



Tick-Borne Infections Council
of North Carolina, Inc.

NEWSLETTER 2016, Volume 1



Quote of the season: “You don’t play politics with people’s lives.”
--C. Everett Koop, MD

Highlights...

Scroll down to see these features and more!

- Giving Tick Information at the Mountains-to-Sea-Trail Meeting
- Shakori Hills Music Festival 2015
- Study at UNC Hospital Found About 20% of Patients Being Seen for Various Problems Were Positive for the Alpha Gal Allergy (Red Meat Allergy)
- Lyme Disease in Georgia
- UF Researchers Discover New Tick Virus
- Tennessee Study Finds Lone Star Ticks Feed on a Variety of Species and the 4-Poster System to Kill Ticks on Deer Was Not Effective
- Alpha Gal Support Group on Facebook
- Sad News for Bird Lovers: More Data on Birds as Vectors for Ticks and Tick-Borne Infections
- The CDC Manual on Tick-Borne Diseases is Available for Smart Phone Users
- Lyme Disease Presenting as Multiple Ischemic Strokes
- Moose Have a Hard Time with Ticks: Report from New Hampshire
- Lyme Disease Tick Vector in Russia Greatly Increasing
- American Dog Ticks Can Survive Canadian Winters

State Vector-Borne Disease Task Force Meeting Schedule

February 12, 2016 May 13, 2016 August 12, 2016 November 18, 2016
(Check with us before going to confirm date as they occasionally change.)

Location:

Office of the Chief Medical Examiner, 4312 District Drive, Raleigh, NC 27607 Photo ID required

Links to Letters to Medical Providers from the State Department of Public Health on Lyme Disease and Rickettsial Diseases

These links are to the letters the state Department of Public Health issues every year to medical providers on Lyme disease and the Rickettsial diseases such as RMSF:

[2015 Rickettsial Disease Memo](#)

[2015 Lyme Disease Memo](#)

[2015 Arboviral Disease Memo](#)

Disease	Total cases by year of report 2012 Final	Total cases by year of report 2013	Cases 2014 Preliminary
	Confirmed + Probable (Confirmed/Probable/Suspected)	Confirmed + Probable (Confirmed/Probable/Suspected)*	(Confirmed/Prob/Suspect) **
Lyme disease	122 (27/95/80)	180 (39/141/89)	27/145/87
Rickettsioses	591 (12/579/341)	426 (11/415/193)	10/496/281
Ehrlichia	105 (18/91/56)	78 (24/54/22)	11/61/34
Anaplasma	21 (0/21/21)	15 (1/14/14)	0/12/12

*This is the year of report, not year of illness onset

** Illness onset may be prior to 1/1/14

These counties are now considered endemic for Lyme disease bringing the total of endemic counties in NC to six: Wake, Guilford, Haywood, Alleghany, Wilkes, Buncombe. As of August 2015.

Counties with one case of locally acquired Lyme disease: Cleveland (2008), Wilson (2009), Pitt (2009), Carteret (2009), Gates (2011), Perquimans (2011), Rowan (2013), Union (2013), Caldwell (2013), Franklin (2014), Stanley (2014), Duplin (2014).

≈≈ TIC-NC Activities ≈≈

Giving Tick Information at the Mountains-to-Sea-Trail Meeting

Board member Joanie Alexander attended the Mountains-to-Sea Trail (ncmst.org) meeting in Burlington, NC on Feb 7th 2015. There were 240 people attending and most were given a TIC-NC brochure. All the people attending, or close to all, spend time in the woods, many of them going on and off trail during trail construction and repair.

North Carolina Mountains-to-Sea Trail - Statewide Status
Current Trail/Road Route and Future All Trail Route
February 01, 2014



Shakori Hills Music Festival 2015

Volunteer staffer Doug Berg during a quiet moment...

We talked to dozens of people, handed out many brochures, sprayed many with repellants, visited the EMTs and educated them about ticks and TBIs. The attendees were very grateful for our presence as ticks are very bad in this location.



