Role of Vaccines in Newborns

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MSD Animal Health
What vaccines can be given to newborns?

What are the other options?
Dam Vaccination

- Rotavec Corona
- Heptavac-P Plus
- Bravoxin 10
Dam Vaccination

- Rotavec Corona
- Heptavac-P Plus
- Bravoxin 10
Dam Vaccination

- Increase immunity of dam in order to improve immunity of newborn
How?
“Passive immunity acquired from antibodies within colostrum provides calves with substantial protection against infection”

Brambwell 1966
Boosting Colostrum’s Protection

Need protective levels of antibodies for up to 28 days in colostrum/milk.
What clinical syndrome does Rotavec Corona help control?
Neonatal Calf Diarrhoea in the UK

- ~ 2 to 3 weeks old
- Multi-factorial
  - Widespread
  - Often worse in winter and spring
- Costly
  - Up to 33% mortality
  - Lower weaning weights
- Often unreported
Rotavec Corona

45% of all diagnoses made by VLA and SAC in 2012 could have been aided by Rotavec Corona Vaccination.
Calf Diarrhoea

• Also known as “Scour”
• “An increase in faecal water loss”
• Damage to gut cells
• Cell damage:
  - Reduced absorption
  - Increased fluid loss
Scour causes gut damage

• Villi lining the gut

Good surface area = good absorption

Reduced surface area = scours
The causes of calf diarrhoea

- Viruses (V)
- Parasites (P)
- Bacteria (B)
- Nutritional causes
Infectious causes

- Rotavirus (V)
- Coronavirus (V)
- E.coli (B)
- Cryptosporidium (P)
- Salmonella (B)
- Coccidiosis (P)
Rotavirus

- 5-14 days of age
- Affects the small intestine
- Reduced absorption
- Profuse diarrhoea
Coronavirus

- 5-28 days of age
- Small and large intestine
- Permanent gut damage
- More severe than rotavirus
E.coli

- 2-3 days of age
- Produces poisonous toxins
- Watery scour
- Rapid dehydration and death
Cryptosporidium

- 2-4 weeks old
- Intermittent diarrhoea
- Blood and mucus
- Often green in colour
- Zoonosis **
Salmonella

- Any age
- Watery diarrhoea with mucus and blood
- High fever
- Death
- Zoonotic
Coccidiosis

- 17-21 days of age
- Scour with blood, mucus
- Abdominal pain
- Permanent gut damage
Nutritional causes of diarrhoea

- Excess volume of milk/milk replacer
- Wrong temperature/concentration
- Irregular feeding times
- Lack of hygiene
How is a calf infected?

• The mother
• The environment
• Other affected calves
  – “Bug factory”

Pathogens present on most farms
Why do calves scour?

CHALLENGE

PROTECTION

Imbalance = scours
Why do calves scour?

Challenge

Virulence
Infectious load
Environment/Husbandry
Quality of stockmanship

Protection

Nutrition
Colostrum
Vaccination

DISEASE
Diagnosis

- Faecal analysis
  - Microscopy
  - Bacteriology/Virology
  - Calf side Test kits

- Post-Mortem examination
Control
Control

• Calf scour is a “multi-factorial” disease
• Control depends on cause of diarrhoea
• Requires assessment of risk factors
Have a programme to control scours

The **FIVE** step programme

An important part of keeping herd performance on track is preventing and controlling calf diarrhoea. Evaluating herd and farm management practices, properly diagnosing likely causes and checking colostrum quality and intake are essential steps in resolving this costly problem. Selecting the right prevention/treatment protocol is also critical to success.

> **STEP 1**

**ASSESS PROBABLE CAUSES OF SCOUR**

In the process of investigating a case of calf diarrhoea on a farm, a thorough discussion about calf management and type of animals affected can often identify a list of possible causes of the scour problem.

