How to use the MLA neonatal calf diarrhoea investigation protocol

This protocol is designed to aid in a thorough investigation of neonatal calf diarrhoea in a suckler beef herd. The package has been produced to use during an outbreak, but sections 2–5 may also be used retrospectively to review procedures, identify important risk factors and prepare recommendations for next calving season. The protocol is split into sections that may be printed and used as required.

The intended use is as follows:

**Summary sheet** – To highlight important information from the investigation and to summarise major causes and corrective actions

**Section 1: Farm details** – Contact information for easy access

**Section 2: Enterprise overview**

**Section 3: Farm history of problem**

The latter 2 sections may be sent to a producer before a farm visit or may be completed in conjunction with the producer.

**Section 4: History of current outbreak** – To be completed in conjunction with producer from herd records when these contain sufficient information.

**Section 5: Assessment of risk factors** – Checklist of common risk factors to be observed while on farms and discussed with the producer. Risk factors have been split into major and moderate risks for guidance only, and adaptation and prioritisation to each situation is recommended. The magnitude of the discrepancy from best practice and knowledge of the epidemiology of contributing pathogens should be major considerations when prioritising management changes.

**Section 6: Recommendations for control** – Checklist that may be handed out to the producer once the situation has been assessed.

**Section 7: Management of affected calves** – A checklist for use on farm to ensure all major aspects of management and treatment of affected calves have been addressed.

**Section 8: Diagnostic tests** – Designed to use after the visit to pull all the diagnostic information into one place and allow for easy assessment. It may also be used on farm as a prompt for appropriate testing procedures.

**Reporting to the producer**

It is recommended that the outcomes from the investigation are reviewed in consultation with the producer and a prioritised and agreed list of management changes to control the outbreak is produced.

Major recommendations are best presented as a clear single-page written report containing:

- the outcomes of the investigation
- key points, timelines and delegation of responsibility for:
  - control strategies
  - management changes
  - treatment
  - further monitoring
- arrangements for follow-up

**Further reading**

Meat & Livestock Australia, *Neonatal calf diarrhoea in suckler beef herds*, 2005
Neonatal calf diarrhoea investigation protocol

Summary sheet
Name ___________________________ Farm ID ____________ Date __________/ /20

Presenting complaint

Redefined problem after investigation

Major age group affected:

<table>
<thead>
<tr>
<th>Severity of outbreak</th>
<th>Observed</th>
<th>Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>% loss pregnancy test to weaning</td>
<td>&lt;5%</td>
<td></td>
</tr>
<tr>
<td>Losses within 24 hours of calving</td>
<td>&lt;2%</td>
<td></td>
</tr>
<tr>
<td>Mortality due to NCD</td>
<td>&lt;2%</td>
<td></td>
</tr>
<tr>
<td>% requiring treatment in past month</td>
<td>&lt;4%</td>
<td></td>
</tr>
</tbody>
</table>

Major contributing factors to outbreak

Key management factors to prevent NCD

At calving

Between calves

Other agreed key factors

|
| NCD is an ongoing problem on this property | Y / N |

Previous investigations have determined that the pathogens involved were:

An increased proportion of heifers’ calves are affected | Y / N
Permanent records are kept on sick calves | Y / N
These records are poor / adequate / detailed
Actual / potential cost of outbreak (estimated with the Cost of NCD calculation tool) $ 

Diagnosis (Section 8)

The major aetiological agents isolated were

K99 E. coli  Salmonella
Cryptosporidia  Coccidia
Rotavirus  Coronavirus
Other

Passive transfer needs to be addressed on this property | Y / N
Trace mineral deficiencies are likely to be contributing to the problem | Y / N

Management of affected calves (Section 7)

Producer has protocol for identification of sick calves
A treatment decision tree has been set up
Calves are being treated with an adequate volume of oral electrolyte solution
Calves are being treated with an appropriate oral electrolyte solution
The oral electrolyte solution is made up to the correct concentration

Date for follow up

1 Should be determined in consultation with the producer

Major areas of risk: List major areas of risk in order of likely impact (Section 5)

Date for follow up
### Section 1: Farm details

<table>
<thead>
<tr>
<th>Property name</th>
<th>Herd manager</th>
</tr>
</thead>
<tbody>
<tr>
<td>Owner</td>
<td>Phone no</td>
</tr>
<tr>
<td>Contact person</td>
<td>No staff</td>
</tr>
<tr>
<td>Phone</td>
<td>Regular vet</td>
</tr>
<tr>
<td>Fax</td>
<td>Phone no</td>
</tr>
<tr>
<td>Email</td>
<td></td>
</tr>
<tr>
<td>Postal address</td>
<td></td>
</tr>
</tbody>
</table>

