Tick-Borne Infections Council of North Carolina, Inc.

NEWSLETTER 2017, Volume2

Quote of the season: -

From a 2016 interview with Dr. James Oliver, Jr. *Is the black-legged tick, Ixodes scapularis, the only species known to transmit Lyme disease?* No, not really. It's the major one, but it's still not decided by a lot of physicians. They were impressed by the idea. There are sociological reasons why Lyme disease is reported more in the Northeast than the South: availability of physicians, people differences, tick variation. They still argue with me, and some people at CDC [Centers for Disease Control] keep pushing [against my research]. *What other species potentially vector Lyme?* From a very natural standpoint, that's the main one, but from a breeding standpoint, you can get other species to transmit it. *Such as?* The lone star tick is one of the candidates, but it's still a question. Rice, Marlin E. "James H. Oliver, Jr.: Ticks, Lyme Disease, and a Golden Gloves Champion." *American Entomologist* 62.4 (2016): 206-213.

Highlights…

Scroll down to see these features and more!

State Vector-Borne Disease Working Group 2017 Meeting Schedule

May 5, 2017 July 21, 2017 Oct 20, 2017

Location:
Office of the Chief Medical Examiner Photo ID required.
4312 District Drive
Raleigh, NC 27607
(Check with us before going to confirm date as they occasionally change.)

The Letters to Medical Providers from the State Department of Public Health on Lyme Disease and Rickettsial Diseases can be seen on our website at http://tic-nc.org/publications/

Disease	Total cases by year of report 2014 Preliminary Confirmed + Probable (Confirmed/Probable/Suspected)*	2015 Final (Probable/Confirmed/Suspected)**	2016 Preliminary (Probable/Confirmed)
Lyme disease	170 (27/143/86)	192/38/46	277/33
Rickettsioses	496 (10/486/278)	454/5/130	475/6
Ehrlichioses	73 (11/62/31)	58/16/18	61/10
Anaplasmoses	12 (0/12/12)	15/4/3	14/1

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

Note: By the former CDC definition, six counties had 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 counties were endemic for Lyme disease by the former CDC definition: Wake, Guilford, Haywood, Alleghany, Buncombe, and Wilkes)** Counties with one case of locally acquired Lyme disease were: 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 Talks and Materials Distributed

Brochures:
South Carolina Mosquito Control Association
Wilmington Vector Control
NC Veterinary School
Asheville, numerous places
Veterinarians across NC
Galloway Ridge Retirement Community
Siler City Hispanic Liason

Talks:
South Carolina Mosquito Control Association
Galloway Ridge Retirement Community

New 2017 Lyme Disease (LD) Case Definition from the CDC

Read the entire definition at https://wwwn.cdc.gov/nndss/conditions/lyme-disease/case-definition/2017/ (Links to earlier definitions are on this page as well.)

The new definition also drops the phrase, "This surveillance case definition was developed for national reporting of Lyme disease; **it is not intended to be used in clinical diagnosis**." It has slight changes in the "Laboratory Criteria for Diagnosis." The most significant change is the dropping of criteria for establishing counties endemic for Lyme disease (meaning LD can be locally acquired in that county according to the 2011 CDC criteria). *Therefore, NC no longer has endemic counties.* The language is now "high-incidence states" (see definition in box) and "low incidence" states.

2011 wording from the CDC website:

Exposure

Exposure is defined as having been (less than or equal to 30 days before onset of EM) in wooded, brushy, or grassy areas (i.e., potential tick habitats) in a county in which Lyme disease is endemic. A history of tick bite is not required.

Endemicity

A county in which Lyme disease is endemic is one in which at least two confirmed cases have been acquired in the county or in which established populations of a known tick vector are infected with *B. burgdorferi*.

2017 wording:

Exposure

Exposure is defined as having been (less than or equal to 30 days before onset of EM) in wooded, brushy, or grassy areas (i.e., potential tick habitats) of Lyme disease vectors. Since infected ticks are not uniformly distributed, a detailed travel history to verify whether exposure occurred in a high or low incidence state is needed. An exposure in a high-incidence state is defined as exposure in a state with an average Lyme disease incidence of at least 10 confirmed cases/ 100,000 for the previous three reporting years. A low-incidence state is defined as a state with a disease incidence of <10 confirmed cases/100,000 (*see* https://www.cdc.gov/lyme/stats/tables.html). A history of tick bite is not required.

Report from the Vectorborne Disease Work Group meeting, January 27, 2017

Case report numbers were presented for both mosquito- and tick-borne disease. Interestingly, Zika virus comprised the largest number of cases for mosquito-borne diseases (*all travel-related*) with 88 positive cases and 24 positive for the class of viruses that Zika is in. Tick-borne disease case numbers are reported in the table above. The state investigates a large number of vector-borne diseases, which is a significant burden on health departments. In 2016, the total events created and investigated were 343 for mosquito-borne diseases and 3,617 for tick-borne diseases. Many do not meet the criteria for reporting.

