Tick-Borne Infections Council of North Carolina, Inc.

NEWSLETTER 2020, Volume 2

As we shelter in place due to Covid19, we wish everyone safety in all regards. If you venture out for allowed walks take care to protect from tick bites.

Quote: - An essential component of compassion is the feeling of interconnectedness with others, which naturally leads to engagement—a critical component of effective health care. … In my view, the lack of compassionate engagement between physicians and patients not only limits the satisfaction of both, it also fosters ineffective treatment of complex chronic diseases. ----*Ralph Synderman, MD in a 2019 discussion on compassion and medicine with the 14th Dalai Lama. More below under International Section.*

Highlights…

- **New study finds ticks can transmit Rocky Mountain spotted fever virtually as soon as they attach to the host**
- **Comparison of Neurological Lyme Between Children and Adults**
- **CDC study: Longhorn tick seems unlikely to transmit Lyme disease in mice**
- **Longer checking intervals in dragging for ticks cause some to drop off**
- **Using mosquito control personnel and tick surveillance**
- **Lyme Carditis in United States Children's Hospitals**
- **Ocular *Spiroplasma ixodetis* in Newborns (ticks can carry Spiroplasma)**
- **Tick microbiomes**
- **Symptom burden in Lyme disease**
- **Chronic Lyme Disease Definition**

- **Western blacklegged ticks do not transmit the Lyme disease bacteria as efficiently as the Eastern species**
- **Migration of deer and the increase of ticks in Canada**
- **Novel targets and strategies to combat borreliosis**
- **Sea snakes with ticks**
- **Pregnancy and tick-borne infections**

State Vector-Borne Disease Working Group 2019 Meeting Schedule

No 2020 VBWG meeting dates have been set due to the Covid19 virus.

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

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

The state has started issuing only one letter. Please see the home page of our website to access. www.tic-nc.org

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"

Case Definition and Report Forms

- Lyme Disease Surveillance Case Definition (revised Jan 2017)
- Lyme Disease Surveillance Case Report FormCdc-pdf 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 14 September 2019.

CDC: The Emerging Issues in Tick-borne Diseases webinar, presented June 13, 2019, is now online.

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.

NC TBIs 2017 final, 2018 to November probable/confirmed

NC EDSS Event Data – Cases Submitted to CDC

Disease	Total Cases / Confirmed Cases by year of report 2017	Total preliminary confirmed and probable Events in NC EDSS Created between 1/1/2018 – 11/13/2018*	Total Events Reviewed and closed by NC DPH 1/1/18 – 11/13/18	Total Events Still Under Investigation by LHD 1/1/18 – 11/13/18	Total Events created in NC EDSS 1/1/18 – 11/13/18
Lyme Disease	298/71C	177/51C	736	110	836
RMSF	521/6C	419/10C	2016	346	2362
Ehrlichiosis	72/18C	86/14C	331	54	398
Anaplasmosis	10/4C	4/0C	22	1	23

»» TIC-NC Activities ««

Announcement placed in the spring Chatham County Health Alliance Newsletter:
Chatham County is known to have a considerable problem with ticks and tick-borne infections. The Tick-borne Infections Council of North Carolina, Inc., is a 501(c)(3) nonprofit organization working to improve the recognition, treatment, control, and understanding of tick-borne diseases in North Carolina. It is based in Pittsboro. More can be seen at www.TIC-NC.org and on our Facebook page, https://www.facebook.com/TICNC/. (Please like our page!) We are in need of board members and volunteers. We particularly need someone with media experience. Please call or email our scientific adviser, Marcia E. Herman-Giddens, at info@tic-nc.org or 919.215.5418. Thank you.

TIC-NC Talks and Materials Distributed

Brochures/booklets:
Western District Manager of NC Dept of Agriculture & consumer Services
Information and/or materials:
Town of Black Mountain Spring Newsletter
Fall farm show in Raleigh
Veterinarian and cooperative extensions, northern North Carolina

North Carolina and South

Notes from the Field: Four Cases of Lyme Disease at an Outdoor Wilderness Camp — North Carolina, 2017 and 2019

On June 10, 2019, the North Carolina Division of Public Health was notified by the Buncombe County Health Department of three cases of Lyme disease among children aged 6–8 years. Lyme disease is a bacterial infection transmitted by the bite of an *Ixodes scapularis* tick that is infected most commonly with the bacterium *Borrelia burgdorferi*. An investigation conducted by Buncombe County communicable disease nurses determined that all three children were homeschooled and had attended a local, year-round, outdoor wilderness day camp. Each child had attended the camp at least 1 day a week over the course of the previous fall and spring. The camp site for the wilderness program is completely outdoors, with a canopy of hardwood forest providing much of the shelter. Further investigation identified an earlier camp participant who had received a diagnosis of Lyme disease in 2017.

North Carolina has historically had a low incidence of reported Lyme disease cases (*1*) but remains the southernmost border of the leading edge of Lyme disease in the United States (*2*). In North Carolina in 2017, 0.69 confirmed cases of Lyme disease per 100,000 residents were reported, a rate significantly lower than the 2017 national average of 9.1 confirmed cases per 100,000 residents (*3*).