Other consultants

<table>
<thead>
<tr>
<th>Phone no</th>
<th></th>
</tr>
</thead>
</table>

Breed(s) of cattle

<table>
<thead>
<tr>
<th>Phone no</th>
<th></th>
</tr>
</thead>
</table>

Number of breeders

<table>
<thead>
<tr>
<th>Phone no</th>
<th></th>
</tr>
</thead>
</table>

Total number of cattle

<table>
<thead>
<tr>
<th>Market supplied</th>
<th></th>
</tr>
</thead>
</table>

Market supplied
Section 2: Enterprise overview

In the past three years has your number of breeders
- Increased by more than 20%
- Decreased by more than 20%
- Stayed about the same

In the past three years has your stocking rate
- Increased
- Decreased
- Stayed about the same

For the last mob of calves reared to weaning
How many cows calved?
How many calves did you rear?
How many calves did you buy in to rear on cows?
At what age were the calves weaned?

Grazing management
Is your grazing management
- Rotational
- Cell grazing
- Set stocked
- Other (please detail):

Calving pattern
Is your calving pattern:
- a) Year round
- b) Seasonal
- c) Split (spring + autumn)

First period
Start date / / Number of weeks Number of cows

Second period
Start date / / Number of weeks Number of cows

How many paddocks do you have?
What is the stocking density?
Only include the area of the farm where beef cattle are run.

How many calves did you buy in to rear on cows?
Section 3: Farm history of problem

How has your property been affected by calf scours in past three years?

<table>
<thead>
<tr>
<th></th>
<th>Total no. calves born</th>
<th>No. affected</th>
<th>No. treated</th>
<th>No. dead</th>
<th>% affected</th>
<th>% treated</th>
<th>% dead</th>
</tr>
</thead>
<tbody>
<tr>
<td>Last year</td>
<td></td>
<td></td>
<td></td>
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<td></td>
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</tbody>
</table>

Previous years compared with last year:

Two years ago: More severe / less severe
Three years ago: More severe / less severe

Have you had any diagnostic tests carried out?

If yes please detail below:

<table>
<thead>
<tr>
<th>Date of test</th>
<th>Type of test: faecal sample/post mortem</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

Animal records

Are there permanent and detailed records of cow ID? Y / N

At what age are calves given individual identification? Y / N

Cows calving

Do you keep records of calving dates for each cow? Y / N

Do these records show if the cow was assisted? Y / N

Do these records show if the calf lived or died? Y / N

Sick animals

Do you keep records of sick calves? Y / N

Do these records include the following:

<table>
<thead>
<tr>
<th>YES</th>
<th>NO</th>
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<tbody>
<tr>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>Date calf affected</th>
<th>YES</th>
<th>NO</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>Suspected problem</th>
<th>YES</th>
<th>NO</th>
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<tr>
<td></td>
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<td></td>
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</table>

<table>
<thead>
<tr>
<th>Severity</th>
<th>YES</th>
<th>NO</th>
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<tr>
<td></td>
<td></td>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>Treatment</th>
<th>YES</th>
<th>NO</th>
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<tbody>
<tr>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>Whether the calf survived</th>
<th>YES</th>
<th>NO</th>
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<table>
<thead>
<tr>
<th>Any laboratory results</th>
<th>YES</th>
<th>NO</th>
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</table>

<table>
<thead>
<tr>
<th>Information on calves sick but not treated</th>
<th>YES</th>
<th>NO</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Are these records accurate?</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Poor</td>
<td>Excellent</td>
<td></td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Are these records complete?</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Poor</td>
<td>Excellent</td>
<td></td>
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</tbody>
</table>
Section 4: History of current outbreak
(Where possible fill in from producer’s records)

Herd information  (to input into Cost of NCD calculation tool)

<table>
<thead>
<tr>
<th>Number in calving group</th>
<th>Realistic sale value</th>
<th>Realistic replacement value as PTIC breeder</th>
<th>% calves born alive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cows</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heifers</td>
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</tr>
</tbody>
</table>

Expected sale value of weaned calf  
Maintenance cost of calf  
(Nominal cost to cover vaccination, drench and pasture intake)

Calving

Calving start date?  
/ /20

How many have calved to date?  

