

Basic Recommendations for Naturally Ventilated Calf Barns *(modified 1/15/2007)*

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Based upon research conducted during the winter of 2004, there are three key items that reduce the risk of respiratory disease in calves in naturally ventilated barns.

1. **NESTING**, through the use of deep straw from November through March allows the calf to reduce cold stress and resist infection. The straw should be so deep that when the calf lies down, it is difficult to see the calf's legs.



Figure 1. *The calf's legs are not visible while lying down. The calf can nest and prevent the loss of body heat when the barn temperature is below 50 degrees Fahrenheit, the lower range of the thermo-neutral zone of week-old calves.*

Calf blankets can substitute for some bedding, but our impression is that even with blankets, calves remain under thermal stress in winter when they have to lie entirely on top of bedding materials.

2. **SOLID PANELS BETWEEN EACH CALF** will reduce the transmission of respiratory disease. However, the solid panels should be limited to a **MAXIMUM** of three sides. The use of “hovers” or solid panels above is discouraged as it will reduce air quality tremendously. Rather than prevent cold stress through enclosure, nesting is preferred.



Figure 2. *These pens illustrate a nearly ideal calf pen design, characterized by two solid sides between pens that can be removed from the calf room for cleaning, open mesh fronts and rears, except for a low solid barrier about 20 inches high in the rear. There is a 16” space between the two rows of stalls shown. Deep straw bedding is used in the winter. An alternative to the sloped drain in front of the pen is to make a deep, crushed rock base to the stalls with tile drainage, covered with sand that is replaced periodically, and further covered with deep straw bedding in winter. The natural ventilation provided by the open sidewalls is supplemented with a positive pressure tube delivery system and fan that distributes about 15-25 cfm of fresh air per calf throughout the barn on a year-around basis.*

3. **POSITIVE PRESSURE VENTILATION SYSTEM** to direct a very small amount of fresh air into the pen. It is important that the volume of air is small as a large draft will chill the calf. Our research has shown that the calf pens do not ventilate naturally, resulting in a tremendous accumulation of airborne bacteria, and that these

high concentrations are associated with risk of respiratory disease. The general plan for installation of the positive pressure system follows.

- a. One tube system with air exiting from both sides at proper speeds will mix air about 15-18 feet on each side of the tube, so one system is needed for approximately every 35 feet of building width. For example, the 52 ft wide building below has two tube systems.



- b. The stainless steel fans are typically mounted in an exterior wall to force exclusively exterior air into the tube. The system should NOT recirculate air within the room. A hood should be placed over the fan to protect it from rain and snow.



- c. The fans should be sized to provide approximately 15 cfm per calf.
- d. The plastic duct should have a cross-sectional diameter slightly larger than the fan, usually 1.3 to 1.5 times the diameter of the fan. This allows for less velocity in the near end of the tube, less turbulence, and more uniform air flow exiting the tube.
- e. The system is most satisfactory if the first few feet of the duct is made of solid material. This prevents the tube from flapping due to a Venturi effect of air turbulence near the fan. Various devices such as plastic barrels or pails with both ends removed have been used to provide a rigid duct for the first feet and also to provide a convenient place to mount the plastic tube.



- f. The tube is usually clipped to a cable that has been stretched the length of the room. Clipping the tube to the cable prevents it from rotating and keeps the air exit holes open toward the desired locations.



- g. The tube should be suspended to clear normal activities within the barn. Generally, the bottom of the tube should be a minimum of 10 ft. to the bottom of the tube. If suspended at this height, holes should usually be punched at the 5:00 and 7:00 o'clock positions. If lower at 8 ft high, the holes should usually be punched at 4:00 and 8:00 positions. If the ceiling is too low to allow this and the bottom of the tube drops as low as 6 feet above the floor, the holes should be punched at 3:00 and 9:00 positions to avoid a perceptible draft on the calves.
- h. The number, spacing, and diameter of the holes need to be calculated carefully. The calculations are based upon the amount of air entering the tube from the fan, a desired exit speed through the holes of about 700-850 ft per minute, and the goal of having small amounts of air exit near every pen within the room.
- i. The fans should run continuously through fall, winter, spring, and summer, never shutting down. This amount of air entering the barn is considered the minimal ventilation rate for calf buildings. The air entering the barn through the tube will exit the room through existing openings, usually an open ridge during the winter.
- j. During moderate winter weather, as well as mild and hot weather, supplement the positive pressure system by opening sidewalls or engaging negative pressure systems. These supplemental systems for warmer conditions are compatible with the positive pressure tube system.
- k. In some cases, the tube will accumulate dust over time. In such cases, untie the end with the fan running and gently slap the tube along its length with a broom, allowing the fan to blow the dust out.

1. I am currently aware of two suppliers of this equipment: FarmTek at 1-800-327-6835 and QC Supply at 800-433-6340. FarmTek carries two grades of tubing and the heavier grade should be selected for most installations.

SUMMARY

Our experience suggests that the preventing cold stress using deep straw, separating each calf with a solid panel, and using a positive pressure ventilation system to mix small amounts of fresh air into the pens will reduce respiratory disease in calves to about 20% of the rate prior to these changes.