On June 13, a North Carolina interagency assessment team traveled to the wilderness day camp to conduct entomologic surveillance for *Ixodes* ticks. Participants covered a total of 0.27 acres (1,077 m_2) of land while "flagging and dragging."* A total of 39 nymphal ticks were collected. Ticks were preserved in 95% ethanol and sent to CDC's Division of Vector-Borne Diseases in Fort Collins, Colorado, for pathogen testing. Of the 39 ticks collected, 37 (95%) were confirmed as *Ixodes scapularis* ticks by molecular testing. Two ticks yielded poor DNA, and pathogen tests were ruled inconclusive. Six of the 35 ticks yielding DNA suitable for analysis tested positive for *B. burgdorferi* sensu stricto, the causative agent of Lyme disease. One of the six ticks was coinfected with *Borrelia miyamotoi*. All 35 ticks tested negative for *Anaplamsa phagocytophilum* and *Babesia microti* (two pathogens tested for when conducting *Ixodes* tick testing). Results indicated that nymphal

ticks collected at the camp site had a *B. burgdorferi* infection prevalence of 17% (95% confidence interval = 8.1–32.7).

This was the first reported cluster of Lyme disease patients with a common exposure to be identified in North Carolina and the furthest south that *Borrelia*-infected ticks have been identified through North Carolina Division of Public Health entomologic surveillance efforts. Clinicians should be aware of the risk for transmission of Lyme disease in North Carolina and consider recommended diagnostic testing and treatment (*4*). To prevent exposure to *Borrelia* and other tick-borne diseases, North Carolina Division of Public Health encourages everyone to wear personal protective clothing, to use EPA-approved repellents such as diethyltoluamide (DEET), and to conduct full-body examinations for ticks following outdoor activities in possible tick habitats. Prevention is the best defense against Lyme disease. Close collaboration between the North Carolina Division of Public Health and county health departments, along with clinician awareness, are essential for rapid identification of vector-borne disease expansion and appropriate treatment. Barbarin e al. *Notes from the Field:* Four Cases of Lyme Disease at an Outdoor Wilderness Camp — North Carolina, 2017 and 2019. MMWR Morb Mortal Wkly Rep 2020;69:114–115. DOI: http://dx.doi.org/10.15585/mmwr.mm6904a5.

Investigating the Role of Coyotes, Canis Latrans, in the Spread of Parasites and Arthropod-Borne Diseases in Georgia, USA

In order to analyze the role of coyotes, Canis latrans, as hosts of parasites and arthropod-borne diseases in the state of Georgia, USA, 38 coyotes representing 18 counties and multiple geographic regions of the state were dissected and analyzed for the presence of Dirofilaria immitis, intestinal parasites, ectoparasites, and tick-borne illnesses… .
…Of the 38 coyotes examined, 21 had adult D. immitis present, 30 had adult parasites or ova present, and 19 had ticks present… . Of 30 specimens analyzed for exposure to tick-borne illness with the SNAP 4dx ELISA test, 10 were found to have been exposed to Ehrlichia canis or Ehrlichia ewingii (33%), and 1 was found to have been exposed to Borrelia burgdorferi (3.33%)… . This study found coyotes to be wildlife hosts and modes of transportation for parasites which can negatively affect the health of both humans and domestic animals. Banks A. S. (Under the Direction of William S. Irby.) Electronic Theses and Dissertations. 2024. https://digitalcommons.georgiasouthern.edu/etd/2024 .

Summary of healthcare claims: Lyme disease is a growing public health issue, NC among the highest

FAIR Health* analyzed recent data from its repository of over 30 billion privately billed healthcare claims to identify trends and patterns related to Lyme disease and compare such trends and patterns to those in other tick-borne diseases. Among the findings:

- Increase. Over about the last decade, Lyme disease increased nationally 117 percent, from 0.027 percent of all medical claim lines in 2007 to 0.058 percent in 2018.

- Predominance. Claim lines for Lyme disease accounted for 94 percent of claim lines for tick-borne diseases in 2018.

• Urban versus rural. Growth in Lyme disease claim lines from 2007 to 2018 was more pronounced in urban than rural areas.

• Monthly distribution. In 2018, the months with the highest share of the distribution of claim lines for Lyme disease were June (10.7 percent) and July (11.0 percent). The months with the lowest share were December (6.2 percent) and February (6.5 percent).

• Geographic spread. In 2007, the five states with the highest number of claim lines with Lyme disease diagnoses as a percentage of all medical claim lines by state were all in the Northeast, but in 2018, one (**North Carolina**) was in the South.

• Age. In both rural and urban areas in 2018, individuals aged 51 to 60 held the largest share of the age distribution of claim lines with Lyme disease diagnoses. The age group 41-50 held the second largest share in both rural and urban areas.

• Gender. In both rural and urban areas in 2018, more claim lines with Lyme disease diagnoses were submitted for females than males.

• Age and gender. In 2018, more claim lines for Lyme disease were submitted for females than males in every age group from 11 to 70, but in the youngest and oldest segments (0-10 and over 70), more claim lines were submitted for males.

• Places of service. The laboratory was the place of service with the largest share of Lyme disease claim lines in both 2014 and 2018. The office held the second largest share both years.

• Procedures. By percent of patients, the most common procedure performed for patients with a Lyme disease diagnosis in 2018 was a 15-minute office or other outpatient visit for an established patient. Among the top five procedures by volume, the procedure that was performed the most times per Lyme disease patient was 45-minute psychotherapy.

• Other diagnoses. In 2018, the 10 most common "other diagnoses" found in patients who had been diagnosed with Lyme disease were, in order from most to least common, general signs and symptoms, dorsopathies, soft tissue disorders, other joint disorders, disorders of the thyroid gland, anxiety and other nonpsychotic mental disorders, osteoarthritis, skin and subcutaneous tissue symptoms, dermatitis and eczema, and mood (affective) disorders. All were more common in patients with Lyme disease than in all patients.

