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Source: Journal of Wildlife Diseases, 33(4) : 900-902

Published By: Wildlife Disease Association

URL: https://doi.org/10.7589/0090-3558-33.4.900

Journal of Wildlife Diseases, 33(4), 1997, pp. 900–902

Tick Paralysis in a Red Wolf

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ABSTRACT: A free-ranging male red wolf (*Canis rufus*) in North Carolina (USA), exhibiting paresis, anorexia and heavy tick infection was diagnosed with tick paralysis. The wolf recovered completely following the removal of all ticks. This is the first record of tick paralysis in the red wolf.

Key words: *Canis rufus*, case report, ixodid ticks, red wolf, reintroduction, tick paralysis.

During the 1980's the U.S. Fish and Wildlife Service (Washington D.C., USA) began reintroducing the endangered red wolf (*Canis rufus*) into the Alligator River National Wildlife Refuge (ARNWR) in eastern North Carolina (USA). Researchers found a variety of parasites, including the ixodid ticks *Dermacentor variabilis, Amblyomma sp.*, and *Ixodes sp.* in the dwindling red wolf population (Riley and McBride, 1972; Custer and Pence, 1981; Pence et al., 1981) and on captive and reintroduced wild wolves (Custer and Pence, 1980; Phillips and Scheck, 1991). The purpose of this report is to present a case report of tick paralysis in a free-ranging red wolf.

In tick paralysis involving a variety of vertebrate species, a female tick secretes a neurotoxin from her salivary glands while feeding; the toxin exerts its effect on the lower motor neurons by either inhibiting depolarization of the terminal portion of the motor nerves, or by blocking the release of acetylcholine at the neuromuscular junction (Gregson, 1973; Wikel, 1984). Paralysis generally begins three to nine days after attachment and originates in the pelvic limbs and ascends anteriorly. Other signs may include anorexia, ataxia, hyporeflexia, and hypotonia. Death by respiratory paralysis may occur if left untreated. Treatment consists of removal of the offending tick or ticks along with symptomatic and supportive care. Recovery of the animal begins within hours of detachment of the tick and is usually complete within 1 to 7 days.

Diagnosis of tick paralysis is difficult, especially without an electromyogram (Parker and Small, 1979). Often the diagnosis is made with the appropriate clinical signs, history, and response to the removal of all ticks. Once an animal has died, diagnosis is nearly impossible since there are no lesions that can be diagnosed post-mortem. This may explain why tick paralysis is diagnosed so infrequently in wildlife, and why wildlife have often been considered resistant to the disease.

On rare occasions tick paralysis has been observed in free-ranging wildlife, such as mule deer (*Odocoileus hemionus*) (Brunetti, 1965), bison (*Bison bison*) (Kohls and Kramis, 1952), black bear (*Ursus americanus*) (Gregson, 1973), grey fox (*Urocyon cinereoargenteus*) (Jessup, 1979), and western harvest mouse (*Reithrodontomys megalotis*) (Botzler et al., 1980). The species of ticks implicated were *Dermacentor variabilis, D. occidentalis, D. andersoni*, and *Ixodes pacificus*. Other host species commonly affected include cattle and sheep, while horses and cats are less commonly affected. In canids, tick paralysis is common in domestic dogs, and Wilkinson (1970) demonstrated tick paralysis in a captive coyote (*Canis latrans*).

On 13 July 1995, a red wolf was reportedly hit by a tractor mower at ARNWR (50°30'N, 53°30'W). It was suspected that the wolf's back had been broken since the hind limbs appeared to be paralyzed. Upon investigation the wolf was determined to be a 14-mo-old wild born male. It was alive and alert but very thin. It was unable to move from the neck down, and

had a heavy infection of ticks, many of them fully engorged. In order to safely handle this wolf, 80 mg ketamine hydrochloride (Vedco Inc., St. Joseph, Missouri, USA) and 40 mg xylazine (Vedco Inc., St. Joseph, Missouri, USA) were administered by intramuscular injection. Because shock was suspected, 32 mg dexamethasone sodium phosphate (Steris Laboratories Inc., Phoenix, Arizona, USA) was administered intravenously. The wolf was then transported to the Roanoke Island Animal Clinic (Manteo, North Carolina, USA).

At the clinic, the wolf was beginning to recover from the general anesthesia administered in the field and able to lift its head slightly. This made it difficult to assess what findings were a result of its underlying condition or due to the anesthesia. There were no signs of trauma but it was in poor condition. The wolf weighed 18.4 kg and was thin. Respiration and heart rate were within normal limits. Chest radiographs appeared normal. When direct firm pressure was applied to the rear toes with a hemostat, it lifted its head in response. This implied that deep pain was present.

At this time the differential diagnosis included trauma, tick paralysis, acute polyreticuloneuritis, botulism, and myasthenia gravis. A complete and thorough bath and dip was performed. Careful attention was paid to removing and eliminating all ticks. Some specimens of these ticks were tentatively identified as *Dermacentor variabilis* and *Amblyomma americanum,* but specimens were not saved for further evaluation, nor were reference specimens placed in a repository. An injection of the combination penicillin procaine and penicillin benzathine (Anthony Products, Arcadia, California, USA) (1×10^6 I.U.) was administered subcutaneously. Vitamin B-complex (1 ml) (Vedco Inc., St. Joseph, Missouri, USA) was administered intramuscularly along with 500 ml of lactated ringers solution subcutaneously. The wolf was then transported back to the containment center in the clinic.

The next morning the wolf was clinically normal, indicating that tick paralysis was the more likely origin of the paralysis. The wolf was released back onto ARNWR nearly 20 hr after treatment and monitored another 62 days with the use of a radio transmitter collar (Telonics, Mesa, Arizona, USA), before dying on the refuge. The cause of death could not be determined as only a hair mat and skeleton remained.

This is the only documented case of tick paralysis in red wolves. There was one other similar incident at ARNWR, but tick paralysis could not be verified. On 3 March 1993, an adult female wolf was believed to be dead as its radio transmitter collar was on mortality mode. This mode is activated if the collar remains motionless for ≥6 hr. The wolf was located 18 km from the wolf in the present case. Upon investigation it was alive but unable to move its hind limbs. It avoided capture and within 36 hr had traveled 5 km from the site. This wolf was later captured and released in April 1994 in good condition. It whelped within 1 mo and has continued to persist in the wild. It is possible this wolf suffered from tick paralysis and recovered after the offending tick released itself, although since it was never handled ticks were not found on the wolf. There is a connection between the two cases, the significance of which is obscure. The female wolf was the mother of the male wolf described in the present case report.

There is only one confirmed case of tick paralysis in free-ranging red wolves and there is no post-mortem indication of tick paralysis. Therefore, the frequency of tick paralysis and it's effects on the wild populations are unknown.

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Received for publication 23 August 1996.