Date of first (index) case  
/ /20

Temporal history

<table>
<thead>
<tr>
<th>Week of calving</th>
<th>Number calved</th>
<th>Number affected</th>
<th>Number treated</th>
<th>Number died</th>
<th>Mean age of affected calves</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cows</td>
<td>Heifers</td>
<td>Cows</td>
<td>Heifers</td>
<td>Cows</td>
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<td>Week 1</td>
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<td>Week 2</td>
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<td>Week 3</td>
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<td>Week 4</td>
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<td>Week 5</td>
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<td>Week 6</td>
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<td>Week 7</td>
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<td>Week 8</td>
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<td>Week 9</td>
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<tr>
<td>Week 10</td>
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<tr>
<td>Week 11</td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>Week 12</td>
<td></td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>Total</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

Input values into cost of NCD calculation tool  
Morbidity %  
Treated %  
Mortality %

<table>
<thead>
<tr>
<th></th>
<th>Morbidity %</th>
<th>Treated %</th>
<th>Mortality %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cows</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heifers</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Age group affected

Please determine the percentage of calves affected in the age groups shown:

<table>
<thead>
<tr>
<th>Age of calf</th>
<th>Total calves this age*</th>
<th>Number affected</th>
<th>Percentage affected</th>
</tr>
</thead>
<tbody>
<tr>
<td>0–4 days</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5–21 days</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3–6 weeks</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7–16 weeks</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

* For older age groups total number should be number of calves that have reached this age

Has the age of affected calves decreased through the calving period?  Y / N

Do the calves show the following symptoms? (Tick all that apply)

- Soft faeces  Y / N
- Straining    Y / N
- Distended abdomen Y / N
- Coughing     Y / N
- Watery diarrhoea Y / N
- Dehydration  Y / N
- Kicking at belly Y / N
- Death        Y / N
- Blood in the faeces Y / N
- Lethargy     Y / N
- Panting      Y / N

Have the outbreaks been associated with

- Cold weather
- Wet weather
- Hot weather

Cost of treatment (input into Cost of NCD calculation tool)

- Cost of treatment per day $ 
- Time for treatment per calf per day (hrs) 
- Hourly cost of labour $ 
- Number of days of treatment 
- Total cost of treatment/calf $ 

Cost of outbreak (from Cost of NCD calculation tool)

- (Projected) total cost of outbreak $ 
- (Projected) cost per breeding cow $
### Section 5: Assessment of risk factors

All risk factors should be assessed. The following list indicates those likely to be major or moderate contributors to disease. Risk factors can be prioritised further once aetiological agents are established.

1. **Risk factors that will increase the exposure of young calves to enteric pathogens**

   **Major risks**
   - Mating period >60 days
   - Same calving paddocks used from year to year
   - Cows kept in the same paddock for the whole calving period
   - Calving and/or nursing areas poorly-drained (water is visible on the surface or in boot prints/hoof prints)
   - Well defined areas for calving: cow camps
   - High-risk stock (calves less than six months of age or calving cows) in the calving and nursery areas in the three months before calving.
   - Newborn calves remain with pregnant/calving cows for more than 24 hours
   - Fewer than four paddocks used for cows with young calves and the same ones used every year
   - Age range of calves in nursery group greater than four weeks
   - Cows and calves can stand and defecate in water source
   - Cows supplementary fed on ground in same region of the paddock each time

   **Moderate risks**
   - Water source exposed to faecal run off from cattle, especially calves upstream
   - Heifers and cows calve in same paddock
   - Cows or heifers in the calving paddock(s) for more than two weeks before calving starts
   - Single watering points encourage cattle to congregate in small area

2. **Risk factors that will affect colostrum intake, calf welfare and nutrition in first six weeks of life**

   **Major risks**
   - Dystocia rate in heifers >10%
   - Dystocia rate in cows >2%
   - >25% of the herd are first-calf heifers
   - >10% of cows have pendulous abdomens or udders
   - ETEC diagnosed and not vaccinating
>10% of cows calving in condition score <2.5 or >3.5

Calving and/or nursing areas are exposed to the prevailing winds

Calves do not have water accessible within 300m

Young calves are camping in crowded areas

**Moderate risks**

Mismothering >2%

Feed shortage before calving

Feed shortage after calving

<10% shade

District is deficient in Se or Cu and cows not supplemented or supplementation inadequate

