Signs of canine anaplasmosis may manifest following infection with either *Anaplasma phagocytophilum* or *Anaplasma platys*. However, many dogs with circulating antibodies to *Anaplasma* species do not exhibit obvious signs of disease. Both agents of anaplasmosis are transmitted by ticks, and their distribution corresponds with the range of their vector. As tick-borne diseases continue to spread and vector-borne disease diagnostics continue to improve, veterinarians are diagnosing more dogs with *Anaplasma* infections. In managing seropositive dogs, consistent messaging for clinic staff and pet owners regarding diagnostic and control recommendations is critical for widespread awareness and success of preventive measures.

**Abstract**

As tick-borne diseases continue to spread and vector-borne disease diagnostics continue to improve, veterinarians are diagnosing more *Anaplasma* infections in dogs. Clinical reference guides created by diagnostic companies can provide assistance in diagnosing, treating, and managing acute and chronic cases of anaplasmosis. Utilizing these guides can aid veterinarians in identifying opportunities for better tick control, encouraging regular testing, and managing pet owner expectations.
Take-Home Points

- Improved diagnostics combined with poor tick control compliance means dogs are more likely to be seropositive for tick-borne agents, such as *Anaplasma* species.
- Veterinarians can consult clinical reference guides from diagnostic companies to assist in diagnosing and managing dogs with test results seropositive for *Anaplasma* species.
- Depending on the agent responsible, dogs with anaplasmosis may have fever, anorexia, lethargy, polyarthritis, epistaxis, or petechiae.
- Following a test result seropositive for *Anaplasma* species, many dogs benefit from additional diagnostic tests, such as a complete blood count.
- Treating seropositive dogs without clinical signs is likely not necessary in most cases.
- Annual screening for vector-borne diseases using serologic assays and administering year-round tick control remain the mainstays for prevention of tick-borne diseases.

Subclinical infections are common, with up to 60% of seropositive dogs not showing obvious signs of infection. If present, disease occurs soon after infection with *A. phagocytophilum*; however, persistent manifestations were noted experimentally and chronic infection with *A. platys* is not uncommon. With *A. platys*, disease is often mild with recurrent thrombocytopenia every 10 to 14 days, which is attributed to phagocytosis of infected platelets. Other signs may include bleeding tendencies (e.g., epistaxis). Dogs with *A. phagocytophilum* infection might be

### TABLE 1 Important Characteristics of the Agents of Anaplasmosis in Dogs in North America

<table>
<thead>
<tr>
<th></th>
<th><em>ANAPLASMA PHAGOCYTOPHILUM</em></th>
<th><em>ANAPLASMA PLATYS</em></th>
</tr>
</thead>
<tbody>
<tr>
<td>Disease name in dogs</td>
<td>Canine granulocytic anaplasmosis</td>
<td>Infectious canine cyclic thrombocytopenia</td>
</tr>
<tr>
<td>Clinical signs</td>
<td>Lethargy, fever, anorexia, lymphadenopathy, joint swelling and stiffness, lameness</td>
<td>Fever, lymphadenopathy, petechiae, ecchymoses, pale mucous membranes</td>
</tr>
<tr>
<td>Laboratory findings</td>
<td>Thrombocytopenia, mild anemia, neutrophilic polyarthritis</td>
<td>Thrombocytopenia, leukocytosis</td>
</tr>
<tr>
<td>Distribution in United States</td>
<td>Northeastern, upper midwestern, and western regions</td>
<td>Southern regions</td>
</tr>
<tr>
<td>Tick vector</td>
<td><em>Ixodes scapularis</em> and <em>Ixodes pacificus</em> (primarily)</td>
<td><em>Rhipicephalus sanguineus</em> (suspected)</td>
</tr>
<tr>
<td>Main reservoir hosts</td>
<td>White-footed mice, redwood chipmunks, woodrats</td>
<td>Dogs</td>
</tr>
<tr>
<td>Public health concerns</td>
<td>Zoonotic</td>
<td>Potentially zoonotic</td>
</tr>
<tr>
<td>Differential diagnoses</td>
<td>Other vector-borne diseases (e.g., Lyme disease, ehrlichiosis), immune-mediated polyarthritis, hemolytic anemia</td>
<td>Other vector-borne diseases (e.g., ehrlichiosis), immune-mediated thrombocytopenia</td>
</tr>
</tbody>
</table>

