Theileriosis on beef farms in the Bay of Islands area

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Introduction
As reported over the last two years, *Theileria orientalis* infection has gone from being seen as an incidental finding to a disease of cattle in its own right. Most of the attention has been on the effects of new infection on dairy farms, as this is where there have been the most cases and the most severe clinical disease and mortality (Mcfadden *et al.* 2013).

The change has corresponded with a different serotype *Theileria orientalis* ikeda being isolated. As with other strains of *Theileria* the main vector for transmission is the cattle tick Haemophysalis longicornis (Watts 2013).

This paper is an attempt to document the disease progression, as I have seen it, in beef animals and share some trial information on attempted prevention strategies so far.

My observations

History
Theileria infection is widespread within our practice area. The first cases (Spring 2012) presented as death of beef calves at around 6-10 weeks old. This has been the stock class we have seen most commonly affected on all the farms covered by our practice (including dairy and beef).

Dairy beef calves imported onto farms at around 100kg weight have been the second most commonly affected group. Affected mobs commonly show symptoms 6-10 weeks after arrival.

Cases in adult stock imported to our area are the least common.

We have seen no confirmed cases in “native” cattle over five months old.

Clinical signs
The most common presenting sign reported from farmers who are not aware of *Theileria* has been deaths. These are usually reported as being sudden.

Sometimes the animals are noticed showing the reported clinical signs of lethargy, dyspnea, exercise intolerance (Mcfadden *et al.* 2011) or these signs are recognised retrospectively. Once farmers were more aware of the disease earlier diagnosis has been possible. In some cases the young calves look ill thrifty, but many appear very healthy and have had ample fat reserves at death.

Disease has not been directly related to tick numbers. There are many herds with ticks on calves that do not seem
to have problems. Some mobs with problems have had low tick numbers. Even within the same farm high and low tick areas have not always been correlated with disease levels.

Some properties have had young calves diagnosed with Theileriosis in 2012 and 2013 and similar percentages affected.

**Diagnosis**

In spring 2012 cases had been seen on two farms before a presumptive diagnosis was made. This was the start of the outbreak. It took four farms before case criteria for theileriosis (at that stage) were met. In hindsight a positive diagnosis could have been made sooner. At that stage theileriosis while on the differential list for anaemia, was not being specifically tested for.

Until the development of the PCR test for *Theileria*, positive diagnosis to me was based more on Occam’s razor than Koch’s postulates as:

- Positive diagnosis from postmortem samples was not possible.
- Blood smears from sick animals may or not have had *Theileria* organisms present,
- The level of anaemia was not always correlated with *Theileria* numbers.

Development of the PCR has been an invaluable tool to confirm what has been suspected. (On four properties with anaemic calves in 2012 none had Theileria isolated on blood smear)

Postmortem results have included: Pale muscle and lung, enlarged jaundiced liver, enlarged spleen, generalized jaundice.

Liver and splenic changes have remained quite obvious postmortem allowing for presumptive diagnosis. Animals showing signs of anaemia can then be looked for within the mob.

*Theileria* counts in blood smears from suspected cases have been quite varied. Many have returned zero counts, low numbers have been a common finding but up to 380/1000 RBCs have been seen. Low counts have been the norm rather than the exception.

Haematuria has only been found in one case.

**Treatment**

Buparvaquone has given varying effectiveness depending on animal age and level of anaemia. The young calves have the worst response, around 50% recover. 100kg calves and adults have responded very well. Nearly all recover. Criteria for treating dairy cattle have been reported (Vink *et al.* 2013). The main challenge for treating young beef calves has been getting early diagnosis as yarding to check animals is not easy.

The act of chasing, catching and restraining sick calves to test and/or treat has lead to death on occasion.

I have not transfused any calves. (blood transfusion (1L/ calf + buparvaquone delayed death. 3L + buparvaquone saved). Meredith Love pers comm.)

