### Significance

Based on the results of this study, mid-diaphyseal fractures had a better prognosis for surgical correction compared with distal or proximal fractures. Less displacement of the fragments were found in older animals, and may allow medical management of selected cattle. In conclusion, the best surgical fixation of comminuted femoral fracture has not yet been found. Continued research is needed to optimize fracture stabilization in young cattle without interfering with the growth of the femur.



# Calf Respiratory Disease and Pen Microenvironments in Naturally Ventilated Calf Barns in Winter

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### Introduction

Dairy operators have constructed naturally ventilated barns with individual pens to house calves from birth to weaning. These barns vary in terms of construction materials, stocking density, pen enclosures, bedding, and operation of sidewall openings and ridges. Endemic calf pneumonia is common in these barns, particularly through the winter months. We investigated the use of airborne bacteria counts to characterize naturally ventilated calf barns and pens, and examined the relationship between airborne bacterial counts, various pen factors, and calf respiratory health.

### Materials and Methods

Thirteen calf barns that met selection criteria were recruited and visited during the winter months of January through March 2004. A minimum of 12 preweaned calves were randomly selected in each barn and scored for the presence of respiratory disease. Respiratory disease scores were based upon body temperature, cough, nasal discharge, ocular discharge, and ear position. Using the Air IDEAL™ impaction microbial sampler, air samples from each of the subject calf pens and from at least five alley sites within each barn were exposed to sheep blood (BAP) and eosin methylene blue (EMB) agar plates. Total colony-forming units on each media were counted and concentrations of bacteria per cubic meter were calculated. Temperature and relative humidity was recorded in each calf pen, the barn alley, and outside the barn. Stall bedding type, dry matter, and a calf nesting score were recorded. Barn and pen construction, dimensions, and calf numbers were recorded. Exterior wind speed and direction, with dimensions of ridge, eave, and curtain openings were used to estimate building ventilation rates. Data were recorded in Excel and analyzed using SAS (SAS, 1999). Pen bacterial counts were compared with alley bacterial counts in PROC FREQ, using Mantel-Haenszel statistics based upon rank scores. PROC MIXED was used to develop models, using a backwards elimination process and with farm as a random effect, for the fixed effects which were significant ($P<0.05$) for alley bacterial count, pen bacterial count, and prevalence of respiratory disease.

### Results

Pen air bacterial counts were significantly different from alley air bacterial counts on both BAP and EMB ($p<0.001$). Significant factors ($p<0.05$) associated with reduced alley air BAP counts were increased ventilation changes per hour, reduced stocking density as measured by volume per kg of calf, reduced pen air BAP counts, and barn type with conventional barns having lower alley air bacterial counts than greenhouse barns. Significant factors associated with reduced pen air BAP counts were increasing number of open planes of the calf stall, decreasing pen temperature, and bedding type (straw vs. wood) with lower counts associated with wood-particle bedding. Factors associated with reduced prevalence of calves with respiratory disease were reduced pen air bacterial counts on BAP, presence of a solid barrier between each calf pen, and increasing "nesting" score, reflecting an ability to nest into the bedding.

### Significance

The single calf pens are microenvironments within the naturally ventilated barns. In winter, natural ventilation of barns that averaged a calculated 18 changes per hour did not provide for clean air in the pens. Increased ventilation rates effectively lowered airborne bacterial concentrations in the alleys, but solid fronts and hovers result in the accumulation of airborne bacteria within the pens. The accumulation of high pen bacterial counts was associated with increasing prevalence of calves with respiratory disease. The solid fronts and hovers are installed to prevent drafts and chilling, but it appears that supplying deep straw bedding in which the calf can "nest" is a preferable strategy. Although straw bedding was associated with higher pen air bacterial counts, the thermal control benefits of nesting appear to outweigh the airborne bacteria associated with straw. While enclosing the pen with solid fronts or covers should be avoided, a single solid barrier between calves is associated with decreased prevalence of respiratory disease.



# Fecal Shedding of *Mycobacterium avium* subsp *paratuberculosis* in Calves: Implications for Disease Control and Management

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### Introduction

It is widely accepted that most infections caused by *Mycobacterium avium* subsp *paratuberculosis* (MAP) occur *in utero* or in the neonatal animal. The challenge, however, has been to demonstrate and detect the infection in the young animal, as the onset of clinical signs often takes several years. Earlier detection may allow for more prudent animal management decisions. Two primary objectives of this study are to determine whether fecal shedding of MAP can be detected in naturally infected young animals and if there is a relationship between MAP-shedding cows and fecal shedding in their offspring. This was a longitudinal, prospective study of two years' duration with more than 1,600 samples. It is a cooperative study with MSU, USDA, Michigan Dairy Association, private practitioners and dairy producers.

### Materials and Methods

This study looks at dairy calves of four age groups from seven herds scattered throughout lower Michigan with varied MAP prevalence and management styles. Fecal samples are obtained from ten calves in each of the four age groups. Calves from positive dams (fecal or ELISA) are targeted; calves from test-negative dams fill out the group and the test interval is three months. Serial testing "high risk" calves (from positive dams) is a priority. The TREK® liquid culture system is the test used for fecal culture. Positive fecal cultures are confirmed with acid fast staining and IS900 real time PCR.

### Results

Preliminary results are in the early stages (240 samples), but we have detected shedding in eight calves representing all four age groups from five of the seven farms. Also, five of the positive fecal cultures were seen in calves with a test-positive dam.

### Significance

One conclusion that can be drawn at this time is that we apparently are able to detect shedding of MAP in naturally infected dairy calves using the TREK liquid culture system. As to the relationship between the culture-positive calf and the status of her dam, the numbers are too small to determine at present. The intended significance of this study is to help determine if this method may be used as a detection tool to identify some Johnes-infected calves at a younger age than was traditionally thought possible. If this is borne out, can the results be used for culling strategies or housing decisions on the infected dairy?