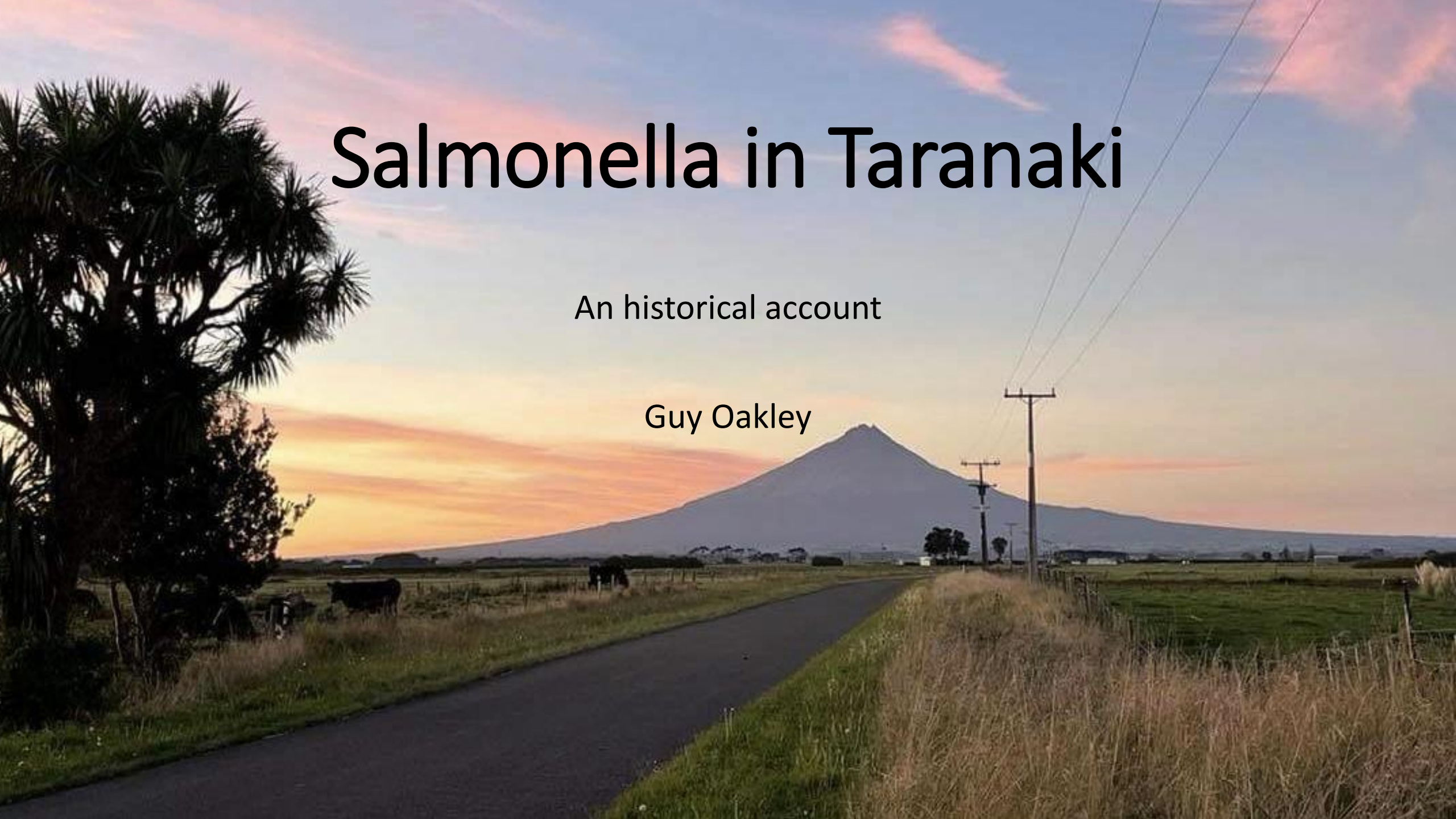


Salmonella in Taranaki

An historical account

Guy Oakley



Who am I?

