Leptospirosis vaccination best practice: Let’s get real.

Julie Collins-Emerson

Yuni Yupiana, Peter Wilson, Jackie Benschop, Emilie Vallée, Jenny Weston, Cord, Heuer.

OHA meeting, 10 – 11 Dec 2019, Wellington, New Zealand.
Background

• Two studies

➢ Firstly, vaccination practices for leptospirosis on dairy farms in NZ

➢ Secondly, disease management of a leptospirosis outbreak on a local dairy farm.

• From both these studies we learnt valuable lessons about the practicalities of implementing vaccination programmes and they highlighted complexities of “One Health”
• Pomona and Hardjobovis historically main lepto strains in dairy in NZ

• Copenhageni associated with rats therefore incorporated into some cattle vaccines as seen as a risk (aka Weil’s disease)

• Cattle vaccines either Hardjo/Pom or Hardjo/Pom/Cop
Vaccine types used in NZ dairy

• Different brands available

• Types:
  - bivalent (Hardjo/Pomona)
  - trivalent (Hardjo/Pomona/Copenhageni)
  - 7 in 1 (5x Clostridial + Hardjo/Pom)

• NB: Vaccines are serovar-specific
One health approach...

Vaccination of livestock in New Zealand will protect against stock/reproductive losses and environmental contamination, but...

...the primary driver is still to vaccinate animals in order to protect people
Human cases after vaccination programme introduced – example of effectiveness of campaign

Introduction of vaccination programme

Source: ESR (*provisional data)

Acknowledgement - M. Moinet
Commissioned report 2012

• Our group produced a report for the New Zealand Veterinary Association

• Covered BEST PRACTICE (BP) recommendations for the use of lepto vaccines
What we did know: vaccination efficacy

• Vaccines used in NZ:
  ➢ ~89% effective in preventing Hardjobovis shedding\(^2\)
  ➢ Vaccine use human infection.

• Best Practice Report finding:
  ➢ failure to vaccinate at the right time may contribute to protection failure.
Meta-analysis of the efficacy of *Leptospira* serovar Hardjo vaccines to prevent urinary shedding in cattle

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Growth response and shedding of *Leptospira* spp. in urine following vaccination for leptospirosis in young farmed deer

S Subharat, PR Wilson, C Heuer & JM Collins-Emerson

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Effectiveness of a commercial leptospiral vaccine on urinary shedding in naturally exposed sheep in New Zealand

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What we did not know: how are lepto vaccines used on-farm?

• No comprehensive investigation into lepto vaccination practices in NZ dairy in the last 40 years.

• Therefore, descriptive analysis of dairy vaccination practices was undertaken

• Part of a more comprehensive study investigating leptospirosis in dairy herds.
Dairy study

- National sampling of dairy cows 2016
- NZ dairy farms stratified by herd size and region.
- Cross-sectional study of 200 randomly selected farms.
- 20 cows/farm (total 4,000 cows sampled).
Typical timeline of farm management events in a New Zealand spring calving dairy herd

- Red bars - Suggested optimal vaccination times as red vertical bars

- **N.B. It was against these recommendations that vaccination timing on farms was assessed in the questionnaire**
Vaccination practices

• Developed and pre-tested the questionnaire
• Administered by farmer’s vet or the vet tech.
Comparison with Best Practice

• For the study, these data assessed against recommendations in Best Practice Report.

• The goal was to understand what factors influence compliance or otherwise to the vaccination Best Practice Recommendations with the ultimate aim of improving disease management and reducing risk to humans.
Key findings:

• Almost universal uptake of vaccination (199/200 farms) & 90% for > 5 years

• Indicates:
  - high level of confidence in vaccination as a control measure and communication about the vaccination has been well received.
  - awareness of legal requirement to take steps to protect staff.

• Bivalent vaccine more commonly used
  - more likely the veterinarian’s choice and/or availability influencing the vaccine type used
Findings:

- Farmers that had changed their vaccine practices in the last 5 years tended to do so by aligning with the BP recommendations on timing and adding booster vaccinations to calves and heifers.
- ~½ had given first vaccinated calf by 4 months of age
- Trend of shortening time between 1st vacc. and booster
- Evidence of the effect of the education campaign.
Clostridial/lepto vaccine

• The 7-in-1 Clostridial/Hardjo/Pomona vaccine used more commonly in calves than other age groups

• *Possibly combining Clostridia/Lepto vaccine fits in more easily to the farm management calendar – something to consider.*
Timing vs administrators of vaccination

• Found greater conformity to BP guidelines for 1st vaccinations for calves and annual boosters for heifers when farmer administered the vaccine rather than contracted veterinary providers.

