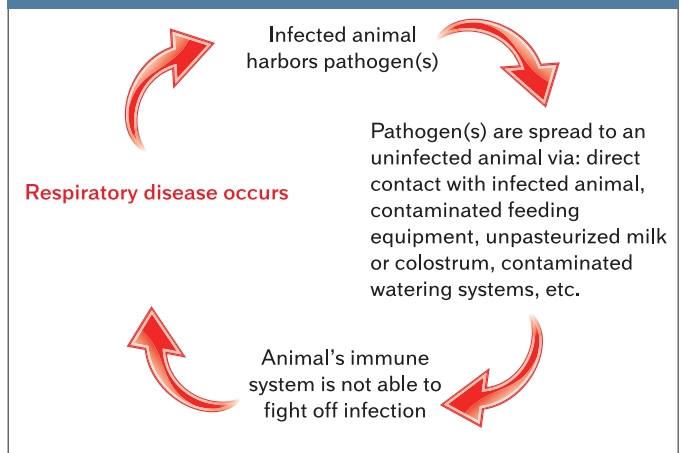
Introducing fog next to the intake of an outside fan will demonstrate the path outside air takes once it enters the barn. Producers can also introduce fog in the center of a barn to see where it exhausts and how quickly it disperses. To estimate your barn's air exchange rate, fill the barn with smoke and then time how long it takes for the smoke to disperse. Then take 60 divided by the time it takes for the smoke to clear (in minutes) and that will give you the number of air changes in an hour. For example, a barn that takes 10 minutes to clear the smoke would be $60 \div 10 = 6$ air exchanges per hour. This smoke test can also help identify areas of still air, known as dead spots.

Contagious pneumonia cases are NOT typically related to air quality and ventilation. Pathogens such as *Salmonella*, *Mycoplasma* and Bovine Respiratory Syncytial Virus (BRSV) are not considered normal flora in healthy calves and are generally not associated with an airborne route of infection. These pathogens are found in infected animals and can be spread to uninfected animals through a variety of routes. The most common infection routes include exposure to an infected animal, infected colostrum or milk, contaminated feeding equipment and shared watering systems. Once a contagious cause of pneumonia, like *Salmonella* or *Mycoplasma* is introduced into a facility it can be difficult to eradicate because the existing population of calves act as a safe harbor for the pathogen; creating a situation where infected animals can pass disease along to uninfected incoming animals. Group housed calves that use a continuous flow management style are at a higher risk of contagious disease transmission when compared to the "all in/all out" management method.

In 2011, Fiona Maunsell stated, "Once established in a multiage facility, *Mycoplasma bovis* is very difficult to eradicate, suggesting ongoing transmission from older to incoming calves...Transmission of *Mycoplasma bovis* in respiratory secretions is considered important in the epidemiology of infection."³

Calves housed in barns with comingled group penning can have a higher percentage of contagious pneumonia cases. This is most likely explained because of the significant contact calves have with each other. While this style of housing generally

Figure 4 HOW CONTAGIOUS CAUSES OF PNEUMONIA CAUSE RESPIRATORY DISEASE IN CALVES



allows for a more open pen style that promotes easier ventilation and improved air quality, things like nose to nose contact, shared feeding equipment and group waterers facilitate the spread of contagious pathogens throughout the group.

Contagious pneumonia cases occur as a result of exposure to infected animals or fomites transmitting infectious pathogens and follow the pattern outlined in Figure 4.

If your farm is routinely dealing with calfhood pneumonia cases caused by *Salmonella*, *Mycoplasma* and Bovine Respiratory Syncytial Virus (BRSV), revisit the 6 major spokes that make up the calf wheel of health with particular attention to sanitation protocols, colostrum management and vaccination evaluation.

There are countless sanitation products and protocols when it comes to keeping calf equipment clean. Regardless of the approach used, an effective cleaning and disinfection protocol should reduce pathogen buildup and remove biofilm from calf feeding equipment and penning. Execute the established cleaning and disinfection protocol, then use an ATP meter or surface protein swab to test what is being left behind. ATP meter readings of 200 RLU or less are the goal for calf feeding equipment and penning after they have been cleaned and disinfected.

Validate proper colostrum collection and storage by periodically performing colostrum cultures to evaluate bacteria levels. Consider additional culturing for *Salmonella* and *Mycoplasma* if there is a history of issues with these pathogens on your dairy. Confirm calves are utilizing the colostrum given and receiving the protection they need from it by routinely testing blood serum total proteins. Colostrum management practices are considered successful if 80 percent of calves tested are at or over a total protein level of 5.5 grams per deciliter.

Vaccine recommendations can vary due to regional and operational differences. There is no such thing as a one-size-fits-all vaccination protocol; therefore, it is best to consult with your veterinarian when designing a protocol for your operation. A judicious, effective vaccination protocol will limit vaccine use to those vaccines with proven efficacy.

Remember that few things in life are black and white. Calfhood pneumonia cases are often complex with

multiple confounding factors. Addressing a calfhood respiratory disease problem is more complex than just saying “We need better ventilation in this barn.” Investing in a better ventilation system will payback dividends when struggling with an environmental pneumonia problem, but will do little to reduce respiratory disease rates when the cause is contagious in nature. Before spending money on changing the ventilation system, be sure that poor air quality is really the issue at hand.

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- 2 Smith, B.P. (2002) *Large Animal Internal Medicine*. Third Edition; 551-569
- 3 F.P. Maunsell et al, *Mycoplasma bovis* Infections in Cattle. *American College of Veterinary Internal Medicine* 2011; 25:772-783

Customer Testimonial: *Owen and Treva Yoder*



Crystal Creek® has had the privilege of serving many wonderful customers over the last two decades. Today we would like to highlight an example of one of many happy customers who has had success while on the Crystal Creek® Dairy Nutrition Program.

Owen and Treva Yoder were married in 1980 in southern Iowa. They started farming during the 1980's which was a very difficult time in the dairy industry. They moved to Wisconsin in 1998 to farm 180 acres. The Yoder family consists of 3 sons, 6 daughters and 33 grandchildren who all live in the Bonduel, Wisconsin area. The Yoder's son Steven and his wife Rosanna currently live on the farm and are in the process of transitioning to help take over the daily farm work. The Yoder operation has been certified organic since 2006. They milk 36 to 40 Holstein cows and raise all their own young stock and corn.

Owen states “We were always looking for a good mineral company. We discovered Crystal Creek®

twelve years ago and have been with them ever since. We really appreciate their products and services. I would recommend Crystal Creek® for whatever livestock you are feeding. They are only a phone call away and their products can be shipped direct to your farm.” When asked what makes Crystal Creek® different than other livestock companies, Owen replied, “They always have time to answer our tough questions. We have seen big improvements in the health of the cows, milk components, and SCC. You can't beat their calf products. Our experience with Crystal Creek® has been fun and enjoyable. We wish we could have done business with them in our farming operation sooner.”

Crystal Creek® values the relationships created with our customers and appreciates hearing their experiences. We strive to deliver exceptional customer service to each and every one of our customers and we wish the Yoder family many more years of continued success.