

# Yersiniosis in animals

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26 March 2019

Exploring *Yersinia* and Yersiniosis in New Zealand



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## Yersiniosis - deer

- Since 1970s *Y. pseudotuberculosis*
- Main cause of death 4-8 month old deer
- Morbidity: 30%
- Stress: separation from mothers; cold, wet, windy weather; underfeeding; transport; parasites; mixing.



*A weaner showing the watery green staining around the tail, characteristic of yersiniosis*

Source: Hodges et al (1984); Slee et al (1990); Wilson (2002)

## Yersiniosis - sheep

- Diarrhoea in hoggets Northland
  - *Y. enterocolitica*
  - morbidity: 30%
- Hogget abortion North Otago *Y. pseudotuberculosis*
  - 28% pregnancies lost
  - pasture contamination by weaner deer
- Winter Diarrhoea Syndrome, *Y. pseudotuberculosis*
  - morbidity: 60%;mortality:10%
  - deer vaccine trial

Figure 1. Near-term dead triplet



Figure 2. 'Long dead in utero' triplet from same litter



Source: Price and Price (2017); Stanger (2019; 2018); Fenwick (1997)

## Yersiniosis – others

- *Y. ruckeri* in salmon
  - SI hatcheries
  - underlying environmental or husbandry issues
- *Y. pseudotuberculosis* in captive bird
  - septicaemia
  - over-crowding/winter
  - 2017 4 cases reported in captive birds
    - Kaka, kakariki, tui
- *Y. mollaretti* in little blue penguins
  - bloody faeces



Figure 5: Diffuse pallor of the liver with numerous pin-point foci of inflammatory necrosis throughout, in a young adult red-crowned parakeet/kakariki that died of yersiniosis. Scale bar = 1mm. Photo: S. Hunter

Source: Surveillance 45(3) 2018

## Yersiniosis - cattle

- Northland dairy farm
  - 15/160 Jersey weaners
  - chronic ill thrift and diarrhoea
  - *Y. pseudotuberculosis*
  - + nematode parasitism and coccidiosis
- BOP beef yearlings
  - 20% diarrhoea, 2% death
  - *Y. enterocolitica*
- Southland dairy weaners
  - 100/300 calves affected
  - 9 died
  - *Y. pseudotuberculosis*



Source: Surveillance 45(3) 2018; Surveillance 36 (4) 2009; Surveillance 41 (2) 2014.

# Veterinary Laboratory Submission Data: Cattle

- 6 January 2011 to 26 September 2017
- 2291 submissions positive for *Yersinia*
  - *Y. pseudotuberculosis* 64% (1469)
  - *Y. pseudotuberculosis* + coccidia 10% (228)
  - *Y. pseudotuberculosis* + strongylata 6% (148)
  - *Y. enterocolitica* 2% (38/2291)
- 70% dairy use classification
- Sparse recording of number at risk, affected and dead