The state Department of Public Health has just hired a second entomologist, Dr. Alexis Barbarin. Dr. Barbarin's background is in bedbugs, having studied and worked at both Penn State and NCSU. She will be mostly involved with tick-related issues.

Dr. Williams presented the new case reporting requirements for Lyme disease from the CDC. Counties will no longer be classified as endemic by the 2011 case definition. We are pleased that the state will continue to collect travel histories and other information necessary to determine whether the person acquired Lyme disease in his or her county. See a full discussion of the new definition below.

TIC-NC Activities

The Chatham County Department of Public Health held a **2017 Chatham County Tick and Tick-borne Illness Forum** on April 28, 2017. This initial exploration of the public health problem caused by ticks and the diseases they vector was for invited guests only. It is hoped that a larger forum for the public will be held later. TIC-NC is involved with this effort.

The forum will host several local, state, and national experts who will cover a range of topics related to ticks and tick-borne illness, including a history and overview of the issue in Chatham County and North Carolina, land use strategies and impacts, and diagnosing tick-borne illness.

Facilitator: L. Layton Long, Health Department Director

Speaker list:

Bruce Harrison, PhD - Public Health Entomologist, Affiliate Professor at Western Carolina University
Graham Hickling, PhD - Director of University of Tennessee Center for Wildlife Health
Steven Seagle, PhD - Appalachian State University
Carl Williams, DVM - NC DHHS, Division of Public Health
Ken Knight - Supervising Wildlife Biologist, NC Wildlife Resources Commission

The information booth at Eno River State Park

ᴎᴎ North Carolina and Southeast Section ᴎᴎ

Gulf Coast Ticks Found to Carry Human Pathogens in Addition to *Rickettsia Parkeri*

Evaluation of Gulf Coast Ticks (Acari: Ixodidae) for *Ehrlichia* and *Anaplasma* Species

Amblyomma maculatum Koch (the Gulf Coast tick) is an aggressive, human-biting ixodid tick distributed throughout much of the southeastern United States and is the primary vector for *Rickettsia parkeri*, an emerging human pathogen. *Amblyomma maculatum* has diverse host preferences that include white-tailed deer, a known reservoir for *Ehrlichia* and *Anaplasma* species, including the human pathogens *E. ewingii* and *E. chaffeensis*. To examine more closely the potential role of *A. maculatum* in the maintenance of various pathogenic *Ehrlichia* and *Anaplasma* species, we screened DNA samples from 493 questing adult *A. maculatum* collected from six U.S. states using broad-range Anaplasmataceae and *Ehrlichia* genus-specific PCR assays. Of the samples tested, four (0.8%) were positive for DNA of *Ehrlichia ewingii*, one (0.2%) was positive for *Anaplasma platys*, and one (0.2%) was positive for a previously unreported *Ehrlichia* species closely related to *Ehrlichia muris* and an uncultivated *Ehrlichia* species from *Haemaphysalis longicornis* ticks in Japan. No ticks contained DNA of *Ehrlichia chaffeensis*, *Ehrlichia canis*, the Panola Mountain *Ehrlichia*, or *Anaplasma phagocytophilum*. This is the first identification of *E. ewingii*, *A. platys*, and the novel *Ehrlichia* in questing Gulf Coast ticks; nonetheless, the low prevalence of these agents suggests that *A. maculatum* is not likely an important vector of these zoonotic pathogens. Allerdice et al. Journal of Medical Entomology, DOI: http://dx.doi.org/10.1093/jme/tjw176 tjw176 First published online: 28 December 2016

◘◘ National Section ◘◘

National legislation: 21st Century Cures Act

http://docs.house.gov/billsthisweek/20161128/CPRT-114-HPRT-RU00-SAHR34.pdf

NOVEMBER 25, 2016 RULES COMMITTEE

TEXT OF HOUSE AMENDMENT TO THE SENATE AMENDMENT TO H.R. 34, TSUNAMI WARNING, EDUCATION, AND RESEARCH ACT OF 2015

Entire bill available at the link. Scroll down to Sec. 2062. Tick-borne diseases. This section can't be copied and pasted due to the format it is in, so readers will have to go there themselves. Among other things, the bill establishes a TICK-BORNE DISEASES WORKING GROUP.

On Dec. 8, 2016: U.S. Senator Charles E. Schumer today announced that the Senate's recently passed *21st Century Cures Act* provides will prioritize the research, vaccine development and treatment

strategies to help stamp out tick-borne diseases, including Lyme disease. Schumer has long pushed for federal funding for the prevention, diagnosis and treatment of Lyme, which sees an increase in cases across New York State nearly every season. Schumer said it is time the federal government got more engaged in the fight against tick-borne diseases; the bill is now headed to the President's desk to be signed.