- Retired veterinarian
- I worked in Taranaki with dairy cows for 40 years
- Now have swapped cows for kiwis



The 2010/11 Salmonella outbreak in Taranaki

- Some background
- Possible causes
- Some investigative work

How common is Salmonella?

- Historically this disease was uncommon and large-scale outbreaks very rare
- Outbreaks tended to occur in the spring at a time of high stress for the cows
- Prior to the 2010/11 outbreak the last recorded case in our practice was in 2003



What can I tell you that might be relevant?

- This was a very interesting outbreak for many reasons
- Both cows and humans were affected
- There was a mineral supplement that was implicated
- High level of cooperation amongst practices
- There was some detective work on the part of veterinarians
- An epidemiologist investigated the outbreak
- A survey was conducted to establish the prevalence of salmonella on farms

When did this outbreak happen?

- The index case was seen in November 2010, not seen by a vet
- The next day there were 7 sick cows, high temperatures and scouring
- Cows were treated with antibiotics
- Faecal samples were taken and all were positive for Salmonella
- Feed samples were taken and they were negative
- Farmer was advised that salmonella could infect him and his family and to take hygiene seriously
- Contact Fonterra
- That farm had 90 cows affected out of 250

Outbreak continued

- A second herd was affected in December with 70/300 affected
- A third herd was affected at drying off in May 2011 60/400

November 2011

- 4 herds were affected in our practice and a further 7 herds seen in other districts in Taranaki
- Veterinarians from the affected practices began meeting to discuss the outbreak
- From these meetings a number of common factors emerged

