

## **Ixodes dammini: Occurrence and Prevalence of Infection with *Borrelia* spp. in Minnesota**

Authors: Drew, Mark L., Loken, Keith I., Bey, Russell F., and Swiggum, Ronald D.

Source: Journal of Wildlife Diseases, 24(4) : 708-710

Published By: Wildlife Disease Association

URL: <https://doi.org/10.7589/0090-3558-24.4.708>

---

BioOne Complete ([complete.BioOne.org](https://complete.BioOne.org)) is a full-text database of 200 subscribed and open-access titles in the biological, ecological, and environmental sciences published by nonprofit societies, associations, museums, institutions, and presses.

Your use of this PDF, the BioOne Complete website, and all posted and associated content indicates your acceptance of BioOne's Terms of Use, available at [www.bioone.org/terms-of-use](https://www.bioone.org/terms-of-use).

Usage of BioOne Complete content is strictly limited to personal, educational, and non - commercial use. Commercial inquiries or rights and permissions requests should be directed to the individual publisher as copyright holder.

---

BioOne sees sustainable scholarly publishing as an inherently collaborative enterprise connecting authors, nonprofit publishers, academic institutions, research libraries, and research funders in the common goal of maximizing access to critical research.

## ***Ixodes dammini*: Occurrence and Prevalence of Infection with *Borrelia* spp. in Minnesota**

**Mark L. Drew, Keith I. Loken, Russell F. Bey, and Ronald D. Swiggum,** Department of Veterinary Pathobiology, College of Veterinary Medicine, University of Minnesota, St. Paul, Minnesota 55108, USA

**ABSTRACT:** The distribution of *Ixodes dammini* in Minnesota was studied by collecting adult ticks from hunting dogs during the grouse seasons in September and October of 1985 and 1986. The tick was most frequently found in the east-central part of the state. *Borrelia* spp. were observed by immunofluorescence in 10% of the ticks. The locations where ticks were found coincide with the primary endemic areas for Lyme disease in the state.

**Key words:** *Ixodes dammini*, distribution, Lyme disease, Minnesota, *Borrelia* spp., hunting dogs, tick reservoirs.

*Borrelia burgdorferi*, the etiologic agent of Lyme borreliosis, is transmitted by *Ixodes dammini* in the northeastern and midwestern United States (Steere and Malawista, 1979; Schmid, 1985). The date of initial appearance of *I. dammini* in Minnesota is unknown; however, the tick (*I. scapularis* reclassified as *I. dammini*) (Spielman et al., 1979) was reported from Wisconsin in 1968 (Jackson and DeFoliart, 1970). A later report suggested that the range of *I. dammini* in Wisconsin was expanding (Davis et al., 1984).

This study was conducted in 1985 and 1986 to determine the distribution of *I. dammini* in Minnesota (USA) and the prevalence of tick infections with *Borrelia* spp. Ticks were collected by ruffed grouse (*Bonasa umbellus*) hunters using dogs during September and October of each year. This method of tick collection was selected to provide a cost-effective preliminary evaluation of the prevalence of *I. dammini* in the forested areas of the state. A total of 58 hunters cooperated in tick collections in 1985 while 50 hunters and 10 additional dog owners participated in 1986. All participating individuals were provided with 10 dram plastic vials containing 70% ethyl

alcohol and prestamped, preaddressed mailing envelopes. Cooperators were instructed to thoroughly groom each dog before leaving a hunting area. Ticks from each area hunted were placed in separate vials. A questionnaire and telephone contacts were utilized at the end of each hunting season to obtain information on areas where ticks were not found.

Ticks were identified using published descriptions (Cooley and Kohls, 1945; Spielman et al., 1979). Specimens of *I. dammini* were deposited in the Rocky Mountain Laboratory Collection (Department of Entomology, Museum Support Center, Smithsonian Institution, Washington, D.C. 20560, USA); RML Numbers 118535 and 118536.