*FAIR Health is an independent nonprofit that collects data for and manages the nation's largest database of privately billed health insurance claims and is entrusted with Medicare Parts A, B and D claims data for 2013 to the present.

Description of Eschar-Associated Rickettsial Diseases Using Passive Surveillance Data — United States, 2010–2016

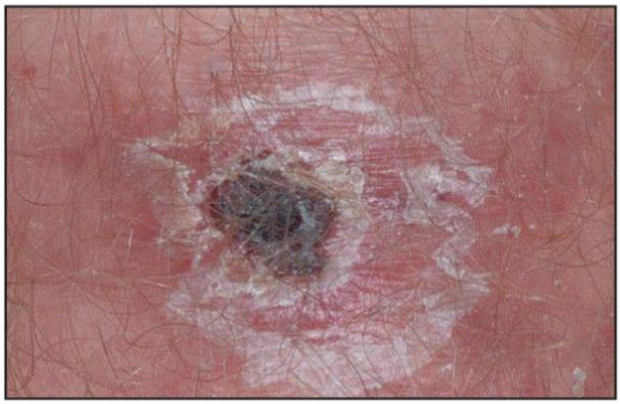
What is already known about this topic? Eschars are a clinical sign used to differentiate less severe rickettsioses from potentially deadly Rocky Mountain spotted fever.

What is added by this report? Eschars are infrequently reported in tick-borne rickettsial disease (TBRD) surveillance data and represent an underutilized resource to aid in distinguishing the various

spotted fever group *Rickettsia*. Although 1% of total TBRD case reports during 2010–2016 documented the presence of an eschar, 81% of cases lacked information on eschars altogether.

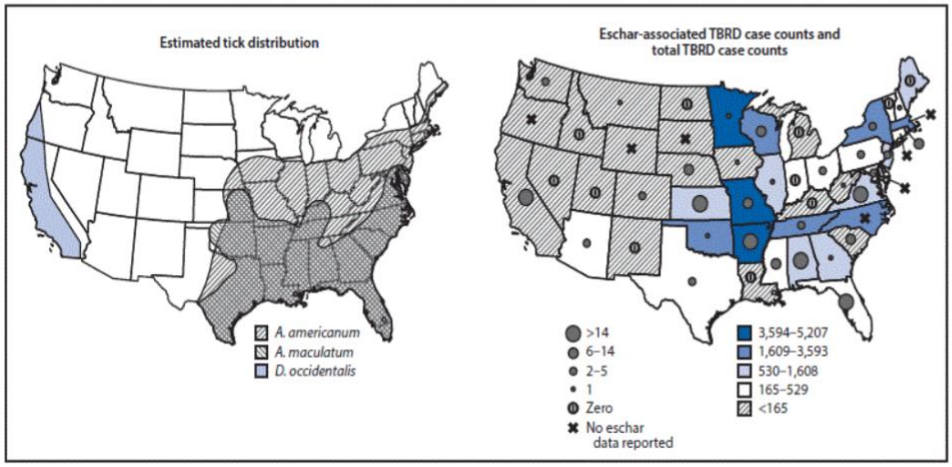
What are the implications for public health practice? Systematic reporting of the presence or absence of eschars on the TBRD case report form can improve the quality of surveillance data and enhance understanding of the impact of spotted fever rickettsioses in the United States.

FIGURE 1. Rickettsial disease eschar from a patient with *Rickettsia parkeri* rickettsiosis



Photo/CDC

FIGURE 2. Estimated geographic range of *Amblyomma americanum*, *Amblyomma maculatum*,* and *Dermacentor occidentalis*† and number of eschar-associated illnesses, compared with total reported tickborne rickettsial diseases (TBRDs)§ — United States, 2010–2016



* https://www.cdc.gov/ticks/geographic_distribution.html.

Drexler N, et al. MMWR Morb Mortal Wkly Rep 2020;68:1179–1182.
DOI: http://dx.doi.org/10.15585/mmwr.mm685152a2. Entire article free of charge.

Exhaustive discussion and thorough review of issues and conflicts with regard to Lyme disease

Lyme Disease Frontiers: Reconciling Borrelia Biology and Clinical Conundrums

Lyme disease is a complex tick-borne zoonosis that poses an escalating public health threat in several parts of the world, despite sophisticated healthcare infrastructure and decades of effort to address the problem.

Concepts like the true burden of the illness, from incidence rates to longstanding consequences of infection, and optimal case management, also remain shrouded in controversy. At the heart of this multidisciplinary issue are the causative spirochetal pathogens belonging to the Borrelia Lyme complex. Their unusual physiology and versatile lifestyle have challenged microbiologists, and may also hold the key to unlocking mysteries of the disease.