*Most seropositive dogs (60%) have no clinical signs.*

*A platys* resides and multiplies in platelets, from which it disseminates. In the United States, most infections are diagnosed in southern regions where the suspected tick vector, the brown dog tick (*Rhipicephalus sanguineus*), thrives. This tick species (FIGURE 1B) feeds on dogs at every life stage, and high tick burdens are not uncommon. Because this tick can infest kennels and homes, year-round activity and pathogen transmission is possible. Dogs are the primary reservoir for *A. platys*, and brown dog ticks, once infected, can maintain infection between molts, allowing efficient pathogen transmission between dogs.
lethargic, anorexic, or feverish. Thrombocytopenia can be seen in > 90% of patients and signs suggestive of polyarthritis, such as reluctance to move, could be present.¹ ²

**TRENDS IN DIAGNOSTIC TESTING**

Canine seropositivity to tick-transmitted *Anaplasma* species has increased over the past few years, and some veterinarians in endemic areas may be detecting *Anaplasma* antibodies more often than any other tick-borne disease agent. When reviewing canine test results from IDEXX between 2013 and 2019, researchers demonstrated the continued expansion of *A. phagocytophilum* across the United States.⁴ More recently in 2021, the Companion Animal Parasite Council documented that 1 out of every 50 tested dogs was seropositive to *Anaplasma* species, whereas in 2022, 1 in 30 dogs tested positive.⁵ ⁶ These escalating trends continued through 2023, and the reports may be explained, in part, by improved diagnostics and awareness. Several point-of-care enzyme-linked immunosorbent assays (ELISAs) exist, with a range of documented sensitivities and specificities; 1 ELISA reports sensitivity and specificity as high as 94.1% (95% confidence interval [CI]: 86.8% to 98.1%) and 98.4% (95% CI: 96.6% to 99.3%), respectively.⁷

Serology remains a popular method of detecting infections with *Anaplasma* species. Generally, it takes 1 to 2 weeks after infection before antibodies can be detected, and because there are varying levels of cross-reactivity, a positive result is reported at the genus level.⁸ Other diagnostics to consider include blood smears for visualization of morulae in neutrophils (*A. phagocytophilum*) or platelets (*A. platys*) (**FIGURE 2**). Neutrophils infected with *A. phagocytophilum* are more likely to be seen during the acute phase in sick dogs, and the evaluation of blood smears yields moderate to high sensitivity in those cases.² However, the lack of morulae on a blood film should not rule out an infection as parasitemia may be low in chronic phases.

**FIGURE 1.** Tick vectors of the causative agents of canine anaplasmosis: (A) *Ixodes* species for *Anaplasma phagocytophilum* and (B) *Rhipicephalus sanguineus* (suspected) for *Anaplasma platys*.

**FIGURE 2.** (A) Neutrophils infected with morulae of *Anaplasma phagocytophilum* (black arrow) and (B) platelets infected with morulae of *Anaplasma platys* (white arrow).
Sending blood or tissue samples to a laboratory for polymerase chain reaction (PCR) testing can also be considered. In chronic cases, PCR testing of biopsy samples from spleen, lymph node, or bone marrow may yield a greater sensitivity than peripheral blood; however, whole blood collected during acute illness appears to have acceptably high sensitivity. PCR results can take several days to return to the clinic, and, as with blood films, a negative result does not rule out infection with low parasitemia, particularly in chronic cases. For these reasons, a multimodal approach to diagnosing anaplasmosis is recommended and samples should be collected as soon as clinical illness presents.

**MANAGING SEROLOGIC RESULTS**

To assist veterinarians with managing seropositive dogs, some diagnostic companies have collaborated with veterinary specialists to develop clinical reference guides. These guides can help veterinarians develop diagnostic and management plans and aid client communication.