Chance of being exposed to Lyme disease in nine Northeastern and Mid-Atlantic national parks

Prevalence and Diversity of Tick-Borne Pathogens in Nymphal Ixodes scapularis (Acari: Ixodidae) in Eastern National Parks

"In this study, we documented acarological risk for exposure to I. scapularis-borne pathogens on frequently used hiking trails in nine eastern national parks, but we observed great variability in acarological risk within and among parks. Compared with B. burgdorferi, ticks infected with B. miyamotoi, A. phagocytophilum, and Ba. microti were less widespread and less prevalent."

Abstract Tick-borne pathogens transmitted by Ixodes scapularis Say (Acari: Ixodidae), also known as the deer tick or blacklegged tick, are increasing in incidence and geographic distribution in the United States. We examined the risk of tick-borne disease exposure in 9 national parks across six Northeastern and Mid-Atlantic States and the District of Columbia in 2014 and 2015. To assess the recreational risk to park visitors, we sampled for ticks along frequently used trails and calculated the density of I. scapularis nymphs (DON) and the density of infected nymphs (DIN). We determined the nymphal infection prevalence of I. scapularis with a suite of tick-borne pathogens including Borrelia burgdorferi, Borrelia miyamotoi, Anaplasma phagocytophilum, and Babesia microti. Ixodes scapularis nymphs were found in all national park units; DON ranged from 0.40 to 13.73 nymphs per 100 m2. Borrelia burgdorferi, the causative agent of Lyme disease, was found at all sites where I. scapularis was documented; DIN with B. burgdorferi ranged from 0.06 to 5.71 nymphs per 100 m2. Borrelia miyamotoi and A. phagocytophilum were documented at 60% and 70% of the parks, respectively, while Ba. microti occurred at just 20% of the parks. Ixodes scapularis is well established across much of the Northeastern and Mid-Atlantic States, and our results are generally consistent with previous studies conducted near the areas we sampled. Newly established I. scapularis populations were documented in two locations: Washington, D.C. (Rock Creek Park) and Greene County, Virginia (Shenandoah National Park). This research demonstrates the potential risk of tick-borne pathogen exposure in national parks and can be used to educate park visitors about the importance of preventative actions to minimize tick exposure. Tammi L, et al. Journal of Medical Entomology. 2016 Dec 27:tjw213.

Lyme disease treatment bill that passed in Iowa, Spring 2017

Governor Terry Branstad has signed into law a bill to permit more aggressive treatment of Lyme disease than previously allowed by the Iowa Board of Medicine.

The bill states:

A person licensed by a board under this subtitle shall not be subject to discipline under this chapter or the board's enabling statute based solely on the licensee's recommendation or provision of a treatment method for Lyme disease or other tick-borne disease if the recommendation or provision of such treatment meets all the following criteria:

1. *The treatment is provided after an examination is performed and informed consent is received from the patient.*
2. *The licensee identifies a medical reason for recommending or providing the treatment.*
3. *The treatment is provided after the licensee informs the patient about other recognized treatment options and describes to the patient the licensee's education, experience, and credentials regarding the treatment of Lyme disease or other tick-borne disease.*
4. *The licensee uses the licensee's own medical judgment based on a thorough review of all available clinical information and Lyme disease or other tick-borne disease literature to determine the best course of treatment for the individual patient.*
5. *The treatment will not, in the opinion of the licensee, result in the direct and proximate death of or serious bodily injury to the patient.*

Lyme disability ruling from Federal Court- 2016

A federal district court has recently ruled in favor of a Lyme patient, ordering that a claim for Social Security disability benefits is viable even when laboratory evidence falls short of two-tiered testing criteria. The U.S. District Court for the Eastern District of California has issued a published order, stating that laboratory findings of limited antibody reactivity to *Borrelia burgdorferi*, when interpreted by a treating physician, meet the evidentiary threshold for proving a "medically determinable impairment" under Social Security law. The written ruling, authored by Magistrate Judge Edmund F. Brennan, states that laboratory evidence such as that referenced in ILADS guidelines provides legally sufficient "objective evidence" to support a treating physician's clinical assessment that the patient suffered from disabling Lyme and other tick-borne diseases.

The Plaintiff in the case, Kelly Moores, found her capacity to work cut short by the onset of symptoms of tick-borne illness. As is common for many Lyme patients, Ms. Moores encountered difficulty and delay in obtaining diagnosis and treatment, and was eventually diagnosed with tick-borne illness by Eleanor Hynote MD of Napa, California. Dr. Hynote, a former ILADS member, passed away suddenly while the case was pending. Fortunately, the Plaintiff's attorney had previously recorded Dr. Hynote's responses to detailed questions about the particular medical findings that led to the diagnosis, and thus laid the groundwork for the court's ruling.