The goal of this review is therefore to integrate established and emerging concepts of Borrelia biology and pathogenesis, and position them in the broader context of biomedical research and clinical

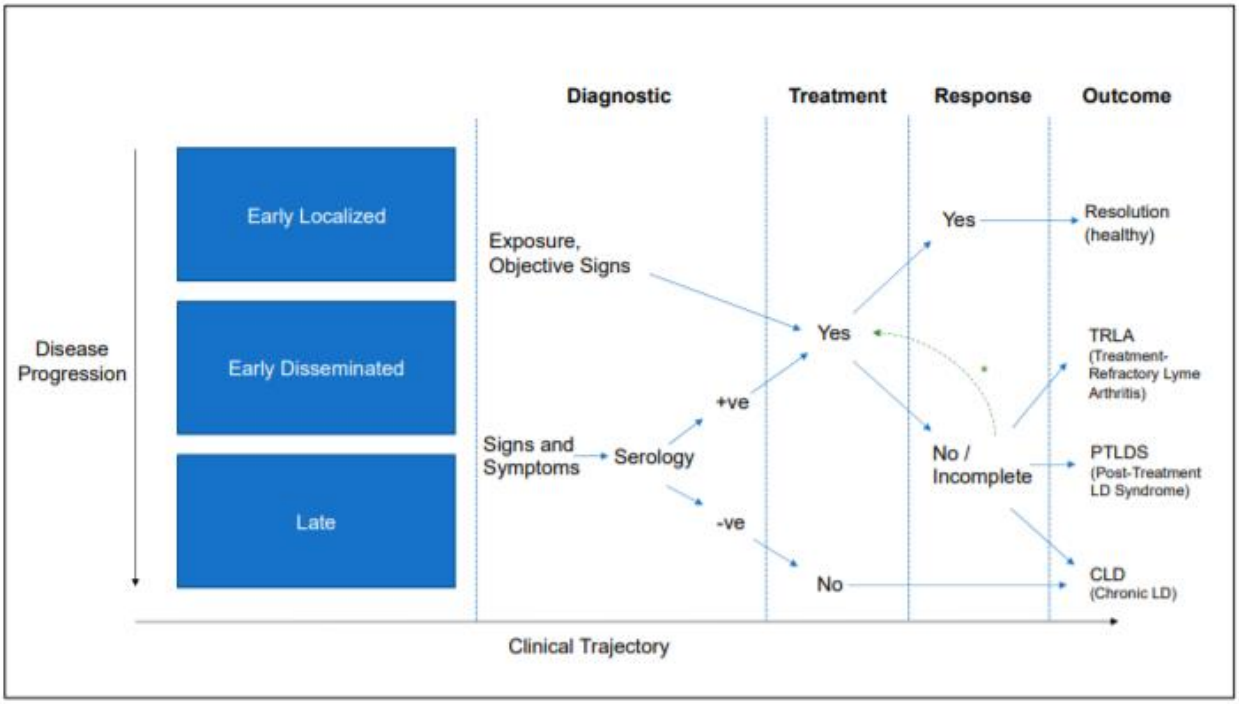


Figure 2. Schematic representation of the stages of Lyme disease, associated clinical decision points commonly applied, and possible outcomes. * *Under specific conditions outlined in the IDSA guidelines, individuals with ongoing signs of Lyme disease may be re-treated.*

practice. We begin by considering the conventions around diagnosing and characterizing Lyme disease that have served as a conceptual framework for the discipline.

We then explore virulence from the perspective of both host (genetic and environmental predispositions) and pathogen (serotypes, dissemination, and immune modulation), as well as considering antimicrobial strategies (lab methodology, resistance, persistence, and clinical application), and borrelial adaptations of hypothesized medical significance (phenotypic plasticity or pleomorphy). Bamm et al. Pathogens 2019, 8, 299; https://www.mdpi.com/2076-0817/8/4/299. Entire paper free of charge.

Comparison of Neuroborreliosis Between Children and Adults.

Lyme neuroborreliosis (NB) is a tick-borne infectious disorder of the nervous system caused by Borrelia burgdorferi spirochetes. There are not many data available regarding the differences in the course of NB in children and adults. The aim of our study was to compare the clinical course of NB between children and adults.

Retrospective analysis of medical documentation of 181 patients with NB was performed. The patients were divided into 2 groups: Group I: 57 children with NB; Group II: 124 adults with NB. Medical data, such as patients' age, sex, place of living (residence), time from a tick bite, subjective complaints, general examination results, laboratory parameters and treatment were analyzed.

In children, the most common symptoms were headache (89.5%), neck stiffness (64.9%) and nausea and vomiting (56.1%). In adults, the most common symptoms were headache (77.4%), facial nerve palsy (59.7%), neck stiffness (59.7%), vertigo (41.9%) and lumbosacral region pain (37.1%). Bannwarth's syndrome was observed in 10.5% of children and 36.3% of adults. In cerebrospinal fluid (CSF) in children, the pleocytosis at admission was higher than in adults, but protein concentration was significantly lower. There were no differences in percentage of mononuclear cells in CSF smear between the groups. In CSF examination after treatment, a decrease in pleocytosis and protein concentration was observed in both groups. Analysis of effectiveness of treatment mostly with third generation cephalosporins (defined as complete recovery) between the groups, calculated by the Kaplan-Meier method and compared with the use of the log-rank test, showed no significant differences between children and adults (log-rank P = 0.619).

In children, NB more frequently presented as meningitis, and in adults in the form of Bannwarth's syndrome. CSF pleocytosis in children with NB was higher than in adults, while the protein concentration in children was lower. Outcomes in children and adults were favorable and did not differ after standard NB treatment. Krawczuk et al. Pediatr Infect Dis J. 2020 (1):7-11. https://www.ncbi.nlm.nih.gov/pubmed/31815836.