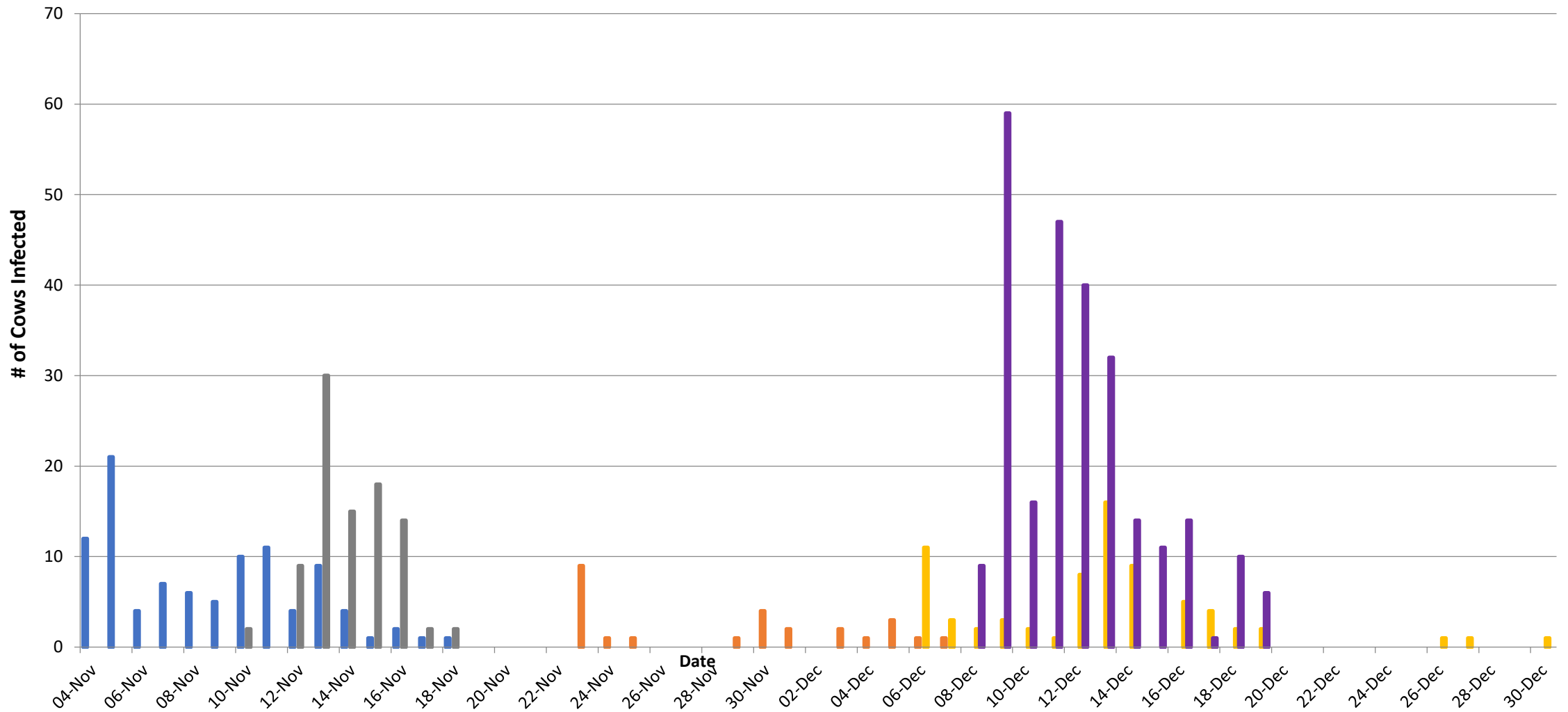
Common factors

- Nearly all the sheds were modern rotaries with in shed feeding systems
- No all grass farms were affected
- All samples taken from affected cows were positive for salmonella. This is unusual
- No calves, heifers or bulls on affected properties became sick
- Outbreaks on farms tended to last 10 -14 days

Additional common factors

- Low mortality but high morbidity
- After the first few cases farmers began to recognize the early symptoms and began treatment earlier
- All affected herds and some herds on neighboring farms were vaccinated
- This reduced mortality and severity but did not seem to stop new cases from occurring
- There was no common strain of Salmonella unlike the current epidemic

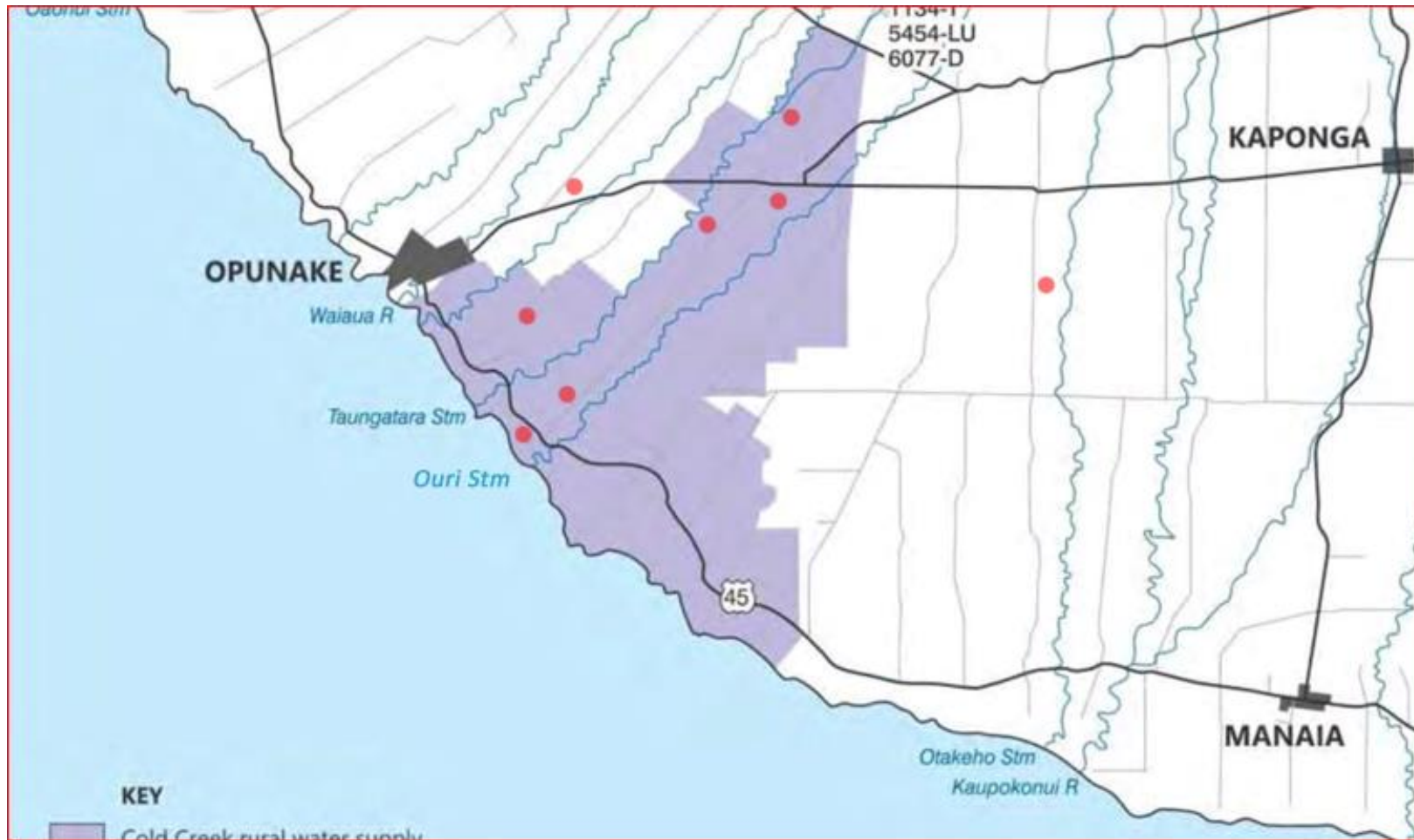
Patterns of infection across five of the farms in 2011