**Key areas for discussion include:**
- Age of the animals affected
- Colostrum management
- Calf feeding protocol
- Housing conditions
- Previous farm disease history
- Veterinary Health Plan protocols

**Causes of diarrhoea and age at which calves are mostly affected**

<table>
<thead>
<tr>
<th>AGENT</th>
<th>AGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Escherichia coli (ECET)</td>
<td>1-5 days</td>
</tr>
<tr>
<td>Clostridium perfringens B/I</td>
<td>0-14 days</td>
</tr>
<tr>
<td>Cryptosporidium parvum</td>
<td>7-12 days</td>
</tr>
<tr>
<td>Rotavirus</td>
<td>4-21 days</td>
</tr>
<tr>
<td>Coronavirus</td>
<td>5-30 days</td>
</tr>
<tr>
<td>Salmonella dublin / Typhimurium</td>
<td>Any</td>
</tr>
</tbody>
</table>

> **STEP 2**

**UNDERTAKE FECAL SAMPLING**

Diarrhoea caused by infectious agents can usually be diagnosed from fresh faecal samples. When sampling a herd the following should be considered:

- Sample and test at least five affected animals
- Collect faecal samples from the animal and not from the floor

**On-site diagnosis is often a quick and easy option**

> **STEP 3**

**EVALUATE COLOSTRUM INTAKE**

Antibodies from colostrum provide local protection in the gut of the calf but some are also absorbed into the bloodstream. The capacity for absorption of antibodies is high during the first few hours after birth and disappears once the calf is 24 hours old. The effectiveness of colostrum feeding can be evaluated by measuring the level of antibodies in blood. Values of less than 10 g/l indicate inadequate colostrum intake.

**Antibody absorption in calves during the first 24 hours of life**

![Antibody absorption graph]

> **STEP 4**

**MEASURE COLOSTRUM QUALITY**

Inadequate colostrum intake can sometimes be the result of feeding poor quality colostrum.

This is more common in high yielding dairy cows and heifers. Periodic testing colostrum quality with a colostrometer can help determine its antibody content.

> **STEP 5**

**DEFINE AND IMPLEMENT A PREVENTION/TREATMENT PROTOCOL**

Actions following the diagnosis of calf diarrhoea on a farm are at three levels:

- **Treatment of affected animals:** e.g. rehydration, antibiotics (if appropriate), Cryptosporidium treatment, anti-inflammatories.
- **Colostrum management:** corrective measures must be taken if problems are identified with the feeding of colostrum to young calves.
- **Prevention:** Implementation of vaccination protocols with Rotavec Corona and preventative use of Halocur for the control of Cryptosporidium.
Step 1: Assess Probable Causes

- Housing conditions
- Calf feeding protocol
- Colostrum management
- Previous disease history
Clean calving area?
Cows clean?
Pens cleaned between calves?
Reduce Risk Factors

- Keep cows clean
- Clean calving boxes/calf pens
- Hygienic feeding equipment
- Isolate scouring calves
Step 2: Undertake Faecal Sampling

- Collect fresh scour samples
- Vet can send to lab, or do a calf side test
- Calf side tests allow rapid diagnosis
Step 3: Evaluate Colostrum Intake

- Calf needs at least 3 litres of **good quality** within 6 hours
- Vet can check calves getting enough colostrum
Step 4: Measure Colostrum Quality

- Colostrometer measures specific gravity
- Simple and quick test to assess antibody level
- Test
  - High yield cows
  - Heifers
Colostrum
“Give enough at the start”

- Calf needs at least 3 litres of good quality within 6 hours
- 20 minutes sucking = 3 litres
- 3 litres by stomach tube is the sure way
- 10% bodyweight as colostrum
Why is Colostrum so Important?

- Colostrum is main source of protection at birth
- Full of energy and antibodies
  - Antibodies stick to gut, creating ‘armour plating’
  - Stops gut pathogens damaging gut wall
  - More antibodies = More protection
Providing Protection with Colostrum

Wilson 2008
Colostrum Quality & Quantity

- 289 samples, 5 dairy farms, various parities
- Mean colostrum IgG concentration = 29.1g/L ± 24.6
- Mean milk yield = 12.7L ± 9.9
- Colostral IgG concentrations similar in lactations 1-3
- 13% colostrum samples would require calves to drink >20L (50% more than 4L) to achieve 100g IgG

Wilson, 2008, DBR Dissertation
TIME IS OF THE ESSENCE

• Recent study (2010) demonstrates that colostrum quality deteriorates quickly after calving due to dilution by milk

• Rate of deterioration is 3.7% per hour

• Therefore by 24 hours, colostrum is only 40% of the strength it was at point of calving.

