Tick-Borne Infections Council of North Carolina, Inc.

NEWSLETTER 2016, Volume 4

Quote of the Season: The new CDC policy:

> **"CDC will use advanced molecular detection methods, including metagenomics screening and whole genome sequencing, to test the specimens for other bacteria that cause tickborne illness."** (Ed. Note- but not Lyme disease [from http://www.thelancet.com/pdfs/journals/laninf/PIIS1473-3099(15)00464-8.pdf])

Highlights…

Scroll down to see these features and more!

- **NC Counties with Established Populations of the Black-legged Tick: Look for your County on the List!**
- **Transfusions Can Pass on Certain Tick-borne Infections**
- **Areas of the US with Blacklegged Ticks Have Doubled in the Last 20 Years**
- **IDEXX Has Interactive Maps on Vector-borne Diseases in Dogs**
- **Blacklegged Ticks Founds to Transmit Two Newly Discovered Human Pathogens**

State Vector-Borne Disease Task Force 2016 Meeting Schedule

November 18, 2016
(Check with us before going to confirm date as they occasionally change.)

Location:
4312 District Drive, Raleigh, NC 27607

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 2013 Final Confirmed + Probable (Confirmed/Probable/Suspected)	Total cases by year of report 2014 Preliminary Confirmed + Probable (Confirmed/Probable/Suspected)*	2015 Preliminary (Probable/Confirmed)**
Lyme disease	180 (39/141/89)	170 (27/143/86)	229/36
Rickettsioses	426 (11/415/193)	496 (10/486/278)	462/5
Ehrlichia	78 (24/54/22)	73 (11/62/31)	75/16
Anaplasma	15 (1/14/14)	12 (0/12/12)	20/4

*This is the year of report, not year of illness onset
** Illness onset may be prior to 1/1/15

Note: Six counties now have confirmed cases of Lyme disease in two persons who had not traveled out of the county for 30 days after their tick exposure. **Therefore, these six counties are now declared endemic for Lyme disease: Wake, Guilford, Haywood, Alleghany, Buncombe, and Wilkes.** 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).

Other State News:

NC- NC has provided additional funding in 2016 to hire 2 PhD-level medical entomologist positions, possibly on a permanent basis. These positions are not just for Zika response, but all arboviral disease activities statewide. The state has also implemented two *Aedes albopictus/Aedes aegypti* surveys in 15+ counties statewide utilizing local public health/mosquito staff, where available, and the laboratory capacity of East and Western Carolina Universities, and N.C. State. Thanks to Dennis Salmen with the Mid-Atlantic Mosquito Control Association for this news.

TIC-NC Talks and Materials Distributed

New Spanish Brochure:

- Public Library, Wadesboro, NC
- Pitt Co. Health Dept & Home Health Nurses
- Carrboro, NC Parks & Recreation
- Asheville, NC
- Mountain to Sea Trail
- Jordan Lake
- Piedmont Health
- Duke Primary Care at Timberlyne
- NC Farmworker Health Program
- Hillsborough Farmers Market
- FLOC (Farm Labor Organizing Committee
- REI in Durham
- Dual Fishing Shop in Hillsborough
- Eno River State Park
- Cedar Grove Community Outreach
- Ixtapa Restaurant
- Sporting Goods Stores in Chapel Hill & Carrboro