• This indicates demands on veterinary practitioners may create a “bottleneck” limiting their availability to administer vaccine at preferred (BP) times to all their clients.
Brought-in stock

- 60% of farmers purchased only vaccinated stock.

- 30% however were unsure of the vaccination status of the stock they brought-in.

- ~61% of farmers had non-dairy stock on farm but only 42% vaccinated some/all of their other stock.

- *This is an area where there could be an educational push to improve practice and for real gains in protection.*
Conclusions from first study

• Cost difference between bi- and trivalent vaccine is minimal and not a barrier.

• Vaccine choice can depend on what is available on the market at the time or vet’s preference.

• A shift towards vaccination timing to those in BP recommendations but identified as an area to improve particularly around calf and heifer vaccination timing.

• Only 20% of farms conformed to BP recommendation for all ages and livestock.

• Possibly encourage more farmers to vaccinate their own stock – shift towards optimal timing?
Second study

Briefly -

• 3 workers ill with lepto on the one dairy farm

• Was an unvaccinated dairy farm and during the milking season

• Serology showed the cattle were infected and the likely source for human infection.
Decisions around management of outbreak

- When to vaccinate all/some cattle?
- Treat cattle with antibiotics? When/if?
- Prophylactic course of antibiotics for other workers and PPE

- Complications
  - when treating with antibiotics costly & there’s a withholding period i.e. the milk can’t be used
  - environmental cost
  - production lost/cost to farmer
  - AMR concerns

- Social implications
  - cost of treatment could cause financial pressures risking livelihoods possibly
Advice

• Vaccinate milking herd first (decrease shedding)

• Suggest workers receive prophylactic antibiotics

• Treat milking herd with antibiotics at dry-off

• Extra PPE for workers and education around risks e.g. effluent spreader
Practical considerations around vaccination

• Need to understand what are barriers to vaccination in relation to work cycle around the farm over the year

  • Convenience plays a part in the equation
  • Importance of being able to fit in with farmers’ work cycles to improve likelihood of compliance. (e.g. ~2/3 of farmers often administered lepto vaccine at the same time as other treatments)
  • Combining multivalent vaccines to ease workload e.g. clostridal/lepto multivalent vaccine

• Customisation for different farming cycles/climates – not a case of “one size fits all”
Education

• Our challenge re continued education - important to improve national lepto management particularly around cows/bulls brought-in or other stock classes.

• The effectiveness of vaccination

• Improving vaccination programmes

• & emphasis on PPE as well

Social factors vs science in our lepto management strategies

Lessons from these studies:

• Any management plan needs to take into consideration human factors for best effectiveness.
  - i.e. what is optimal scientifically may not necessarily be the best course of action.

• Therefore, many factors to consider around protection of workers/treatment of stock/effectiveness of PPE and economic and environmental when developing a management plan
Acknowledgements

- The farmers and veterinary practices that participated
- Dr Ahmed Fayaz for database support and Neville Haack for lab support
- Funding from: NZ Ministry of Primary Industry’s Sustainable Farming Fund, AGMARDT, Zoetis, MSD, Virbac and NZAID.

Ngā mihi Thank you
Hosts and cycling

Asymptomatic rodent carriers

Wild animals

Livestock and domestic animals

Soil and water

Uveitis

Meningitis

Myocarditis

Pulmonary haemorrhage syndrome

Hepatic dysfunction

Renal dysfunction
Maintenance hosts for leptospirosis in New Zealand

*L. borgpetersenii* serovar Ballum: rodents and hedgehogs
*L. borgpetersenii* serovar Hardjo (subtype Hardjobovis*): cattle, deer, sheep
*L. borgpetersenii* serovar Balcanica: possums
*L. borgpetersenii* serovar Tarassovi: rodents and pigs

*L. interrogans* serovar Pomona*: pigs, ruminants
*L. interrogans* serovar Copenhageni*: rodents

*animal vaccines available
Milking shed types

Rotary milking shed

Herringbone milking shed
# Summary of MAT titre in Rotary shed

## Prevalence of Leptospirosis in Rotary herd

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![Prevalence of Leptospirosis in Rotary herd](image)