Further investigations

- Two bulls running with 100 affected cows seemed healthy. The farmer suggested we sample their dung. They were negative.
- Two cows that seemed healthy in the herd on that farm had their dung sampled and they were positive
- This led us to believe that the disease was somehow associated with the cowshed despite nearly all supplementary feed testing negative
- People living in the area became concerned that the Cold Creek water scheme might have been contaminated. A sample of water was taken under public scrutiny and was tested. This was negative

Cold Creek water scheme supply area



Further investigations

- Many of the affected farms had access to the Ouri stream. The water from this stream was tested at a number of locations. One sample was positive for *S mbndaka*
- The most common strain isolated from affected cows was *S typhimurium* type 101
- Other types were 8, 42,156 and *S mbndaka*

Treatment

- Affected cows were often very sick with high temperatures, dehydration and bloody diarrhoea so treatment with injectable antibiotics was commenced
- The number of cows treated ranged from many to the whole herd in one case
- The treatment of so many cows posed a problem regarding withholding times for milk
- When only a few cows are under treatment the dilution of the other cows may cover up any variations in the clearance of antibiotics

Treatment continued

- When a large proportion of the herd is being treated we were advised not to allow the sudden reintroduction of the cows back into the herd once the WHT was completed. A staged re introduction of cows was suggested to farmers. This was a further cost to those farmers because the cows were out of the vat for longer

Financial implications

- Drop in milk production during the outbreak
6,300 L/day to 4,000L/day
- Antibiotics and vaccine costs
- Discarded milk during treatment and
withdrawal period
- Cow deaths
- Time in running separate treatment herds

Human health implications

- Despite being warned about the implications of the cows being infected with a zoonosis a number of farmers and their family members became sick with the disease.
- An Okato client was hospitalized with Salmonella and it was the same type as that affecting their herd

Discovery of the cause of the problem

- With the signs pointing to something going on in the cowshed veterinarians turned their attention to what was being fed to the cows
- A list was compiled of the various supplements being fed to the cows on each farm.
- Peter Morgan, a veterinarian from Okato noticed that when a farmer was washing the yard down after milking a granular material was left behind
- He determined that this was Product B. A granulated form of CaCO_3 , MgO and NaCl that was incorporated into their feed. It appeared to not break down as it was supposed to.

