



Tick-Borne Infections Council
of North Carolina, Inc.

NEWSLETTER 2018, Volume 5



Quote of the season: - “I’m convinced that the first lone star tick crawled directly out of the pits of hell, because its offspring are literally the spawn of Satan.” -- Ben Garrett, editor of the *Independent Herald* in Oneida, Tennessee

Highlights...

- **Alpha-gal (red meat allergy), anesthesia, and Coronary Artery Plaque**
- **Rickettsiae in Ticks from Missouri**
- **Blood type attraction for European black-legged ticks**
- **Obstructions to treatment of Lyme disease**
- **European study found Lyme disease could be transmitted within 12 hours after tick bite**
- **The Lyme disease bacteria now found in northern Canada in songbirds**
- **Toolkit from the CDC for Rocky Mountain Spotted Fever**

Scroll down to see these features and more!

State Vector-Borne Disease Working Group 2018 Meeting Schedule

The last 2018 VBWG meeting was held November 16. The 2019 dates are not yet posted.

Location:

Office of the Chief Medical Examiner Photo ID required.
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.

<http://tic-nc.org/wp-content/uploads/2018/07/2018-TBD-Lyme-memo-final.pdf>
<http://tic-nc.org/wp-content/uploads/2018/07/2018-Arbo-memo-final.pdf>

Where To Find CDC Case Definitions and their Statement that the Surveillance Case Definitions Are “not to be used as the sole criteria for establishing critical diagnosis”

Go to: www.cdc.gov/lyme/healthcare/index.html. (The links below in a clip of the website are not active.) Scroll down and find “Case Definition and Report Forms”. See the grey box with “Note” containing the disclaimer.

Case Definition and Report Forms

- [Lyme Disease Surveillance Case Definition](#) (revised Jan 2017)
- [Lyme Disease Surveillance Case Report Form](#) [PDF - 2 pages] (for public health officials' use)

Note: Surveillance case definitions establish uniform criteria for disease reporting and should not be used as the sole criteria for establishing clinical diagnoses, determining the standard of care necessary for a particular patient, setting guidelines for quality assurance, or providing standards for reimbursement.

Accessed and copied 15 August 2017.

State tick research

Minutes from the last state meeting are not out as of this publication date.

NC TBIs 2017 Final and Preliminary 2018 Data to Date

Disease	Total Cases/Confirmed cases by year of report 2017†	Total preliminary confirmed and probable Events in NCEDSS created between 1/1/2018 - 8/9/2018*	Total Events Reviewed and closed by NC DPH 1/1/17 - 8/9/2018	Total Events Still Under Investigation by LHD 1/1/18 - 8/9/2018	Total Events created in NCEDSS 1/1/18 - 8/9/2018
Lyme Disease	298/71C	81/35C	530	102	632
RMSF	521/6C	418/6C	2039	282	2321
Ehrlichiosis	72/18C	51/8C	192	18	210
Anaplasmosis	10/4C	9/4C	29	4	33

* Note 2018 data are preliminary

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.

Report from the Vectorborne Disease Work Group meeting

Minutes from the last state meeting are not out as of this publication date.

TIC-NC Talks and Materials Distributed

Brochures/booklets:

El Centro Hispano Durham
Catholic Charities
Piedmont Health
Wm B Umstead State Park
Jordan Lake State Park
Stone Mountain State Park
Pilot Mountain State Park
Falls Lake State Park
Eno River State Park
REI in Durham, Greensboro and Raleigh
Festival on the Eno
Mountain to Sea Trail
Eno River Association
Friends of State Parks
Murphy's Naturals
Brochure distribution shelves at OC Convenience Center
Cedar Creek Gallery friendsofblaineavery.com
Sierra Club > Veterinarian for OC Animal Shelter

Booth: Orange County Health Fair, Hillsborough

§§ TIC-NC Activities §§

Orange County Health Fair, Hillsborough, September 22, 2018



TIC-NC staffed a booth for the fair which was well organized. Interest was high, although some people passed by with a shiver, but people with tick issues were full of questions. Several new members signed up. We talked about some ideas with the Orange County Health Department.

Visitors to our booth were especially interested in learning about alpha-gal allergy. Some had never heard of it, others were experienced and knew which restaurants were safe. People were also eager to learn about ‘seed’ ticks, the newly-hatched larval lone star ticks, which are a special concern in autumn when a person might accidentally step in a nest of these tiny ticks. Hundreds can end up biting and cause misery from the lengthy removal process and intense itching. Getting an infection from these ‘baby’ ticks is possible but unlikely.



§§ North Carolina and South §§

NC 12th for number of tickborne diseases from 2004 and 2016- US data

According to CDC data, North Carolina was 12th in the nation for tick-borne diseases, with 9,075 documented cases between 2004 and 2016. See entire article: patch.com/north-carolina/charlotte/tick-borne-diseases-rise-nc-elsewhere-us-cdc. Also see article below.

Report from the CDC- tickborne disease reports have doubled in past 12 years

Trends in Reported Vectorborne Disease Cases — United States and Territories, 2004–2016.

Vectorborne diseases are major causes of death and illness worldwide. Data reported to the National Notifiable Diseases Surveillance System for 16 notifiable vectorborne diseases during 2004–2016 were analyzed; findings were tabulated by disease, vector type, location, and year.

