

Complications of Severe Tick Infestation

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History

Bear, an 8-year-old neutered male cocker spaniel, and Yoto, a 4-year-old intact male Pyrenees cross, were presented with weakness and anorexia. Bear was presented in mid-July with severe weakness. Bear lives outdoors and was current with his vaccines. According to his owners, he was given a monthly internal parasite-control product (specific product not identified) but did not receive routine flea and tick control.

Yoto also lives outdoors. He was presented in late September for lethargy of 1 week's duration with several instances of vomiting. His vaccinations were reported as "current" by his owner, but records were not available. Yoto was not on a monthly heartworm and intestinal parasite control product or external parasiticide.

Examination

Both Bear and Yoto were nonambulatory at presentation with evidence of hypovolemic shock, including tachycardia (heart rate 140 and 150 beats per minute, respectively) and tachypnea (30 and 36 breaths per minute, respectively), poor peripheral pulses, and pale pink mucus membranes. No icterus was noted in either dog.

No free fluid was found in the thorax or abdomen with targeted ultrasound of both patients. It was difficult to find areas of skin that were not occupied by ticks on both dogs (Figures 1 and 2). All ticks were initially identified by the attending clinician as nymphal and adult *Rhipicephalus sanguineus*, the brown dog tick. This identification was confirmed by a boarded parasitologist by microscopic examination and comparison to standard keys.

Whole blood was collected for complete blood count. Pertinent laboratory values obtained from each dog are provided in Table.

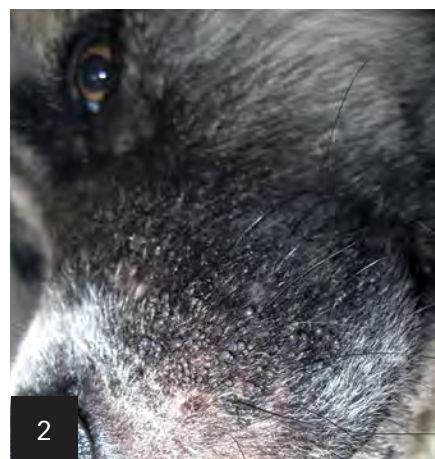
Table. Laboratory Values

Parameter	Bear	Yoto	Reference Range
PCV	10%	6%	35%–57%
Total solids (g/dL)	3.2	4.6	5.0–7.4
WBC ($\times 10^3/\mu\text{L}$)	21.9	21.6	4.0–15.5
Reticulocyte	7.4%	8.0%	0%–1%
Reticulocyte/ μL (absolute)	155,400	106,600	<60,000

PCV = packed cell volume, WBC = white blood cell



1 Ticks attached to Bear at presentation. Note cluster of engorged, feeding female ticks surrounded by smaller feeding male ticks and immature ticks.



2 Feeding adult and immature ticks clustered on the muzzle of Yoto. The skin and surrounding fur are darkened by tick frass and serous exudate from associated tissue damage.

Ask Yourself



1. What are the differentials for this anemia?
2. Do these patients require blood transfusions?
3. Could tick infestation be a cause of the anemia, and how should severe tick infestations be treated?
4. What is the life cycle of *Rhipicephalus sanguineus*?

continues

Diagnosis

Tick exsanguination

Treatment

Major cross-matching was performed, and both patients were administered whole blood transfusions to replace blood volume and red blood cells. Yoto's shock was deemed severe enough, based on degree of anemia, tachycardia, and profound weakness, that he was also administered boluses of synthetic colloid and crystalloid fluids to help stabilize his circulatory volume while whole blood was being prepared from resident, pre-screened donors and administered. Packed cell volume (PCV) in both cases initially improved after the first transfusion but began to decline quickly, and both dogs required second transfusions within 24 hours.

Ticks were initially killed using a topical pyrethrin spray (Vet-Kem Ovitrol Plus, VPL.com) and the dogs were bathed in warm water with a pyrethrin shampoo (Mycodex, VPL.com) to attempt to manually remove as many ticks as could be gently dislodged, taking care to avoid hypothermia. Once patients were dry, fipronil spray (Frontline, merial.com) was applied to as many of the affected areas as possible. Several days of bathing and gentle manipulation were required to remove the bulk of the ticks. The immediate area around the kennels required continuous monitoring to remove and kill ticks as they detached from the patients. Both dogs were treated with cefpodoxime (10mg/kg q24h for 7 days) for concurrent dermatitis at tick attachment sites and with doxycycline (5 mg/kg q12h for 21 days) as a prophylactic treatment for potential tick-associated rickettsial diseases transmitted by *R sanguineus*, including *Ehrlichia canis*, *Anaplasma platys*, and *Rickettsia rickettsii*.