Product B

- Peter rang me regarding this and asked me to contact my clients to see if any were using it.
- I called my clients and found 7/8 were incorporating Product B into their feed
- Mark Stevenson, an epidemiologist from Massey University was engaged to determine if there was a link between the feeding of Product B and the Salmonella outbreak

Product B



Peter Morgan photo

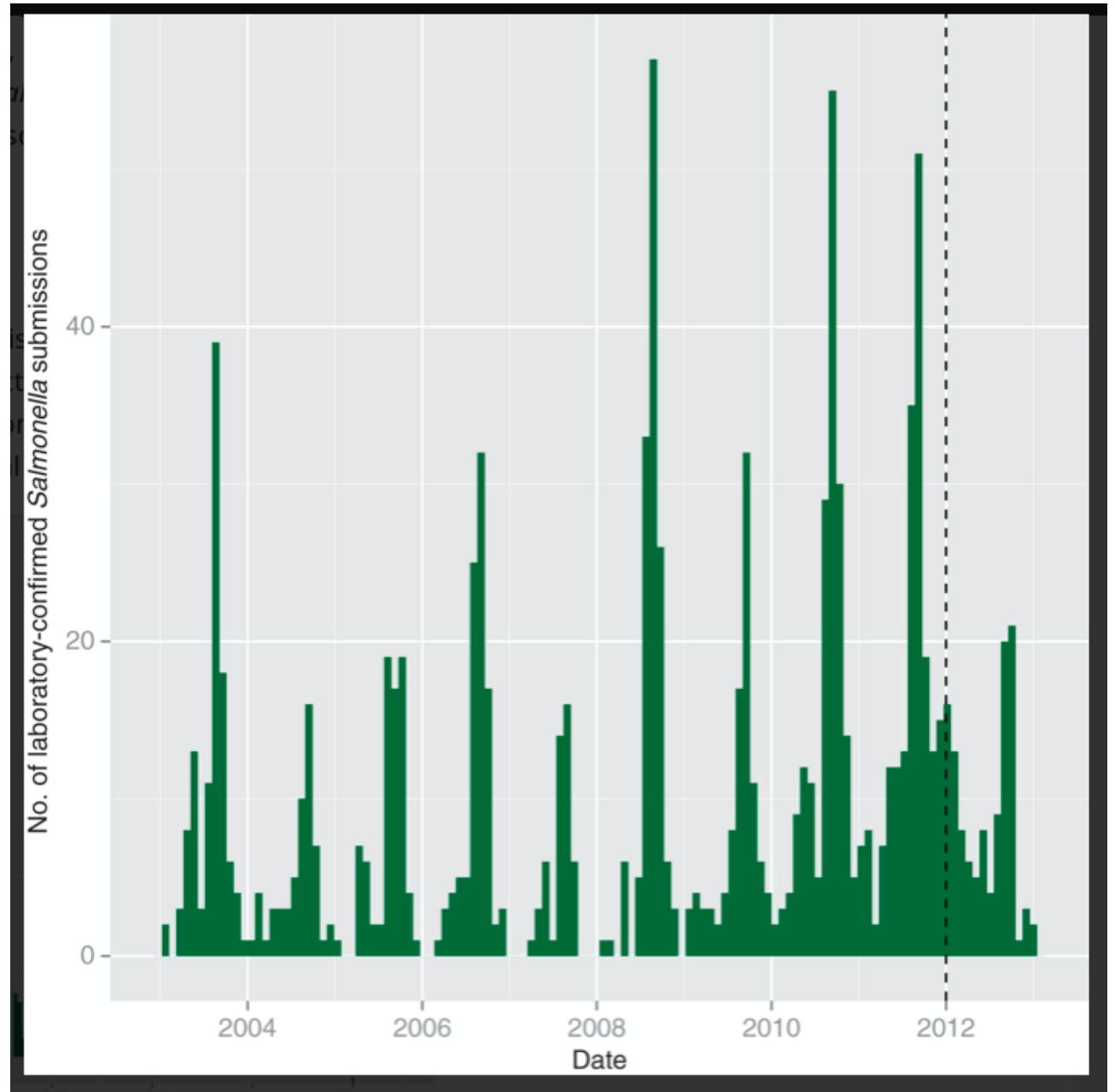
Mark Stevenson's findings

He determined that 3 factors contributed to the outbreak

- The use of continuous troughs for in shed feeding
OR 6.2
- The use of Palm Kernel Expeller as a supplementary feed OR 8.7
- The use of pelletised magnesium in the feed
OR 10
- On the basis of his findings farmers were advised to stop feeding meal that contained Product B. This appeared to stop further outbreaks