Free Tick Testing

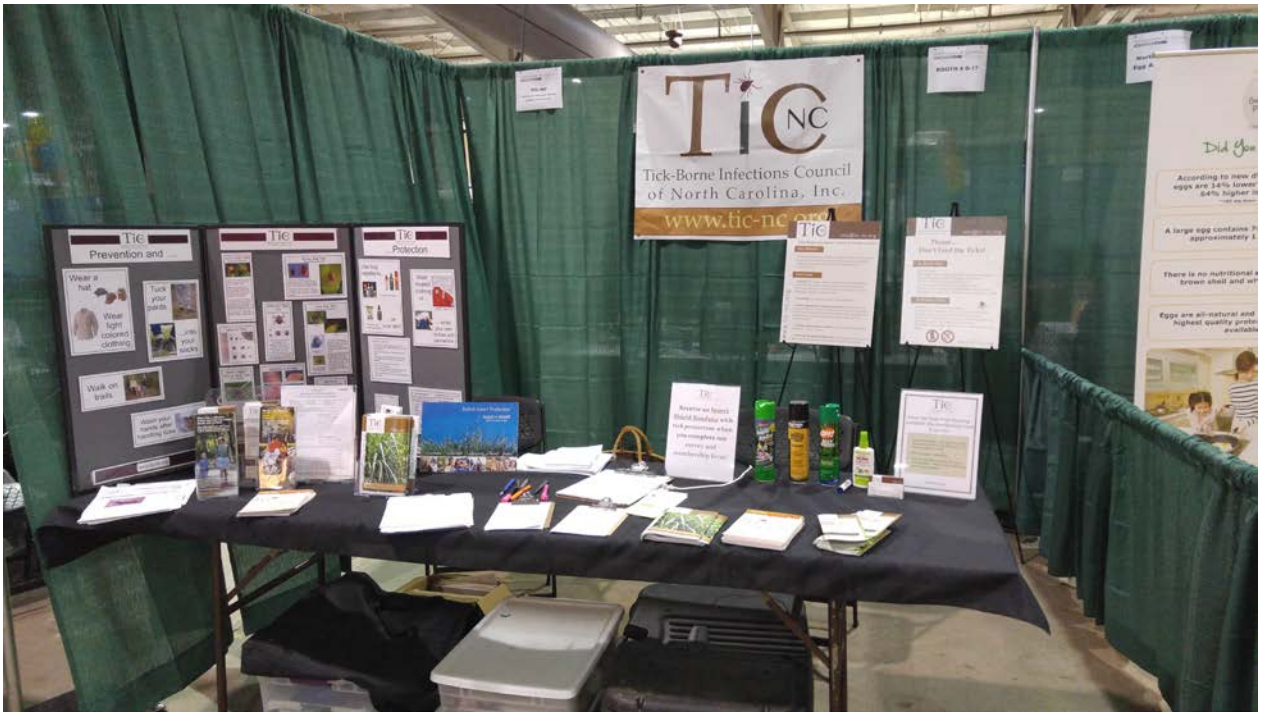
For the entire year of 2016 the Bay Area Lyme Foundation of California will offer free testing to assist individuals with identifying whether ticks, attached or simply collected, are infected with a number of vector-borne pathogens. This study is currently testing for 6 pathogens, including Borrelia burgdorferi (which causes Lyme); Ehrlichia chafeensis (causes Ehrlichiosis), and Rickettsia rickettsii (the agent of Rocky Mountain Spotted Fever).

For more information and to print-out the tick submission form, go to http://www.bayarealyme.org/lyme-disease-prevention/tick-testing/

You will be emailed the results within 7-10 business days after receipt of the tick(s) at the study location - Northern Arizona University.

TIC-NC Activities

State Employees Wellness Expo at the state fairgrounds, May 11, 2016



We staffed the all-day expo with several board members. As is usual, we heard many stories about people affected with tick-borne diseases and distributed a lot of information and brochures. Many people thanked us for the work we do. That felt good!

North Carolina and Southeast Section

Ticks that Transmit Lyme Disease Reported in 48.6% of U.S. Counties- An Almost 50% Increase Since 1998

Since 1991, when standardized surveillance and reporting began, Lyme disease case counts have increased steadily in number and in geographical distribution in the eastern United States. Similar trends have been observed for anaplasmosis and babesiosis. To better understand the changing landscape of risk of human exposure to disease agents transmitted by I. scapularis and I. pacificus, and to document changes in their recorded distribution over the past two decades, we updated the distribution of these species from a map published in 1998. Notably, the number of counties in which I. scapularis is considered established (six or more individuals or one or more life stages identified in a single year) has more than doubled since the previous national distribution map was published nearly two decades ago. Here we document a shifting landscape of risk for human exposure to medically important ticks and point to areas of re-emergence where enhanced vector surveillance and control may be warranted. Entomology Today January 2016
http://entomologytoday.org/2016/01/18/ticks-that-transmit-lyme-disease-reported-in-fifty-percent-of-u-s-counties/