A total 642,602 cases were reported. The number of annual reports of tickborne bacterial and protozoan diseases *more than doubled* during this period, from >22,000 in 2004 to >48,000 in 2016. Lyme disease accounted for 82% of all tickborne disease reports during 2004–2016. The occurrence of mosquito-borne diseases was marked by virus epidemics.

Vectorborne diseases are a large and growing public health problem in the United States, characterized by geographic specificity and frequent pathogen emergence and introduction. Differences in distribution and transmission dynamics of tickborne and mosquito-borne diseases are often rooted in biologic differences of the vectors. To effectively reduce transmission and respond to outbreaks will require major national improvement of surveillance, diagnostics, reporting, and vector control, as well as new tools, including vaccines. Rosenberg, et al. *Vital Signs: MMWR Morb Mortal Wkly Rep* 2018;67:496–501. DOI: <http://dx.doi.org/10.15585/mmwr.mm6717e1>. Entire paper is free.

CDC Toolkit on RMSF for health providers

Rocky Mountain Spotted Fever (and other tickborne diseases) Toolkit for Healthcare Providers with Continuing Education

Rocky Mountain spotted fever (RMSF) is a bacterial disease spread through the bite of an infected tick. Early symptoms include fever, headache, and rash; and prompt treatment with doxycycline is critical to prevent severe and fatal outcome. This activity provides information pertinent to healthcare providers and public health practitioners on the epidemiology, risk factors, clinical characteristics, treatment, and diagnosis of RMSF. The toolkit includes an instructional video and companion learning tools that can be used as references. Through awareness and early recognition, front line providers can reduce the morbidity and mortality associated with RMSF. Many other tickborne diseases are also endemic to the United States, and are important causes of illness, requiring awareness, identification, and proper treatment.

The toolkit includes the following elements:

- **Training Video:** narrated video discussing the clinical signs and symptoms, diagnosis, and treatment of RMS
- **Physician Pocket Card:** quick reference of key facts about the clinical diagnosis and treatment of RMSF
- **Clinical Timeline:** printable graphic that provides key clinical facts and images to aid in the diagnosis of RMSF.
- **Tickborne Diseases of the United States Manual:** manual for healthcare providers highlighting transmission, epidemiology, clinical, diagnostic, and treatment features for tickborne diseases throughout the country.

Available at: www.cdc.gov/rmsf/resources/toolkit.html

South needs more attention to its tick problems

Risk for Ehrlichiosis and Lyme Disease Where Vectors for Both Are Sympatric, Southeastern United States

To the Editor of the CDC's *Emerging Infections* journal from TIC-NC's Medical Director, Dr Marcia Herman-Giddens: The timely study on the relative risk for ehrlichiosis and Lyme disease in which the tick vectors, *Amblyomma americanum* and *Ixodes scapularis*, are sympatric notes that knowledge of tickborne diseases is “startlingly low” (1). The call for more research in diseases other than Lyme disease (LD) is long overdue. In the southeastern United States, 5 species of ticks bite humans (2). At least 11 associated human pathogens have been identified; all may cause tick paralysis (2,3).

This study also prompts comment on drawbacks. First, even where *A. americanum* ticks outnumber *I. scapularis* in high-incidence LD areas (1), there is no mentioned concern about inflated LD case numbers resulting from reporting patients with erythema migrans (EM) from *A. americanum* tick bites (4). Second, there is no evidence for or against a 1:1 transmissibility factor. Bites from infected ticks may not result in illness because of various factors. Subclinical cases may occur. Finally, LD may be reported more frequently because of EM occurrence compared with ehrlichiosis, which depends on laboratory criteria (5).

In addition, this study prompts pertinent observations. *A. americanum* ticks are known vectors of numerous pathogens and conditions, including several not yet reportable—for example, a gal allergy, Southern tick-associated rash illness, and Heartland virus—and no prevalence studies have been conducted, so their impact is unknown. It is notable that Monmouth County, New Jersey, USA, tests *I. scapularis* but not *A. americanum* ticks, which are more numerous, carry a greater number of pathogens, and are aggressive biters of humans.

Even though the Southeast United States has more tick species and tickborne pathogens, tick education campaigns, such as those conducted in the Northeast, are absent. The Southeast is experiencing human misery and economic impact from the increase in tick species and diseases. Attention to diseases other than LD is needed and is gratifying to see. Herman-Giddens, M. E. (2018). *Emerging Infectious Diseases*, 24(2), 404-405. <https://dx.doi.org/10.3201/eid2402.170962> .

An article from the Wall Street Journal, June 22, 2018

www.wsj.com/articles/lyme-disease-an-even-bigger-threat-than-you-think-1529672401?shareToken=st9dca8c218bcd464885fd616df8aded3c&ref=article_email_share

Some excerpts: Fourteen high-incidence states account for 95% of confirmed cases reported to the CDC. Since 2017, low-incidence states can only report cases with laboratory evidence of infection, while high-incidence states are still able to report cases with the classic rash associated with the disease absent laboratory evidence.