Using mosquito control personnel and tick surveillance

Open Access

Leveraging the Expertise of the New Jersey Mosquito Control Community to Jump Start Standardized Tick Surveillance

Despite the rising incidence of tick-borne diseases (TBD) in the northeastern United States (US), information and expertise needed to assess risk, inform the public and respond proactively is highly variable across states. Standardized and well-designed tick surveillance by trained personnel can

facilitate the development of useful risk maps and help target resources, but requires nontrivial start-up costs.

To address this challenge, we tested whether existing personnel in New Jersey's 21 county mosquito control agencies could be trained and interested to participate in a one-day collection of American dog ticks (*Dermacentor variabilis*), a presumably widespread species never before surveyed in this state. A workshop was held offering training in basic tick biology, identification, and standard operating procedures (SOPs) for surveillance, followed by a one-day simultaneous collection of *D. variabilis* across the state (the "NJ Tick Blitz").

In total, 498 *D. variabilis* were collected from 21 counties and follow-up participant surveys demonstrated an increase in knowledge and interest in ticks: 41.7% of respondents reported collecting ticks outside the Tick Blitz. We hope that the success of this initiative may provide a template for researchers and officials in other states with tick-borne disease concerns to obtain baseline tick surveillance data by training and partnering with existing personnel. Egizi et al. *Insects* 2019, *10*(8), 219; https://doi.org/10.3390/insects10080219

Rickettsia spp. Infecting Lone Star Ticks (*Amblyomma americanum*) (Acari: Ixodidae) in Monmouth County, New Jersey

Tick-borne rickettsiae are undergoing epidemiological changes in the eastern United States while human encounters with lone star ticks (*Amblyomma americanum* L.) have increased substantially. We used real-time polymerase chain reaction assays to test for three species of spotted fever group rickettsiae (SFGR) (Rickettsiales: Rickettsiaceae) in 1,858 nymphal *A. americanum* collected from Monmouth County, New Jersey, a coastal county with endemic Lyme disease and established tick surveillance.

Out of the 1,858 tested, 465 (25.0%) were infected with *Rickettsia amblyommatis* Karpathy, a species of undetermined pathogenicity found frequently in *A. americanum*, while 1/1,858 (0.05%) contained *Rickettsia rickettsii* Brumpt, the agent of Rocky Mountain spotted fever. No ticks tested positive for mildly pathogenic *Rickettsia parkeri* Lackman, and no ticks were co-infected with multiple *Rickettsia* spp.

Our results indicate that *A. americanum* could be involved in transmission of *R. rickettsii* to humans in New Jersey, albeit rarely. The much higher rates of *R. amblyommatis* infection are consistent with hypotheses that human sera reacting to this species could contribute to reports of mild SFGR cases. Egizi, et al, *Journal of Medical Entomology*, tjz251, https://academic.oup.com/jme/article-abstract/doi/10.1093/jme/tjz251/5698250?redirectedFrom=fulltext

Muslin works better than flannel for tick drags

A standardized method for the construction of a tick drag/flag sampling approach and evaluation of sampling efficacy

Drag sampling and flagging are two of the most effective and widely applied techniques to monitor tick populations. Despite the importance of this sampling strategy, there is a lack of standardized

protocols for the construction of an inexpensive tick drag/flag. To this end, we provide a step-by-step protocol that details the construction of a tick drag/flag. We provide evidence of efficacy by comparing results obtained over 3-months at 108 locations within the William B. Bankhead National Forest, Alabama, USA.

Overall, our drag/flag sampling approach yielded 1127 larvae, 460 nymphs, and 53 adults for a total of 1640 ticks representing three species. We detected significant patterns in *Amblyomma americanum* abundance for nymphs and adults with greater counts in June ($\beta = 0.91 \pm 0.36$, 95% CI 0.55–1.27; $\beta = 2.44 \pm 0.63$, 95% CI 1.81–3.07, respectively) and July ($\beta = 0.73 \pm 0.36$, 95% CI 0.37–1.09; $\beta = 1.65 \pm 0.66$, 95% CI 0.99–2.31, respectively) as compared to August. We also detected a significant difference in tick captures by tick drag/flag fabric type with greater captures when muslin was used as compared to flannel ($\beta = 1.07 \pm 0.06$, 95% CI 1.01–1.13). Our goal is to provide instructions to assemble a highly effective tick drag/flag using minimal supplies. Evaluation and improvements of sampling techniques is essential to understand impacts of landscape management and larger stressors, such as climate change on tick populations but also for enhancing detection of invasive non-native species. Newman et al. Exp Appl Acarol (2019). https://link.springer.com/article/10.1007%2Fs10493-019-00429-6

CDC study: Longhorn tick seems unlikely to transmit Lyme disease in mice

Failure of the Asian longhorned tick, Haemaphysalis longicornis, to serve as an experimental vector of the Lyme disease spirochete, Borrelia burgdorferi sensu stricto

The invasive, human-biting Asian longhorned tick, Haemaphysalis longicornis, was detected in New Jersey in the eastern United States in August of 2017 and by November of 2018 this tick had been recorded from 45 counties across 9 states, primarily along the Eastern Seaboard. The establishment of H. longicornis in the United States has raised the questions of how commonly it will bite humans and which native pathogens may naturally infect this tick. There also is a need for experimental vector competence studies with native pathogens to determine if H. longicornis can acquire a given pathogen while feeding, pass it transstadially, and then transmit the pathogen in the next life stage.