**Prevention**

Strategies for preventing *Theileria* infection were/are a daunting task without knowing what the infective dose is. I have seen severe clinical disease and death in animals that would have been infected when tick numbers are at their lowest. How low do tick numbers need to be before animals can cope? Will this delay rather than prevent disease? We can no more keep animals tick free than we can keep them worm free.
**Trial 1**

A trial was planned in spring 2013 to see if tick control from birth using Python Ear tags (Zetacypermethrin, Phoenix Pharm) would prevent theileriosis. Unfortunately this failed to happen due to a faulty applicator. I hope to try it this year. Tick tags were chosen to try first as they can be applied as soon as the calf is born, while they can be caught. There should be minimal risk of maternal licking of the calf removing the treatment. On the farm where the trial was planned the calves were given Bayticol at approximately four weeks of age. This did not stop clinical Theileriosis.

**Trial 2**

**Aim:** To see if repeat treatments of buparvaquone are necessary.

Three anaemic calves from a known *Theileria* infected property were treated with buparvaquone. Three days later when they were retreated a blood sample was taken and smear submitted to Gribbles Veterinary Pathology for analysis.

No *Theileria* organisms were seen on the second blood smear.

This occurred prior to availability of PCR which would be a far more sensitive test.

**Trial 3**

**Aim:** To see if treatment to prevent ticks prevents disease due to *Theileria* in imported animals.

It has been common practice for 100kg beef animals to be bought from outside the area. This has been identified as a risk for Theileriosis. On two properties that had committed to buying animals blood testing was to be done to check the risk of this practice, and to see if there is an effect from attempting tick control at arrival. Bayticol (Flumethrin 10%, Bayer) was used as the tick control treatment.

**Trial Start 16 December 2013**

28 ~100kg Friesian heifers were bought from an area of no known *Theileria* infections at that time.

The mob was randomly divided into two groups identified by ear tag numbers. One group received tick treatment before they left the yards. Both groups were grazed together for the duration of the trial.

PCV was to be recorded every three weeks from the start of the trial to track the effects of *Theileria* infection on the mob. Bayticol was reapplied at three weeks to give maximum tick prevention. At six weeks control animals were also given Bayticol as it was determined that enough data had been collected for the purpose of the trial. Monitoring continues as funding allows tracking disease progression.

At three weeks both the treatment and control groups were tested (Gribbles NZ) using the PCR test for *Theileria* ikeda, one pool per group.

Any animals showing noticeable clinical signs of anaemia or with significantly low PCV’s (Packed Cell Volume) were to be removed from the trial and treated with Buparvaquone (Butalex, MSD). Reference range for PCV is 25–40.

Previous experience with dealing with infected mobs of stock in our practise we had determined that there was often a high percentage of animals with a PCV<25, most of which did not go on to develop clinical signs of disease.

**Results**

At three weeks there was no difference in PCV between treatment and control. At this stage both groups tested positive for *T. orientalis* ikeda. At six weeks there was a significant drop in PCV in both groups, with the control
group significantly lower than the treatment group. This difference was gone by week nine as the treatment groups average PCV had fallen further.

Four animals were removed from the trial by week nine. All from the control group. Two had PCV of 15, two looked anaemic but had PCV within normal range.

Animals in both groups became anaemic PCV<25.

<table>
<thead>
<tr>
<th>Treatment PCV</th>
<th>Control PCV</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 weeks</td>
<td>38.5</td>
</tr>
<tr>
<td>Ikeda PCR +ve</td>
<td>Ikeda PCR +ve</td>
</tr>
<tr>
<td>Ticks visible</td>
<td>Ticks visible</td>
</tr>
<tr>
<td>6 weeks</td>
<td>30.6</td>
</tr>
<tr>
<td>2/14 anaemic</td>
<td>26.3</td>
</tr>
<tr>
<td>(PCV &lt;25)</td>
<td>5/14 anaemic</td>
</tr>
<tr>
<td>9 weeks</td>
<td>26.7</td>
</tr>
<tr>
<td>4/14 anaemic</td>
<td>27.6</td>
</tr>
</tbody>
</table>

**Table 1. Average PCV after preventive treatment using Bayticol.**

Trial 4
A repeat of Trial 2 on a different property. Initially 100 animals were enrolled, to be run in two groups of 50 with half treatment and control in each group.