§§§ North Carolina and Southeast Section §§§

Study at UNC Hospital Found About 20% of Patients Being Seen for Various Problems Were Positive for the Alpha Gal Allergy (Red Meat Allergy)

High rate of galactose-alpha-1,3-galactose sensitization in both eosinophilic esophagitis and patients undergoing upper endoscopy Serum from 50 subjects with a new diagnosis of Eosinophilic esophagitis (EoE) and 50 non-EoE subjects (either with gastroesophageal reflux disease or dysphagia from non-EoE etiologies) was tested for alpha-gal-specific IgE using an ImmunoCAP-based method. Specific IgE > 0.35 kU_A/L was considered a positive result. Subjects with EoE were a mean of 35 years old, 68% were male, and 94% were white. Of the EoE cases, 12 (24%) were positive, and of the non-EoE controls, 10 (20%) were positive (p=0.63). Neither the proportion sensitized nor the absolute values differed between EoE and non-EoE subjects. We found a similar but high rate of alpha-gal sensitization in patients with EoE as found in non-EoE controls who were undergoing endoscopy. While our data do not support alpha-gal sensitization as a risk factor for EoE, the high rates of sensitization observed in patients undergoing upper endoscopy for symptoms of esophageal dysfunction is a new finding. *Journal of Esophageal Diseases*, CM Burk et al. March 2015

Lyme Disease in Georgia

The Confusing Story of Lyme Disease in Georgia Might Best Be Titled “A Tale Of Two Ticks.”



The lone star tick (this is a female--the male does not have a white dot), a common species in Georgia that frequently feeds on humans, is not known to carry Lyme disease, according to the Centers for Disease Control.

It's like a book with an uncertain ending – and chapters still to be written. Plenty of residents bitten by ticks each year are convinced they have gotten Lyme disease – despite a widespread belief the dangerous illness doesn't even occur in Georgia. Doctors say most of those cases are a Lyme-like ailment with similar but less-serious symptoms.

The truth might still be somewhere in the middle. Entire article at:

<http://chronicle.augusta.com/sports/outdoors/2015-04-17/study-asserts-georgia-does-have-lyme-disease> The Augusta Chronicle, Rob Pavey **Outdoors** Friday, April 17, 2015

UF Researchers Discover New Tick Virus



Dr. Katherine Sayler passes a white sheet over leaf debris in San Felasco Hammock on Jan. 6. The sheet method is one Sayler used to attract ticks for her research. (Photo by Mindy Cherisse Miller) Jan 2015

University of Florida researchers have discovered that a tick common to the southeastern United States may harbor an unusual virus that belongs to the family Arenaviridae. Some arenaviruses are associated with severe hemorrhagic disease and significant mortality in people in South America and sub-Saharan Africa.

Known as Tacaribe virus, the virus discovered in ticks has never before been found in an animal or human species in the United States, report scientists from the UF colleges of Veterinary Medicine and Public Health and Health Professions in a study that appeared in the journal PLOS ONE in December. The researchers found evidence of the virus in nearly 10 percent of ticks collected and they cultured the virus from ticks trapped in North Central Florida. Entire article: <http://veterinarypage.vetmed.ufl.edu/2015/01/14/uf-researchers-discover-new-tick-virus/>

Tennessee Study Finds Lone Star Ticks Feed on a Variety of Species and the 4-Poster System to Kill Ticks on Deer Was Not Effective

The current status of tick-borne diseases in the southeastern United States is challenging to define due to emerging pathogens, uncertain tick/host relationships, and changing disease case definitions. A golf-oriented retirement community on the Cumberland Plateau in Tennessee experienced an ehrlichiosis outbreak in 1993, prompting efforts to reduce the local tick population using ‘4-Poster’ acaricide devices targeting white-tailed deer (*Odocoileus virginianus*). In 2009, the prevalence of *Ehrlichia* spp. in questing ticks was surveyed in the area and compared to a Tennessee state park where acaricide had not been applied. The range of wildlife hosts that immature *Amblyomma americanum* fed upon and the role that these hosts may play in pathogen dynamics were investigated using a reverse line blot (RLB) bloodmeal analysis technique.