In this experimental study, we evaluated the vector competence of a population of H. longicornis originating from the United States (New York) for a native isolate (B31) of the Lyme disease spirochete, Borrelia burgdorferi sensu stricto (s.s.). In agreement with a previous experimental study on the vector competence of H. longicornis for Borrelia garinii, we found that uninfected H. longicornis larvae could acquire B. burgdorferi s.s. while feeding on infected Mus musculus mice (infection prevalence > 50% in freshly fed larvae) but that the infection was lost during the molt to the nymphal stage.

None of 520 tested molted nymphs were found to be infected, indicating that transstadial passage of B. burgdorferi s.s. is absent or rare in H. longicornis; and based on the potential error associated with the number of nymphs testing negative in this study, we estimate that the upper 95% limit for infection prevalence was 0.73%. An Ixodes scapularis process control showed both effective acquisition of B. burgdorferi s.s. from infected mice by uninfected larvae and transstadial passage to the nymphal stage (infection prevalence of 80–82% for both freshly fed larvae and molted nymphs). We also observed that although H. longicornis larvae could be compelled to feed on mice by placing the ticks within feeding capsules, attachment and feeding success was minimal (< 0.5%) when larvae were placed freely on the fur of the mice.

We conclude that H. longicornis is unlikely to contribute more than minimally, if at all, to transmission of Lyme disease spirochetes in the United States. Nicole E. Breuner, et al., Ticks and Tick-borne Diseases, https://doi.org/10.1016/j.ttbdis.2019.101311

Longer checking intervals in dragging for ticks cause some to drop off

How the Distance Between Drag-Cloth Checks Affects the Estimate of Adult and Nymphal *Ixodes scapularis* (Acari: Ixodidae) Density

Drag-cloth sampling is the most commonly used method to sample for ticks. A cloth is dragged along the ground and checked for ticks at regular intervals to count ticks before they drop off. The distance between drag-cloth checks differs between studies, which could result in lower density estimates for studies with greater distances between checks. Here, we measured this effect by 1) calculating the rate at which nymphal and adult *Ixodes scapularis* Say ticks drop off the cloth per meter dragged and 2) measuring tick density by drag-cloth sampling with three different drag-cloth check interval distances.

We found a higher drop-off rate for adult ticks, 0.083/m, than nymphal ticks, 0.047/m. The estimated density of ticks decreased with increasing check interval distance. Our results not only highlight the importance of accounting for check interval distance when estimating tick density, but also provide the first estimate of nymphal *I. scapularis* drop-off rate. Borgmann-Winter & Allen. *Journal of Medical Entomology*, https://doi.org/10.1093/jme/tjz179.

Rocky Mountain spotted fever bacteria can transmit in less than eight hours to guinea pigs, sometimes upon attachment

Minimal Duration of Tick Attachment Sufficient for Transmission of Infectious *Rickettsia rickettsii* (Rickettsiales: Rickettsiaceae) by Its Primary Vector *Dermacentor variabilis* (Acari: Ixodidae): Duration of Rickettsial Reactivation in the Vector Revisited

It has been reported that starving ticks do not transmit spotted fever group *Rickettsia* immediately upon attachment because pathogenic bacteria exist in a dormant, uninfectious state and require time for ‘reactivation’ before transmission to a susceptible host.

To clarify the length of reactivation period, we exposed guinea pigs to bites of *Rickettsia rickettsii*-infected *Dermacentor variabilis* (Say) and allowed ticks to remain attached for predetermined time periods from 0 to 48 h. Following removal of attached ticks, salivary glands were immediately tested by PCR, while guinea pigs were observed for 10–12 d post-exposure. Guinea pigs in a control group were subcutaneously inoculated with salivary glands from unfed *D. variabilis* from the same cohort. In a parallel experiment, skin at the location of tick bite was also excised at the time of tick removal to ascertain dissemination of pathogen from the inoculation site.

Animals in every exposure group developed clinical and pathological signs of infection. The severity of rickettsial infection in animals increased with the length of tick attachment, but even attachments for less than 8 h resulted in clinically identifiable infection in some guinea pigs. Guinea pigs inoculated

with salivary glands from unfed ticks also became severely ill. Results of our study indicate that *R. rickettsii* residing in salivary glands of unfed questing ticks does not necessarily require a period of reactivation to precede the salivary transmission and ticks can transmit infectious *Rickettsia* virtually as soon as they attach to the host. *Journal of Medical Entomology*, tjz191, https://doi.org/10.1093/jme/tjz191. Entire paper is free of charge.

Increasing Burden of Lyme Carditis in United States Children's Hospitals

We sought to characterize the shifting epidemiology and resource utilization of Lyme disease and associated carditis in US children's hospitals. We hypothesized that the Lyme carditis burden has increased and that hospitalizations for Lyme carditis are costlier than those for Lyme disease without carditis. The PHIS database was queried for Lyme disease encounters between January 1, 2007 and December 31, 2013. Additional diagnostic codes consistent with carditis identifed Lyme carditis cases. Demographic, clinical, and resource utilization data were analyzed. All costs were adjusted to 2014 US dollars.

Lyme disease was identified in 3620 encounters with 189 (5%) associated with carditis. Lyme disease (360 cases in 2007 vs. 672 in 2013, p=0.01) and Lyme carditis (17 cases in 2007 vs. 40 in 2013, p=0.03) both significantly increased in frequency. This is primarily accounted for by their increase within the Midwest region. Carditis frequency among cases of Lyme disease was stable (p=0.15). Encounters for Lyme carditis are dramatically costlier than those for Lyme disease without carditis [median $9104 (3741–19,003) vs. 922 (238–4987).