North Carolina Counties with Established or Reported Populations of The Black-Legged Tick (Ixodes Scapularis)

Alamance	B. Harrison/NCPHPM[c], unpublished
Anson	
Beaufort	
Bertie	B. Harrison/NCPHPM[c], unpublished
Bladen	
Brunswick	
Camden	B. Harrison/NCPHPM[c], unpublished
Carteret	B. Harrison/NCPHPM[c], unpublished
Catawba	
Chatham	(Smith et al. 2010)
Chowan	B. Harrison/NCPHPM[c], unpublished
Columbus	B. Harrison/NCPHPM[c], unpublished
Craven	B. Harrison/NCPHPM[c], unpublished
Cumberland	

Currituck	
Dare	
Duplin	B. Harrison/NCPHPM[c], unpublished
Durham	B. Harrison/NCPHPM[c], unpublished
Edgecombe	B. Harrison/NCPHPM[c], unpublished
Forsyth	B. Harrison/NCPHPM[c], unpublished
Gates	B. Harrison/NCPHPM[c], unpublished
Granville	B. Harrison/NCPHPM[c], unpublished; http://vectormap.nhm. ku.edu/vectormap/
Greene	B. Harrison/NCPHPM[c], unpublished
Guilford	B. Harrison/NCPHPM[c], unpublished
Halifax	B. Harrison/NCPHPM[c], unpublished
Harnett	B. Harrison/NCPHPM[c], unpublished
Haywood	B. Harrison/NCPHPM[c], unpublished
Hertford	B. Harrison/NCPHPM[c], unpublished
Hoke	
Hyde	B. Harrison/NCPHPM[c], unpublished
Johnston	B. Harrison/NCPHPM[c], unpublished
Jones	B. Harrison/NCPHPM[c], unpublished
Lenoir	
Martin	B. Harrison/NCPHPM[c], unpublished
Mecklenburg	B. Harrison/NCPHPM[c], unpublished
Moore	
Nash	B. Harrison/NCPHPM[c], unpublished
New Hanover	B. Harrison/NCPHPM[c], unpublished
Onslow	
Orange	B. Harrison/NCPHPM[c], unpublished
Pamlico	B. Harrison/NCPHPM[c], unpublished
Pasquotank	B. Harrison/NCPHPM[c], unpublished
Pender	B. Harrison/NCPHPM[c], unpublished

Perquimans	B. Harrison/NCPHPM[c], unpublished
Pitt	B. Harrison/NCPHPM[c], unpublished
Randolph	http://vectormap.nhm.ku.edu/vectormap/
Robeson	B. Harrison/NCPHPM[c], unpublished
Rowan	B. Harrison/NCPHPM[c], unpublished
Rutherford	
Sampson	B. Harrison/NCPHPM[c], unpublished
Scotland	B. Harrison/NCPHPM[c], unpublished
Stokes	(Sakamoto et al. 2014); B. Harrison/NCPHPM[c], unpublished
Surry	B. Harrison/NCPHPM[c], unpublished
Tyrrell	B. Harrison/NCPHPM[c], unpublished
Vance	B. Harrison/NCPHPM[c], unpublished
Wake	B. Harrison/NCPHPM[c], unpublished
Warren	B. Harrison/NCPHPM[c], unpublished
Washington	B. Harrison/NCPHPM[c], unpublished
Wayne	H. Gaff, unpublished; B. Harrison/NCPHPM[c], unpublished