A total of 950 and 590 ticks were collected in 1985 and 1986, respectively, of which 95% were identified as adult *I. dammini*; the remainder were identified as *Dermacentor variabilis*. The mean numbers of *I. dammini* collected during each hunt when ticks were found were 13 in 1985 and 11 in 1986 (range: 1–82 in 1985; 1–76 in 1986). *Ixodes dammini* was found most frequently in east-central Minnesota and occasionally in the southeastern part of the state (Fig. 1). Midgut smears of ticks were examined for the presence of *Borrelia* spp. by indirect immunofluorescence (Anderson et al., 1983). A total of 212 randomly selected adult ticks were dissected and examined. Spirochetes were observed in 22 (10%) ticks collected from areas throughout their range. *Borrelia burgdorferi* has been isolated from east-central Minnesota where the ticks were prevalent (Loken et al., 1985). However, since the polyclonal antibody used in the indirect

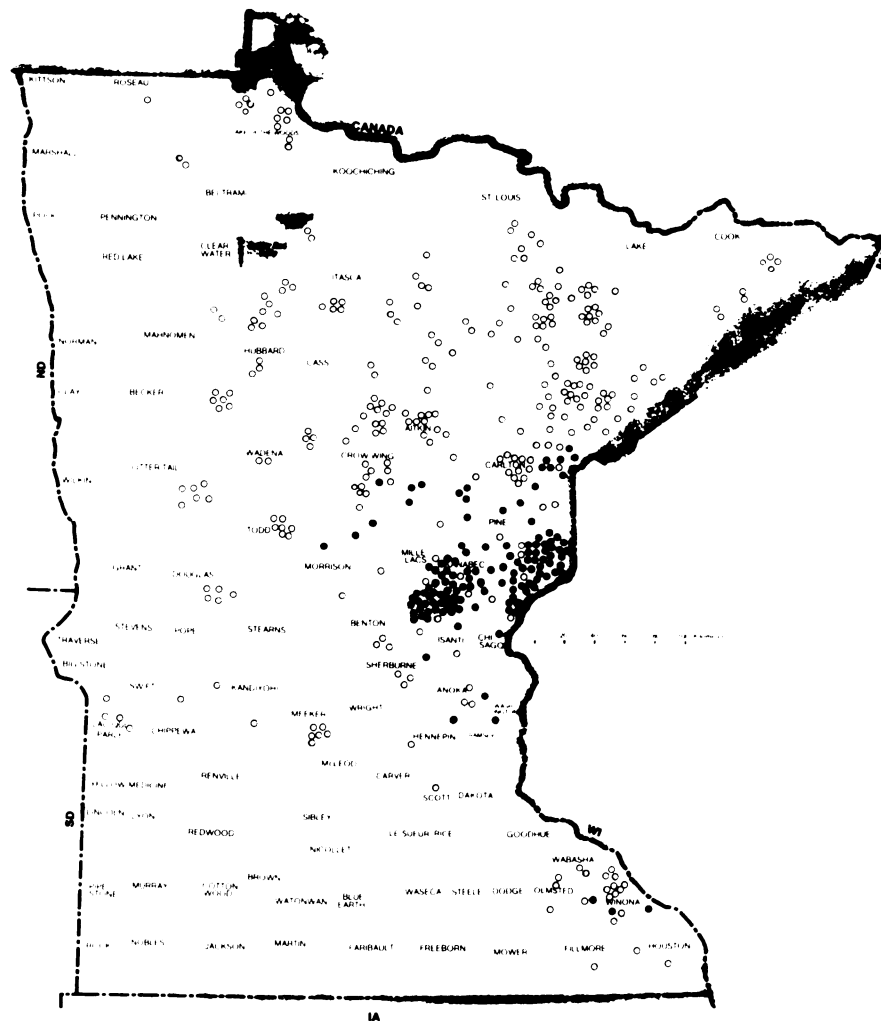


FIGURE 1. The occurrence of *Ixodes dammini* in Minnesota. Sites where ticks were collected are designated by solid circles and sites where ticks were not collected are marked with open circles.

immunofluorescence procedure may react with other species of *Borrelia*, a species designation of the spirochetes is inappropriate (Lane and Burgdorfer, 1988).

The prevalence of spirochetes in adult ticks in our study was almost identical to that reported in adult ticks in Connecticut but less than the prevalence of infection in adult ticks collected in New York and New Jersey (Magnarelli et al., 1986; Schulze et al., 1986). The area where ticks were often found coincided with the area described as the primary endemic area for Lyme disease in the state (Osterholm et

al., 1984; Minnesota Department of Health, 1987). While the survey identified areas of the state in which *I. dammini* was prevalent, it provided no assurance that ticks were not present in other areas. The large number of areas in northern Minnesota where ticks were not found strongly suggests that the tick was not well established in that area. Data was not obtained from the southwestern and extreme northwestern parts of the state which include relatively little ruffed grouse habitat. The immature stages of *I. dammini* feed on a variety of mammals and birds while the

common host of the adult stage is the white-tailed deer (*Odocoileus virginianus*) (Carey et al., 1980; Magnarelli et al., 1984) and tick abundance has been related to the presence of high deer populations (Anderson and Magnarelli, 1980). However, white-tailed deer occur throughout Minnesota and are abundant in areas of northern Minnesota in which no ticks were collected. Future studies may determine if the range and abundance of *I. dammini* is increasing.