The ruling is a first of its kind, in that it is a published, citable court order in which laboratory findings in keeping with the ILADS standards are deemed a sufficient legal basis for a federal disability claim. This means a federal district court has now issued an order consistent with a number of state laws, which recognize the validity of clinical-focused diagnostic criteria for Lyme disease, where laboratory findings play a supportive, but not determinative, role. Calif. Bus. & Prof. § 2234.1, Conn. Stat. Ann. § 20-14m; Maine Rev. Stat. Ann. § 1646; Mass. G. L. ch. 112, § 12DD; New Hamp. H.B. 295 § 157; N.Y. Pub. Health § 230, 9-b; R.I. Gen. L. § 5-37.5-6; Vermont 18 V.S.A. § 1793; Virginia Code Ann. § 54.1-2963.2. The authority of the present case is currently limited to the jurisdiction in which the order was issued. However, the order can be cited as persuasive authority for claims arising in other jurisdictions. The case citation is *Moores v. Colvin*, 173 F. Supp. 3d 989 (E.D. Calif. 2016). Barbara Arnold, Esq., of Oakland, California, ably represented the Plaintiff.

Evaluation of three over the counter pesticides show effectiveness for suppressing ticks- no information in abstract about toxicities

Ability of Three General-Use Pesticides To Suppress Nymphal *Ixodes scapularis* and *Amblyomma americanum* (Acari: Ixodidae)

We evaluated 3 over-the-counter pesticides for their ability to suppress host-seeking *Ixodes scapularis* and *Amblyomma americanum* nymphs. We applied liquid concentrate and granular formulations of Bayer Advanced Complete Insect Killer, Spectracide Triazicide Insect Killer, and Ortho Bug-B-Gon to forest plots using equipment available for purchase at retail home improvement outlets. All 3 liquid formulations provided rapid knockdown (≥98% control) of both species 1 day after application. Liquid Ortho Bug-B-Gone provided 100% suppression of *I. scapularis* throughout the 28-day postapplication period, while the other 2 liquid materials provided >95% control after 28 days. All liquid products also provided ≥95% control of *A. americanum* nymphs after 28 days. Granular formulations provided less consistent results, including lower 1-day knockdown rates for both species, due to very dry conditions, which prevented adequate release of the active ingredient from the carrier materials. After it rained in the study area, 7 and 14 days after application, we observed ≥99% suppression of both species. At 28 days posttreatment, control ranged between 87.5% and 95.6% for *I. scapularis* and between 89.3% and 94.4% for *A. americanum*. We show that these over-the-counter acaricides effectively suppressed 2 medically important tick vectors for at least 4 wk, and they provide a cost-effective tick control option for homeowners. In general, liquid formulations provided more rapid and greater and more consistent suppression than granular formulations, which may have implications for homeowner use of these products. Jordan et al. *Journal of the American Mosquito Control Association* 33(1):50-55. 2017 doi: http://dx.doi.org/10.2987/16-6610.1

Western Lyme disease tick's microbiome altered by the blood of the animal it feeds on

Tick microbiome and pathogen acquisition altered by host blood meal

Lyme disease, a zoonotic disease, is the most prevalent vector-borne disease in the Northern Hemisphere. Diversity of the vector (tick) microbiome can impact pathogen transmission, yet the biotic and abiotic factors that drive microbiome diversity are largely unresolved, especially under

natural, field conditions. We describe the microbiome of Ixodes pacificus ticks, the vector for Lyme disease in the western United States, and show a strong impact of host blood meal identity on tick microbiome species richness and composition. Western fence lizards, a host that is refractory to the Lyme disease pathogen, significantly reduces microbiome diversity in ticks relative to ticks that feed on a mammalian reservoir host. Host blood meal-driven reduction of tick microbiome diversity may have lifelong repercussions on I. pacificus vector competency and ultimately disease dynamics. Swei & Kwan, *The ISME Journal* | doi:10.1038/ismej.2016.152

Medical providers in Lyme disease area do poor job of identifying ticks and blacklegged tick pathogens

Use of tick-borne disease manual increases accuracy of tick identification among primary care providers in Lyme disease endemic areas

Given the high incidence of tick bites and tick-borne diseases in the United States, it is important for primary care providers to recognize common ticks and the pathogens they may transmit. If a patient has removed and saved an attached tick, identifying the tick helps guide clinical management and determine whether antibiotic prophylaxis for Lyme disease is appropriate. To investigate providers' ability to recognize common ticks and the pathogens they may transmit, we asked 76 primary care providers from Lyme disease endemic areas to identify the common name or genus of preserved ticks found in their area. At baseline, 10.5%, 46.1%, and 57.9% of participants correctly identified an adult female blacklegged tick (engorged), dog tick, and lone star tick, respectively. Less than half of participants identified the three pathogens most frequently transmitted by blacklegged ticks. Use of a reference manual with tick photographs and drawings substantially improved identification of ticks and associated pathogens and therefore should be encouraged in clinical practice. Butler et al. Ticks and Tick-borne Diseases, http://dx.doi.org/10.1016/j.ttbdis.2016.11.010