# *Yersinia* positive laboratory submissions (2011-2017)

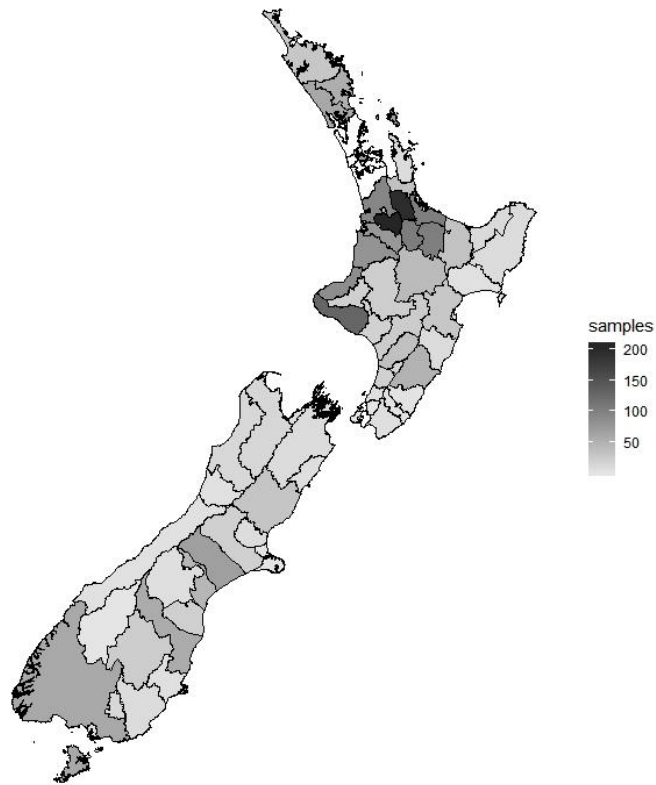
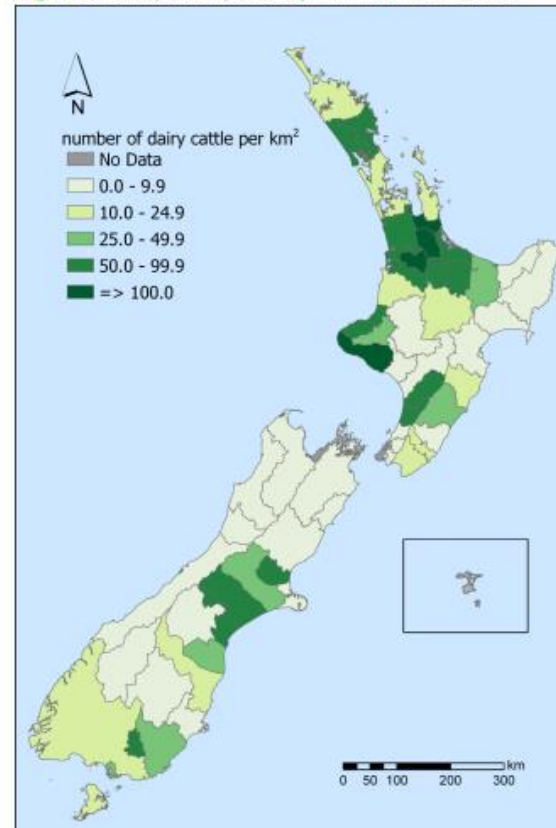
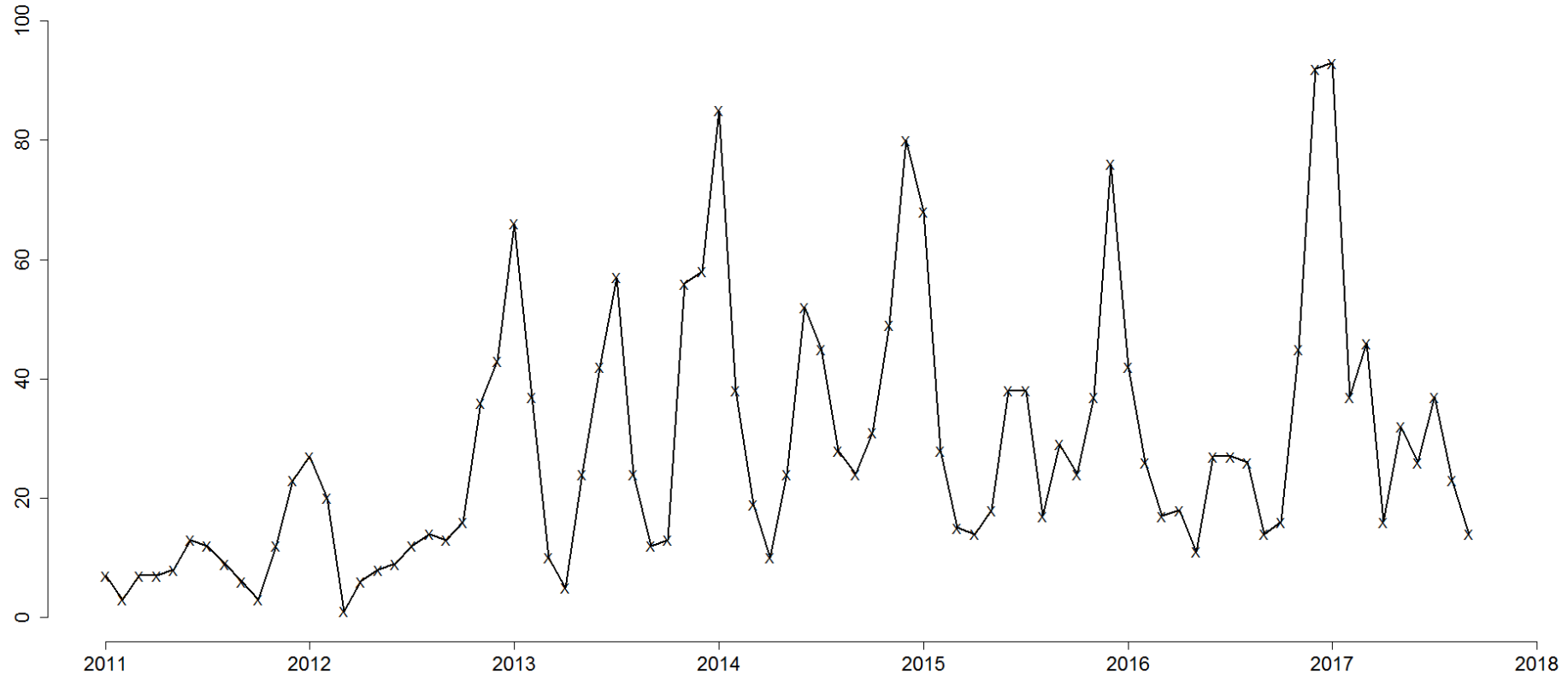


