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Case Study: Calf Pneumonia

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ABSTRACT: This article describes the investigation of a calf pneumonia outbreak in a dairy herd and the practical steps taken to treat sick animals, as well as improve overall calf management. High levels of morbidity meant a blanket treatment approach with antibiotics and NSAIDs was taken for all calves. Key management changes were made in calving pens, colostrum management was improved, changes to ventilation in calf sheds were made, and a protocol for feeding calves was drawn up. DOI: 10.1111/j.2044-3870.2012.00148.x

INTRODUCTION

Calf pneumonia has major impacts on the economic performance of cattle operations. This is due to direct costs of morbidity, mortality and treatment as well as long-term effects on performance. A single case of pneumonia carries a mean cost of £43.26 per sick dairy calf, and a mean cost of £29.58 per calf for the rest of the group. Costs in suckler calves are higher with a mean cost of £82.10 per sick calf, and £74.10 per calf for the rest of the group (Andrews, 2000). These estimates do not include a value for the welfare costs endured by the calves, nor the emotional cost to the stockman and others within the industry (Robertson, 2000).

BACKGROUND

This case study focuses on a dairy herd of 220 cows with 180 homebred youngstock. The herd has calvings all year round but autumn and winter calving predominates. Cows are vaccinated for BVD, leptospirosis, rotavirus, coronavirus and *E. coli* K99. The Johne's status of the herd is unknown.

On 20th December 2011 veterinary assistance was sought as three calves had been treated for pneumonia in the last week. There was a concern that the problem was more widespread and the aim of the vet visit was to minimise further illness and prevent any losses.

Fig. 1: *Calving shed.*

ISSUES AND SOLUTIONS

- **High numbers of cattle calving in one place.** Significant risks to the newborn calf as calving cows are the main source of infectious agents for the calf, such as rotavirus, coronavirus, *E. coli*, *Cryptosporidia*, *Coccidia*, *Salmonellae* and Johne's.

  Solution: Not possible to have individual calving pens - clean out after every calving if possible, reduce maximum interval to two-weekly intervals.
- **Calves kept too long in calving pen.** Increases risk of transmission of disease particularly in multi-calving pen.

  Solution: Remove calves sooner, removal at birth was advised.
- **Sick animals kept in calving pen.** Such animals pose a significant threat to both newly calved cows and their calves. Sick cows are more likely to be PIs or have Johne's disease. Herd was vaccinated for BVD but not tested, and Johne's status was unknown.

  Solution: Stop keeping sick cows in calving pen.

In order to assess the situation a 'walk-through' of all areas where calves were kept was performed. This was done with all members of staff who had involvement with calves on the farm.

CALVING

Cows moved into the calving shed (Fig. 1) in groups of 10-12 animals, approximately two weeks before calving. Calves were then kept with their mothers in this shed for 2 - 7 days. Calving pens were cleaned out every three weeks and appeared clean and dry. Sick cows were often kept in the same group as the calving cows. In Fig. 1 the animal behind the calf in the foreground is in fact a lame heifer.

CALF MANAGEMENT

Newborn calves were fed 4 L of their mother's colostrum by bottle ASAP after birth. Further questioning revealed there was also a good store of frozen colostrum. On the day of investigation four

calves were between two and eight days old, and bled to determine passive transfer (Table 1). All showed partial failure of passive transfer i.e. total protein <5.2 g/dL. Failure of passive transfer from colostrum has a major impact on the incidence of calf respiratory disease (Potter and Aldridge, 2010).

TABLE 1: Serum total protein levels from four calves taken on the day of investigation measured using a refractometer

Calf Number	Serum Protein (g/dL)
1	4.5
2	4.6
3	5.0
4	4.7

COLOSTRUM FEEDING SUGGESTIONS

- Protocol in place excellent so focus on:
  1. Ensure colostrum harvested hygienically.
  2. Use colostrometer to test all colostrum fed to calves - only use if suitable quality*
  3. Calf should receive 4 L more of mother's colostrum 12 hours after first 4 L.

* If a cow or heifer produced poor colostrum, then stored colostrum of sufficient quality would be used from animals ideally with a known, negative Johne's status

Fig. 2: *Calf preparatory shed.*

Fig. 3: *Inside the calf preparatory shed.*

From the calving pen, calves were moved into a preparatory shed and placed in individual pens for two weeks (Figs. 2 and 3). No pneumonia was reported in this shed in the current outbreak, although cases had occurred in the past. Calves in this shed were bright and clean, all bedding was fresh and there was clean fresh water and feed in front of every animal (Fig. 4). Each calf received 2 L milk powder twice daily that was gradually increased up to 3 L twice daily by the time of weaning.