Lone star ticks now in Wisconsin and are spreading ehrlichiosis

Occurrence of *Amblyomma americanum* (Acari: Ixodidae) and Human Infection With *Ehrlichia chaffeensis* in Wisconsin, 2008–2015

Because of the increasing incidence of human ehrlichiosis in Wisconsin, we assessed reports of human infections by *Ehrlichia chaffeensis* and the distribution of its vector, the lone star tick (*Amblyomma americanum* (L.)). From 2008 through 2015, 158 probable and confirmed human cases of *E. chaffeensis* infections were reported to the Wisconsin Department of Health Services. Five cases without travel history outside of Wisconsin were confirmed as *E. chaffeensis* by polymerase chain reaction. Surveillance for the vector occurred from 2008 through 2015 and was based on active and passive methods, including examination of white-tailed deer, collections from live-trapped small mammals, submissions of ticks removed from wild and domestic animals through the Wisconsin Surveillance of Animals for Ticks (SWAT) program, digital or physical submissions by the public to the University of Wisconsin Insect Diagnostic or Medical Entomology laboratories, and active tick dragging. More than 50 lone star ticks (46 adults, 6 nymphs, and 1 larva) were identified. Lone star ticks were more commonly found in south central Wisconsin, particularly in Dane County, where discovery of more than one life stage in a single year indicates possible establishment. Christenson et al. Journal of Medical Entomology, http://dx.doi.org/10.1093/jme/tjw218 online: 23 December 2016

Several states now require patients be told the uncertainties about Lyme disease testing

Virginia Law: Required Labeling:

"YOUR HEALTH CARE PROVIDER HAS ORDERED A LABORATORY TEST FOR THE PRESENCE OF LYME DISEASE FOR YOU. CURRENT LABORATORY TESTING FOR LYME DISEASE CAN BE PROBLEMATIC AND STANDARD LABORATORY TESTS OFTEN RESULT IN FALSE NEGATIVE AND FALSE POSITIVE RESULTS, AND IF DONE TOO EARLY, YOU MAY NOT HAVE PRODUCED ENOUGH ANTIBODIES TO BE CONSIDERED POSITIVE BECAUSE YOUR IMMUNE RESPONSE REQUIRES TIME TO DEVELOP ANTIBODIES. IF YOU ARE TESTED FOR LYME DISEASE, AND THE RESULTS ARE NEGATIVE, THIS DOES NOT NECESSARILY MEAN YOU DO NOT HAVE LYME DISEASE. IF YOU CONTINUE TO EXPERIENCE SYMPTOMS, YOU SHOULD CONTACT YOUR HEALTH CARE PROVIDER AND INQUIRE ABOUT THE APPROPRIATENESS OF RETESTING OR ADDITIONAL TREATMENT."

Ohio Law: Patient Must Sign

"Your health care provider has ordered a test for the presence of Lyme disease. Current testing for Lyme disease can be problematic and may lead to false results. If you are tested for Lyme disease and the results are positive, this does not necessarily mean that you have contracted Lyme disease. In the alternative, if the results are negative, this does not necessarily mean that you have not contracted Lyme disease. If you continue to experience symptoms or have other health concerns, you should contact your health care provider and inquire about the appropriateness of additional testing or treatment."

Maryland Law: Must Give to Patient when Blood is Drawn

"Your health care provider has ordered a laboratory test for the presence of Lyme disease for you. Current laboratory testing for Lyme disease can be problematic and standard laboratory tests often result in false negative and false positive results and, if done too early, you may not have produced enough antibodies to be considered positive because your immune response requires time to develop antibodies. If you are tested for Lyme disease and the results are negative, this does not necessarily mean you do not have Lyme disease. If you continue to experience unexplained symptoms, you should contact your health care provider and inquire about the appropriateness of retesting or initial or additional treatment."

Comments on a possible Lyme disease vaccine

… Thus, the future seems reasonably bright for the development of vaccines against Lyme disease, if the mistakes made with the last vaccine can be avoided. In my view, the target product profile is of a vaccine that prevents strains prevalent on both sides of the Atlantic, is well tolerated, lacks any epitopes that would hypothetically cross-react with human proteins, is licensed for use in children, and provides at least 80% efficacy for 2 years. To promote the licensure of a new vaccine against Lyme disease, perhaps the greatest need is a concerted demand by the public health community, which would convince manufacturers that there is a market for such a vaccine.

Plotkin, New England Journal of Medicine 375;10:2016. (Dr. Plotkin reports personal fees from GlaxoSmithKline, Sanofi, Merck, Pfizer, Inovio, Dynavax, CureVac, and Takeda outside the submitted work.)