Figure 3: Density of dairy cattle by TA in New Zealand, 2012\*



Source: <http://www.ehinz.ac.nz>

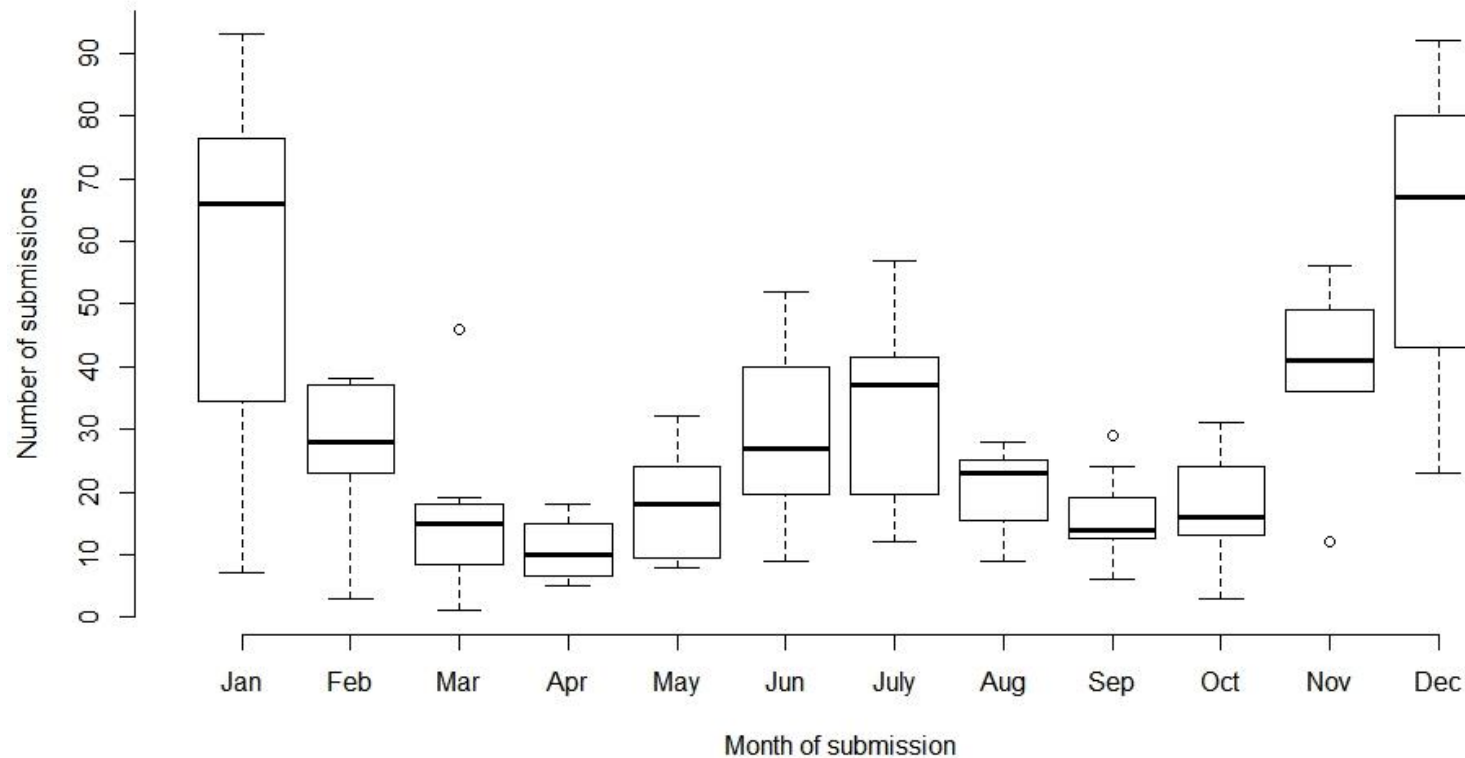
## *Yersinia* positive laboratory submissions: NZ cattle