Cows calve in cold, wet and windy weather

Cows calve in hot weather

Dystocia rate is above recommended level and assisted calves are not supplemented with colostrum

Assisted calves are supplemented with colostrum but <5% of body weight is given or it is more than 12 hours after birth

Calves that require an assisted calving in wet cold weather are left exposed to elements

**3. Biosecurity**

**Major risks**

Dead calves are replaced with bobby calves from another property

Recently purchased animals are introduced into the calving group or nursery herd with calves less than six weeks old

Calving cows and cows with calves less than six weeks old are in paddocks with watercourses arising from adjoining properties

Colostrum is sourced from a dairy property

**Moderate risks**

Colostrum is sourced from another beef property

Visitors or vehicles from other properties entering calving and nursing areas without thorough cleaning and disinfection
Section 6: Recommendations for control

1. Protect newborn calves and young calves in unaffected mobs
   - Move all pregnant cows to a clean calving paddock
   - Change calving paddock every three weeks or more frequently if wet and boggy
   - Drift off newborn calves and their dams from the calving herd to a ‘nursery’ group in a fresh paddock
   - Start a new nursery group every three weeks
   - Do not put new calves into an affected group
   - Disinfect thoroughly after handling sick calves
   - Always have overalls and gloves specifically for treating sick calves
   - Wear clean overalls and disposable gloves when handling newborn calves
   - Place supplementary feed in a new region of the paddock each time
   - Use troughs, feeders or racks to avoid faecal contamination
   - Feed colostrum to calves from assisted calvings
   - Other:

2. Isolate the affected mob
   - Put unaffected mob in adjacent paddock
   - or Put unaffected mob in distant paddock
   - Keep affected mob in one paddock or area of the farm to minimise contamination of paddocks
   - Keep mobs separate until all calves are at least six weeks old. If handling is required, yard unaffected calves first.
   - Other:

3. Minimise transmission within the affected mob
   - Isolate scouring calves and their dams (<10% of calves affected)
   - Fence off heavily used calf camps in affected paddocks.
   - Apply soil, sand or woodchips plus 1kg lime/m² to muddy areas around water troughs
   - Drift off cows with calves older than six weeks from affected group, and quarantine them in one area for as long as feed allows
   - Ensure affected calves have no access to watercourses or surface water
   - Delay stressful management procedures for as long as practical
   - Other:
4. **Minimise spread of zoonotic pathogens to humans**

- Wear overalls and disposable gloves when working with sick calves.
- Always wash your hands after working with calves.
- Do not eat, drink or smoke while working with calves.
- Do not work with sick calves when you are on antibiotics, immunocompromised, or taking immunosuppressive medication.
- Keep contaminated clothing away from family members especially children, seniors and immunocompromised people.
Section 7: Management of affected calves

Identification of sick calves
Calves are checked at least once a day to ensure they are healthy Y / N
The property has an appropriate protocol to identify sick calves Y / N
The property has an appropriate protocol to identify dehydrated calves Y / N
All staff use same protocol Y / N

Treatment of sick calves
There is a protocol or decision tree to ensure appropriate treatment of calves Y / N

Electrolytes
Calves are given sufficient electrolytes to provide for rehydration, maintenance and ongoing loss Y / N
When calves are left on the cow, the oral electrolyte solution contains acetate or propionate not bicarbonate or citrate Y / N
The electrolytes used for calves that are not sucking contains sufficient alkalising agent Y / N / unsure
Electrolytes meet recommended standards* Y / N / unsure
Electrolytes are mixed to manufacturer’s recommendations Y / N

Antibiotics
Antibiotics are only given according to a treatment protocol recommended by a veterinarian Y / N
Antibiotics used are appropriate for the condition treated Y / N
Antibiotics are given at the correct dose Y / N
Adequate records are maintained to ensure that appropriate withholding periods are observed Y / N

Isolation of sick calves
Calves requiring repeat treatment are confined Y / N
Calves are returned to their dams within 36 hours Y / N
Calves are isolated with their dams Y / N
The whole mob is mustered to separate cows and sick calves. Y / N
Calves and dams remain isolated until all calves in the mob are at least six weeks old Y / N

Hygiene
The oesophageal feeder is cleaned and disinfected between calves Y / N
The isolation area is cleaned and disinfected (or moved) at least weekly Y / N

Summary of treatment protocol recommended

Criteria for administration of electrolytes:

Electrolytes to be used:

Indications for antibiotic use:

Antibiotics to be used:

Criteria for isolation:

Disinfectant to use:

Other:

A decision tree has been set up for treatment of sick calves
Yes / No

The producer has been advised on the electrolyte volumes required
Yes / No

The producer is competent in the use of an oesophageal feeder
Yes / No

A protocol for disinfection has been put in place
Yes / No
### Section 8: Diagnostic tests

#### Faecal cultures

<table>
<thead>
<tr>
<th>Pathogen</th>
<th>No. tested</th>
<th>No. +ve</th>
<th>Rotavirus</th>
<th>No. tested</th>
<th>No. +ve</th>
</tr>
</thead>
<tbody>
<tr>
<td>K 99 E. coli</td>
<td></td>
<td></td>
<td>Rotavirus</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Salmonella</td>
<td></td>
<td></td>
<td>Coronavirus</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cryptosporidia</td>
<td></td>
<td></td>
<td>Coccidia</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
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</tr>
</tbody>
</table>

**Total samples tested**

**Number of samples with interpretable results**

- Yes: [ ]
- No: [ ]

**Samples were collected from representative animals**: [ ]

**Samples were collected from healthy animals because there were not sufficient sick animals**: [ ]

**Pathogens were identified that could account for the problem**: [ ]

#### Sample details – use this table to collate lab results

<table>
<thead>
<tr>
<th>Date</th>
<th>Calf ID</th>
<th>Calf age</th>
<th>Disease severity</th>
<th>Sample type</th>
<th>Taken by</th>
<th>Lab submitted to</th>
<th>Pathogen isolated</th>
<th>2nd pathogen isolated</th>
</tr>
</thead>
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Post mortem investigation

Post mortem investigation(s) were carried out on calves that had died

Post mortem investigation(s) were carried out on sacrificed calves

Faecal samples were confirmed by post mortem investigation(s)

Details of post mortem investigations

<table>
<thead>
<tr>
<th>Date</th>
<th>Calf ID</th>
<th>Calf age</th>
<th>Disease severity</th>
<th>Taken by</th>
<th>Lab submitted to</th>
<th>Diagnosis</th>
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Evaluation of failure of passive transfer

FPT was assessed by sampling:

- A minimum of six sick calves
- A minimum of 10 healthy calves aged <10 days

Other:

<table>
<thead>
<tr>
<th>Date</th>
<th>Test used</th>
<th>Test cut off point</th>
<th>No. calves sampled</th>
<th>No. calves FPT</th>
<th>% FPT</th>
<th>Risk level</th>
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</table>

<10% (low risk) 10–25% (moderate risk) >25% (high risk)

Evaluation of trace mineral status

Cows had previously been sampled to determine trace mineral status on this property

A minimum of 10 animals were blood sampled to evaluate trace mineral status

Liver samples were collected from ___ animals

Tests showed that copper was deficient on this property

Tests showed that selenium was deficient on this property

1 If more than 25% of sick calves have FPT, the problem should be confirmed in healthy newborn calves as immunoglobulins may be lost from the gut with inflammatory diarrhoea.

NORMAL LEVELS

<table>
<thead>
<tr>
<th>Serum protein</th>
<th>GGT</th>
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<tbody>
<tr>
<td>&lt; 5.0 g/L</td>
<td>&lt; 100 IU/L</td>
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<tr>
<td>(5.5 g/L sick calves)</td>
<td>75 IU/L</td>
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<tr>
<td>≤4 days</td>
<td>5-7 day</td>
</tr>
<tr>
<td>&lt; 100 IU/L</td>
<td>&lt; 75 IU/L</td>
</tr>
<tr>
<td>5-7 day</td>
<td>8-10 days</td>
</tr>
<tr>
<td>&lt; 75 IU/L</td>
<td>&lt; 50 IU/L</td>
</tr>
<tr>
<td>8-10 days</td>
<td>Sick calves</td>
</tr>
<tr>
<td>&lt; 50 IU/L</td>
<td>(calves &lt;21 days)</td>
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</tbody>
</table>
Diagnostic possibilities that have not been fully explored

<table>
<thead>
<tr>
<th>Diagnostic test</th>
<th>Reason why not investigated</th>
<th>Trigger for further investigation</th>
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Major contributing factors to outbreak

- Factor 1
- Factor 2
- Factor 3
- Factor 4

Overall diagnosis:

- Diagnosis 1
- Diagnosis 2
- Diagnosis 3
- Diagnosis 4