Using education and prevention to stop tick-borne diseases

PCT Magazine, November 2016. An educator and IPM (Integrated Pest Management) colleague discusses how PMPs can expand their public health protector role by increasing their focus on tick education and prevention.

…**MORE TICKS IN MORE PLACES.** There are more ticks in more places yielding more tick encounters. Among tick-borne diseases, Lyme disease is the most frequently reported vector-borne illness in the United States and it is on the rise. In some areas of the United States, as many as 40-70% of blacklegged ticks are infected with the *Borrelia burgdorferi* bacteria. While Lyme disease is endemic in the Northeast and Upper Midwest states, other tick-borne diseases, including Babesiosis, Ehrlichiosis, Rocky Mountain Spotted Fever and Anaplasmosis are also prevalent in these and other parts of the United States…

… At a recent Tick IPM symposium in Washington, D.C., the CDC predicted the estimated 2026 costs to be $8.3 billion.

WHO'S AT RISK? Anyone spending time outdoors in proximity to tick habitat is at risk, including children playing in the yard, homeowners gardening or raking leaves, hunters, fishermen and your furry companion animals.

According to the CDC, 75% of Lyme disease cases are contracted within 100 feet of the home. So you need not be hiking the Appalachian Trail to pick up a tick…

Dr. Tom Mather collecting ticks.

… **BEYOND PESTICIDE TREATMENTS.** Education and awareness are essential elements in a sound Integrated Pest Management (IPM) strategy, particularly one that reduces future tick encounters for humans and companion animals. This effort must be collaborative in nature among the local pest management professional and the general public, veterinarians, health care professionals, youth groups and municipalities.

IPM strategies should include:

- A thorough understanding of tick biology, species distribution and associated pathogens.
- **Acknowledging the impact of recent changes in tick populations that** may be attributed to ecological changes and shifts in land use, a healthy deer herd and/or abundant rodent population.
- Improved identification and surveillance of ticks.
- Understanding the 2-year life cycle of deer ticks.
- Become proactive rather than reactive.
- Identify and avoid tick habitat.
- Properly identify and promptly remove attached ticks.

Entire article by Bob Maurais at http://www.pctonline.com/article/using-education--and--prevention--to-stop-tick-borne-diseases/

New Lyme disease vaccine to be in Phase I trials soon in US and Europe-- A complex and controversial issue

Valneva wins green light to test Lyme disease vax on humans

> Valvena describes themselves as a "leading pure play vaccine company." (We are not sure what this means.) They further describes themselves as a "fully integrated, commercial stage biotech company focused on developing innovative life-saving vaccines. The company seeks financial returns through focused R&D investments in promising product candidates and growing financial contributions from commercial products, striving towards financial self- sustainability. Their main office is located in France, with others in multiple locations around the world. More can be seen at http://www.valneva.com/

Below is information taken from several sites about the Lyme disease vaccine being developed by Valneva.

From Valneva. Dec 13, 2016. "The first and only licensed vaccine used three doses to fight Lyme disease and was made by what's now GlaxoSmithKline. Even though it showed about 80% effectiveness, LYMErix, licensed in 1998, was voluntarily withdrawn from the market by 2002 because of safety concerns over its possible relationship to autoimmune arthritis. The company also chose to **settle** a class action lawsuit even though no study has ever corroborated the hypothesis.

VAL15 uses the same basic idea as LYMErix, but is trying to tackle bacteria species not just found in the U.S. but also in Europe, which LYMErix failed to cover. The phase 1 trials will be carried out on 180 individuals at two sites in the U.S. and Belgium.

Another Lyme candidate developed by Pasteur Mérieux Connaught never sought licensure even though phase 3 data were positive. A small market size was cited as a reason to abandon the project." http://www.fiercepharma.com/vaccines/valneva-gets-green-lights-to-test-lyme-disease-vax-human-u-s-and-europe

From: globenewswire.com/news-release/2016/12/09/896331/0/en/VALNEVA-Valneva-Receives-FDA-and-European-Approvals-to-Start-Clinical-Testing-of-Lyme-Disease-Vaccine-Candidate.html . "Valneva's Phase I trial VLA15-101 is being conducted at two sites - one in the U.S. and one in Europe (Belgium) and will enroll 180 subjects, aged 18-40 years. The primary objective of the single-blind, partially randomized, dose escalation study will be to evaluate the product candidate's safety and tolerability. Immunogenicity, measured by observing IgG antibodies specific against six OspA serotypes, will also be monitored for different dose groups and formulations at different time-points.

