Anaplasma phagocytophila -anaplasmosis: a versatile and highly prevalent tick borne disease in Connecticut and neighboring states

Anaplasmosis affects horses, dogs, cats, ruminants and humans in Connecticut and neighboring states. The nomenclature of this bacterium that infects granulocytes has been reviewed. The former Ehrlichia equi and phagocytophila denominations have been unified under a single Anaplasma phagocytophila specie. Therefore, the disease is now called equine or canine anaplasmosis for horses and dogs (formerly granulocytic ehrlichiosis). For ruminants, it is still called bovine or ovine ehrlichiosis, because “ruminant anaplasmosis” refers to infection with Anaplasma marginale or ovis, intracellular bacteria that infect erythrocytes and not granulocytes (Fig 1).

In our region, A. phagocytophila is predominantly transmitted by Ixodes scapularis (Fig 2) as is the case with Borrelia burgdorferi. At CVMDL we found 3% of our tick submissions that were positive for both agents over the past 3 years.

Anaplasmosis is well recognized in horses throughout our region. Horses older than 2-years, exhibiting acute fever, lethargy, anorexia and eventually affected by limb swelling or mucous membrane petechiation during tick season are good candidates for testing. A leukopenic (granulocytes and lymphocytes) and thrombocytopenic hemogram reinforces the diagnosis, but definite confirmation requires specific testing (see section below). In 2011, CVMDL tested 119 horses by serology, and found 53% with positive serological titers (>1/80).

Anaplasmosis in dogs and cats is a recently described disease (1995 & 2004). Animals have similar clinical signs to those in horses. Dogs additionally may show coughing and lameness.

The most consistent clinicopathologic finding in dogs with anaplasmosis is a moderate to severe thrombocytopenia. The platelet depletion is exacerbated by co-infection with Lyme disease, but even then the lower level of 20,000 pt/ul is not reached. Therefore spontaneous bleeding does not occur typically in dogs. In 2011, CVMDL tested 6 dogs by serology and all had positive titers.

Ehrlichiosis in ruminants has been well characterized in Europe, in sheep and is also emerging in cattle. A serologic survey in Connecticut has demonstrated the serological signature of the agent in cattle.

Laboratory confirmation: Regardless of the species, the good news is that laboratory confirmation is available with one or two blood tubes. Two tools are being currently used:

- PCR is the best technique in the acute phase of disease (Fig 2). It is very sensitive and detects A. phagocytophila as early as 3 days post-infection in dogs, and lasts for about 2 weeks. It has made the historical blood smear examination for morulae (Fig 1) obsolete in a diagnostic setting.
- Antibody detection by the serological method of IFA is not as early and as specific as PCR, but it has the advantage of lasting longer (several months in dogs). Dogs seroconvert typically 10 to 20 days after inoculation. A rise in titer between paired samples is considered the gold standard for serological diagnosis in humans, and it is recommended in low titer results: in horses a 4-fold increase cut-off value has been proposed.

With this early spring, adult ticks of various species have already emerged and got active in southern New England. Let's take this opportunity to re-examine the current knowledge and diagnostic criteria on one of these important tick borne diseases.

Special offer: We are in the process of validating our PCR testing and will offer free PCR testing to samples taken from animals with clinical signs compatible with anaplasmosis during tick season and submitted for serology (until we get enough data for validation). Don't forget therefore to add a purple top tube (EDTA) and request for this on your submission!
## Testing for the prevalent tick borne diseases of New England at CVMDL

<table>
<thead>
<tr>
<th>Pathogen</th>
<th>Species</th>
<th>Method</th>
<th>Sample</th>
<th>turn around time</th>
<th>price</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. phagocytophila</td>
<td>Any</td>
<td>PCR</td>
<td>Blood 2ml in EDTA</td>
<td>3-5 days</td>
<td>$50.00</td>
</tr>
<tr>
<td>A. phagocytophila</td>
<td>Equine, canine, bovine</td>
<td>IFA</td>
<td>Serum 2ml</td>
<td>2-3 days</td>
<td>$28.00</td>
</tr>
<tr>
<td>Lyme Disease</td>
<td>Canine, Equine</td>
<td>ELISA</td>
<td>Serum 2ml</td>
<td>2-3 days</td>
<td>$17.00</td>
</tr>
<tr>
<td>Lyme Disease</td>
<td>Bovine, Caprine, Feline, Ovine, Porcine</td>
<td>IFA</td>
<td>Serum 2ml</td>
<td>2-3 days</td>
<td>$17.00</td>
</tr>
<tr>
<td>Lyme Disease</td>
<td>Bovine, Canine, Equine, Feline</td>
<td>Western Blot</td>
<td>Serum 2ml</td>
<td>5-7 days</td>
<td>$45.00</td>
</tr>
<tr>
<td>Lyme Disease bundle</td>
<td>see above</td>
<td>ELISA/IFA and Western Blot combination</td>
<td>Serum 2ml</td>
<td>5-7 days</td>
<td>$60.00</td>
</tr>
</tbody>
</table>

These diseases can also be tested directly on ticks by PCR.

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**References**

1. Bradford Smith, Large animal internal medicine, 4th edition
2. Green, Infectious diseases of dogs & cats, 3rd ed
4. Woldehiwet, Ann NY Acad Sci, 2006, 446-60
5. Egenvall et al, Vet Rec, 1998, 10, 412-17

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