Amblyomma americanum was by far the most common tick species in both study areas (>99% of ticks collected). Of 303 adult and nymphal *A. americanum* tested at the retirement community, six were positive for *Ehrlichia chaffeensis* (2.0%), 16 were positive for *E. ewingii* (5.3%), and six were positive for Panola Mountain *Ehrlichia* (2.0%). This is the first confirmation of Panola Mountain *Ehrlichia* in *A. americanum* from the state of Tennessee. The 9.3% prevalence of *Ehrlichia* spp. in ticks from the retirement community was similar to that detected at the state park site (5.5%), suggesting that the 4-Poster treatment had not been sufficient to reduce *Ehrlichia* spp. cycling in the tick population.

At both study sites, *A. americanum* fed on a wide range of mammal and bird species, with a minority of detectable bloodmeals coming from deer. Of the *Ehrlichia*-infected nymphs with positive bloodmeal identification, none fed on deer, indicating that multiple vertebrate species are contributing to sylvatic maintenance of *Ehrlichia* spp. at these sites. This highlights the difficulty of attempting to reduce the risk of tick-borne disease through host-targeted interventions alone.

From: Molecular identification of *Ehrlichia* species and host bloodmeal source in *Amblyomma americanum* L. from two locations in Tennessee, United States

Ticks and Tick-borne Diseases, 2015 Jessica R. Harmon, et al. <http://dx.doi.org/10.1016/j.ttbdis.2015.01.004>

Alpha Gal Support Group on Facebook

https://www.facebook.com/groups/alphagal?_rdr=p

Southern and Northern Black-Legged Ticks Are Equally Competent for Infecting Rodents with the Lyme Disease Bacteria

Comparison of Tick Feeding Success and Vector Competence for *Borrelia burgdorferi* Among Immature *Ixodes scapularis* (Ixodida: Ixodidae) of Both Southern and Northern Clades

Northern and southern *Ixodes scapularis* Say populations differ greatly in density, host utilization, and especially questing behavior of the immatures. Haplotypes of *I. scapularis* in North America can be divided into two major clades—the All American Clade (haplotypes A through J) and the Southern Clade (M through O). This genetic variation may affect feeding success and vector competence. This study compared feeding success of larval *I. scapularis* measured by time-to-drop-off and subsequent transmissibility success of *Borrelia burgdorferi* to mice using ticks from Mississippi, Connecticut (both F haplotype), and Louisiana (haplotype O). Northern ticks (CT) fed to repletion much faster than MS and LA ticks: overall, 73.6% of CT ticks had dropped off mice at Day 3 compared to only 1.7% and 6.6% of ticks dropped off for MS and LA ticks at that same time point. As for vector competence, 4 of the 4 mice in each case (MS or CT) that had been fed on by infected nymphs tested positive for *B. burgdorferi*.

In a second experiment, 5 of the 6 mice tested positive for *B. burgdorferi* after exposure to infected LA ticks as compared with 3 of the 4 mice exposed to infected CT ticks. These data demonstrate that there is no difference in northern and southern populations of *I. scapularis* in their ability to transmit *B. burgdorferi*, but the ability of the northern populations to feed rapidly on rodents exceeds that of southern populations.

Goddard et al. *J. Med. Entomol.* 52(1): 81–85 (2015); DOI: 10.1093/jme/tju005

§§ National Section §§

The Lyme Disease Clinical Research Center at the Johns Hopkins University School of Medicine Opened April 2015

The Lyme Disease Research Foundation is pleased to announce the April 2015 opening of The Lyme Disease Clinical Research Center in the Division of Rheumatology at the Johns Hopkins University School of Medicine.

The Center was established with a major gift from the Lyme Disease Research Foundation and represents the culmination of years of extraordinary work by donors, staff, and members of the Board of this organization. The Center is grateful for the tremendous dedication and support of donors. The Center builds upon the success of Dr. John N. Aucott's patient based research program at the Foundation and brings this premier clinical research program to a platform of national prominence.

For more information about the Center and Dr. Aucott's leading-edge clinical research program, please read the *Spring 2015 Newsletter*.

New Virus Suspected in Death of Kansas Man

A new virus appears to have caused the death last spring of a man in Kansas, the Centers for Disease Control and Prevention reported Friday in its journal *Emerging Infectious Diseases*. The virus, called Bourbon virus after the county where the man lived, is probably spread by ticks; the man was healthy before seeking treatment

for fever and fatigue after getting a tick bite. Bourbon virus belongs to a group called thogotoviruses, the C.D.C. said. It is the first time a thogotovirus has been known to make an American ill; there have been seven cases in Africa, Europe and Asia, the report said.

