Why leptospirosis continues to occur in workers of vaccinated dairy herds


School of Veterinary Science, Massey University, New Zealand
• **Human leptospirosis:**
  • Flu-like signs, kidney colonisation
  • ~100 notified cases per year since 1997
    • 62% farm workers
  • Dairy: high exposure to urine at milking
  • Serovars:
    • **In vaccines:** Hardjobovis, Pomona, Copenhageni (~ Icterohaemorrhagia)
    • **Other:** Tarassovi, Ballum, Canicola, Australis
  • **Cases in dairy farmers despite vaccination**

• **2011 pilot study in vaccinated dairy herds**
  • 30% herds and 4% cows PCR+ (shedding)
  • No serovar information
Cross-sectional: 200 farms

- January – March 2016
  - Random selection of herds
    - stratified by region and herd size
  - 20 cows per herd; MAT serology; urine PCR

- Results:
  - Herds: 27% shedding (CI: 20 – 33%)
  - Cows: 2.4% shedding (CI: 1.9% – 2.8%)

<table>
<thead>
<tr>
<th>Serovar</th>
<th>Vaccination Status</th>
<th>Herds</th>
<th>Cows</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hardjobovis</td>
<td>vaccinated</td>
<td>99%</td>
<td>44%</td>
</tr>
<tr>
<td>Pomona</td>
<td>vaccinated</td>
<td>96%</td>
<td>28%</td>
</tr>
<tr>
<td>Copenhageni</td>
<td>vaccinated</td>
<td>16%</td>
<td>3%</td>
</tr>
<tr>
<td>Copenhageni</td>
<td>non-vacc</td>
<td>15%</td>
<td>1%</td>
</tr>
<tr>
<td>Tarassovi</td>
<td>non-vacc</td>
<td>74%</td>
<td>17%</td>
</tr>
<tr>
<td>Ballum</td>
<td>non-vacc</td>
<td>36%</td>
<td>3%</td>
</tr>
</tbody>
</table>
MAT type ‘Tarassovi’

• Strong impact of Tarassovi on shedding

• 75 pos. urine samples:
  • PCR sequencing
  • gyrase B amplicons

Wilkinson et al. 2018
Emergence? Crude prevalence of Tarassovi in dairy cattle (n)

- 34 years gap -

- 74% herds

- Increasing herd size
- More intensive production
- Economy of scale
- Increased antimicrobial use

Kirschner (1954) 1953 100
Marshall (1973) 1968 403
Lake (1973) 1971 890
Brockie (1976) 1973 410
Hellstroem 1978 1974 480
Ryan + Marshall 1976 1975 480
Mackintosh 1982 1976 300
2016 4,000
Tarassovi in notified human cases 2005 - 2010

- Cowie and Bell: NZMJ 27 July 2012, Vol 125 No 1358

<table>
<thead>
<tr>
<th>Occupational group</th>
<th>Serovar case numbers (%)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Ballum</td>
<td>Copenhageni</td>
</tr>
<tr>
<td>Dairy farmer</td>
<td>5 (20)</td>
<td>1 (4)</td>
</tr>
<tr>
<td>Farmer and farm manager</td>
<td>6 (17.6)</td>
<td>1 (2.9)</td>
</tr>
<tr>
<td>Meat processor</td>
<td>0 (0)</td>
<td>0 (0)</td>
</tr>
</tbody>
</table>

PR dairy vs non-dairy = 7.5 fold (p=0.004)
PR dairy vs meat proc. = 7.5 fold (p=0.028)
Public Health Surveillance data (ESR):
Occupation of 1,556 human cases 1999 – 2016

Shah et al. 2017
Conclusions:

• Vaccination against Hardjobovis, Pomona, Copenhageni effective

• However, a small percentage of cows (albeit 27% herds) continue to shed *Leptospira* and expose dairy workers
  • Tarassovi = main reason for *shedding and disease* in dairy workers
  • 75% herds with evidence of Tarassovi
  • More than half of ‘Tarassovi’ shedders are ‘Agent X’

• Emergence of a new Tarassovi strain in cattle [sheep, deer]

• ‘Want’ to add Tarassovi to vaccines
  • Ongoing: isolation and whole genome sequencing
Acknowledgements

- SFF/MPI, AGMARDT + several other funders
- NZVA-DCV Jenny Weston, Mark Bryan
- FLAG-Dairy Roger Marchant, Chris Morley, Shirley Read, Richard McIntyre
- 150 veterinary colleagues and vet-tecs sampling
- Dairy Farmers compliance
- DairyNZ random selection
- mEpiLab/EpiCentre Ahmed Fayaz, Neville Haack