Still, to streamline the process, some high-incidence states have taken a different approach. In New York, counties with the largest Lyme burden investigate only 20% of positive laboratory reports and then extrapolate to estimate the full number of cases. But the CDC won't accept estimates. Consequently, in 2016, New York recorded 6,597 Lyme cases, but the CDC listed only 2,623 for the state.

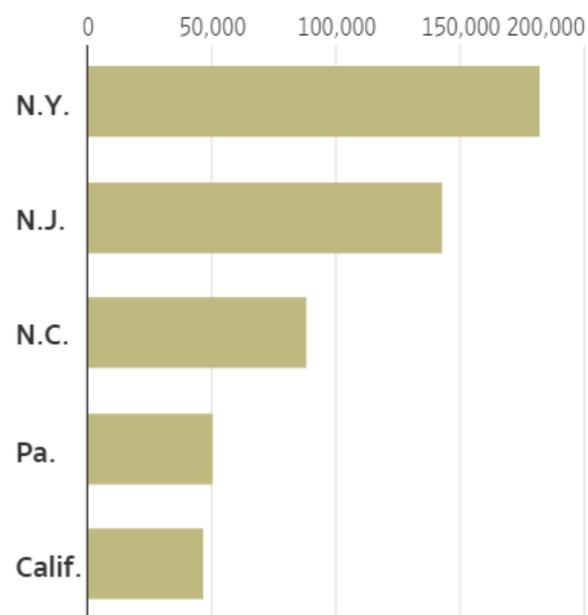
...In 2016, Fair Health, a nonprofit organization that oversees the nation's largest collection of health-care claims data, examined 23 billion records for more than 150 million privately insured individuals and documented 747,101 claims for Lyme disease.

Nine of the CDC's high-incidence states were among those submitting the largest number of claims—but so were several low-incidence states.

North Carolina reported 32 Lyme cases to the CDC in 2016 but in the same year made **88,539 health-care claims for a Lyme diagnosis**. California reported 90 cases to the CDC but had 46,820 claims. Texas reported 31 cases to the CDC but had 31,129 claims. All three are considered low-incidence states.

Ed. note. A claim does not equal a case. Some patients may file multiple claims.

Top five states with the highest claims of Lyme disease in 2016



Source: Fair Health

Viruses transmitted by ticks

We have recently learned that NC had a non-fatal case of Heartland virus in June of 2014.

There are four known tick-borne viruses transmitted by North American ticks:

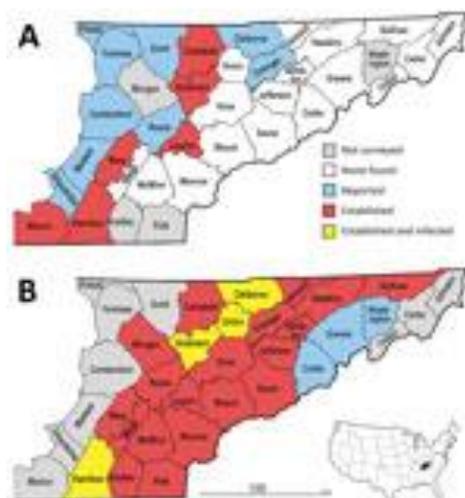
Disease	Class of Virus	Discovered	Tick vector
Colorado tick fever	Coltivirus	1944 – Colorado	Dermacentor variabilis (American dog tick)
Powassan encephalitis	Flavivirus	1958 – Ontario	Ixodes cookie, Ixodes marxi and Ixodes scapularis (Blacklegged tick)
Heartland virus disease	Phlebovirus	2009 – Missouri	Amblyomma americanum (Lone star tick)
Bourbon virus	Thogotovirus	2015 – Kansas	Amblyomma americanum (Lone star tick)

Unlike Lyme disease, viruses can be passed from the mother tick to her eggs. So, one infected female may pass the virus to thousands of eggs at one time, which will turn into infected larvae, nymphs and adults. Some viral pathogens can be transmitted within 15 minutes of tick attachment.

Arthropod-borne viruses (arbovirus) like Powassan, zika, and chikungunya, are extremely neuroinvasive. This means they have a propensity to infect the brain and nervous system, with serious consequences. Adapted from www.lymedisease.org/lyme-sci-tick-borne-viruses/ June 2018

Increasing prevalence of *Borrelia burgdorferi sensu stricto*–infected blacklegged ticks in Tennessee Valley, Tennessee, USA

In the United States, Lyme disease caused by tickborne bacterium *Borrelia burgdorferi sensu stricto* occurs primarily in the Northeast and upper Midwest ([1](#)). In eastern Tennessee, which is considered nonendemic for Lyme disease, most of the human population resides in a low-elevation swath of the



Tennessee Valley bordered to the west by the Cumberland Plateau and the east by the Great Smoky Mountains. The vector of Lyme disease, the blacklegged tick *Ixodes scapularis*, was unreported in this area before 2006; in this year, uninfected adult ticks were collected from hunter-harvested deer in 8 Tennessee Valley counties ([Figure 1](#), panel A) ([2](#)). This finding, plus uninfected *I. scapularis* ticks detected in Knox County in 2013, were later incorporated into the national distribution map for *I. scapularis* ticks ([3](#)).