Sad News for Bird Lovers: More Data on Birds as Vectors for Ticks and Tick-Borne Infections

Study IDs key birds that host Lyme disease bacteria in California

Birds are more important than previously recognized as hosts for Lyme disease-causing bacteria in California, according to a new study led by UC Berkeley researchers. The birds in the study that were found to be important hosts of Lyme disease bacteria, such as American robins, dark-eyed juncos and golden-crowned sparrows, are coincidentally ones that are commonly found in suburban environments.



The Golden-Crowned Sparrow, one of the 53 species of birds tested in the UC Berkeley study and a common sight in suburban areas, was revealed to be an important host of the Lyme Disease-causing bacteria *Borrelia burgdorferi*. (Michael McCloy photo)

“Birds are much more capable of carrying diseases long distances than the small-mammal hosts typical of Lyme disease, and so may constitute an underappreciated component of Lyme disease ecology,” said Tingley. Among the 23 species of birds that were infected, the study authors highlighted the lesser goldfinch, oak titmouse and dark-eyed junco as birds that harbored more subtypes of Lyme disease bacteria than others. In addition, the golden-crowned sparrow was infected more frequently than other species.

Perhaps one of the most surprising results of this study is that “another species of Lyme disease spirochete closely related to, but distinct from, *Borrelia burgdorferi* was detected in birds for the first time anywhere in the world,” said study co-author Robert Lane, a medical entomologist and UC Berkeley Professor of the Graduate School, and a leading expert on ticks and Lyme disease.

That spirochete, named *Borrelia bissettii*, has been known to cause a Lyme disease-like illness in people in central and southern Europe. Furthermore, this bacterium was the most common of the *Borrelia* species found in birds.

Paper free at: [Borrelia burgdorferi sensu lato spirochetes in wild birds in northwestern California](#) (Link to *PLOS ONE* study)

Entire story by [Sarah Yang](#), Media Relations | February 25, 2015 at: newscenter.berkeley.edu/2015/02/25/birds-lyme-disease-bacteria/

The CDC Manual on Tick-Borne Diseases is Available for Smart Phone Users

Download it free. The app synthesizes information from multiple sources into a streamlined interface with clinical images and links to key references. The free app is available for Apple devices. Download from the [App store](#) . The Android version was out in late April.

This application has been designed as a way for health care providers to access concise, comprehensive, and updated information about the prevention, identification, and treatment of tickborne diseases. The application allows the user to easily view content directly from an iPhone, iPod Touch, or iPad. This application is a companion to the printed manual, Tickborne Diseases of the United States: A Reference Guide for Health Care

Providers.

Key features:

- Tick identification with vivid photos and illustrations
- Summarized information about signs and symptoms of the most common tickborne diseases
- Information about diagnostic tests and supporting lab tests
- Treatment table summaries
- Live links to additional journal articles and resources
- Prevention and prophylaxis recommendations

Lyme Advocates Met with the Infectious Disease Society of America President, March 2015

Representatives from The Mayday Project Lyme patient advocacy group met with Infectious Diseases Society of America (IDSA) President, Dr. Stephen Calderwood, on Friday, March 20, to discuss concerns about the IDSA's guidelines for diagnosis and treatment of Lyme disease. The 90-minute meeting took place via teleconference and was the first time the IDSA leadership has met with a Lyme patient advocacy group.

The meeting was the culmination of a series of multi-day, boots-on-the-ground protests backed by an aggressive publicity campaign that began with a two-day protest May 22–23, 2014, at IDSA headquarters in Arlington, VA.



