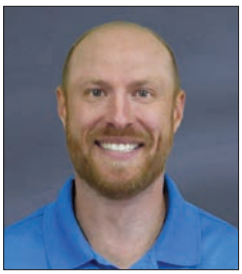
CRYSTAL CREEK NEWSLETTER
AUGUST 2022

3 Common Calf Barn Ventilation Questions Answered



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I have been fascinated with calf barn ventilation for more than a decade; to the point where I have made its study the focus of much of my professional career. Calf raisers around the world often have the same questions when it comes to ventilation and this article will discuss the three most common calf barn ventilation questions I receive. Interestingly enough, the questions themselves are often more complicated than their associated answers.

Question #1: Can Calves Get "Too Much" Fresh Air?

Simply put, no. There is no such thing as "too much" fresh air. In the entire history of the world, no calf has ever died from an overdose of fresh air volume. Conversely, untold numbers of calves die every year from inadequate ventilation leading to poor air quality and subsequent respiratory disease.

Consider calves raised in outdoor hutches. While people may not like the labor issues associated with outdoor calf raising, it is an undisputed fact that calf health performance is excellent in outdoor hutch systems. When those calves step outside of their hutch, they are surrounded by an almost infinite amount of fresh, outside air. No calf raiser has ever said "Doc, sometimes I worry about my calves standing outside their hutches being exposed to "too much" fresh air. Do you think it will hurt them?" Calves raised in outdoor hutches have proven for decades that there is no such thing as "too much" fresh air. It's a simple answer to a seemingly simple question…but is it really a simple question?

Over the years I've learned that when people ask me about calves having "too much" fresh air, rarely are they asking about the volume of fresh air that a calf will breathe. Typically, conversations go like this:

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Producer: "Doc, can calves get too much fresh air?"

Me: "What do you mean by "too much"?"

Producer: "Well, I don't want my barn to be drafty."

Me: "A draft is a measure of air speed, not volume. Are you concerned about air speed and drafts or the actual volume of fresh air brought into the barn?"

Producer: "I just don't want my calves to be cold."

Drafts and cold are the real concerns of most calf raisers. When most people ask the question "Can calves have too much fresh air?" what they are

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really asking is "If it's cold outside and we bring all that fresh air into the barn, won't that make my calves cold?" or "If we bring in high volumes of fresh air won't that make it drafty on the calves?"

We cannot adequately answer the question of "too much" fresh air without answering the draft and cold related questions because that is what the vast majority of producers are actually asking about.

What producers are really asking in regards to fresh air:

A. "If it is cold outside and we bring that fresh air into the barn, won't that make my calves cold?"

Bringing cold outside air into a barn will make the barn cold…not necessarily your calves. Using management tools like frequent bedding with generous amounts of long-stem lofty straw, calf jackets and increased calorie feeding will keep calves warm and healthy despite cold temperatures in the barn.

B. "If high volumes of fresh air are brought into the barn, won't that make it drafty on the calves?"

The simple answer: It depends. Some ventilation systems can bring in high volumes of fresh air without creating a draft and others cannot. The ideal calf barn ventilation system should adjust along with seasonal changes to provide heat abatement during periods of heat stress and provide safe, draft-free ventilation when it's cold.

Question #2: What is a Draft and Should They be Avoided?

Webster's dictionary defines a draft as "a current of air". This definition implies that it is neither good nor bad. We know that currents of moving air increase heat removal rates through the convective process. If you burn your finger on a stove, you will probably blow on it. Why? Because we inherently know that by increasing airspeeds over a surface, we can cool the object faster. Moving air has the ability to strip heat off objects. This is the key to understanding drafts as they relate to calves.

In 1986, a paper by the American Society of Agricultural and Biological Engineers titled "*Design of Ventilation Systems for Poultry and Livestock Shelters*" defined a draft as "airspeeds in excess of 29.5-59 feet per minute". A definition with this level of precision makes nice lecture material for freshman veterinary students but leaves calf raisers looking for something more tangible. Most ventilation professionals today have universally accepted 60 feet per minute (0.68 miles per hour) as a draft threshold of pre-weaned calves during times of cold weather.

In the case of cold weather, drafts are to be avoided because they will exacerbate cold stress. But, in the case of hot weather, the convective properties of drafts can help calves stay cool.

Young calves have a thermoneutral zone (TNZ) of 50 to 78 degrees Fahrenheit (Wathes et al, 1983) where they burn no additional calories to maintain body temperature. This means that when temperatures dip below 50 degrees Fahrenheit calves begin to burn calories to stay warm and above 78 degrees Fahrenheit, they burn calories in metabolic cooling processes.

Simply put, when it is above 78 degrees Fahrenheit, calves can benefit from high-speed air, 2 miles

An anemometer is a windmill-style air speed meter.

per hour or greater, to assist in heat abatement. In this case, drafts over 2 miles per hour have also been shown to help reduce fly pressure on calves as well as help keep bedding dry. During heat stress, drafts are good for calf health.

When it is below 50 degrees Fahrenheit calves should not be exposed to airspeeds greater than 60 feet per minute in order to prevent excess convective heat loss. There is a grey area about how to ventilate for temperatures between 50 and 78 degrees Fahrenheit. Science has yet to pin down an ideal airspeed vs. ambient temperature relationship. Until that day comes, calf raisers are left to use their experience to guide their decision-making process.

Question #3: What is the Most Important Factor to Consider When Designing a Ventilation System?

There are three major criteria that must be considered when designing a calf barn ventilation system. They are:

1. How much fresh air volume needs to be brought into the barn?
2. How is the air speed at the calf level going to be controlled?
3. How is the fresh air going to be effectively distributed into the calf space?

Of these three criteria, the most important one is effective fresh air distribution into to the calf space. Calculating the correct air volume and making it non-drafty in the winter does no good if that fresh air does not reach the calf. All too often people think about ventilating the barn, when what should be addressed is the effective ventilation of the calf space, however that is defined. In a barn with two rows of 25 individual calf pens, the major concern is effective delivery of air into the calf pens themselves. Instead of thinking about ventilating the barn as a whole, envision two narrow rectangles, each of them being 7 feet wide x 4 feet tall x 100 feet long. Those narrow rectangles of calf penning within the barn represent the space in which the calves are living and more importantly, breathing. Everything in the design considerations needs to focus on effective delivery of air into that small space.

When it comes to the science of calf barn ventilation, there is still a lot for us to learn. As our knowledge on this topic progresses, it often seems there are more questions than answers. We are beginning to understand how the interrelationships between air speed, volume, distribution and temperature all impact air quality. Understanding these interrelationships will allow us to create better ventilation systems that ultimately improve calf health.

For a deeper understanding of the differences between varying styles of ventilation systems and their associated pros/cons read "*Winter Calf Barn Ventilation: Can Calf Barns Really Have Too Much Fresh Air in the Winter?"* published in the December, 2017 Crystal Creek® Newsletter.