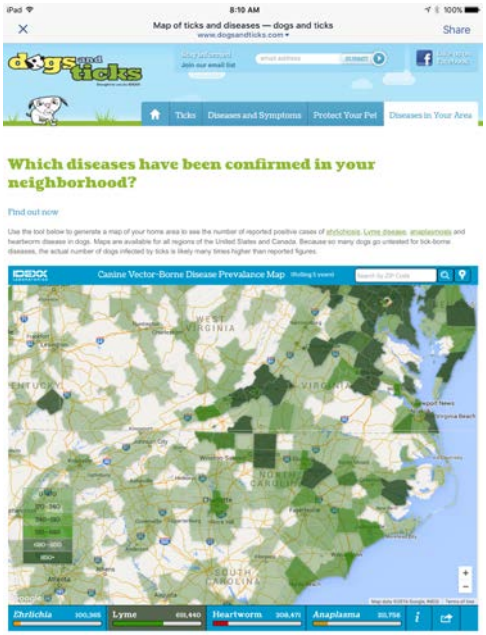
Habitat and Vegetation Variables Are Not Enough When Predicting Tick Populations in the Southeastern United States

Two tick-borne diseases with expanding case and vector distributions are ehrlichiosis (transmitted by Amblyomma americanum) and rickettiosis (transmitted by A. maculatum and Dermacentor variabilis). No variables were significant predictors of A. americanum adult and nymph tick abundance, and no clustering was evident because this species was found throughout the study area. For A. maculatum, adult tick abundance was predicted by NDVI and by the interaction between habitat type and plant diversity. For D. variabilis no environmental variables were significant predictors of adult abundance; however, there were some clusters in agriculture areas with defined edges. The amount of explained variation was not useful for predicting reliably where ticks occur; consequently, additional research that includes multiple sampling seasons and locations throughout the southeast are warranted. This low amount of explained variation may also be due to the use of hosts for dispersal, and potentially to other abiotic and biotic variables. Fryxall et al. PLoS One, Dec 11, 2015. Entire paper: http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0144092

CDC Study for 3 Tick-borne Diseases in Texas- 23% of Tested Ticks Carried at Least One

Frequency and Distribution of Rickettsiae, Borreliae, and Ehrlichiae Detected in Human-Parasitizing Ticks, Texas, USA
CDC: To describe the presence and distribution of tickborne bacteria and their vectors in Texas, USA, we screened ticks collected from humans during 2008–2014 for Rickettsia, Borrelia, and Ehrlichia spp. Thirteen tick species were identified, and 23% of ticks carried bacterial DNA from at least 1 of the 3 genera tested. Mitchell EA et al. Emerg Infect Dis. 2016 Feb .http://dx.doi.org/10.3201/eid2202.150469. Entire article at http://wwwnc.cdc.gov/eid/article/22/2/15-0469_article

IDEXX Laboratory Website Has Interactive Maps on Vector-borne Diseases in Dogs



IDEXX: "Use the tool below to generate a map of your home area to see the number of reported positive cases of ehrlichiosis, Lyme disease, anaplasmosis and heartworm disease in dogs. Maps are available for all regions of the United States and Canada. Because so many dogs go untested for tick-borne diseases, the actual number of dogs infected by ticks is likely many times higher than reported." figures. http://www.dogsandticks.com/diseases_in_your_area.php

Northern Blacklegged Ticks Feed Faster than Southern, but Southern Transmits Lyme Disease Just as Well

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. 2015 Jan;52(1):81-5. doi: 10.1093/jme/tju005.

ℵℵ General Section ℵℵ

CDC Announces New Guidelines for Rickettsial Diseases Such as Rocky Mount Spotted Fever

New CDC guidelines for tickborne rickettsial diseases which were made available online in mid-May, 2016:http://www.cdc.gov/mmwr/volumes/65/rr/rr6502a1.htm?s_cid=rr6502a1_e.

New Borrelia Found That Causes Disease—Named Borrelia mayonii

Until now,* Borrelia burgdorferi *was only species believed to cause Lyme disease in North America
Rochester, Minn. — Mayo Clinic researchers, in collaboration with the Centers for Disease Control and Prevention (CDC) and health officials from Minnesota, North Dakota and Wisconsin, have discovered a new bacterial species that causes Lyme disease in people. The new species has been provisionally named *Borrelia mayonii.* Prior to this finding, the only species believed to cause Lyme disease in North America was *Borrelia burgdorferi.*

In the paper published recently in *The Lancet Infectious Diseases*, Mayo Clinic scientists tested samples from U.S. patients from 2003 to 2014 for evidence of Lyme disease using a method called polymerase chain reaction (PCR). From 2012 to 2014, the researchers noticed unusual test results from 6 of 9,000 samples from residents of Minnesota, North Dakota and Wisconsin.

