**Back to Basics: Calf Barn Ventilation**
Lindsay Ferlito and Casey Havekes

When it comes to troubleshooting calf health challenges, one of the first areas we focus on is ventilation. Ensuring that calves have clean, fresh air is critical for their success. Over the past several decades there have been various calf barn ventilation strategies that have been explored and implemented in attempt to maximize air exchanges and improve air quality for calves. Even with some of these fancy new technologies and systems, it's important to understand the basics of each ventilation system and to understand it's not a "one size fits all" concept. Each calf barn is structurally unique (especially those that are retrofitted!) and each barn warrants individual consideration when it comes to ventilation. In this article we will breakdown the most common ventilation systems, discuss pros and cons of each, and the importance of adequate ventilation.

The goal of a calf barn ventilation system is to provide adequate fresh air and remove odors, dust, pathogens, and excess moisture from the barn. This is done by having 4 air exchanges an hour (the entire volume of air in the barn is exchanged with fresh air from outside) in the winter and 40 to 60 air exchanges in the summer. Fresh air should be delivered consistently throughout the barn at calf level without creating a draft (in the summer, slightly higher air speeds near the calf are okay). Good barn ventilation can be achieved in a few different ways, discussed below.

**Hutches**
While hutches aren't actually a "barn", they are one of the more common ways to house calves. In this system, calves are usually either tethered to one hutch or have a small penned area in front of their hutch. The ventilation in hutches is the simplest and most natural system of all as there are no mechanics involved. Natural ventilation is discussed in more detail below. Hutches are relatively cheap, it's easy to add or remove hutches, and you don't need to build a barn or structure. However, it can be hard to see and access calves when they are inside the hutch, airflow can be poor in the summer, and employees may not like feeding calves outside during winter in the North Country.

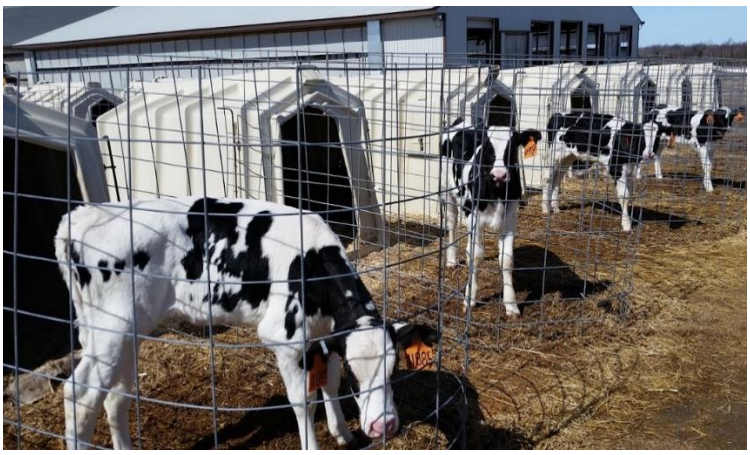
Photo credit: L. Ferlito.

**Natural Ventilation**
Naturally ventilated barns usually have side curtains that open and close with the weather, and they don't have an additional ventilation system (fans) to help move air. While these types of barns provide a lot of natural light, are more affordable and there is less to maintain, they do not provide constant and consistent air flow (you are relying on the wind/breeze) and they work best with narrow barns.

Photo credit: L. Ferlito.

**Mechanical Ventilation**

Mechanical ventilation is when you use fans to push or pull air in and out of the barn to achieve the desired ventilation rates. Mechanical ventilation can be either cross ventilated (air inlet on one side of barn and fans on the other pull air across the width of the barn), tunnel ventilated (opening at one end of barn and fans at the other pulling air down the length of the barn), or neutral pressure (fans on one side of barn pushing air into barn, and holes and fans on the other end pushing air out of barn). These systems can achieve a good amount of airflow and can be all automated, however, they usually don't have a lot of natural light, they can be expensive and have more moving parts to maintain(more fans), and it is hard to troubleshoot the more complex systems.

Photo credit: L. Ferlito.

**Positive Pressure Tube Ventilation**

Positive pressure tube ventilation (PPTV) is when a tube is hung from the ceiling of the barn, with a fan blowing air through holes along the tube to deliver fresh air throughout the barn. Tubes can be added to a naturally or mechanically ventilated barn to help increase air exchanges, and can work well when retrofitting a barn. Tubes can provide good air flow at calf level, they are somewhat easy to design, and

can be relatively affordable. However, not every barn is a good candidate for tubes (ie: low ceilings) and it can take multiple tubes to get the desired air exchanges (so the cost can add up and there becomes more to maintain). Also, not all tubes are created equal, so make sure it's designed properly for your barn and goals (space, number of animals, desired air exchanges and air flow, type of material used, etc…).


Photo credit: L. Ferlito.

Other factors to consider when designing a ventilation system are the amount of space per calf (recommendation: >35 sq ft/calf), as well as the feeding protocols and the age of the calves in the barn (calves fed more milk or weaned calves that are still in the barn will produce a bit more waste requiring more ventilation). Also, regardless of what system you have, there will be some regular maintenance involved. Dirty build up can significantly reduce fan efficiency and therefore provide fewer air exchanges than the system was designed for. If your answer to the question "when was the last time your fans were cleaned and inspected?" is similar to "well we installed the barn 5 years ago, so… 5 years ago" or "hmm I don't remember", then it's probably time to clean those fans (recommendation: at least 1/year and ideally more like 2-3 times depending on how dirty they get).

Adequate ventilation becomes increasingly important when we consider that one quarter of pre-weaned heifer deaths were due to respiratory health issues (USDA NAHMS, 2014). Further, according to USDA NAHMS 2014 data, the main cause of death for weaned heifers was respiratory issues. A system that does not provide adequate fresh air can evidently have a negative impact on calf performance and health, with poor ventilation being linked to increased pneumonia and respiratory disease. Recently, research has demonstrated that respiratory issues during the early stages of life can actually lower productivity and reproductive performance later in life (Abuelo et al., 2021). Combined, these facts confirm that proper ventilation for calves should be a top priority for dairy producers.

If you are interested in learning more or seeing a hands-on demonstration of fogging a calf barn to troubleshoot ventilation issues, make sure to attend our upcoming free Calf Barn Ventilation Program on July 27 (Stauffers, North Lawrence, NY) and July 28 (Bellers, Carthage, NY). Click here to register:

https://ncrat.cce.cornell.edu/event_preregistration_new.php?id=1597.

For help troubleshooting calf barn ventilation at your farm, contact a CCE NCRAT Dairy Specialist, Casey Havekes (cdh238@cornell.edu; 315-955-2059) or Lindsay Ferlito (lc636@cornell.edu; 607-592-0290).