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SUPPRESSION OF *IXODES* TICK POPULATIONS IN LARGE RESIDENTIAL COMMUNITIES

Ground and aerial applications of several rates of granular carbaryl to the shrub layer and wooded buffers of a forested residential community during the peak activity period of *Ixodes dammini* nymphs significantly reduced their abundance on *Peromyscus leucopus*. Ground applications of liquid and granular carbaryl formulations to similar residential habitats yielded comparable levels of control. At the maximum recommended rates, carbaryl granules provided better control, but required significantly more active ingredient compared to the liquid formulation. Although both formulations effectively suppressed populations of this important tick vector, factors such as logistics, depth of leaf litter, and available application equipment must be considered in the design of the control program. The use of properly timed acaricide applications to *I. dammini* habitat within residential communities provides a reliable means of reducing exposure to *I. dammini* nymphs, the stage which is chiefly responsible for transmitting *Borrelia burgdorferi* to humans.

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EPIDIOLOGIC FINDINGS IN 4 MID-WEST COUNTY FARMS - VARIATIONS IN ANIMAL & TICK INFECTION RATES

Dr. Burgess' education includes the Ohio State University of School of Veterinary Medicine, DVM 1971. University of Wisconsin-Madison Veterinary Science MS 1978 PhD 1981. She is employed at the University of Wisconsin School of Veterinary Medicine. Her research interests include epizootiology of diseases of wild and domestic animals, and epizootiology of *B. burgdorferi* infection. She has had 21 published papers on B. burgdorferi in wild and domestic animals in reviewed journals.

BORRELIA BURGDORFERI INFECTION IN DAIRY COWS, RODENTS, AND BIRDS FROM FOUR WISCONSIN DAIRY FARMS.

A combinatin of culture and subsequent spirochete identification with the polymerase chain reaction technique was used to identify cows, rodents, and birds infected with *Borrelia burgdorferi*. Animals were trapped on four Wisconsin dairy farms during the summer of 1990. Farms 1 and 2 were located in counties nonendemic for Lyme disease and Farms 3 and 4 were located in counties endemic for Lyme disease. The results of the rodent and bird samples were as follows given as the number yielding organisims number tested: Farm 1, 1/17 *Mus musculus* and 2/52 *P. domesticus*; Farm 2, 4/49 *M. musculus*, 1/2 *Peromyscus maniculatus*, 1/1 P. *leucopus*, and 1/35 *P. domesticus*; Farm 3, 0/27 *M. musculus*, 0/5 *P. leucopus*, 0/12 *P. maniculatus* and 3/58 *P. domesticus*; and Farm 4, 1/24 *M. musculus*, 2/19 *P. leucopus*, 1/12 *Microtus pennsylvanicus*, and 0/17 *P. domesticus*. One *P. leucopus* and *M. musculus* from Farm 2 were pregnant and fetal tissues form both were positive. Cow blood sample results were as follows: Farm 1, 7/47 in July, and 2/45 in august; Farm 2, 0/28 in August and 0/23 in October; Farm 3, 0/13 in July and 1/18 in August 29; and Farm 4, 3/45 in August. Ticks were found on rodents on Farm 4 and on onle bird on Farm 3. Spirchetemic cows, rodents and birds were found in non-Lyme endemic counties suggesting that alternate modes of transmission other than by ticks may be important. Transplacental transmission was shown in *M. musculus* and *P. leucopus*.

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INFECTION OF CALVES WITH *BORRELIA BURGDORFERI*

Dr. Bushmich received her DVM from the New York State College of Veterinary Medicine. She got her MS from Texas A & M University in the Physiology of Reproduction. Her BS came from Cornell University in Animal Science. Dr. Bushmich first became interested in Lyme Disease while in clinical veterinary practice in central Connecticut. After joining the faculty of the Department of Pathobiology at the University of Connecticut in 1988, she joined Dr. John Post in research concerning the pathogenesis of Lyme Disease in Cattle.

Two studies will be discussed. In the first study, symptomatic and asymptomatic cows from a New England dairy herd with clinical history and serological evidence consistent with Lyme Borreliosis were evaluated using several diagnostic techniques. Eleven dairy cows with clinical signs of lameness, erythema, and/or joint swelling along with 15 healthy herd mate controls were tested serologically by Immune Fluorescent Antibody (IFA) test and Western blot analysis. Presence of *Borrelia burgdorferi* in blood and urine samples from these cows determined by using 3 techniques of varying sensitivity and specificity: dark field examination, fluorescent antibody (FA) staining and polymerase chain reaction. Serological results showed no

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significant difference between symptomatic and asymptomatic cow groups in 1. percent seropositivity (IFA) or 2. antibody response to specific proteins of *B burgdorferi* (Western blot). Most cows (both symptomatic and asymptomatic) appeared to have been exposed to *B burgdorferi*. Symptomatic cows were significantly (p=.003) more likely to shed spirochetes in the urine compared to asymptomatic control cows using the sensitive and specific PCR technique. A similar, but not significant, trend was seen when FA was utilized for detection of Borrelia in the urine. Preliminary results of experimental infection of calves with *Borrelia burgdorferi* will also be discussed.