"Using a laboratory-developed test with a method called 'melting temperature analysis,' we detected six specimens that produced a PCR result that was clearly different from *B. burgdorferi,*" saysBobbi Pritt, M.D., director of the Clinical Parasitology Laboratory at Mayo Clinic who is first author of the study. "Mayo Medical Laboratories, the reference laboratory at Mayo, has tested more than 100,000 patient samples from all 50 states over the past decade using our PCR assay, but we've only recently detected evidence of *B. mayonii.*"

Based on these findings, the researchers believe that the organism may have only recently emerged in the upper Midwestern U.S. "It is possible that this species has been present for even longer but at such low levels that it escaped detection," adds Dr. Pritt.

As with *B. burgdorferi,* researchers believe that *B. mayonii* is transmitted to humans by the bite of an infected black-legged tick (otherwise known as the deer tick). Typical symptoms of Lyme disease include fever, headache, rash, neck pain, and arthritis in later stages. Unlike *B. burgdorferi,* however, *B. mayonii* causes an illness that appears to be associated with nausea and vomiting, diffuse rashes (rather than a single bull's-eye rash), and a higher concentration of bacteria in the blood.

Patients infected with *B. mayonii* will test positive for Lyme disease with currently available U.S. Food and Drug Administration-cleared Lyme disease tests. In some instances, *B. mayonii* bacteria also may be seen on a blood smear. "Specific identification of the organism can be made by using the Mayo Clinic PCR test, which detects the DNA of the Lyme disease bacteria," notes Dr. Pritt.

For treatment, the patients described in the study fully recovered using antibiotics commonly used to treat Lyme disease caused by *B. burgdorferi*. The CDC recommends that health care providers who are caring for patients infected with *B. mayonii* also follow the antibiotic regimen described by the Infectious Diseases Society of America.

Dr. Pritt adds, “At this time, there is no evidence that *B. mayonii* is present outside of the Upper Midwest. However, the public should continue to take the recommended precautions against tick bites, as Lyme disease and other tick-borne diseases are well-established in much of the Northeast.” For more information, visit http://www.mayoclinic.org/first-aid/first-aid-tick-bites/basics/art-20056671 and http://http://www.cdc.gov/ticks/. Paper: Lancet Infect Dis 2016 Published Online February 5, 2016 http://dx.doi.org/10.1016/ S1473-3099(15)00464-8.

Black-legged Ticks Vector the New Borrelia, Other Ticks Not Tested Yet

Vector competence of the blacklegged tick, *Ixodes scapularis*, for the recently recognized Lyme borreliosis spirochete *Borrelia mayonii*

A novel species within the *Borrelia burgdorferi* sensu lato complex, provisionally named *Borrelia mayonii*, was recently found to be associated with Lyme borreliosis in the Upper Midwest of the United States. Moreover, *B. mayonii* was detected from host-seeking *Ixodes scapularis*, the primary vector of *Borrelia burgdorferi* sensu stricto in the eastern United States. We therefore conducted a study to confirm the experimental vector competence of *I. scapularis* for *B. mayonii* (strain MN14-1420), using colony ticks originating from adults collected in Connecticut and CD-1 white mice. Larvae fed on mice 10 weeks after needle-inoculation with *B. mayonii* acquired spirochetes and maintained infection through the nymphal stage at an average rate of 12.9%. In a transmission experiment, 40% of naïve mice exposed to a single infected nymph developed viable infections, as compared with 87% of mice fed upon by 2–3 infected nymphs. Transmission of *B. mayonii* by one or more feeding infected nymphs was uncommon up to 48 hours after attachment (one of six mice developed viable infection) but occurred frequently when nymphs were allowed to remain attached for 72–96 hours or feed to completion (11 of 16 mice developed viable infection). Mice infected via tick bite maintained viable infection with *B. mayonii*, as determined by ear biopsy culture, for at least 28 weeks. Our results demonstrate that *I. scapularis* is capable of serving as a vector of *B. mayonii*. This finding, together with data showing that field-collected *I. scapularis* are infected with *B. mayonii*, indicate that *I. scapularis* likely is a primary vector to humans of this recently recognized Lyme borreliosis spirochete. Dolan et al. Ticks and Tick-borne Diseases, online 12 February 2016, doi:10.1016/j.ttbdis.2016.02.012.

