Seroprevalence of specific *Leptospira* serovars in pigs from five provinces in Vietnam

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Outline

• Introduction of leptospirosis
• Materials and methods
• Results
• Discussion
• Future direction
Leptospirosis

• A bacterial zoonotic disease caused by the spirochetes of the genus *Leptospira*

• Pathogenic:
  – *L. interrogans* and *L. kirschneri*
    • More than 200 serovars
• Zoonotic disease
  • Transmitted to humans from a variety of wild domesticated animal hosts
  • Most common reservoirs: rodents, wild animals (raccoon) and farm animals
  • Occupational disease of animal handling

• Transmitted through the damaged skin or mucus membranes of exposed humans and animals

• Indirect contact (water, soil and feed) with infected urine from an animal with leptospirosis

Epidemiology
## Host animals

<table>
<thead>
<tr>
<th>Species</th>
<th>Common infections</th>
<th>Possible others</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dogs</td>
<td>Canicola, Icterohemorrhagiae, Grippotyphosa, Pomona</td>
<td>Bratislava, Autumnalis</td>
</tr>
<tr>
<td>Cats</td>
<td>rarely identified</td>
<td></td>
</tr>
<tr>
<td>Cattle (and deer)</td>
<td>Hardjobovis, Pomona, Grippotyphosa, Icterohemorrhagiae</td>
<td>Australis, Autumnalis, Canicola, Bataviae, Hebdomadis, Krematosis, Tarassovi, Sejroe, Bratislava</td>
</tr>
<tr>
<td>Pigs</td>
<td>Pomona, Bratislava, Canicola, Tarassovi, Icterohemorrhagiae</td>
<td>Grippotyphosa, Sejroe</td>
</tr>
<tr>
<td>Sheep</td>
<td>Pomona, Grippotyphosa, Bratislava, Hardjo</td>
<td></td>
</tr>
<tr>
<td>Horses</td>
<td>Pomona, Bratislava, Canicola, Icterohemorrhagiae, Sejroe</td>
<td></td>
</tr>
</tbody>
</table>

Materials and methods
Sampling: January to early June 2016

- National Institute of Veterinary Research (NIVR) – Hanoi, Vietnam
- Swine serum samples from 5 provinces
  - Fattening pigs (6-9 months & 60-120kg)
  - At least 385 samples† / province
  - Multi-stage sampling
    (province-district-commune)
  - Slaughterhouses
  - Sampling information
- Microscopic agglutination test (MAT)
  - 15 serovars*
  - starting from 1:100 up to 1:800
  - Positive sample ≥ 1:100

†Sample size (each province): 50% prevalence, 95% CI, precision 5%
Sampling - Slaughterhouses
Sampling - Slaughterhouse
Sampling – meeting and lab analysis
Results
By each province

<table>
<thead>
<tr>
<th>Province</th>
<th>Total tested samples</th>
<th>Seropositive samples (a titer≥1:100 for any serovars)</th>
<th>Seropositive (%) with 95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hanoi</td>
<td>390</td>
<td>37</td>
<td>9.49 (6.77-12.84)</td>
</tr>
<tr>
<td>Son La</td>
<td>384</td>
<td>27</td>
<td>7.03 (4.68-10.07)</td>
</tr>
<tr>
<td>Nghe An</td>
<td>380</td>
<td>33</td>
<td>8.68 (6.05-11.98)</td>
</tr>
<tr>
<td>Dak Lak</td>
<td>385</td>
<td>27</td>
<td>7.01 (4.67-10.04)</td>
</tr>
<tr>
<td>An Giang</td>
<td>420</td>
<td>36</td>
<td>8.57 (6.08-11.67)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1,959</strong></td>
<td><strong>160</strong></td>
<td><strong>8.17 (6.99-9.47)</strong></td>
</tr>
</tbody>
</table>
Serovars by each province

- Australis
- Autumnalis
- Grippotyphosa
- Hardjo
- Javanica
- Tarassovi Mitis
- Hebdomadis
- Icterohaemorrhagiae
- Canicola