During 2000–2014, human Lyme disease cases expanded southward along the eastern foothills of the Appalachian Mountains in nearby Virginia ([4](#)). In the winters of 2012 and 2013, *B. burgdorferi*–infected adult *I. scapularis* ticks were

detected in Pulaski County, Virginia (5). This report of abundant infected *I. scapularis* ticks only 100 km from the Tennessee border motivated us to investigate whether *Borrelia*-infected ticks might now be present in the Tennessee Valley.

Figure 1. County-level distribution of *Ixodes scapularis* ticks and *Borrelia burgdorferi*-infected *I. scapularis* ticks in upper Tennessee Valley, USA, 2006 and 2017. A county was classified as having an established *I. scapularis* population... Hickling et al. Emerging Infectious Dis. 2018 Sep. <https://doi.org/10.3201/eid2409.180343>

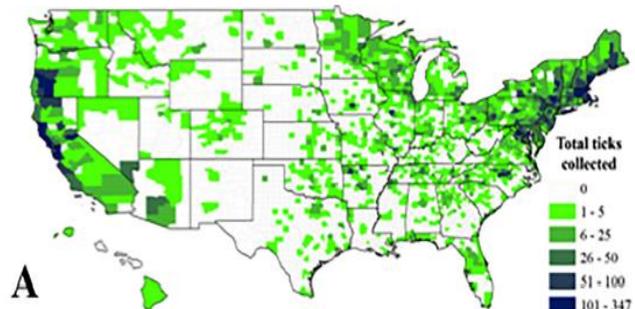
▣▣ National Section ▣▣

Using citizen science to describe the prevalence and distribution of tick bite and exposure to tick-borne diseases in the United States

Tick-borne pathogens are increasing their range and incidence in North America as a consequence of numerous factors including improvements in diagnostics and diagnosis, range expansion of primary vectors, changes in human behavior, and an increasing understanding of the diversity of species of pathogens that cause human disease. Public health agencies have access to human incidence data on notifiable diseases e.g., *Borrelia burgdorferi*, the causative agent of Lyme disease, and often local pathogen prevalence in vector populations. However, data on exposure to vectors and pathogens can be difficult to determine e.g., if disease does not occur.

We report on an investigation of exposure to ticks and tick-borne bacteria, conducted at a national scale, using citizen science participation. 16,080 ticks were submitted

between January 2016 and August 2017, and screened for *B. burgdorferi*, *B. miyamotoi*, *Anaplasma phagocytophilum*, and *Babesia microti*. These data corroborate entomologic investigations of tick distributions in North America, but also identify patterns of local disease risk and tick contact with humans throughout the year in numerous species of ticks and associated pathogens. Nieto et al. PLoS ONE 13(7): e0199644. <https://doi.org/10.1371/journal.pone.0199644>
Paper free of charge: <http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0199644>



Obstruction to Treatments Meeting International Standards for Lyme and Relapsing Fever Borreliosis Patients

This paper reviewed how certain institutional policies and practices, as well as questionable research, are creating obstacles to care and informed consent for Lyme and relapsing fever Borreliosis patients. The interference is denying access to treatments that meet the internationally accepted standards as set by the Institute of Medicine. This obstruction to care contributes to significant human suffering,

disability and negative economic effect across many nations and in many regions of the world. We note how evidence-based medicine emphasizes the importance of clinical experience and patient-centered care and how these patients benefit significantly when their rights to choose among treatment options are upheld. Luché-Thayer, et al. ILADS, July 2018. Paper free of charge at: <http://www.ilads.org/wp-content/uploads/2018/07/Distribution-PARIS-June-25-2018-JLuche-Thayer-C-Perronne-C-Meseko-18fr060041.pdf>

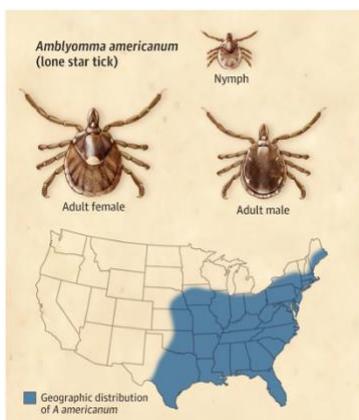
Risk of encountering questing ticks (Ixodidae) and the prevalence of tickborne pathogens in Oklahoma State Parks

State parks, used by many for various kinds of recreation, are also places where people and their companion animals are exposed to ticks and tickborne pathogens. While most studies in state parks in the United States have evaluated risk of encounter of Lyme-infected ticks, limited studies have focused on state parks in the Great Plains region where tick-borne rickettsial pathogens are more common. Six state parks in four ecoregions of Oklahoma were surveyed for exposure to questing ticks by flag sampling along hiking trails between April and August 2015, and pooled prevalence of tick-borne pathogens was assessed using polymerase chain reaction (PCR).