European Black-legged Tick Larvae Can Transmit One Species of Lyme Disease and *Borrelia miyamotoi* to Mice

Larvae of *Ixodes ricinus* transmit *Borrelia afzelii* and *B. miyamotoi* to vertebrate hosts
Abstract Lyme borreliosis is the most common tick-borne human disease and is caused by *Borrelia burgdorferi sensu lato* (*s.l.*).*Borrelia miyamotoi*, a relapsing fever spirochaete, is transmitted transovarially, whereas this has not been shown for *B. burgdorferi* (*s.l*). Therefore, *B. burgdorferi* (*s.l*) is considered to cycle from nymphs to larvae through vertebrates. Larvae of *Ixodes ricinus* are occasionally *B. burgdorferi* (*s.l*) infected, but their vector competence has never been studied.
Methods We challenged 20 laboratory mice with field-collected larvae of *I. ricinus*. A subset of these larvae was analysed for infections with *B. burgdorferi* (*s.l*) and *B. miyamotoi*. After three to four challenges, mice were sacrificed and skin and spleen samples were analysed for infection by PCR and culture.
Results Field-collected larvae were naturally infected with *B. burgdorferi* (*s.l*) (0.62 %) and *B. miyamotoi* (2.0 %). Two mice acquired a *B. afzelii* infection and four mice acquired a *B. miyamotoi* infection during the larval challenges.

Conclusion We showed that larvae of *I. ricinus* transmit *B. afzelii* and *B. miyamotoi* to rodents and calculated that rodents have a considerable chance of acquiring infections from larvae compared to nymphs. As a result, *B. afzelii* can cycle between larvae through rodents. Our findings further imply that larval bites on humans, which easily go unnoticed, can cause Lyme borreliosis and *Borrelia miyamotoi* disease. Duijvendijk et al. *Parasites & Vectors*20169:97, DOI: 10.1186/s13071-016-1389-5, Feb 2016.

Laboratory Evaluations of Seven Insect Repellents Against the Lone Star Tick Amblyomma Americanum

In laboratory bioassays, BioUD, Bio Block-Organic Outdoor, Bio BlockOrganic Pest Control, Bio Blocker-Organic Insect Repellent, OFF! Botanicals Insect Repellent, OFF! Deep Woods Insect Repellent, and Repel Insect Repellent Sportsman Gear Smart insect repellents were applied to poster paper and assessed by four volunteers for efficacy against unfed nymphal Amblyomma americanum ticks. Assessment times of 10 and 120 minutes post application were chosen to mimic freshly applied repellent and suggested duration of effectiveness against ticks as determined by the product manufacturers. Significant differences between repellents existed when both application periods were compared but not between volunteers. At 10 min post application, Bio Block Pest Repel was the most effective product at repelling ticks (85%) and Repel the least effective (30%). At 120 min, BiteBlocker-Insect Repel, OFF! Deepwoods, and Bio Block-Organic Outdoor provided ≥55% protection from ticks. Efficacy at 120 min, when measured at 50% or greater repellency, did not reflect duration times listed on the BioUD (20%), and OFF! Botanicals (30%) product labels. Scott et al. 2016. Entire paper at: floridamosquito.org/Archive/FMCA/Technical%20Bulletins/FMCA_Bulletin_Volume_10-2016.pdf#page=88

Will Culling White-Tailed Deer Prevent Lyme Disease?