During IDWeek, Mayday released an open letter to IDSA members calling on them to intervene on the behalf of patients to help rectify the guidelines in the interest of improving patient care. The letter called on the IDSA leadership to work with a sense of urgency to develop a national action plan to stem the rapidly spreading epidemic of Lyme disease and related tick-borne illnesses. Entire article at: http://www.webwire.com/ViewPressRel.asp?aId=196644#.VRH_ePnF-Sp Arlington, VA – WEBWIRE – Tuesday, March 24, 2015

Lyme Disease Presenting as Multiple Ischemic Strokes

A 46-year-old man presented with recurrent left hemiparesis and headache. MRI of brain showed an acute right pontine and subacute right thalamic infarcts and MR angiogram showed multiple intracranial arterial stenoses, suggesting cerebral vasculopathy. There was a cerebrospinal fluid lymphocytic pleocytosis with *Borrelia burgdorferi* antibodies. Central nervous system Lyme disease occasionally presents with ischaemic strokes; this case is unusual in showing vasculopathy on brain imaging, supporting meningovascularitis as the likely mechanism.

Li et al. *Pract Neurol* doi:10.1136/practneurol-2014-001072 2015

Tick Community Composition in Midwestern US Habitats in Relation to Sampling Method and Environmental Conditions

The ranges of many tick species are changing due to climate change and human alteration of the landscape. Understanding tick responses to environmental conditions and how sampling method influences measurement

of tick communities will improve our assessment of human disease risk. This study compared tick sampling by three collection methods (dragging, CO₂ trapping and rodent surveys) in adjacent forested and grassland habitats in the lower Midwest, USA, and analyzed the relationship between tick abundance and microclimate conditions. The study areas were within the overlapping ranges of three tick species, which may provide conditions for pathogen exchange and spread into new vectors. *Dermacentor variabilis* (American dog tick) was found using all methods, *Amblyomma americanum* (lonestar tick) was found by dragging and CO₂ trapping and *Ixodes scapularis* (blacklegged deer tick) was found only on rodents. Proportion of each species differed significantly among sampling methods. More ticks were found in forests compared to open habitats. Further, more ticks were collected by dragging and from rodents in hotter, drier conditions. Our results demonstrate that multiple sampling methodologies better measure the tick community and that microclimate conditions strongly influence the abundance and activity of individual tick species.

The final publication is available at link.springer.com. Published online April 2014 in *Experimental and Applied Acarology*. Evelyn C. Rynkiewicz • Keith Clay.

DOI 10.1007/s10493-014-9798-7

Moose Have a Hard Time with Ticks: Report from New Hampshire

Excerpt from pdf: Moose is an Algonquin term that means “eater of twigs”. With a neck considerably shorter than their legs moose tend to browse on twigs that are easily within their reach. Parasites are a major cause of mortality, primarily winter tick (*Dermacentor albapictus*), brainworm (*Parelaphostrongylus tenuis*) and possibly lungworm (*Dictyocaulus viviparus*). They get on the moose in the fall and spend the winter feeding on their host, dropping off in the spring to lay eggs. An average tick load is about 35,000 ticks per moose with some animals carrying up to 150,000 ticks (Samuel and Welch 1991). It is believed that tick related death is due to a combination of anemia, increased energy expenditure resulting in depletion of fat reserves, secondary infections and hypothermia [KM Rines - 2015](#)

§§ International Section §§

Lyme Disease Tick Vector in Russia Greatly Increasing

Ixodes ricinus (Acari: Ixodidae) L. transmit a wide variety of pathogens to vertebrates including viruses, bacteria and protozoa. Understanding of the epidemiology of tick-borne infections requires basic knowledge of the regional and local factors influencing tick population dynamics. These ticks were monitored over 35 years (1977–2011) in the eastern, poorly studied part of its range. We have found that the multiannual average abundance of ticks is small and varies depending on the biotope and degree of urban transformation. Tick abundance increased from 0.1–0.9 specimens per 1-km transect to 18.1 ± 1.8 individuals per 1-km transect in moist floodplain terraces, and 4.8 ± 0.9 in xerophytic hill woods. Long-term growth of tick abundance occurred in spite of a relatively constant abundance of small mammals and only minor fluctuations in the abundance of large wild animals. Climate and anthropogenic changes appear to be the main contributors to increased abundance of the tick.