Outcome

Both dogs survived and were returned home within 5 days after each received 2 whole blood transfusions. A single antiinflammatory dose of an intermediate-acting corticosteroid (dexamethasone, 0.1 mg/kg IV) was used to help control inflammation and the resulting continued loss of protein associated with serous exudate at the tick bites. Because anemia was the result of blood loss, single doses of iron (15 mg/kg IM iron dextran) and cyanocobalamin (25 µg/kg SC) were administered. The patients were discharged on a high-quality, high-energy diet with 2 weeks of oral iron supplementation (75 mg q24) per dog.

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Did You Answer?



1. Laboratory findings, as well as physical examination and clinical history, support a severe blood loss anemia with a good regenerative response. The regenerative response indicates anemia of a minimum of 2 days' duration. The most likely differentials for blood loss anemia without external evidence of bleeding or trauma include hemothorax or hemoabdomen secondary to coagulopathy (such as rodenticide toxicity), or splenic disease, gastrointestinal blood loss (such as with ulceration), or severe parasitism (such as gastrointestinal *Ancylostoma caninum* or external parasites such as fleas or ticks).
2. These patients were clearly in need of whole blood to replace both red blood cells and blood volume. Although there is no exact PCV below which transfusion is required, a transfusion of red blood cells is nearly always appropriate at any PCV less than 15%. The duration of blood loss, rapid onset of anemia, hemodynamic stability of the patient, evidence of tissue hypoxia, and likelihood of ongoing blood loss all affect the decision of when to transfuse.
3. The severity of tick infestation in these patients presented several challenges when devising a treatment plan. Both patients were in a debilitated state and were simultaneously affected by severe anemia, tissue hypoxia, hypoproteinemia, and severe dermatitis. Although amitraz is an effective acaricide that would have also interfered with tick feeding, it was unlikely that these patients would have been able to withstand potential neurotoxic side effects. Topical application of a pyrethrin spray was selected because of the relatively high safety margin of these pesticides in dogs, rapidity of action, and the ability to easily wash the chemical away if needed. In both cases, bathing in warm water aided in gently debriding the skin wounds and washing away dead or dying ticks while keeping the patient warm. As a second treatment, fipronil was applied topically using a spray. Topical spot-on products may be less useful for patients with infestations of this severity because the extensive skin lesions could interfere with compound spreading to the distal locations harboring the bulk of

the ticks (eg, feet, ears, tail, muzzle). Isoxazoline compounds have recently been introduced to the market and may constitute an alternative treatment with systemic effects and a fairly rapid kill. To assist in minimizing tick escape from the kennel and limit the chance for clinic infestation, a strip of wide, double-sided adhesive tape (eg, carpet tape) can be placed on the floor around the perimeter of the kennel as a barrier.

4. *Rhipicephalus sanguineus* is unusual compared to other common tick species affecting dogs in that it has a strong host preference for dogs and is found almost exclusively in and around kennels and homes with dogs; access to natural, wooded areas is not necessary for a severe *R*

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sanguineus infestation to develop. Although brown dog ticks can complete their entire life cycle indoors, and often present as home or kennel infestations, this tick will also survive in yards and gardens surrounding homes, particularly in mild climates. These cases highlight the importance of routine treatment of all pets with tick control products. Infestations with *R sanguineus* can establish quickly in and around urban environments shared with people. Eliminating premise infestations once established usually requires application of environmental tick control products by a licensed pest control operator for several months as well as consistent treatment of pets.

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Suggested Reading

Biology and ecology of the brown dog tick, *Rhipicephalus sanguineus*. Dantas-Torres F. *Parasit Vector* 3:26, 2010.

Biology, treatment, and control of flea and tick infestations. Blagburn BL, Dryden MW. *Vet Clin North Am Small Anim Pract* 39:1173–1200, 2009.

Transfusion therapy. Giger U. In Silverstein DS, Hopper K (eds). *Small Animal Critical Care Medicine*, 2nd ed—St. Louis: Elsevier, 2015, 327–332.



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