Considering the strong interest shown on the disease by investors, shareholders and the general public, Valneva is hosting a conference on Lyme disease in New York on December 12, 2016 to provide more detailed information on the disease and the opportunity to develop a vaccine. The conference will be co-presented by Prof. Stanley A. Plotkin, Emeritus Professor, University of Pennsylvania, and Valneva's Lyme R&D experts led by CEO Thomas Lingelbach. To register for the conference, please visit Valneva's website (http://www.valneva.com/en/)

From: www.historyofvaccines.org/new-lyme-disease-vaccine-clinical-trial "This single vaccine could unite both the US and European markets for the first time. Valneva says the potential market is about $500 million a year. A study conducted by researchers at Johns Hopkins University Bloomberg School of Public Health estimated that US treatment costs for Lyme disease are about $1.3 billion a year.

In its press materials announcing the clinical trial, Valneva points to a study that exonerates the previous vaccine of causing arthritis and Lyme-disease-like symptoms in recipients. These allegations and accompanying lawsuits were in large part responsible for the withdrawal of the earlier vaccine from the market."

Vitamin B1 not needed for Lyme disease bacteria

Lyme disease spirochaete *Borrelia burgdorferi* does not require thiamin

Thiamin pyrophosphate (ThDP), the active form of thiamin (vitamin B_1), is believed to be an essential cofactor for all living organisms1,2. Here, we report the unprecedented result that thiamin is dispensable for the growth of the Lyme disease pathogen *Borrelia burgdorferi* (*Bb*)3. *Bb* lacks genes for thiamin biosynthesis and transport as well as known ThDP-dependent enzymes4, and we were unable to detect thiamin or its derivatives in *Bb* cells. We showed that eliminating thiamin *in vitro* and *in vivo* using BcmE, an enzyme that degrades thiamin, has no impact on*Bb* growth and survival during its enzootic infectious cycle. Finally, high-performance liquid chromatography analysis reveals that the level of thiamin and its derivatives in *Ixodes scapularis* ticks, the enzootic vector of *Bb*, is extremely low. These results suggest that by dispensing with use of thiamin, *Borrelia*, and perhaps other tick-transmitted bacterial pathogens, are uniquely adapted to survive in tick vectors before transmitting to mammalian hosts. To our knowledge, such a mechanism has not been reported previously in any living organisms. Zhang et al. *Nature Microbiology* **2**, doi:10.1038/nmicrobiol.2016.213

Ticks highly infected with Lyme disease spirochetes on an island in Ontario

Established Population of Blacklegged Ticks with High Infection Prevalence for the Lyme Disease Bacterium, *Borrelia burgdorferi* Sensu Lato, on Corkscrew Island, Kenora District, Ontario

We document an established population of blacklegged ticks, *Ixodes scapularis*, on Corkscrew Island, Kenora District, Ontario, Canada. Primers of the outer surface protein A (*OspA*) gene, the flagellin (*fla*) gene, and the flagellin B (*flaB*) gene were used in the PCR assays to detect *Borrelia burgdorferi* sensu lato (s.l.), the Lyme disease bacterium. In all, 60 (73%) of 82 adult *I. scapularis*, were infected with *B. burgdorferi* s.l. As well, 6 (43%) of 14 unfed *I. scapularis*nymphs were positive for *B. burgdorferi* s.l. An *I. scapularis* larva was also collected from a deer mouse, and several unfed larvae were gathered by flagging leaf litter. Based on DNA sequencing of randomly selected *Borrelia* amplicons from six nymphal and adult *I. scapularis* ticks, primers for the flagellin (*fla*) and flagellin B (*flaB*) genes reveal the presence of *B. burgdorferi* sensu stricto (s.s.), a genospecies pathogenic to humans and certain domestic animals. We collected all 3 host-feeding life stages of *I. scapularis* in a single year, and report the northernmost established population of *I. scapularis* in Ontario. Corkscrew Island is hyperendemic for Lyme disease and has the highest prevalence of *B. burgdorferi* s.l. for any established population in Canada. Because of this very high infection prevalence, this population of *I. scapularis* has likely been established for decades. Of

epidemiological significance, cottage owners, island visitors, outdoors enthusiasts, and medical professionals must be vigilant that *B. burgdorferi* s.l.-infected *I. scapularis* on Corkscrew Island pose a serious public health risk. Scott JD, et al. Established Population of Blacklegged Ticks with High Infection Prevalence for the Lyme Disease Bacterium, *Borrelia burgdorferi* Sensu Lato, on Corkscrew Island, Kenora District, Ontario. *Int J Med Sci* 2016; 13(11):881-891. doi:10.7150/ijms. 16922.. Available from http://www.medsci.org/v13p0881.htm

Sorry, Anglophiles, Lyme disease risk increasing in England

Ticks and *Borrelia* in urban and peri-urban green space habitats in a city in southern England

Ticks are increasingly recognized as important vectors of pathogens in urban and peri-urban areas, including green space used for recreational activities. In the UK, the risk posed by ticks in such areas is largely unknown. In order to begin to assess the risk of ticks in urban/peri-urban areas in southern England, questing ticks were collected from five different habitat types (grassland, hedge, park, woodland and woodland edge) in a city during the spring, summer and autumn of 2013/2014 and screened for *Borrelia burgdorferi* sensu lato. In addition, seasonal differences in *B. burgdorferi* s.l. prevalence were also investigated at a single site during 2015. *Ixodes ricinus* presence and activity were significantly higher in woodland edge habitat and during spring surveys.