The increase in Lyme carditis cases in US children's hospitals is associated with an increased Lyme disease incidence, suggesting that there has not been a change in its virulence or cardiac tropism. The increasing number of serious cardiac events and costs associated with Lyme disease emphasize the need for prevention and early detection of disease and control of its spread. Beach et al. Pediatric Cardiology, https://link.springer.com/article/10.1007%2Fs00246-019-02250-9

Literature review finds Lyme disease patients likely to report nonspecific long-term problems

Long-term sequelae and health-related quality-of-life associated with Lyme disease: A systematic review

Lyme disease (LD) is the most commonly reported vector-borne disease, but its clinical consequences remain uncertain. We conducted a systematic review of the long-term sequelae and health-related quality-of-life (HRQoL) associated with LD in North America and Europe.

We performed searches in six electronic databases up to December 2018 following PRISMA guidelines, including observational studies reporting long-term sequelae, HRQoL, and prognostic factors. We included 46 studies, published between 1994 and 2019. Based on 21 studies reporting attributable outcomes, higher proportions of sequelae reported from exposed patients were: neck pain, myalgia, arthralgia, paresthesia, sleep disorder, poor appetite and concentration difficulties. Patients with PTLDS reported impaired HRQoL compared to the general US population. Included studies were highly heterogeneous in terms of study design, settings, patient characteristics and quality.

Patients with LD are more likely to report non-specific long-term sequelae, especially those experiencing persistent symptoms post-treatment. Opportunities exist for prospective longitudinal studies to better understand LD outcomes. Mac et al. *Clinical Infectious Diseases*, ciz1158, https://doi.org/10.1093/cid/ciz1158.

The General Symptom Questionnaire-30 (GSQ-30): A Brief Measure of Multi-System Symptom Burden in Lyme Disease

The multi-system symptoms accompanying acute and post-treatment Lyme disease syndrome pose a challenge for time-limited assessment. The General Symptom Questionnaire (GSQ-30) was developed to fill the need for a brief patient-reported measure of multi-system symptom burden. In this study we assess the psychometric properties and sensitivity to change of the GSQ-30.

342 adult participants comprised 4 diagnostic groups: Lyme disease (post-treatment Lyme disease syndrome, $n = 124$; erythema migrans, $n = 94$); depression, $n = 36$; traumatic brain injury, $n = 51$; healthy, $n = 37$. Participants were recruited from clinical research facilities in Massachusetts, Maryland, and New York. Validation measures for the GSQ-30 included the Patient Health Questionnaire-4 for depression and anxiety, visual analog scales for fatigue and pain, the Sheehan Disability Scale for functional impairment, and one global health question. To assess sensitivity to change, 53 patients with erythema migrans completed the GSQ-30 before treatment and 6 months after 3 weeks of treatment with doxycycline.

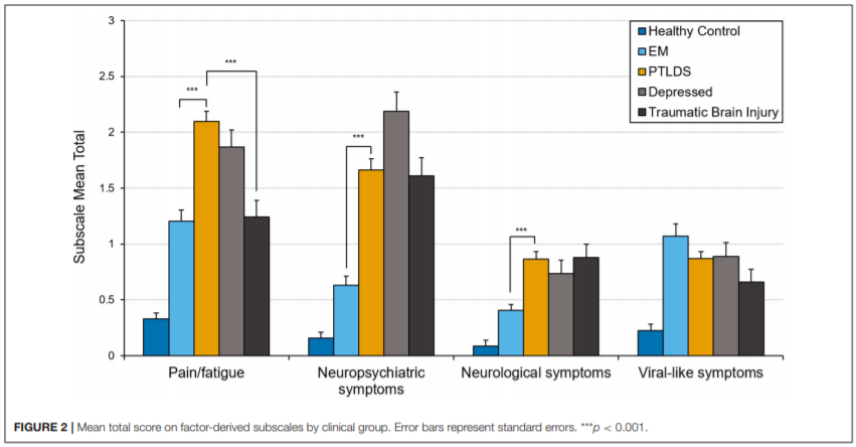


FIGURE 2 | Mean total score on factor-derived subscales by clinical group. Error bars represent standard errors. ***$p < 0.001$.

The GSQ-30 demonstrated excellent internal consistency (Cronbach $\alpha = 0.95$). The factor structure reflects four core domains: pain/fatigue, neuropsychiatric, neurologic, and viral-like symptoms. Symptom burden was significantly associated with depression ($r_s = 0.60$), anxiety ($r_s = 0.55$), pain ($r_s = 0.75$), fatigue ($r_s = 0.77$), functional impairment ($r_s = 0.79$), and general health ($r_s = -0.58$). The GSQ-30 detected significant change in symptom burden before and after antibiotic therapy; this change correlated with change in functional impairment. The GSQ-30 total score significantly differed for erythema migrans vs. three other groups (post-treatment Lyme disease syndrome, depression, healthy controls). The GSQ-30 total scores for traumatic brain injury and depression were not significantly different from post-treatment Lyme disease syndrome.

The GSQ-30 is a valid and reliable instrument to assess symptom burden among patients with acute and post-treatment Lyme disease syndrome and is sensitive in the detection of change after treatment among patients with erythema migrans. The GSQ-30 should prove useful in clinical and research settings to assess multi-system symptom burden and to monitor change over time. The GSQ-30 may also prove useful in future precision medicine studies as a clinical measure to correlate with disease-relevant biomarkers. Fallon et al. Front. Med. | doi.org/10.3389/fmed.2019.00283. Entire article is free of charge.