Morin et al. 2010 JAVMA
Step 5: Implement a Prevention Protocol

• Improve colostrum
• Reduce risk factors
• Prompt treatment
• Vaccines
Prevention

To aid in the control of calf diarrhoea
What do you need from a scour vaccine?
Gut lining – growth and repair

Cells migrate to top of villi

Rapidly dividing new cells

Dead cells drop off to be replaced by new ones
Rotavirus infection

Rotavirus attacks and kills rapidly dividing cells
Rotavirus infection
Rotavirus infection
Rotavirus infection

Antibodies bind to and neutralise virus
Scour causes gut damage

Normal Villi

Damaged Villi
What do you need from a scour vaccine?

- High initial antibody levels
- Prolonged protection
What do the vaccines do?

- Extra antibodies = extra protection
- Vaccination of dam boosts antibody levels in colostrum/milk against
  - Rotavirus
  - Coronavirus
  - *E. coli* K99
How do they work?

- The presence of the colostrum antibodies in the calf’s gut, provides protection against Rotavirus, Coronavirus and E coli K99
- No colostrum in the gut, no antibodies, no protection.
Boosting Colostrum’s Protection

Rotavirus

Coronavirus

Need protective levels of antibodies for up to 28 days in colostrum/milk
Prolonged Protection

Rotavirus

Coronavirus

E. coli K99

Colostrum/milk antibody levels

Vaccinated  Unvaccinated

High risk  Low risk

Protection  No protection

Days after calving

Days after calving

Days after calving

PREVENTING AND CONTROLLING NEONATAL DIARRHOEA
Calf scour vaccines on Dairy Farms

• Gold Standard
  – 2-4 weeks of colostrum/milk

• Often 1-4 days
  – Maximise antibody intake during first few days
# Vaccines

<table>
<thead>
<tr>
<th>Company</th>
<th>Rotavec Corona</th>
<th>Trivacton 6</th>
<th>Lactovac</th>
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</thead>
<tbody>
<tr>
<td>Pathogens</td>
<td>E.coli, Rot &amp; Coronavirus</td>
<td>E.coli, Rota &amp; Coronavirus</td>
<td>E.coli, Rota &amp; Coronavirus</td>
</tr>
<tr>
<td>Adjuvant</td>
<td>Oil</td>
<td>Alum hydro</td>
<td>Alum hydro</td>
</tr>
<tr>
<td>Dose</td>
<td>2ml i/m, Single dose</td>
<td>5ml s/c, 2 doses</td>
<td>5ml s/c, 2 doses</td>
</tr>
<tr>
<td>Primary Course</td>
<td>One injection, 12-3 weeks pre calving</td>
<td>1&lt;sup&gt;st&lt;/sup&gt; injection, 1-2 months pre calving</td>
<td>2 doses, 4-5 weeks apart, with 2&lt;sup&gt;nd&lt;/sup&gt; dose at 2-3 weeks pre calving</td>
</tr>
<tr>
<td>Booster</td>
<td>One injection, 12-3 weeks pre calving</td>
<td>No data to support single dose booster</td>
<td>One injection, 2-6 weeks pre calving</td>
</tr>
<tr>
<td>Pack</td>
<td>10 &amp; 40ml</td>
<td>50ml</td>
<td>25ml</td>
</tr>
</tbody>
</table>
Maximising Protection with Rotavec Corona

• Vaccinate all cows in the herd
• Feed enough colostrum to all calves within first 6 hours
• Continue to feed colostrum over 14 to 21 day risk period
One Day Dairy Upgrade

• Often farm management only allows 1 - 4 days of colostrum feeding
• If this is the case you have 2 choices
  1. use a single scour paste
  2. vaccinate cows with Rotavec and feed colostrum for as long as possible
• Which gives the greatest protection?
Summary

• Vaccination of Dams can play a significant role in improving the health and welfare of newborn animals

• The importance of good colostrum management cannot be overemphasised
Thank you for listening
Any Questions?