Exposure to ticks varied among parks by location and month, with an encounter rate of 10.8 ticks per minute at Sequoyah State Park in eastern Oklahoma, to less than one tick per minute at Roman Nose State Park in western Oklahoma. Questing ticks were tested for *Rickettsia* sp., *Ehrlichia chaffeensis*, and *Borrelia burgdorferi* with pooled prevalence rates between 56 and 0% differing among parks. The greatest risk of encountering ticks was at Sequoyah State Park in May 2015, with pooled prevalence rates of 93.3% (*Rickettsia* sp.) and 13.3% (*E. chaffeensis*). Results indicated that risk of exposure to ticks and tick-borne pathogens depended on the state park during summer months. These data could be used by the park system to alert visitors to risk of encountering pathogen-infected ticks in a given state park. Mitcham et al. Southwestern Entomologist 43(2):303-315. 2018. doi.org/10.3958/059.043.0202

Red Meat allergy associated with coronary artery plaque

Recently published [research](#) has found a possible link between an allergy to red meat and coronary artery disease.



Researchers find an association between red meat allergy and coronary heart disease. Sanchez et al. *JAMA*. 2016;315(16):1767-1777.

Funded by the National Heart, Lung, and Blood Institute (NHLBI), scientists from the University of Virginia Health System studied 118 patients who underwent intravascular ultrasound along with cardiac catheterization. The researchers analyzed blood samples from study participants to screen for antibodies to galactose- α -1,3-galactose (alpha-Gal), a complex sugar that is the main allergen in red meat.

Alpha-Gal antibodies were found in blood samples from 26% of participants, and they had 30% more plaque buildup in their coronary arteries than those who weren't sensitive to the allergen. This association was most pronounced in

those 65 years of age or younger and remained statistically significant after adjusting for possible confounders, such as diabetes, hypertension, and statin use. In addition, plaques in the arteries of participants sensitive to alpha-Gal tended to be less structurally stable, potentially increasing heart attack or stroke risk...

Researchers estimate that 1% of individuals in some regions might have a red meat allergy, although as many as 20% might develop alpha-Gal antibodies without allergy symptoms. The allergy tends to be more common in the Southeast and Eastern US where the lone star tick, whose [bite can sensitize people to the red meat allergen](#), is most prevalent. Rubin R. Health Agencies Update. *JAMA*. 2018;320(4):331. doi:10.1001/jama.2018.9762 and www.ahajournals.org/doi/10.1161/ATVBAHA.118.311222

Alpha-gal and anesthesia

What does a Red Meat allergy have to do with anesthesia? Perioperative management of Alpha-Gal Syndrome.

Over the past decade, there has been a growing awareness of a new allergic syndrome known as alpha-gal allergy or alpha-gal syndrome, commonly recognized as a red meat allergy. We performed a review of the literature to identify articles that provide both background on this syndrome in general and any reports of reactions to medications or medical devices related to alpha-gal syndrome. Alpha-gal syndrome results from IgE to the oligosaccharide galactose- α -1,3-galactose, expressed in the meat and tissues of noncatarrhine mammals. It is triggered by the bite of the lone star tick and has been implicated in immediate-onset hypersensitivity to the monoclonal antibody cetuximab and delayed-onset hypersensitivity reactions after the consumption of red meat.

There is growing recognition of allergic reactions in these patients to other drugs and medical devices that contain alpha-gal. Many of these reactions result from inactive substances that are part of the manufacturing or preparation process such as gelatin or stearic acid. This allergy may be documented in a variety of ways or informally reported by the patient, requiring vigilance on the part of the anesthesiologist to detect this syndrome, given its serious implications.

This allergy presents a number of unique challenges to the anesthesiologist, including proper identification of a patient with alpha-gal syndrome and selection of anesthetic and adjunctive medications that will not trigger this allergy. Dunkman WJ et al. *Anesthesia and Analgesia*. DOI: [10.1213/ANE.0000000000003460](https://doi.org/10.1213/ANE.0000000000003460)

A *Rickettsia milder* than RMSF may help with immunity

Spotted fever group *Rickettsiae* in ticks from Missouri

Tick-borne rickettsioses pose a major health threat among vector-borne infections in Missouri but there are some uncertainties regarding the vector competence and range of tick species, as well as the virulence of certain bacterial species.

A survey was developed and implemented to assess local healthcare practitioners' awareness of the prevalence and diagnosis of tick-borne diseases. In addition, ticks collected from rural areas of St. Louis County, Missouri, were evaluated to detect spotted fever group (SFG) rickettsiae and to determine the most common tick species present. Physician responses showed a good general awareness of tick-borne diseases and antibiotic choices but responses varied regarding length of treatment, the most common tick-borne diseases, and tick vectors.

No new tick vectors were collected in the area; *Rickettsia amblyommatis* was the predominant SFG species, and it was detected in *Amblyomma americanum*, *Dermacentor variabilis*, and *Ixodes scapularis*; *Rickettsia montanensis* was detected in *D. variabilis*. The high prevalence of *Rickettsia amblyommatis* in these ticks suggests that there is a high risk of exposure to this SFG rickettsial species to humans and that it may be providing some cross-protective immunity to *R. rickettsii*. Santanella et al. Ticks and Tick-borne Diseases. <http://doi.org/10.1016/j.ttbdis.2018.06.008>

Now New England is getting worried about the lone star tick

Distribution and Establishment of the Lone Star Tick in Connecticut and Implications for Range Expansion and Public Health