Korotkov et al. (2015), Observations on changes in abundance of questing *Ixodes ricinus*, castor bean tick, over a 35-year period in the eastern part of its range (Russia, Tula region). *Medical and Veterinary Entomology*. doi: 10.1111/mve.12101

Common Allergy Medication May Be Effective at Killing the Bacteria That Causes Lyme Disease

A new study funded by the Bay Area Lyme Foundation and conducted by Stanford School of Medicine researchers shows that loratadine, a common antihistamine frequently taken to treat allergy symptoms, may be able to help kill *Borrelia burgdorferi*, the bacteria associated with Lyme disease.

This new laboratory study shows that loratadine (trade name Claritin®) and specifically its metabolite, desloratadine, are able to prevent manganese (Mn) from entering the cell wall of the bacteria, starving it in test tubes. The antihistamine accomplishes this by inhibiting the bacteria's transport system, *Borrelia* metal transporter A. Much more work needs to be done on this issue. Dosing requirements may be difficult to work out. The study was published in the open access publication *Drug Design, Development and Therapy* in February 2015.

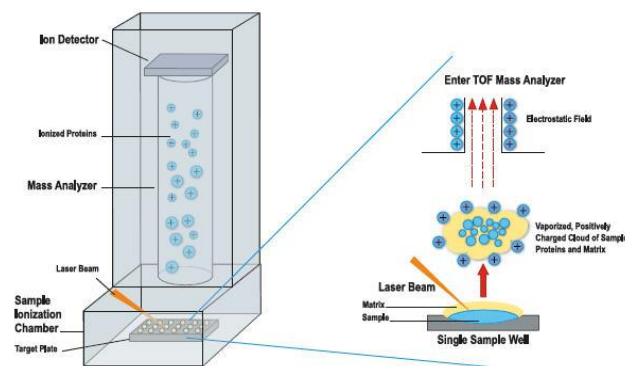
Routine Fire Suppression Contributes to Increased Parasites Like Ticks and Fleas in the Environment

As land settlement patterns changed, especially due to colonial expansion in North America, Africa, and Australia, fire suppression became a major form of land use change which has led to broad-scale ecosystem changes. Because parasites of humans and animals can vector viral, bacterial, prion, fungal, or protozoan pathogens, concomitant changes associated with these man-made changes to fire frequencies and intensities are of concern. At least 24 studies indicate that restoring fire in natural areas has the potential to reduce ectoparasites without wings such as ticks, chiggers, fleas, and lice; ectoparasites with wings such as mosquitos, horn flies, face flies, and stable flies; and endoparasites affecting livestock and wildlife. This suggests that fire ecology and parasitology be considered as a priority area for future research that has implications for both humans and animals.

Fire and Parasites: An Under-Recognized Form of Anthropogenic Land Use Change and Mechanism of Disease Exposure, DJ Scasta, *EcoHealth* March 2015

A New Machine, the Background Matrix Assisted Laser Desorption/Ionization Time-of-Flight Mass Spectrometry (MALDITOF MS) Can Identify Arthropods and Human Diseases.

Background Matrix Assisted Laser Desorption/Ionization Time-of-Flight Mass Spectrometry (MALDITOF MS) has been shown to be an effective tool for the rapid identification of arthropods, including tick vectors of human diseases. The MS profiles generated from protein extracts prepared from tick legs exhibited mass peaks that distinguished the infected and uninfected Ticks, and successfully discriminated the *Rickettsia* spp. A blind test was performed using Ticks that were reared, collected in the field or removed from infected or not by *Rickettsia* spp. A query inlab arthropod MS reference database that the species and infection status of all correctly identified at the species and status levels. The present work offers new perspectives for the monitoring of other borne diseases that present public health Matrix-Assisted Laser Desorption



laboratory-
patients and
against our
revealed
Ticks were
infection
vector
concerns.
Ionization-

Time of Flight Mass Spectrometry for Rapid Identification of Tick Vectors. Amina Yssouf, Christophe Flaudrops, Rezak Drali, et al. J Clin Microbiol. 2013 February; 51(2): 522–528. doi: 10.1128/JCM.02665-12
Open access paper at:
<http://www.plosntds.org/article/fetchObject.action?uri=info:doi/10.1371/journal.pntd.0003473&representation=PDF>

The Effect of Climate Change on the Black-legged Tick and Risk of Disease Transmission

In this 19 year study, warmer years through May and August were associated with a nearly three-week advance in the phenology* of nymphal and larval ticks relative to colder years, with little evidence of increased synchrony. Warmer Octobers were associated with fewer larvae feeding concurrently with nymphs during the following spring. Projected warming by the 2050s is expected to advance the timing of average nymph and larva activity by 8–11 and 10–14 days, respectively. If these trends continue, climate warming should maintain or increase transmission of persistent pathogens, while it might inhibit pathogens that do not produce long-lasting infections.