Spearman's test for trend,  $\rho = 0.49$ ,  $p < 0.001$



## *Yersinia* positive laboratory submissions: NZ cattle



## Primary Costs of an outbreak of BY on a typical NZ dairy farm (2018)

Veterinary Action	Cost of Action Lower estimate	Cost of Action Upper estimate
Call out fee (including mileage)	\$60	\$175
Faecal culture	\$60	\$65
Needle and syringe	\$3.50	\$3.50
Tetracycline dose (per calf)	\$4.26	\$15
<b>Total veterinary action</b>	<b>\$232.74</b>	<b>\$610.50</b>

- Represents a 431 cow herd, with 25% replacement rate requiring 108 replacement heifer calves/year
- Assumptions:
  - Morbidity rate of 12.8% (14 heifer calves)
  - All receiving 1 dose, 60% recovering, 35% requiring further 2 treatments, 5% mortality (1 heifer calf)
- In addition, calves requiring 3 treatments would also need meal feed for longer than a healthy calf

## Secondary Costs on NZ dairy farm due to death of replacement heifer calf

Mechanism of loss	Magnitude of loss
Casualty removal from farm (1 calf)	\$20
<b>Milk production loss (4 years loss):</b>	
Annual milk solid yield	368 kg
Milk solid pay out (kg of milk solid)	\$6.68 kg/milk solid
<b>Reproduction loss:</b>	
Heifer calves lost (2)	\$200/calf
Bobby calves lost (2)	\$20/calf
<b>Total loss due to death</b>	<b>\$10,292.96</b>

# Herds affected by yersiniosis

- MPI Surveillance and Incursion Investigation Group data from the NZ Veterinary Pathology laboratory network: using latest year's data: Sept 2016 – Sept 2017
  - Total submissions testing positive = 479
  - % +ve submissions from dairy farms = 68.8% (329/479)
  - Estimated % of dairy farms with some R1s diagnosed with yersiniosis = 2.84% (329/11590)
- Anecdotal: In a good year 2 – 5% of herds affected  
In a bad year 6 – 12% of herds affected
- Morbidity: 12.8% (Ball, 2010)
- Including primary & secondary costs: Cost to farm with average herd-size ~ \$24,000  
Cost to large herd farm (1500+) ~ \$110,000

## Financial burden of yersiniosis to the NZ dairy sector

	Cost estimates	Assumptions
<b>Upper Estimate</b>	<b>\$7.40 mill</b>	<ul style="list-style-type: none"> <li>• Replacement 25%, morbidity 12.8%, mortality 5%</li> <li>• Recovery after 1 treatment 50%</li> <li>• Requiring 3 treatments 45%               <ul style="list-style-type: none"> <li>○ Half of these don't achieve breeding weight</li> <li>○ One quarter culled at 2<sup>nd</sup> breeding season</li> </ul> </li> </ul>
<b>Average Estimate</b>	<b>\$6.53 mill</b>	<ul style="list-style-type: none"> <li>• Replacement 25%, morbidity 12.8%, mortality 5%</li> <li>• Recovery after 1 treatment 60%</li> <li>• Requiring 3 treatments 35%</li> </ul>
<b>Lower Estimate</b>	<b>\$4.70 mill</b>	<ul style="list-style-type: none"> <li>• Replacement 20%, morbidity 12.8%, mortality 5%</li> <li>• Recovery after 1 treatment 60%</li> <li>• Requiring 3 treatments 35%</li> </ul>

- Based on BY laboratory data ~ 2.8% of herds

# Take Home Messages: Yersiniosis in animals in New Zealand

- Emerging (deer, goat) or intensifying (dairy) industries
- Stress: feed, crowding, transport, weather, co-morbidities
- Appears to be a low frequency event with high consequence

# Acknowledgments

- MPI Surveillance and Incursion Investigation Group
- Participating Veterinarians