Ventilation in this building was extremely poor however (Fig. 5). The cubic capacity of the shed was 176 m^3. Animals in the shed weighed up to 60 kg, so required 6 m^3 each. The shed never housed more than 12 animals = 72 m^3 required air space. Inlet area totalled 7.12 m^2 with the large open-fronted door

Fig 4: *Calf in individual pen in preparatory shed. All bedding was fresh and there was clean fresh water and feed in front of every animal.*

Fig. 5: *Roof of the preparatory shed with no outlet and subsequent poor ventilation, demonstrated by lots of cobwebs.*

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accounting for more than half of this (it was open on the day of investigation but could be closed in adverse weather conditions). A side window which joined an adjacent building full of bulling heifers, accounted for most of the rest of the inlet space. A rough on-farm calculation using 0.08 m^2 as the required inlet area for animals weighing 60-200 kg gave a total requirement of 12 x 0.08 = 0.96 m^2. Therefore, inlet although poorly controlled was sufficient, but there was no outlet. Insufficient outlet is the main reason for poor ventilation in the majority of livestock accommodation (Kelly, 2002). Any building without an exhaust in the roof will not function simply by stack effect and openings in the sidewalls will be required to operate as both inlets and outlets. The active inlet area is therefore reduced in such a situation. The roof space will have the potential to accumulate heat and moisture, leading to condensation and an ideal environment for promoting the potential survival of microorganisms (Robertson, 2000).

IMPROVING THE OUTLET AREA

- Outlet area should be approx. 0.04 m^2 for animals between 60-200 kg (a total for this building of 0.48 m^2 (12 x 0.04).
- Surface area of roof tiles was 0.108 m^2
- Removing five ridge tiles gives an outlet of 0.54 m^2.

Animals of this size will probably not drive a stack effect, but outlet would improve ventilation within the building.

Fig. 6: *Main calf shed.*

Fig. 7: *Inside the main calf shed.*

Fig. 8: *Dedicated area for preparing feed.*

Calves were then moved into the main calf shed in pairs at three weeks of age where they remained until weaning at three months (Figs. 6 and 7). Mixing of age groups was unavoidable due to lack of space. There was also a group of 10 weaned calves in a single pen at the top of the shed. Again all animals, bedding, feed and water were clean and fresh. There was a dedicated area for preparing feed which was very clean and tidy (Fig. 8). A 'Homebrew' calf mix fed twice daily was not measured or weighed.

Ventilation in the main calf building was poor and a significant contributory factor to the pneumonia issue. 32 calves were in this building - a high stocking rate, the mean calf weight in the building was 100 kg. At this weight cubic capacity requirement is 11 m^3 per animal, in total = 352 m^3. The cubic capacity of the building was 729 m^3, so ample. Taking an inlet requirement of 0.08 m^2 and outlet requirement of 0.04 m^2 per animal, targets were 2.56 m^2 and 1.28 m^2 respectively for the whole building. Again inlets were poorly controlled with a large contribution coming from two doorways but overall totalled 7.38 m^2. There were no outlets. Tiles had a surface area of 0.108 m^2; removal of 12 would provide a suitable outlet in the building of 1.296 m^2 and was recommended.

APPROACH TO CURRENT OUTBREAK

Three animals in the main calf shed had been treated for pneumonia with a florfenicol/flunixin meglumine combination (Resflor, MSD Animal Health). The presenting signs had been anorexia, depression and coughing. The farmer felt that there had been a poor response to treatment. Eight animals from different groups in the shed were examined. Seven had elevated temperatures ≥ 39.5°C, all were tachypnoeic, with wheezes and crackles over both lung fields. There was widespread coughing

ISSUES AND SOLUTIONS

- **Mixing of cattle** from different management and age groups increases the number of likely pathogens as the cattle may be carriers of any (or all) of the infectious agents likely to cause disease (Gibbs, 2001).
  Solution: Lack of space prevented better group management – increased importance of improving environment.
- Poor recording of feed. Adequate rumen development is essential at weaning; this cannot be gauged effectively if feed intake is not known. Calves weaned at three months should be eating > 1.5 kg concentrates per day.
  Solution: A protocol for feeding the different aged calves in the shed was drawn up to reach this target.

throughout the shed but no obvious ocular or nasal discharges. The presentation was that of an acute pneumonia outbreak.

A decision was made to treat all 32 animals in the group with a long acting antibiotic - gamithromycin (Zactran, Merial Animal Health) and an anti-inflammatory - flunixin meglumine (Flunixin, Norbrook). The decision was guided by the high levels of morbidity in the group and to minimise handling with subsequent stress to the calves. The single most important factor determining the success of therapy in calves with pneumonia is early onset of treatment and subsequent adequate duration of treatment (Lorenz *et al.*, 2011). Early and effective treatment of calves is essential to reduce spread of infection. It also minimises the possibility of long-term pulmonary damage and chronic pneumonia (Gibbs, 2001).

