Ticks and tick-borne Diseases of Veterinary Importance in Japan

Hisaaki NOKUMA
Department of Clinical Veterinary Medicine,
Obihiro University of Agriculture and Veterinary Medicine, Obihiro, Japan
Nice and cool in Summer

Minus 20–30 degree in winter!
Obihiro is a cattle country.

400,000 cattle in Obihiro
(20% of Japan)

Theileria orientalis infection
An important disease of cattle in pasture in Japan

Tick control program for cattle
Animals are usually infested by many ticks.

Today’s topics:
Ticks and Tick-borne Diseases in Japan
Attachement to humans and animals
Lyme disease by *Borrelia garinii*

Ticks feed blood!

*Haemaphysalis longicornis*
Pathogens invade into animals with tick saliva.

ex. Babesia

Salivary gland
Eggs from engorged-female

What kind of ticks we have in Japan?

Tick species in Japan

6 Genus 43 species
Tick survey of companion dogs in 2011

1162 dogs from 108 Animal hospitals

In all 47 prefectures in Japan

4232 ticks were recovered
Pathogens transmitted by the major ticks of dogs

<table>
<thead>
<tr>
<th>Tick species</th>
<th>Pathogens</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>H. longicornis</em></td>
<td><em>B. gibsoni</em>, <em>B. ovata</em>, <em>T. orientalis</em>, <em>R. japonica</em></td>
</tr>
<tr>
<td><em>H. flava</em></td>
<td><em>R. japonica</em>, <em>E. muris</em>, <em>Francisella</em></td>
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<tr>
<td><em>I. ovatus</em></td>
<td><em>Borrelia</em> spp., TBE virus</td>
</tr>
<tr>
<td></td>
<td><em>Ehrlichia</em> sp. detected from <em>I. ovatus</em>,</td>
</tr>
<tr>
<td></td>
<td><em>R. japonica</em>, <em>R. asiatica</em></td>
</tr>
<tr>
<td><em>R. sanguineus</em></td>
<td><em>B. gibsoni</em>, <em>B. canis</em>, <em>Hepatozoon canis</em>,</td>
</tr>
<tr>
<td></td>
<td><em>Rickettsia conorii</em>, <em>Rickettsia rickettsii</em>,</td>
</tr>
<tr>
<td></td>
<td><em>Bartonella vinsonii</em>, <em>E. canis</em>, <em>A. platys</em></td>
</tr>
</tbody>
</table>
Japanese spotted fever

Photograph: Dr. Mahara

Japanese spotted fever

Photograph: Dr. Mahara
Babesia gibsoni infection in dogs

Fever, Anorexia, Jaundice, Hemolytic Anemia, Splenomegaly etc.

Ehrlichia muris transmitted by H. flava

Morulae of E. muris in DH82 cells
**Ehrlichia muris**

Splenomegary of mice

![Image of liver and spleen with arrows]

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**Anaplasma phagocytophilum**

Granulocytic anaplasmosis

- Human, Horses, Dogs, Cats
- Cattle = Tick-borne fever

![Image of microorganism]
Tick-borne fever in Europe

- Anorexia
- Fever
- Abortion
- Cough
- Decreased milk production

TBF is endemic in France

Results: TBF prevalence agent, in France, from 1991 to November 2005


1st case

58 Departments / Bovine Cases
- 2 Dpts / human -3- cases (55-67)
- 12 Dpts / Equine cases (LDA14)
- 2 Dpts / Wild Ungulates (Roe Deer, Izard)

74 departments

«Babesiosis» Survey (Nantes N. Vet. S.)
1987-1989

Theoretical site for Ticks’ presence/absence

(Dr. Guy Joncour, Group Veterinaire de Callac, France)
Dr. Guy Joncour, Group Veterinaire de Callac, France

A. phagocytophilum has been detected from Sika Deer and ticks in Japan (2006)
Deer is an important tick harbor.

Sika Deer enter pasture land of cattle.
Cattle is also infected with *A. phagocytophilum* in Japan, without clinical symptoms.
Anaplasma sp. in Japan

Anaplasma sp. from SD-1
Anaplasma sp. from SD-2

A. phagocytophilum in US and European countries

Anaplasma sp.

HSP &

A. phagocytophilum in US and European countries

groEL
(nucleotide)
<table>
<thead>
<tr>
<th>Organism</th>
<th>16S</th>
<th>gltA Nuc</th>
<th>gltA A.A.</th>
<th>groEL Nuc</th>
<th>groEL A.A.</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>A. Phagocytophilum</em></td>
<td>98.6</td>
<td>76.5</td>
<td>66.7</td>
<td>80.3</td>
<td>94.9</td>
</tr>
<tr>
<td>(Franch strain)</td>
<td></td>
<td></td>
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<tr>
<td><em>A. platys</em></td>
<td>97.7</td>
<td>72.9</td>
<td>61.1</td>
<td>79.3</td>
<td>93.9</td>
</tr>
<tr>
<td><em>A. marginale</em></td>
<td>96.3</td>
<td>73.1</td>
<td>63.4</td>
<td>77.2</td>
<td>83.9</td>
</tr>
</tbody>
</table>

- Japanese *Anaplasma* sp. closely related to
*A.phagocytophilum* has phylogenetic divergence from any other known *Anaplasma* species.

**Conclusion & Future studies**

This *Anaplasma* sp. detected in Japan can be a potentially a novel species.
Adrian et al., Veterinary Microbiology 2012

1. Pathogenecity and epidemiology of the novel *Anaplasma* sp. in Japan.
2. Geographic divergence of *A.phagocytophilum*
3. Vaccine development for pasture fever by using the new pathogens?
Thank all local staffs for the field studies of tick-borne diseases.