In the United States, the lone star tick, *Amblyomma americanum* (L.) (Acari: Ixodidae), is an aggressive southeastern species whose range has reportedly been steadily expanding northward. The number of *A. americanum* specimens submitted to the Tick Testing Laboratory (TTL) at the Connecticut Agricultural Experiment Station (CAES) increased by 58% from the period of 1996–2006 ($n = 488$) to 2007–2017 ($n = 773$), mainly from Fairfield County in the southwestern corner of the state. The greatest numbers of *A. americanum* submissions to the CAES-TTL were from the City of Norwalk and a few adjacent municipalities. We also report the discovery of a large infestation of adult and nymphal lone star ticks detected on a dead male white-tailed deer, *Odocoileus virginianus* (Zimmerman) (Artiodactyla: Cervidae), on Manresa Island, Norwalk, in June 2017, indicating a long established, undetected population along the southwestern coast. A sample of nymphal and adult host-seeking *A. americanum* collected July 2017 from Manresa Island were tested and a proportion were positive for *Ehrlichia chaffeensis*, *Ehrlichia ewingii*, and *Anaplasma phagocytophilum*.

The *A. americanum* tick and its associated disease pathogens are expected to become an increasing public health concern in southern New England. Stafford III et al. *Journal of Medical Entomology*, tjt115, <https://doi.org/10.1093/jme/tjt115>.

Obstacles to diagnosis and treatment of Lyme disease in the USA: a qualitative study

For many individuals with Lyme disease, prompt treatment leads to rapid resolution of infection. However, severe complications can occur if treatment is delayed. Our objective was to identify themes around belated diagnosis or treatment of Lyme disease using the General Model of Total Patient Delay (GMTPD). Appraisal delay themes included symptom misattribution, intermittent symptoms and misperceptions about the necessity of a bull's-eye rash. Health insurance status was a driver of illness and behavioural delays. Scheduling delay was not noted by participants, in part, because 10 of the 26 patients went to urgent care or emergency department settings. Misdiagnoses were more common in these settings, contributing to treatment delay. Hirsch et al. <dx.doi.org/10.1136/bmjopen-2017-021367> Entire paper free of charge: <http://bmjopen.bmj.com/content/8/6/e021367>

A resource from the CDC: The Public Health Image Library (PHIL)

These images are in the public domain and available without charge.

phil.cdc.gov/ Much of the information critical to the communication of public health messages is pictorial rather than text-based. Created by a Working Group at the Centers for Disease Control and Prevention (CDC), the PHIL offers an organized, universal electronic gateway to CDC's pictures. We welcome public health professionals, the media, laboratory scientists, educators, students, and the worldwide public to use this material for reference, teaching, presentation, and public health messages.

PHIL Content Disclaimer. The imagery showcased in the PHIL is historic in nature; the contents depicted, though appropriate at the time a photograph was captured, may no longer be appropriate in the context of the current time period, and is not to be viewed as a source of the most current public health information.

Interesting book review

Memoirs of Disease and Disbelief

Porochista Khakpour's deliberately unheroic "Sick" raises questions about what we expect of female patients with chronic illness. By Lidija Haas

Lyme disease a feminist issue? It may sound ludicrous to ask this of a tick-borne infection that can usually be dispatched with a course of antibiotics. Yet its name commemorates the two women living in the town of Lyme, Connecticut, who, in the mid-seventies, fought the medical establishment to have the disease acknowledged and treated. "You know," a doctor informed one of them after failing to find the source of her symptoms, "sometimes people subconsciously want to be sick." It's tempting to think of this reflexive, paternalistic skepticism directed at female patients as a remnant of a bygone era. And yet there's a class of illnesses—multi-symptomatic, chronic, hard to diagnose—that remain associated with suffering women and disbelieving experts. Lyme disease, symptoms of which can afflict patients years after the initial tick bite, appears to be one. Entire review at: www.newyorker.com/magazine/2018/06/04/memoirs-of-disease-and-disbelief

§§ International & General Section §§

Study of European black-legged tick found they were most attracted to type A blood in humans, then O, and the least to type B

Pilot study of *Ixodes ricinus* ticks preference for human ABO blood groups using a simple in vitro method

The existence of a blood group preference for ticks is a problem widely discussed among the lay public but often neglected by the scientific community. The *Ixodes ricinus* tick transmits serious zoonotic diseases such as Lyme borreliosis, tick encephalitis, or anaplasmosis. The preventive strategies include vaccination (if available) and individual measures including the use of repellents and avoidance of risk areas.

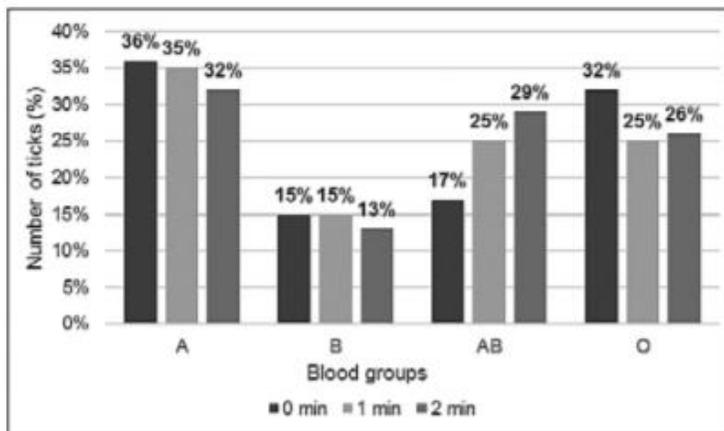


Figure 1. Percentage of ticks attracted by a blood drop of a particular blood group and its changes in time

Since this topic is relatively neglected in the scientific literature, a simple in vitro method was used. Ticks used in this study were collected in the suburban region of Ruda in Brno, Czech Republic. One hundred active nymphs of the collected ticks were tested for preferences for blood groups, using Petri dishes and blood samples from volunteers. To demonstrate the threat of ticks and the diseases they transmit, the positivity of one of the most abundant zoonosis, Lyme borreliosis, was tested using dark-field microscopy.

