

# Ventilation – Managing Calf Barns

**Summary:** Calves need good quality air if they are going to be healthy. Ventilation management is essential to achieve this goal. The steps to go good management are:

- **Setting air quality goals**
- **Measuring air quality – what to do**
- **Managing housing – if you are already meeting your goals right now**
- **Managing housing - when threshold values are not met**

## The role of ventilation management in providing good air

In addition to good nutrition, water and a clean, dry, and comfortable place to rest calves need good quality air. Regardless of the type of housing used quality of air can depend on the location of the calves. Where a choice is available it's preferable to find locations that are up wind of older heifers and cows. Further, calf housing several hundred yards from cow and heifer barns takes advantage of dispersion of contaminants regardless of wind direction. Our goal is clean fresh air.

Calf hutches or outdoor pens compared to barns have an advantage in providing access to good quality air. However, many calf enterprises have chosen barns for housing. Operator comfort and convenience of calf access are often cited as major advantages.

One huge change when moving from outdoor housing to barns is the responsibility for ventilation. The calf care person is now in charge of providing “good air” rather than the calf. Agricultural engineer Kurt Gooch observed, “Problems arise when the ventilation system is managed based on human needs and not that of the calf. Remember, calves are in the barn 24/7 and the caretaker only a comparatively small proportion of time.” (Gooch, 2007)

For those of us located in cold climates providing “good air” in barns is especially challenging because, compared to higher warm weather air exchange rates, winter-time lower airflow rates:

- (1) Dilute dust, bacteria, viruses and noxious gases much more slowly, and
- (2) Do a poorer job of removing moisture (about 0.22 lbs. (100g) of moisture are released per hour for every 100 pounds (45kg) of live body weight in the barn).

## Setting air quality goals

We know that diseases spread through the air. Airborne viruses and bacteria can be passed from infected animals to healthy ones. Low air exchange rates favor high concentrations of pathogens. Also, when there are many small airborne water droplets pathogens hitchhike rides from sick animals to others in the same air space. Noxious gases, especially ammonia, reduce the

Sam Leadley, Calf & Heifer Management Specialist

[sleadley@yahoo.com](mailto:sleadley@yahoo.com) [www.atticacows.com](http://www.atticacows.com)

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effectiveness of the natural defense mechanisms designed to keep bacteria and viruses out of calves' lungs

Let's say we set three air quality goals to provide a healthful calf environment:

- (1) little or no ammonia odor in the barn,
- (2) the relative humidity inside the barn is no more than 10 % higher than outside, and
- (3) the air temperature inside the barn is no more than 10°F (6°C) warmer than outside.

## **Measuring air quality – what to do**

You can assess ammonia odors by placing your nose at the same level above the bedding as a calf's nose would be when in a lying position. It helps to do this right away upon entering the barn since your sensitivity to ammonia gas drops fairly quickly on exposure.

If in doubt about whether or not there is an ammonia odor have a non-farm friend make the “sniff test” for you. Remember that the test is done at calf nose location, not standing in the middle of the feed alley.

More exact measurement can be done with a toxic gas detector. I've seen them for sale on E-Bay for less than US\$100. My more expensive instrument draws air in through a single-use glass tube and reads directly in parts per million (ppm) of ammonia.

I use a digital read-out meter that cost about US\$170 that measures both relative humidity and temperature. It takes about 15 minutes to reach a stable reading. Our local hardware store sells instruments ranging from \$10 to \$30. All of these are easy to read directly in percent relative humidity. Any inexpensive thermometer will work to estimate temperature.

Caution! It is best if these relative humidity measurement instruments are not left in a calf barn any longer than the time it takes to get valid measurements. Experienced persons tell us that dust will accumulate in and on instruments left in the barn. The dust can make the relative humidity readings inaccurate.

## **Managing housing – if you are already meeting your goals right now**

The first two steps in managing housing for maintaining good air quality are (1) identify specific goals, and (2) measure air quality regularly. Let's say that you compare current readings with your goals. Today, everything is okay.

Nevertheless, only one thing is certain: Nothing will stay the same! Weather changes from season to season, from day to day, and even sometimes from hour to hour. Think about all the other changes, too. The numbers of calves in our barn go up and down. We use different bedding depending on cost and availability. The people providing calf care change.

Sam Leadley, Calf & Heifer Management Specialist

[sleadley@yahoo.com](mailto:sleadley@yahoo.com) [www.atticacows.com](http://www.atticacows.com)

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Expect your air quality values to change. Therefore, be consistent in collecting information and recording it. Make changes in ventilation before you start treating sick calves.

## **Managing housing when threshold values are not met**

What if differences in relative humidity inside the barn compared to outside exceed 15 or 20 percent? And/or differences in temperature are over 15 or 20 degrees? Or, you can pick up an ammonia odor in pens of older calves? These facts suggest that inadequate air exchange is a problem.

In **naturally ventilated barns** (usually less than 35 feet (10-11 meters) wide, most often only two rows of pens) our challenges most often are how to:

- (1) open up the sides and ends of the barn without letting in too much precipitation and,
- (2) depending on the temperature, not creating excessive draftiness.

“Research has shown that a New York State naturally ventilated calf barn’s curtains needed to be repositioned as many as 7 to 10 times per day during transition weather periods in order to maintain a quality environment.” (Gooch 2007, p137). This need for constant attention is why they recommend if feasible “an automatic control system that continuously monitors the barn environment and makes appropriate system adjustments is best.”

Lacking an automatic control system to open and close curtains this is my rule of thumb. Plan on being in the barn at least four different times throughout the day to assess conditions and make needed changes.

Regardless of the type of pen (individual or group) it is essential to maintain dry bedding to suppress ammonia release in calf barns. Scrape alleys and areas around automatic or mob feeders accumulate manure. That can release ammonia as well. It is essential to schedule cleaning these areas frequently enough to control ammonia production.

In **mechanically ventilated barns** where our air quality goals are not met we need to review our maintenance schedule. I have observed that the most common cause of poor air quality in these barns is not incorrect design. It is inadequate maintenance of ventilation controls and equipment.

If maintenance does not improve conditions for sure check ventilation design. Gooch describes two design approaches: “the room volume air exchange method” and “the per animal head method” You can find suggested minimum ventilation rates for four weather conditions (summer, warm, mild and cold) for both design methods by going to [www.calfacts.com](http://www.calfacts.com) and scrolling to “Ventilation Air Exchange Rates by Season.”

Sam Leadley, Calf & Heifer Management Specialist

[sleadley@yahoo.com](mailto:sleadley@yahoo.com) [www.atticacows.com](http://www.atticacows.com)

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Additional ventilation suggestions including positive pressure tubes are found in “Practical Considerations for Ventilating Calf Barns” by K.V. Nordlund at this URL:

[http://www.vetmed.wisc.edu/dms/fapm/fapmtools/8calf/VCNA\\_Calf\\_Barn\\_Ventilation.pdf](http://www.vetmed.wisc.edu/dms/fapm/fapmtools/8calf/VCNA_Calf_Barn_Ventilation.pdf)

References: Gooch, Curt “Role of Facility Design and Ventilation on Calf Health.” Proceedings of the Professional Dairy Calf and Heifer Conference, March 20-23, 2007, Burlington VT, pp135-146. And, “Cold Weather Ventilation and Humidity Management for Improved Respiratory Health” American Veal Association Technical Bulletin.

Sam Leadley, Calf & Heifer Management Specialist

[sleadley@yahoo.com](mailto:sleadley@yahoo.com) [www.atticacows.com](http://www.atticacows.com)

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