A week later the group of 10 older animals were to be removed from the shed to reduce infection pressure. This was a short-term solution until building modifications could be made to improve ventilation. No new animals were to enter the shed until the current pneumonia outbreak was under control.

FOLLOW-UP

A full written report was emailed to the farmer two days later with all the findings of the investigation and subsequent recommendations. This included a protocol for new cases - see below. A follow-up phone call was made five days later and the farmer reported significant improvement in all animals in the calf shed.

PROTOCOL FOR ILL CALVES

If there are any new cases of pneumonia the following protocol should be followed:

- Isolate.
- Check temperatures twice daily. (≥ 39.5°C is high)
- Four feeds a day, six hours apart, two of 2 L milk + Rehydion, and two of 2 L LifeAid Extra. Tube if required.
- Zactran 1 ml/25kg s/c + Flunixin 2 ml/45kg s/c.
- Attend to last of all after dealing with healthy calves.

DISCUSSION

It is often the case with outbreaks of pneumonia for farmers to contact a practice with the complaint: "We've got a bug - we want a drug" and it may only be when the outbreak is advanced that vets do get an opportunity to investigate. This case demonstrated several important points to the farmer when time was spent both investigating and discussing the problem.

It is very important to emphasise what is being done well - in order to encourage, as well as stimulate a good working relationship. The approach to feeding of colostrum, milk, concentrates and roughage was excellent on the farm and all pens were clean and

dry. The key finding was that it was unlikely the current pneumonia issue began in the shed where animals were clinically sick. There was a partial failure of passive transfer, the preparatory shed was not fit for purpose and neither was the main calf shed. In addition better management of feeding was required.

Any disease control plan should be specific to each individual farm. To provide solutions to the immediate crisis was essential in this case; however follow-up advice is also needed. Vaccination programmes should be designed to take into account the circumstances on individual farms and should be based around the knowledge of the risk factors and the circulating pathogens (Potter & Aldridge, 2010). However, basic management issues must be addressed first to ensure that the specific pneumonia control strategies have the best possible chance of success; the fundamental issues to consider are colostrum intake, nutrition, other diseases, stress management, housing and disease management. Until all these areas have been addressed there is little point in spending money on specific diagnostic and control measures (Gibbs, 2001). In addition vaccination provides best results when carried out in healthy animals and prior to the exposure to defined stressful events (Lorenz *et al.*, 2011). A review meeting is scheduled for a full assessment of existing changes and to plan possible future control measures including vaccination.

NEWS REVIEW

MERIAL REVEALS THE INCREDIBLE LIFE OF THE LIVER FLUKE

Merial Animal Health is showing a unique video of the life cycle of the Liver Fluke on its stand at this year's Livestock Event. The video includes amazingly detailed footage of the key aspects of the life of the liver fluke from the laying of eggs in the bile ducts of cattle livers, through its development in faeces, seeking out a mud snail, and then its growth inside the animal.

Merial Animal Health's Veterinary Adviser Fiona MacGillivray says: "At previous events the 'flukey livers' we have displayed have always been a talking point because many farmers have never had a close-up view of fluke. Merial has invested in producing some stunning video and still images, and I know many vets and farmers will be fascinated by events such as egg-laying, the miracidia searching for a mud snail host, cercaria moving onto the meadow grass, and the juvenile fluke as it moves towards the bile ducts.

"I am sure that seeing this video will bring home the threat that liver fluke poses for many farmers. Unfortunately it is a growing problem with more than one in five of all cattle that go for slaughter in Britain suffering from infection.[1] These tiny creatures could be costing farmers up to £14m every year[2]."

1. FSA Figures
2. EBLEX 2011

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CONTINUING PROFESSIONAL DEVELOPMENT

In order to test your understanding of this article, answer these multiple choice questions, or if you are a subscriber, go online at www.ukvet.co.uk, and find many more multiple choice questions to test your understanding.

1. **The mean cost of a single case of pneumonia per sick dairy calf is:**
   a. £23.26
   b. £33.26
   c. £43.26
   d. £53.26

2. **The mean cost for the rest of the group is:**
   a. £19.58
   b. £24.58
   c. £29.58
   d. £33.58

3. **Which of the following is NOT a potential infectious agent to the calf in the calving pen:**
   a. *Salmonella*
   b. *Cryptosporidium*
   c. Johne's
   d. Neospora

Answers to the above questions appear on page 43 of the print version, and as supporting information in the online version of this article at: www.wileyonlinelibrary.com/journal/coan

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