Different to Trial 3 before the animals left the yards blood samples were taken from 20 animals in each group. Each pool of 20 were tested for *Theileria ikeda* using pooled PCR co confirm they were free from *Theileria* at trial start. At three weeks there was a pooled PCR for both treatment and control taken from each mob. Trial start 14 January 2014 (Trial still running at manuscript submission date).

**Results**
There was no *Theileria* present at Day 0. As in Trial 3, both treatment and control in both mobs tested positive for *T. orientalis ikeda* at week three.

There was a significant drop in PCV between week three and week six but no statistical difference between treatment and control either within the experimental groups or when treatment and control data was pooled.

There was no statistical difference in the percentage of animals that were anaemic. PCV<25

18 animals were removed from the trial data due to incomplete data.

<table>
<thead>
<tr>
<th>Treatment PCV</th>
<th>Control PCV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day 0</td>
<td>Ikeda PCR –ve</td>
</tr>
<tr>
<td>3 weeks</td>
<td>32.8</td>
</tr>
<tr>
<td>Ikeda PCR +ve</td>
<td>Ikeda PCR +ve x 2</td>
</tr>
<tr>
<td>1/43 anaemic</td>
<td>1/43 anaemic</td>
</tr>
<tr>
<td>6 weeks</td>
<td>25.1</td>
</tr>
<tr>
<td>18/42 anaemic</td>
<td>19/40 anaemic</td>
</tr>
</tbody>
</table>

**Table 2. Average PCV after preventive treatment using Bayticol.**
Conclusion

Treating calves to prevent ticks at the time of arrival is not preventative for *Theileria* infection.

Treatment does not prevent anaemia.

Discussion

The best advice I had prior to this trial, and my suspicion, was that Bayticol would not prevent Theileriosis. To be fair no claim has been made by Bayer that it would. Bayticol has no claim to stop ticks from feeding. “Overseas trials with various tick species indicate that Bayticol provides protection against reinfestation for 3-6 weeks” Bayticol lable information.

For optimum tick prevention, time should be given between application and challenge to allow for the chemical to spread over the body. This was not tested as the decision was made to test what would be most common practice on farm.

It was hoped that if we could lower the number of infective organisms by lowering tick numbers, severity of disease would be reduced.

My rationale for conducting the trial was also that if I proved attempting tick control didn’t prevent theileriosis, further pressure could be placed on getting Buparvaquone registered for New Zealand. The current system is not economic or practical for us or our clients.

In Trial 3 treated animals had a lower drop in PCV at six weeks. The difference was gone by week nine and was not repeated in the second larger trial. At farmer level none of the treated animals in Trial 3 showed signs of anaemia or ill thrift and unless blood tested would have been regarded as normal. There was an obvious difference between treatment and control groups in weight gain and general appearance.

In Trial 4 there is no difference between treatment and control either at observational or numerical level.

Cases I have seen have been mostly in spring and summer. I believe this is due to the arrival of naïve animals by birth or transportation rather than a change in tick numbers. Timing from arrival to clinical signs shows infection is rapid.

I am yet to see any cases in northland bred dairy calves.

The lowest lable dose on Bayticol is the 200kg dose. The dose rate has a linear scale based on bodyweight. 1ml/10kg for higher weight ranges. The dose given was a high dose 1ml/5kg. If this dose is not preventative, the dose for heavier animals is likely to be less so. Personal experience has shown Bayticol not to be preventative of disease in adult dairy cattle introduced to *Theileria* positive herds during lactation.

Identifying anaemic animals within a mob of beef animals is not easy, treating them can be challenging and preventing them is beyond me at this stage.

Acknowledgements

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Any faults are mine alone.
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References


Watts J, Pulford D. Theileria: The risks and the ticks. Vetscript 26, 10, 2013