Mark Stevenson's findings

- A frequency histogram showing the number of Laboratory confirmed *Salmonella* submissions from cattle, NZ, Jan 2003 to Dec 2013. The date of withdrawal of the leading brand of pelletized magnesium is indicated by the vertical dashed line
- Drop in reported cases from 148 6 months before compared to 58 6 months after withdrawal



Typical
rotary cow
shed



Feed silo



Continuous feed tray



The presence of Salmonella on farms

- Many experts told us that Salmonella was always present on farms, it was just that we were missing it
- However nearly all veterinarians were routinely conducting some form of surveillance. Scouring cows were routinely sampled for Salmonella but it was very rarely found
- In the past, diagnosed cases were rare and outbreaks even more so
- I had one large outbreak in the early 1990's with a large proportion of the herd affected. The cause of this was never discovered
- Prior to the 2010 outbreak the last diagnosed case was in 2003

How common is Salmonella?

How would we find this out?

- Very little work had been done regarding this
- Lindsay Burton from Fonterra became interested in this project and with MAF, agreed to fund a survey
- After studying the literature a decision was made to culture milk filter socks
- This is an established technique overseas and many socks could be collected in a day so would not take a lot of effort

Salmonella Survey – Filter socks

- Socks were collected from 3 farms that had experienced the disease in the current season and 3 from farms that had it the previous season. Carriers?
- Farmers were contacted, they left the filters out for collection and they were placed in Ziploc bags and sent to Gribbles for culture
- Two filters returned positive results

Salmonella Survey – Sand traps

- This seemed to be a poor culture positive rate
- An alternative collection method was explored and it was decided that the sand trap in the yard could be sampled as all the faecal matter from the yard would go through it
- Samples from 2 farms were taken and there was one positive result. This turned out to be *S luckenwalde* which was not associated with any of the outbreaks
- Gribbles complained that there were a lot of environmental organisms present that made interpreting the culture difficult

Salmonella Survey – Faecal survey

- A recent graduate, working at our practice, Sarah Procter, suggested collecting a composite sample from each farm.
- This was discussed with Gribbles and they felt it would be a good idea. They attempted a validation test and were confident that a composite sample from 50 cows would give a 95% chance of detecting Salmonella in a 400 cow herd
- Following milking, pooled samples were taken from all 8 farms
- No salmonella was detected from any of the farms

Survey data

	Date of outbreak	Number affected	Filter sock	Sand trap	Pooled faecal
Farm 1	Oct 10/10	120/240	-ve	+ve*	-ve
Farm 2	Dec 10/10	70/280	-ve		-ve
Farm 3	May11/10	60/400	-ve		-ve
Farm 4	Oct 11/11	200/200	+ve		-ve
Farm 5	Oct 11/11	90/400	-ve	-ve	-ve
Farm 6	Nov 11/11	21/280	+ve		-ve
Farm 7	Dec 11/11	250/500	ND		-ve
Farm 8	Dec 11/11	63/307	ND		-ve
*				S luckenwalde, not the same as the outbreak	

Conclusions

- Until recently Salmonella was uncommon on farms in Taranaki
- It would appear that Product B contributed to the outbreak, however only 15 farms affected when approximately 90 farms were feeding it
 - pH change in rumen allowing Salmonella to flourish?
 - Porous nature protected salmonella?
 - Abrasions to the intestines?
- Some farmers began feeding remaining meal from their silos once the outbreak was over. Salmonella broke out after about 1 week of feeding meal
- Attempts to culture Salmonella from the environment on affected farms was unsuccessful
- The literature suggests that coarse MgO can cause salmonella in livestock
- Is the trend towards large scale supplementary feeding providing an environment where salmonella can flourish?

References

- A case-control study to identify risk factors for acute salmonellosis in New Zealand dairy herds, 2011–2012
M.A. Stevenson, P.L. Morgan, [J. Sanhueza](#), G.E. Oakley, R.S. Bateman, A.Mc Fadden, N.McPherson, K.L. Owen, L.Burton, S.Walsh, J. Weston and R.Marchant
- Salmonella outbreak case studies spring 2011 P.Morgan