#### LITERATURE CITED

- ANDERSON, J. F., AND L. A. MAGNARELLI. 1980. Vertebrate host relationships and distribution of ixodid ticks (Acari: Ixodidae) in Connecticut, USA. *Journal of Medical Entomology* 17: 314-323.
- , ———, W. BURGDORFER, AND A. G. BARBOUR. 1983. Spirochetes in *Ixodes dammini* and mammals from Connecticut. *American Journal of Tropical Medicine and Hygiene* 32: 818-824.
- CAREY, A. B., W. L. KRINSKY, AND A. J. MAIN. 1980. *Ixodes dammini* (Acari: Ixodidae) and associated ixodid ticks in south-central Connecticut, USA. *Journal of Medical Entomology* 17: 89-99.
- COOLEY, R. A., AND G. M. KOHLS. 1945. The genus *Ixodes* in North America. National Institute of Health Bulletin 184. U.S. Government Printing Office, Washington, D.C., 145 pp.
- DAVIS, J. P., W. L. SCHELL, T. E. AMUNDSON, M. S. GODSEY, A. SPIELMAN, W. BURGDORFER, A. G. BARBOUR, M. LA VENTURE, AND R. A. KASLOW. 1984. Lyme disease in Wisconsin: Epidemiologic, clinical, serologic and entomologic findings. *The Yale Journal of Biology and Medicine* 57: 685-696.
- JACKSON, J. O., AND G. R. DEFOLIART. 1970. *Ixodes scapularis* Say in northern Wisconsin. *Journal of Medical Entomology* 7: 124-125.
- LANE, R. S., AND W. BURGDORFER. 1988. Spirochetes in mammals and ticks (Acari: Ixodidae) from a focus of Lyme borreliosis in California. *Journal of Wildlife Diseases* 24: 1-9.
- LOKEN, K. I., C. C. WU, R. C. JOHNSON, AND R. F. BEY. 1985. Isolation of the Lyme disease spirochete from mammals in Minnesota. *Proceedings of the Society for Experimental Biology and Medicine* 179: 300-302.
- MAGNARELLI, L. A., J. F. ANDERSON, C. S. APPERSON, D. FISH, R. C. JOHNSON, AND W. A. CHAPPELL. 1986. Spirochetes in ticks and antibodies to *Borrelia burgdorferi* in white-tailed deer from Connecticut, New York State, and North Carolina. *Journal of Wildlife Diseases* 22: 178-188.
- , ———, AND W. A. CHAPPELL. 1984. Antibodies to spirochetes in white-tailed deer and prevalence of infected ticks from foci of Lyme disease in Connecticut. *Journal of Wildlife Diseases* 20: 21-26.
- MINNESOTA DEPARTMENT OF HEALTH. 1987. Lyme disease in Minnesota, 1982-1986. *Disease Control Newsletter* 13: 33-36.
- OSTERHOLM, M. T., J. C. FORFANG, K. E. WHITE, AND J. N. KURITSKY. 1984. Lyme disease in Minnesota: Epidemiologic and serologic findings. *The Yale Journal of Biology and Medicine* 57: 677-683.
- SCHMID, G. P. 1985. The global distribution of Lyme disease. *Reviews of Infectious Diseases* 7: 41-50.
- SCHULZE, T. L., M. F. LAKAT, W. E. PARKIN, J. K. SHISLER, D. J. CHARETTE, AND E. M. BOSLER. 1986. Comparison of rates of infection by the Lyme disease spirochete in selected populations of *Ixodes dammini* and *Amblyomma americanum* (Acari: Ixodidae). *Zentralblatt für Bakteriologie Mikrobiologie und Hygiene A* 263: 72-78.
- SPIELMAN, A., C. M. CLIFFORD, J. PIESMAN, AND M. D. CORWIN. 1979. Human babesiosis on Nantucket Island, USA: Description of the vector, *Ixodes (Ixodes) dammini*, n. sp. (Acarina: Ixodidae). *Journal of Medical Entomology* 15: 218-234.
- STEERE, A. C., AND S. E. MALAWISTA. 1979. Cases of Lyme disease in the United States: Locations correlated with distribution of *Ixodes dammini*. *Annals of Internal Medicine* 91: 730-733.

Received for publication 5 January 1988.