Phenology is the study of cyclic and seasonal natural phenomena, especially in relation to climate and plant and animal life.

From: Accelerated phenology of blacklegged ticks under climate warming. Philosophical Transactions B, April 2015, Volume: 370 Issue: 1665. Levi et al. DOI: 10.1098/rstb.2013.0556 Publ. 16 February 2015

American Dog Ticks Can Survive Canadian Winters

Ed note. People seem to assume that cold winters kills the ticks. While some may succumb, there are still plenty left as this recent study from Canada shows.

Ability of Unfed *Dermacentor variabilis* (Acari: Ixodidae) to Survive a Second Winter as Adults in Manitoba, Canada, Near the Northern Limit of Their Range

One thousand seven hundred unfed field-collected adult *Dermacentor variabilis* (Say) were overwintered in 34 outdoor enclosures near the northern limit of their distribution in Manitoba, Canada. At the northern limits of the range of *D. variabilis*, it had always been assumed that unfed adult ticks questing in spring succumbed before the next winter and were not part of the population observed in the following year. Survival of the collected ticks was assessed on two occasions. In midwinter, an average 39.4% (SE \pm 2.50) of the ticks were still alive, while an average 19.9% (SE \pm 1.14) survived to April. Female ticks had significantly higher survivorship than males. The ability to survive an additional winter allows ticks to act in a greater capacity as reservoirs for tick-associated pathogens in this region. Journal of Medical Entomology 52(2):138-142. 2015. Matthew E. M. Yunik, et al.

Advertisement



About Insect Shield Technology:

Insect Shield's EPA-registered technology converts clothing and gear into effective and convenient insect protection. The repellency is long-lasting and appropriate for use by the entire family with no restrictions for use.

Quick Facts:

- Repellency is in the clothing and gear – not on your skin
- Lasts through 70 launderings
- EPA-registered
- No restrictions for use
- Appropriate for the entire family
- No need to re-apply
- Repels mosquitoes, ticks, ants, flies, chigger and midges including those that can cause Lyme disease, malaria and other dangerous insect-borne diseases

www.insectshield.com

Online store: <http://www.insectshield.com/lifestyle/>

Get your own clothes treated: <http://www.insectshield.com/PDF/IS%20Your%20Own%20Clothes%20-%20U.S.%20form.pdf>



TIC-NC is grateful for the financial contributions of Insect Shield International, LLC.

Tick-Borne Infections Council of North Carolina is a non-profit 501(c)3 organization formed to improve the recognition, treatment, control, and understanding of tick-borne diseases in North Carolina. We are all-volunteer and appreciate donations.

Board

Susan Walser, President	Hillsborough
Kim Brownley, Secretary/Treasurer	Mebane
Joanie Alexander, Director	Hillsborough
Sandy DeMaioNewton, Director	Raleigh
Marcia E. Herman-Giddens, PA, DrPH, Scientific Advisor & Director	Pittsboro
Amy J. Stinnett, Director, MPA	Durham
Chrissy Jahnes, Director	Pittsboro

Disclaimer

TIC-NC’s newsletter content, including text, graphics, images and information is for general informational purposes only. The contents are not intended to be a substitute for professional medical advice, diagnosis or treatment.

Any contact information is provided for you to learn about tick borne illnesses and related issues. Our organization is not responsible for the content of other material or for actions as a result of opinions or information expressed which may appear from time to time.

It is the responsibility of you as an individual to evaluate the usefulness, completeness or accuracy of any information you read and to seek the services of a competent medical professional of your choosing if you need medical care.

This organization is not a representative, program, affiliate of any other organization, unless specifically stated. Contact us at info@tic-nc.org or 919-542-5573

You have received this newsletter because you are on our membership list. If you want to be taken off at any time, just reply with 'unsubscribe' in the subject box.