The results obtained showed that the examined ticks were attracted most by blood group A, whereas the least preferred was group B, which was proved statistically.

<http://www.aaem.pl/Pilot-study-of-Ixodes-ricinus-ticks-preference-for-human-ABO-blood-groups-using-a.85167.0.2.html>

2015 Japanese paper found that the Longhorned tick (recently found in the US, including NC) may cause alpha-gal allergy

Haemaphysalis longicornis tick bites are a possible cause of red meat allergy in Japan.

Recent studies revealed that Amblyomma or Ixodes tick bites may cause red meat allergy, in which galactose- α -1,3-galactose (α -Gal) is a major IgE-binding epitope. The incidence of red meat allergy is high in Shimane Prefecture, as is tick-transmitted Japanese spotted fever. Therefore, we speculated that tick bites may cause these meat allergies. The carbohydrate α -Gal was detected in the salivary gland protein of *Haemaphysalis longicornis* (*H. longicornis*), the vector for Japanese spotted fever, by immunoblotting using anti- α -Gal antibody. *H. longicornis* salivary gland protein-specific IgE was detected in the sera of 24 of 30 patients with red meat allergies. Sensitization to tick salivary gland protein containing α -Gal is possibly a major etiology of red meat allergy; the carbohydrate plays a crucial role in its allergenicity. These results further indicate that the α -Gal epitope is present not only in *Amblyomma* or *Ixodes*, but also in *Haemaphysalis*. [Chinuki et al. Allergy. 2016 Mar;71\(3\):421-5. doi: 10.1111/all.12804.](https://doi.org/10.1111/all.12804)

The Lyme disease bacteria now found in northern Canada in songbirds

Far-reaching dispersal of *Borrelia burgdorferi sensu lato*-infected blacklegged ticks by migratory songbirds in Canada

Lyme disease has been documented in northern areas of Canada, but the source of the etiological bacterium, *Borrelia burgdorferi sensu lato* (Bbsl) has been in doubt. We collected 87 ticks from 44 songbirds during 2017, and 24 (39%) of 62 nymphs of the blacklegged tick, *Ixodes scapularis*, were positive for Bbsl.

We provide the first report of Bbsl-infected, songbird-transported *I. scapularis* in Cape Breton, Nova Scotia; Newfoundland and Labrador; north-central Manitoba, and Alberta. Notably, we report the northernmost account of Bbsl-infected ticks parasitizing a bird in Canada. DNA extraction, PCR amplification, and DNA sequencing reveal that these Bbsl amplicons belong to *Borrelia burgdorferi sensu stricto* (Bbss), which is pathogenic to humans.

Based on our findings, health-care providers should be aware that migratory songbirds widely disperse *B. burgdorferi*-infected *I. scapularis* in Canada's North, and local residents do not have to visit an endemic area to contract Lyme disease. [Scott et al. Healthcare 2018, 6, 89; doi:10.3390/healthcare6030089.](#)

Study from Sweden on peoples' protective behavior against ticks

Learning to live with ticks? The role of exposure and risk perceptions in protective behaviour against tick-borne diseases

The purpose of this study is to analyze the role of risk perceptions and exposure for protective behavior against tick bites and the related diseases Lyme borreliosis (LB) and tickborne encephalitis (TBE), both of which are growing health concerns.

We use data from a national survey in Sweden with respondents in geographical areas with substantial differences in both abundance of ticks and incidence of LB and TBE. We find that the share of respondents who frequently use protective clothing (64%), perform tick checks (63%) or avoid tall grass while in areas with ticks (48%) is relatively high. However, the use of protective measures is uneven and a considerably lower share tuck their trousers into their socks (18%), use repellent against ticks (16%) or use a combination of protective measures.

Thirty-one per cent of the respondents report one or more tick bites in the last year and 68% report one or more lifetime tick bites, indicating that it is difficult to protect oneself from tick bites.

...Recommendations include informing people of the risks associated with tick bites, the efficacy of various protective measures and the importance of combining multiple types of protection. Given the high exposure to tick bites, the growing incidence of TBE and LB, and the difficulties in preventing tick bites, other preventive measures should be further discussed, including vaccination programs. Slunge and Boman. PLoS ONE 13(6): e0198286. <https://doi.org/10.1371/journal.pone.0198286>. Entire paper free of charge.