% sero-positive samples (titer≥1:100)
## Serovars by using 4 cutoff titers

### Sero-positive results

<table>
<thead>
<tr>
<th>Serovar</th>
<th>Total tested samples (n)</th>
<th>≥ 1:100</th>
<th>≥ 1:200</th>
<th>≥ 1:400</th>
<th>≥ 1:800</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australis</td>
<td>1,959</td>
<td>38 (1.94 (1.37-2.65))</td>
<td>16 (0.82 (0.42-1.22))</td>
<td>7 (0.36 (0.09-0.62))</td>
<td>4 (0.20 (0.001-0.40))</td>
</tr>
<tr>
<td>Autumnalis</td>
<td>1,959</td>
<td>23 (1.17 (0.75-1.76))</td>
<td>7 (0.36 (0.09-0.62))</td>
<td>2 (0.10 (0-0.24))</td>
<td>1 (0.05 (0-0.15))</td>
</tr>
<tr>
<td>Canicola</td>
<td>1,959</td>
<td>2 (0.10 (0-0.24))</td>
<td>1 (0.05 (0-0.15))</td>
<td>0</td>
<td>Null</td>
</tr>
<tr>
<td>Grippotyphosa</td>
<td>1,959</td>
<td>21 (1.07 (0.62-1.53))</td>
<td>9 (0.46 (0.16-0.76))</td>
<td>4 (0.20 (0.001-0.40))</td>
<td>4 (0.20 (0.001-0.40))</td>
</tr>
<tr>
<td>Hardjo</td>
<td>1,959</td>
<td>1 (0.05 (0-0.15))</td>
<td>1 (0.05 (0-0.15))</td>
<td>0</td>
<td>Null</td>
</tr>
<tr>
<td>Hebdomadis</td>
<td>1,959</td>
<td>2 (0.10 (0-0.24))</td>
<td>1 (0.05 (0-0.15))</td>
<td>0</td>
<td>Null</td>
</tr>
<tr>
<td>Icterohaemorrhagiae</td>
<td>1,959</td>
<td>2 (0.10 (0-0.24))</td>
<td>2 (0.10 (0-0.24))</td>
<td>2 (0.10 (0-0.24))</td>
<td>1 (0.05 (0-0.15))</td>
</tr>
<tr>
<td>Javanica</td>
<td>1,959</td>
<td>33 (1.68 (1.11-2.25))</td>
<td>8 (0.41 (0.13-0.69))</td>
<td>3 (0.15 (0-0.33))</td>
<td>1 (0.05 (0-0.15))</td>
</tr>
<tr>
<td>Tarassovi Mitis</td>
<td>1,959</td>
<td>43 (2.20 (1.55-2.84))</td>
<td>11 (0.56 (0.23-0.89))</td>
<td>3 (0.15 (0-0.33))</td>
<td>1 (0.05 (0-0.15))</td>
</tr>
</tbody>
</table>
Proportion of positive MAT by *Leptospira* serovar using 4 different cutoff titers

<table>
<thead>
<tr>
<th>Serovar</th>
<th>≥ 1:100</th>
<th>≥ 1:200</th>
<th>≥ 1:400</th>
<th>≥ 1:800</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australis</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Autumn.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Canicola</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gripp.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hardjo</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hebdomadis</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ictero.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Javanica</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tarassovi</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Discussion

- Seropositive rate is relatively lower compared to previous studies in Vietnam
  - Samples were collected at slaughterhouses during dry season
  - Older pigs were more likely to be exposed to organisms
  - Animals sent for slaughter may be less likely to be visibly ill

- Tarassovi Mitis, Australis, Javanica and Autumnalis showed relatively high positive rates
  - Tarassovi Mitis and Autumnalis: pig
  - Australis, Tarassovi Mitis: Wild boar – further study required
  - Javanica and Icterohaemorrhagiae: Rat – further study required

- Human cases (underreported) – further study required
  - 48 cases have been reported last 5 years (annually, 0.011 per 100,000)
Future directions

• Pig samples will be collected during rainy season in 2017 (June-October)
  • To make a comparison between dry and rainy seasons
  • To identify potential risk factors

• Human samples will be collected at hospitals/community levels across the country
  • To identify circulating serovars in Vietnam
  • To identify potential risk factors

• Survey: awareness/perception of zoonotic diseases
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