Positive Result With Clinical Signs

If a dog is exhibiting clinical signs of anaplasmosis and a serologic test result is positive, next considerations should include a complete blood count (CBC) and blood film evaluation of fresh whole blood. If thrombocytopenia or anemia—with or without neutrophilia and monocytosis—is present, the results agree with a diagnosis of anaplasmosis. Appropriate treatment with doxycycline, or other tetracycline, should be strongly considered, particularly if no other cause for these abnormalities is found. The diagnosis would be strengthened if morulae are found in neutrophils (A phagocytophilum) or platelets (A platys).

In diagnosed cases, a recheck CBC should be considered approximately 7 days later to assess progression of disease or response to treatment. Alternatively, if no morulae are detected on blood film and the CBC is within normal limits, the positive serologic test may be an incidental finding and the noticeable clinical signs could be due to another cause; therefore, other testing (e.g., PCR) should be considered. In these situations, it is important to remember that many dogs can be seropositive without obvious clinical signs. Additionally, the signs suggestive of tick-borne diseases (e.g., lethargy, fever) overlap with those of many other infectious diseases.

Negative Result With Clinical Signs

If a dog is exhibiting clinical signs suggestive of anaplasmosis but a serologic test result is negative, the dog may be displaying acute disease prior to development of antibodies. When disease is recognized in dogs, it is shortly (approximately 1 to 2 weeks) after infection and may slightly precede production of antibodies, which can become detectable as early as 8 days after infection. In these cases, a second serologic test may be warranted in 2 to 4 weeks, and PCR testing should be strongly considered since it is more likely to detect acute infections.

Since the window between clinical disease and antibody production is small, another cause may be responsible for the clinical signs observed. Performing additional diagnostic tests, such as a CBC, serum chemistry panel, blood film, urinalysis with urine protein to creatinine ratio, or tick-borne PCR panel, should be considered to explore other possibilities for the clinical signs.

Positive Result Without Clinical Signs

If a dog is not exhibiting clinical signs of anaplasmosis but a serologic test result is positive, a CBC and blood film are warranted. If morulae are seen on a blood film or thrombocytopenia is present on the CBC, then the dog may have anaplasmosis and treatment should be considered along with recheck testing of the CBC a week later. If no improvement is noted on recheck, other causes for the abnormalities should be investigated.

If a clinically normal, seropositive dog has a CBC within normal limits, the positive serologic result likely indicates a prior infection that remained undiagnosed or subclinical. In these cases, a recheck CBC can be performed in 7 days to ensure no clinical abnormalities.
Develop, and treatment is not warranted if the CBC stays within normal limits. Antibodies to Anaplasma species can be long-lived (i.e., several months or years), and chronically infected dogs may have high titers; however, if the pathogen is actively evading the immune system, a chronically infected dog may be seronegative at times.

Owners of seropositive but apparently healthy dogs should be advised on the signs of anaplasmosis and educated on proper tick control and removal and the value of annual tick-borne disease testing.

Negative Result Without Clinical Signs
If no clinical signs of anaplasmosis are present and an annual serologic test result is negative, infection with Anaplasma species is unlikely. However, the many benefits of tick prevention and annual testing for common tick-borne diseases should be reviewed with the pet owner. There is enough convincing evidence to suggest that tick-borne diseases will continue to spread to new areas; thus, the infection risk is rarely zero.

SUMMARY
Current trends in canine tick-borne diseases suggest anaplasmosis is a growing threat to dogs. As diagnostics improve and awareness of routine tick-borne disease testing increases, more dogs will be identified as seropositive to Anaplasma species. Not all seropositive dogs will display clinical signs, and the need for treatment is likely unnecessary in most cases. However, performing a CBC to assess platelet counts in seropositive dogs is necessary given the potential severity of disease; when thrombocytopenia is present, treatment should be considered. Additionally, PCR tests may provide more diagnostic evidence, but the results should be combined with serology and clinical history for treatment decisions. Evidence of infection by detection of antibodies presents the opportunity to educate clients on the need for annual tick-borne disease screening and strict tick control.

References