White-tailed deer play an important role in the ecology of Lyme disease. In the United States, where the incidence and geographic range of Lyme disease continue to increase, reduction of white-tailed deer populations has been proposed as a means of preventing human illness. The effectiveness of this politically sensitive prevention method is poorly understood. We summarize and evaluate available evidence regarding the effect of deer reduction on vector tick abundance and human disease incidence. Elimination of deer from islands and other isolated settings can have a substantial impact on the reproduction of blacklegged ticks, while reduction short of complete elimination has yielded mixed results. To date, most studies have been conducted in ecologic situations that are not representative to the vast majority of areas with high human Lyme disease risk. Robust evidence linking deer control to reduced human Lyme disease risk is lacking. Currently, there is insufficient evidence to recommend deer population reduction as a Lyme disease prevention measure, except in specific ecologic circumstances. Kugelar et al. Zoonoses and Public Health, Article first published online: 18 DEC 2015, *DOI*: 10.1111/zph.12245

Knowledge of Tick-borne Diseases and Prevention Poor Even in an Endemic Area

Tick-Borne Disease Preventive Practices and Perceptions in an Endemic Area (SW Connecticut) Lyme disease is the most commonly reported vector-borne illness in the United States. Since the institution of Nationally Notifiable surveillance efforts for Lyme disease in the United States in 1991, there has been a consistent increase in the number of reported cases. Between June and September

2014, an anonymous questionnaire was administered to 275 participants through a point-of-contact convenience sample obtained at community events in southwestern Connecticut. Some 80% of participants were female; median age was 55 years (IQR 45-64 years); 30% reported having been treated for a tick-borne illness and 50% reported a family member having been treated for a tick-borne illness.
Overall, participants' knowledge of tick-borne diseases was poor; the average knowledge score was only 57% (SD 22.6. The most commonly reported behavior was performing a tick check (68%); use of tick repellent was the least commonly reported behavior (38%). Belief that a prevention behavior is effective was highly correlated with performing that behavior but perceived burdensomeness does not appear to influence behavior performance. The reasons for differential uptake of preventive behaviors remains unknown; further study of barriers to performance of personal preventive behaviors is needed to better target public health interventions. Butler at al. Ticks and Tick-borne Diseases, online Dec 7, 2015, doi:10.1016/j.ttbdis.2015.12.003

Tick-borne Disease Anaplasmosis Transmitted by Transfusions

Transfusion-transmitted anaplasmosis from a leukoreduced platelet pool

Human granulocytic anaplasmosis is an emerging tick-borne illness. *Anaplasma phagocytophilum* resides intracellularly, can cause asymptomatic infection, and can survive blood component refrigeration conditions for at least 18 days. To date, eight cases of transfusion-transmitted anaplasmosis (TTA) have been reported: seven attributed to red blood cell (RBC) units, five of which were prestorage leukoreduced using RBC leukoreduction filters, and one involving a process leukoreduced apheresis platelet (PLT) unit. Here, we report a case of TTA from a whole blood–derived PLT pool. Transmission was confirmed by positive *A. phagocytophilum* PCR and serology in one of 16 donors and by positive PCR and seroconversion in the recipient. This is the first confirmed case of TTA from a whole blood–derived PLT pool prepared from PLT concentrates leukoreduced by in-line filtration of PLT-rich plasma. Fine et al. Transfusion. Dec 2015 DOI: 10.1111/trf.13392

Study Suggests the Possibility of *B. miyamotoi* Transmission by Blood Transfusion

Distribution and survival of *Borrelia miyamotoi* in human blood components

Borrelia miyamotoi, the agent of relapsing fever, is a tick-borne spirochete first isolated in Japan in 1994. Since then, the spirochete has been detected in ticks globally, generally in the same vectors as the Lyme disease agent.

Freshly collected human whole blood was spiked with in vitro cultured *B. miyamotoi* or *B. miyamotoi*–infected mouse plasma and separated into red blood cells (RBCs), plasma, and platelets. Components were either injected into immunocompromised (SCID) or wild-type immunocompetent mice. Infection was monitored by microscopic observation, blood smears, and polymerase chain reaction.

