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Source: Journal of Wildlife Diseases, 22(1) : 122-124

Published By: Wildlife Disease Association

URL: <https://doi.org/10.7589/0090-3558-22.1.122>

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Intradermal Infestation of a Red Fox (*Vulpes vulpes*) by the Lone Star Tick (*Amblyomma americanum*)

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Numerous small dark spots and nodules were observed on the visceral side of the skin of a red fox (*Vulpes vulpes*), captured in December 1982, 4.5 km north of Kingsville, Johnson County, Missouri. Upon closer examination the spots were determined to be ticks located in the dermis and hypodermis. Approximately 25 were adults and nymphs, and over 200 larval ticks were present.

Specimens of the ticks were excised and placed in 70% isopropyl alcohol; some were embedded in paraffin, sectioned, and stained with hematoxylin and eosin (H&E). Several ticks were independently keyed by the authors, and a specimen was sent to The Veterinary Diagnostic Laboratory, Kansas State University for confirmation.

All ticks were identified as *Amblyomma americanum*. Most were present in the axilla and groin with the larval ticks predominating in the groin and perineal regions, while the larger ticks were most common in the axillary area (Fig. 1). No inflammation was present around individual ticks, although a reddening of the skin was apparent externally in the groin region of the left leg, possibly due to scratching of the area by the fox. The white spot on the scutum of some of the female ticks was visible from the inner side of the skin, indicating that they were upside down relative to their typical attachment.

The sectioned ticks were found enclosed totally by several layers of squa-

mous epithelial cells, which in turn were surrounded by loose connective tissue typical of the hypodermis (Figs. 2, 3). There were no unusual accumulations of stratum corneum, nor were inflammation, edema, or tick feces observed.

Questionnaires were distributed to a number of persons who skinned animals or handled raw furs and hides, to determine if they were familiar with ticks located seemingly under the skin. Five trappers responded with completed questionnaires. All were either dry-land trappers or mixed water and dry-land trappers, so all caught at least a few canidae each year. One had trapped over 200 coyotes (*Canis latrans*) in one year. Six fur buyers responded. All had been trappers prior to becoming buyers, but as buyers

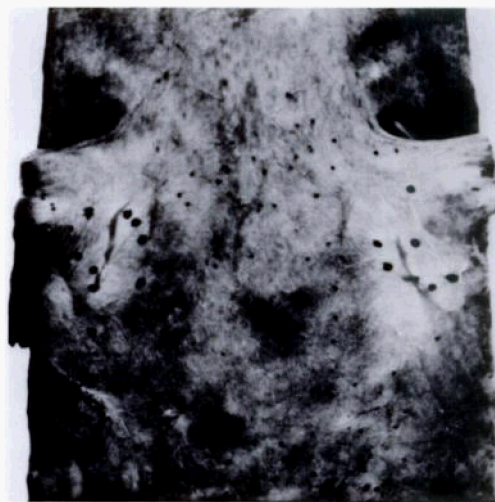


FIGURE 1. Photograph of visceral side of skin of red fox at axillary region showing approximately 17 nymph and adult Lone Star ticks (*Amblyomma americanum*) and numerous larvae. $\times \frac{1}{4}$.

Received for publication 30 April 1985.