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ANIMAL FINDINGS REGARDING IN UTERO LYME BORRELIOSIS

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To determine if *in utero* transmission of *B. burgdorferi* could occur in dogs, 10 female Beagles were inoculated intradermally with approximately 1000 *B.burgdorferi* on day 1 of proestrus and repeated every 2 weeks during the gestation period. Ten female controls were similarly inoculated with phosphate-buffered saline solution. Prior to the start of the experiment, all of the females and 3 males were used for breeding seronegative for *B. burgdorferi* on the basis of results of the indirect immunofluorescent antibody test (IFA) and the western blot test (WB). Similarly results of blood culture of *B. burgdorferi* were negative. All 20 of the females were bred naturally. Blood was collected weekly for serologic tests and culture. Live pups were bled on day 1 of life and then weekly until 6 weeks of age when they were humanely euthanitized and tissues cultured and tested by the polymerase chain reaction test (PCR). Eight of 10 spirochete inoculated females (SI) became infected with *B. burgdorferi* as evidenced by culture and/or PCR detected *B. burgdorferi* DNA in the tissues of the females or their pups. Eight of the 10 SI females delivered litters (3 to 7 pups) that had at least 1 pup with PCR positive tissues for *B. burgdorferi* DNA in neonatal or 6 week old pups and pups from 2 litters were also culture positive. Three pups from 2 separate litters (a stillborn, a neonate that survived to 30 minutes of age, and a 20 hr. old) had PCR positive tissues demonstrating *in utero* infection. Further evidence of *in utero* exposure was the presence of IgM antibodies to *B. burgdorferi* detectable by

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WB in 3/7 1 day old pups that did not receive colostrum, demonstrating a primary immune response exposure.

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New Ticks

UNUSUAL FINDINGS IN FELINE LYME BORRELIOSIS

Lyme Disease (LD) is a multisystem disease with mainly skin, neural, cardiac, muscular and joint manifestations. The disease is casued by the gram negative spirochete Borrelia burgdorferi (Bb) and is transmitted by infected ticks. Experimental models of Lyme disease have been demonstrated in species such as mice, rats, hamsters, cats, and dogs. Recent experiments by Dr. Elizabeth Burgess (University of Wisconsin) reported that cats are susceptible to infection with LD but that clinical signs may or may not be apparent. We have investigated further this feline model of LD using 20 uninfected normal healthy cats. These cats were divided into 4 groups each containing 5 cats. One group was used as a control group, whereas each remaining of the 3 groups were injected intradermally in a single site in the sacral region with 10^6 live Borrelia burgdorferi spirochetes isolated from different arthropods. The 3 different isolates of Borrelia burgdorferi used were Bb31 (a reference strain isolated from the tick Ixodes scapularis), Bb1579 (isolated from the Lone Star tick, A. americanum), and Bb532 (isolated from a pool of 5 cat fleas, Ctenocephalides from Fort Bend County in Texas). The cats were examined daily, bled biweekly, and one cat per group was sacrificed each month for serological and histological studies on all tissues and organs. Clinically, in the test cats there was a variable picture ranging from front or hind-limb lameness to hyperemia in all joint at necropsy. Gross pathology at necropsy indicated that Bb injected cats had liver degeneration, hyperplasia of the spleen, plasmacytosis of regional lymph nodes and occasional pneumonitis of the lungs. Control cats had no abnormal lesions. Differential WBC counts indicated that infected cats had cycles of reduction in the neutrophil count accompanied by an increase in the lymphocyte and eosinophil counts. During the course of infection of these cats we noted appearance of an "atypical cell" in the blood films. Following staining with Hemacolor this "atypical cell" has the following characteristics: 6-7 u in diameter, a single compact round dark blue nucleus 1.5-3 u in diameter, blue-gray cytoplasm. These "atypical cells" differ from the enlarged immunoblastic cells (occasionally similar to Reed-Sternberg cells of Hodgkin's disease) or atypical enlargement plasmacytoid

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immunoblastic cells (sometime binucleate) reported for certain cases of Lyme Borreliosis. To the best of our knowledge these "atypical cells" have not been reported before any animal specied infected with Bb. The presence of this "atypical cell" in other animal species infected with Bb is currently under study.

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PATIENT EDUCATION

Pamela Paparone is a graduate of Rutgers and Seton Hall Universities. She is a certified Medical Surgical Clinical Nurse Specialist and Adult Nurse Practitioner currently in practice in nearby Absecon, NJ. She is the authur of the *Lyme Disease Coloring Book*, several articles on Lyme disease and holds the distinction of being named Nurse Educator of the Year, 1989, by the American Association of Offic Nurses.

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PATIENT EVALUATIONS - INCREASING PRIMARY CARE GIVER EFFICIENCY

Our main goal in caring for the Lyme disease patient is to make their visit as effective as possible. We want to get all the pertinent information necessary in making a diagnosis and developing a treatment plan for each individual patient. We send questionnaires and lab request forms to be filled out by the patient before they arrive for their initial appointment. This allows more time to be spent on patient evaluation rather than paperwork. When the treatment is started and the patient returns for a follow-up visit, we use a patient evaluation form so we can assess their condition since the last appointment. This form is filled out by the patient upon arrival at the office. Using the forms, one is able to address those problems that are most serious, urgent, or that require additional attention. This facilitates making necessary changes in the treatment program as well as providing a more complete and objective medical record.