In vivo, all the SCID mice challenged with the components before storage and the RBCs stored for up to 42 days developed the infection. Wild-type mice also developed the infection when injected with prestorage samples from all components, while a lower number of mice were infected by RBCs stored

for 42 days. In vitro, spirochetes grew in all samples but frozen plasma. This study demonstrated that *B. miyamotoi* can survive standard storage conditions of most human blood components, suggesting the possibility of transmission by blood transfusion. Thorp et al. Transfusion, first published online: 21 DEC 2015, DOI: 10.1111/trf.13398

New Human Pathogen Found, Transmitted by Black-legged Ticks

Co-Feeding Transmission of the *Ehrlichia muris*–Like Agent (EMLA) to Mice (*Mus musculus*)
The *Ehrlichia muris*–like agent (EMLA) is a newly recognized human pathogen found in Wisconsin and Minnesota. Ecological investigations have implicated both the blacklegged tick, *Ixodes scapularis*, and the white-footed mouse, *Peromyscus leucopus*, as playing roles in the maintenance of EMLA in nature. The work presented here shows that *I. scapularis* is an efficient vector of EMLA in a laboratory mouse model, but that *Dermacentor variabilis*, another frequent human biting tick found in EMLA endemic areas, is not. Additionally, *I. scapularis* larvae are able to acquire EMLA through co-feeding with infected nymphs. As EMLA only persists in mouse blood for a relatively short period of time, co-feeding transmission may play an important role in the maintenance of EMLA in ticks, and subsequently may play a role in limiting the geographic distribution of this pathogen in areas where co-feeding of larvae and nymphs is less common. Sandor et al. Vector-Borne and Zoonotic Diseases. January 2016. doi:10.1089/vbz.2015.1878.

Lone Star Ticks in Kansas-- Getting Worse

Maximum Entropy-Based Ecological Niche Model and Bio-Climatic Determinants of Lone Star Tick (*Amblyomma americanum*) Niche
The potential distribution of *Amblyomma americanum* ticks in Kansas was modeled using maximum entropy (MaxEnt) approaches based on museum and field-collected species occurrence data. Various bioclimatic variables were used in the model as potentially influential factors affecting the *A. americanum* niche. Following reduction of dimensionality among predictor variables using principal components analysis, which revealed that the first two principal axes explain over 87% of the variance, the model indicated that suitable conditions for this medically important tick species cover a larger area in Kansas than currently believed. Soil moisture, temperature, and precipitation were highly correlated with the first two principal components and were influential factors in the *A. americanum* ecological niche. Assuming that the niche estimated in this study covers the occupied distribution, which needs to be further confirmed by systematic surveys, human exposure to this known disease vector may be considerably under-appreciated in the state. Ram et al. Vector-Borne and Zoonotic Diseases. January 2016. doi:10.1089/vbz.2015.1837.

International Section

Lyme Disease in Turkey

Evaluation of 10 cases of Lyme disease presenting with erythema migrans in Istanbul, Turkey

Lyme disease (LD) is a tick-borne, multisystemic infection caused by Borrelia burgdorferi. Although variable rates of seropositivity for B.burgdorferi have been reported between 2% to 44% in Turkey, its actual prevalence is not well-understood. The aim of this retrospective study was to evaluate the characteristics of 10 cases of LD presenting as erythema migrans (EM) between 2009 and 2013 from Istanbul which is one of the metropolitan cities of Turkey. Of the patients, five were male and five were female, ages between 9-51 years (mean age: 34.5 years). All were treated according to standard guidelines and were doing well one year later. The increase in the number of LD cases may be associated with increased tick bite and increased awareness due to the emergence of concurrent Crimean-Congo hemorrhagic fever epidemic in Turkey. When enlarged erythematous lesions on the skin are observed, LD must also be considered in differential diagnosis, history of tick bite should be questioned and etiological diagnostic test should be performed. Belli et al. Mikrobiyoloji Bulteni [2015, 49(4):525-531]

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.

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