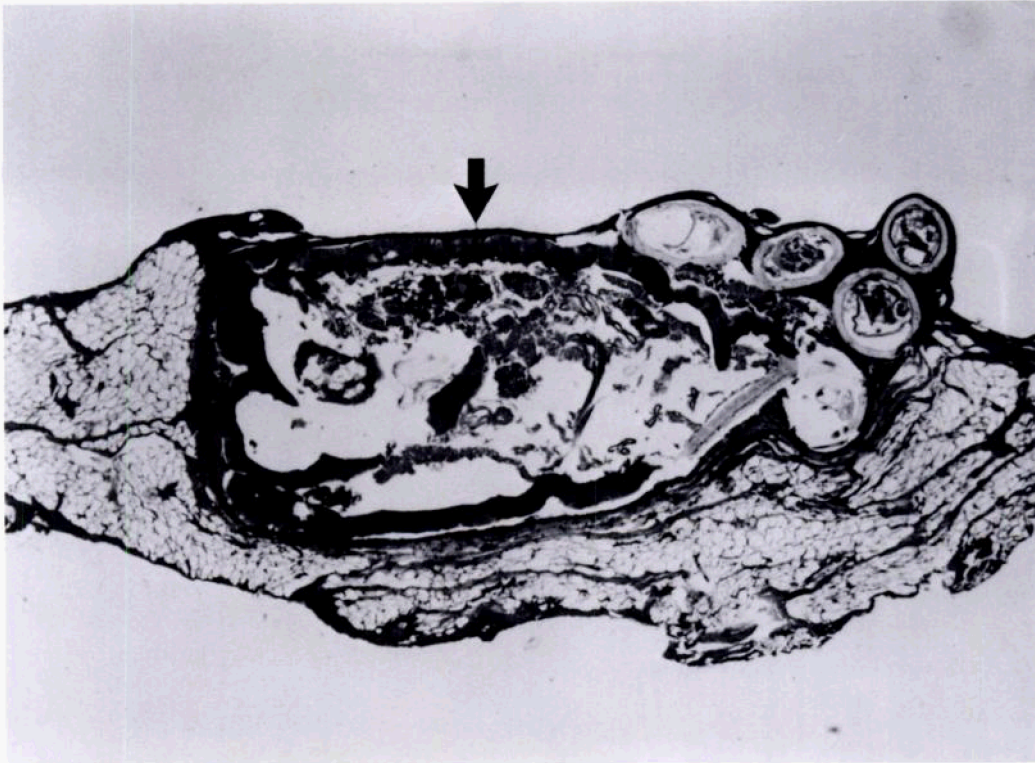


FIGURE 2. Photomicrograph of sectioned tick completely enclosed by several layers of squamous epithelial cells and surrounded by loose and adipose connective tissue in a red fox. Arrow points to area enlarged in Figure 3. H&E, $\times 55$.

they might handle as many furs in one day during the trapping season as a trapper might handle in an entire season. Two biologists responded who taught mammalogy or taxidermy courses requiring the skinning of a variety of animals. Two taxidermists responded who mounted all types of animals. The two butchers who responded processed wildlife during the local hunting season, skinning between 50 and 100 white-tailed deer (*Odocoileus virginianus*) each year. Of the 17 individuals responding to the questionnaire, with an average of 26 yr engaged in their respective pursuits, only one trapper had observed ticks embedded under the skin of one coyote.

Based on the results of our survey, such occurrences must be rare at least in west-central Missouri and eastern Kansas. We

have also examined skins of nine other red foxes, two gray foxes (*Urocyon cinereoargenteus*), nine coyotes, and a number of cottontail rabbits (*Sylvilagus floridanus*), fox squirrels (*Sciurus niger*), muskrats (*Ondatra zibethicus*), beaver (*Castor canadensis*), mink (*Mustela vison*), raccoons (*Procyon lotor*), and opossums (*Didelphis marsupialis*) from western Missouri without finding similar infestations. However, a single adult male tick was found beneath the skin of one other red fox. Scars consistent with those resulting from tick bites were not uncommon, and noted most often on hides of mink and red fox.

Infestations of *A. americanum* apparent on the visceral side of skins of red fox have been reported previously from Missouri (Portman and Dalke, 1945, J. Econ. Entomol. 38: 397) and northwestern Ar-

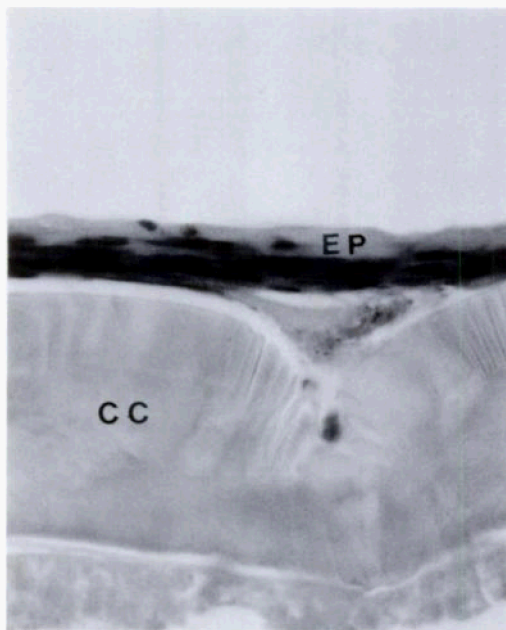


FIGURE 3. Layers of epithelial cells (EP) covering chitinous cuticle (CC) of the tick in a red fox. H&E, $\times 630$.

kansas (Tugwell and Lancaster, 1962, J. Kans. Entomol. Soc. 35: 202–211). Counts were made of over 150 and 301 ticks, respectively.

Nuttall (1914, Parasitology 7: 258–259) reviewed the presence of ticks beneath skin of man, horse, cattle, dog, and fox and reported the presence of “encysted” *Ixodes ricinus* and *I. hexagonus* in fox. He hypothesized this to be a host response to a long hypostome with subsequent edema-

atous swelling and finally envelopment of the tick. This seems plausible, but is difficult to reconcile with our sectioned specimens which show no edema nor inflammation. We postulate that the *Amblyomma-vulpes* association observed by us may have resulted from a combination of circumstances consisting of: 1) Deep embedding of the ticks for possibly a longer period of time than normal. 2) Entrapment of hypostome and legs by rapid growth of host epidermis. 3) Overgrowth of epidermis and dermis of host around the tick. 4) And, all of this with apparently little inflammatory response by the host.

Nuttall (1914, op. cit.) also stated that “subsequent escape (is) impossible and they (the ticks) must die *in situ*.” Bell and Chalgren (1943, J. Wildl. Manage. 7: 270–278) described a subcutaneous infestation of a cottontail with *Ixodes dentatus* some of which were disintegrating, whereas others were perfectly preserved. Upon natural death of the host, it seems possible that with decomposition of carcass and skin, some of the live ticks might be released to continue their life cycle.

The authors wish to thank all who responded to the questionnaires; and Drs. R. R. Ridley, Veterinary Diagnostic Laboratory, and R. J. Elzinga, Biology Department, Kansas State University, Manhattan, Kansas 66506, for confirming identification of the tick.