European study found Lyme disease could be transmitted within 12 hours after tick bite and organs affected depended on species

Infection Kinetics and Tropism of *Borrelia burgdorferi sensu lato* in Mouse After Natural (via Ticks) or Artificial (Needle) Infection Depends on the Bacterial Strain

Borrelia burgdorferi sl is a complex of pathogen bacteria transmitted to the host by Ixodes ticks. European Ixodes ricinus ticks transmit different *B. burgdorferi* species, pathogenic to human. Bacteria are principally present in unfed tick midgut, then migrate to salivary glands during blood meal and infect a new host via saliva. In this study, efficiency of transmission in a mouse model of three pathogen species belonging to the *B. burgdorferi* sl complex, *B. burgdorferi sensu stricto* (B31, N40, and BRE-13), *B. afzelii* (IBS-5), and *B. bavariensis* (PBi) is examined in order to evaluate infection risk after tick bite.

We compared the dissemination of the *Borrelia* species in mice after tick bite and needle injection. Location in the ticks and transmission to mice were also determined for the three species by following infection kinetics. After inoculation, we found a significant prevalence in the brain for PBi and BRE-

13, in the heart, for PBI, in the skin where B31 was more prevalent than PBI and in the ankle where both B31 and N40 were more present than PBI. After tick bite, statistical analyses showed that BRE-13 was more prevalent than N40 in the brain, in the bladder and in the inguinal lymph node. When *Borrelia* dissemination was compared after inoculation and tick bite, we observed heart infection only after tick inoculation of BRE-13, and PBI was only detected after tick bite in the skin. For N40, a higher number of positive organs was found after inoculation compared to tick bite.

All European *B. burgdorferi* s1 strains studied were detected in female salivary glands before blood meal and infected mice within 24 h of tick bite. Moreover, *Borrelia*-infected nymphs were able to infect mice as early as 12 h of tick attachment. Our study shows the need to remove ticks as early as possible after attachment. Moreover, *Borrelia* tropism varied according to the strain as well as between ticks bite and needle inoculation, confirming the association between some strains and clinical manifestation of Lyme borreliosis, as well as the role played by tick saliva in the efficiency of *Borrelia* infection and dissemination in vertebrates. [Sertour N et al. Front. Microbiol. 9:1722. doi: 10.3389/fmicb.2018.01722](https://doi.org/10.3389/fmicb.2018.01722). Open access.

World map of vector-borne disease occurrence based on animal data by Bayer

From Bayer: “Each country in the world has its specific occurrence of CVBDs (Companion Vector Borne Diseases: diseases transmitted by parasites – also called vectors - such as ticks, flies, fleas, sand flies and mosquitoes), depending on climate and endemic vectors. Based on current scientific knowledge and feed-back from experts around the world, the CVBD Occurrence World Map presents the country-specific situation in an easy-to-grasp way.”

You can point your mouse to each state or country and get more specific data. Of course, it will not be entirely accurate, especially for human disease, but it gives an overall impression. www.cvbd.org/en/occurrence-maps/world-map/

***Rickettsia Helvetica*, an organism in Europe related to RMSF may cause mild illness, whether it can cause a meningitis is not as clear**

Evidence of rickettsiae in Danish patients tested for Lyme neuroborreliosis: a retrospective study of archival samples

With a prevalence of 4.7–13% in Danish *Ixodes ricinus* ticks, *Rickettsia helvetica* is one of the most frequently detected tick-borne organisms in Denmark. Most reports of human exposure have described asymptomatic seroconversion or a mild, self-limiting flu-like illness but it has also been implicated as a cause of subacute lymphocytic meningitis. Because *Borrelia burgdorferi* sensu lato (*Bbsl*) and *R. helvetica* are both found in the same tick species, potential co-transmission is a possibility. We examined 1) the seroprevalence of anti-rickettsia antibodies in patients investigated for Lyme neuroborreliosis (LNB), and 2) the cerebrospinal fluid (CSF) and sera of same patients for the presence of *Rickettsia* DNA.

Ninety-nine sera and 87 CSF samples from patients with intrathecal synthesis of anti-*Borrelia* antibodies and 101 sera and 103 CSF samples from patients with no detectable intrathecal synthesis were retrospectively examined for this study. Sera were analyzed for antibodies against spotted fever

group (SFG) rickettsiae and both the CSF and sera were tested for *Rickettsia* DNA using a genus-specific real-time PCR.

Of the patients tested for LNB, 32% (64/200) had IgG antibodies against SFG rickettsiae. Among patients with confirmed intrathecal synthesis of *Borrelia*-specific antibodies, 38% (38/99) exhibited IgG antibodies. None of these values were statistically significant when compared with sera from healthy blood donors ($p = 0.7$ and 0.19). *Rickettsia* DNA was found in the CSF of 4% (8/190) of patients.

No statistically significant difference was found in the seroprevalence of anti-rickettsia antibodies in patients tested for LNB and healthy blood donors, indicative of a low rate of exposure in this group of patients. Eight patients showed evidence of *Rickettsia* DNA in the CSF, five of whom had LNB. However, cycle threshold (Ct) values were high, indicating low concentrations of DNA, and no apparent alteration in the clinical manifestations of LNB were noted in the medical records of these patients. Ocias et al. *BMC Infectious Diseases* 2018 18:325 <https://doi.org/10.1186/s12879-018-3210-x>

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