DNA of *Borrelia burgdorferi* s.l. was detected in 18.1% of nymphs collected across the 25 sites during 2013 and 2014 and two nymphs also tested positive for the newly emerging tick-borne pathogen *B. miyamotoi*. *Borrelia burgdorferi* s.l. prevalence at a single site surveyed in 2015 were found to be significantly higher during spring and summer than in autumn, with *B. garinii* and *B. valaisiana* most commonly detected. These data indicate that a range of habitats within an urban area in southern England support ticks and that urban *Borrelia* transmission cycles may exist in some of the urban green spaces included in this study. Sites surveyed were frequently used by humans for recreational activities, providing opportunity for exposure to *Borrelia* infected ticks in an urban/peri-urban space that might not be typically associated with tick-borne disease transmission. Hansford et al. Ticks and Tick-borne Diseases http://dx.doi.org/10.1016/j.ttbdis.2016.12.009

Manifestations of Lyme carditis

The first data of Lyme carditis, a relatively rare manifestation of Lyme disease, were published in eighties of the last century. Clinical manifestations include syncope, light-headedness, fainting, shortness of breath, palpitations, and/or chest pain. Atrioventricular (AV) electrical block of varying severity presents the most common conduction disorder in Lyme carditis. Although is usually mild, AV block can fluctuate rapidly and progress from a prolonged P-R interval to a His-Purkinje block within minutes to hours and days. Rarely, Lyme disease may be the cause of endocarditis, while some studies and reports, based on serological and/or molecular investigations, have suggested possible influence of *Borrelia burgdorferi* on degenerative cardiac valvular disease. Myocarditis, pericarditis, pancarditis, dilated cardiomyopathy, and heart failure have also been described as possible manifestations of Lyme carditis. The clinical course of Lyme carditis is generally mild, short term, and in most cases, completely reversible after adequate antibiotic treatment. Kostić, et al. International Journal of Cardiology, http://dx.doi.org/10.1016/j.ijcard.2016.12.169

Crows spreading ticks and diseases, at least in Romania

Urban Breeding Corvids as Disseminators of Ticks and Emerging Tick-Borne Pathogens

Crows (Corvidae) are common city dwellers worldwide and are increasingly important subjects of epidemiology studies. Although their importance as hosts and transmitters of a number of zoonotic parasites and pathogens is well known, there are no studies on their importance as tick hosts. After mosquitoes, ticks are the most important vectors of zoonotic pathogens, especially for those causing emerging zoonotic diseases. Pathogenic bacteria, especially *Borrelia* spp., *Rickettsia* spp., and *Anaplasma* spp., vectored by ticks, are the cause for most vector-borne diseases in Europe. Here we report on ticks and tick-borne pathogens harbored by urban breeding crows. A total of 36 birds (33.33%, $n = 108$) hosted ticks, with 91 individual ticks belonging to 6 species (*Haemaphysalis concinna*, *Haemaphysalis parva*, *Haemaphysalis punctata*, *Hyalomma marginatum*, *Ixodes arboricola*, and *Ixodes ricinus*). *Rickettsia* spp. DNA was found in 6.6% of ticks and 1.9% of bird tissues, whereas *Anaplasma phagocytophilum* was found in 5.9% of ticks and 0.9% of birds. Two rickettsial genospecies were located, *Rickettsia helvetica* and *Rickettsia monacensis*. This is the first study to determine such a diverse tick spectrum feeding on urban corvids, while highlighting their importance as tick hosts and raising concerns about their potential risk to human health. Attila, et al. Vector-Borne and Zoonotic Diseases. December 2016, ahead of print. doi:10.1089/vbz.2016.2054.

Ticks and infections in the Galápagos Islands

Prevalence of vector-borne diseases in a sample of client-owned dogs on Santa Cruz in the Galápagos Islands: A pilot study

Prevalence of exposure to *Anaplasma* and *Ehrlichia* spp. in a sample of dogs on Santa Cruz was 13.51% and 37.84%, respectively. *Borrelia burgdorferi* and *Dirofilaria immitis* were not detected in the sampled dogs on Santa Cruz. Tick infestation and sex were determined to be risk factors for exposure to *Anaplasma* and *Ehrlichia* species. Adams et al. *Veterinary Parasitology: Regional Studies and Reports*, *Volume 6*, *December 2016*. http://dx.doi.org/10.1016/j.vprsr.2016.11.007

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