Chronic Lyme Disease: An Evidence-Based Definition by the ILADS Working Group

Chronic Lyme disease has been a poorly defined term and often dismissed as a fictitious entity. In this paper, the International Lyme and Associated Diseases Society (ILADS) provides its evidence-based definition of chronic Lyme disease.

ILADS defines chronic Lyme disease (CLD) as a multisystem illness with a wide range of symptoms and/or signs that are either continuously or intermittently present for a minimum of six months. The illness is the result of an active and ongoing infection by any of several pathogenic members of the Borrelia burgdorferi sensu lato complex (Bbsl). The infection has variable latency periods and signs and symptoms may wax, wane and migrate. CLD has two subcategories, CLD, untreated (CLD-U) and CLD, previously treated (CLD-PT). The latter requires that CLD manifestations persist or recur following treatment and are present continuously or in a relapsing/remitting pattern for a duration of six months or more.

Systematic review of over 250 peer reviewed papers in the international literature to characterize the clinical spectrum of CLD-U and CLD-PT.

This evidence-based definition of chronic Lyme disease clarifies the term's meaning and the literature review validates that chronic and ongoing Bbsl infections can result in chronic disease. Use of this CLD definition will promote a better understanding of the infection and facilitate future research of this infection. Shor et al. Antibiotics 2019, 8, 269 https://www.ncbi.nlm.nih.gov/pubmed/31888310. Entire paper free of charge.

White footed mouse is competent reservoir for Borrelia mayonii

Experimental Demonstration of Reservoir Competence of the White-Footed Mouse, Peromyscus leucopus (Rodentia: Cricetidae), for the Lyme Disease Spirochete, Borrelia mayonii (Spirochaetales: Spirochaetaceae)

The white-footed mouse, Peromyscus leucopus (Rafinesque), is a reservoir for the Lyme disease spirochete Borrelia burgdorferi sensu stricto in the eastern half of the United States, where the blacklegged tick, Ixodes scapularis Say (Acari: Ixodidae), is the primary vector. In the Midwest, an additional Lyme disease spirochete, Borrelia mayonii, was recorded from naturally infected I. scapularis and P. leucopus. However, an experimental demonstration of reservoir competence was lacking for a natural tick host. We therefore experimentally infected P. leucopus with B. mayonii via I. scapularis nymphal bites…

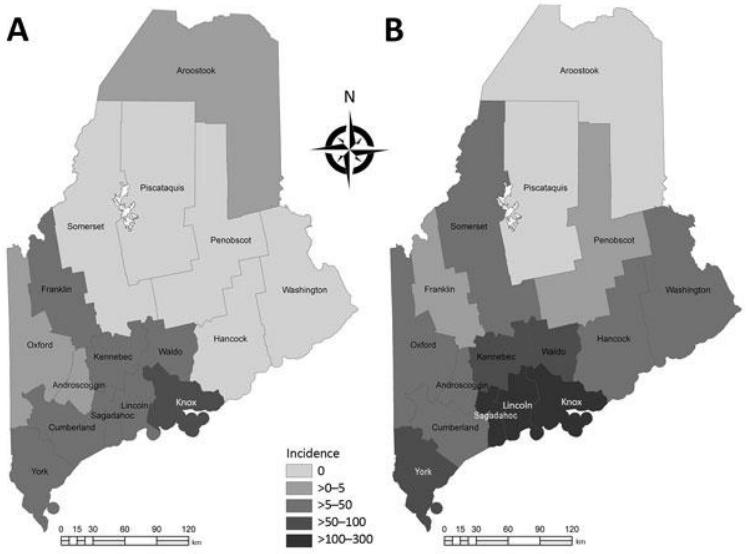
We conclude that P. leucopus is susceptible to infection with B. mayonii via bite by I. scapularis nymphs and an efficient reservoir for this Lyme disease spirochete. Parise et al. J Med Entomol. 2019 pii: tjz242. https://academic.oup.com/jme/article/doi/10.1093/jme/tjz242/5670886. See DOI for complete abstract.

Surge in Anaplasmosis Cases in Maine, USA, 2013–2017

… We sought to determine whether the increase in anaplasmosis cases reflected broader geographic transmission of *A. phagocytophilum* from ticks to humans through range expansion of *I. scapularis* ticks, increased testing effort through increased use of tick panels that detect multiple

pathogens by PCR, or both. Evidence for increased transmission would include geographic range expansion of HGA incidence and hospitalizations. Evidence of increased testing effort would be increased use of tick panels, which could lead to discovery of mild *A. phagocytophilum* infections, especially pediatric cases, because HGA in children is generally a mild illness…

2013 2017



We conclude that the surge in anaplasmosis incidence in Maine, an increase of 602% from 2013 to 2017, was a combination of increased transmission and testing effort, although we cannot partition the relative contribution of each. The 231% rise in hospitalized patients with HGA and the geographic expansion of HGA incidence and hospitalization indicate increased transmission. Range expansion of *I. scapularis* ticks in Maine likely has contributed to the rise in HGA cases in areas where this tick species is emergent (i.e., a recent colonizer). Elias, S. P., Bonthius,. *Emerging Infectious Diseases*, *26*(2), 327-331. https://dx.doi.org/10.3201/eid2602.190529. Entire article free of charge.

Evaluation of a Novel High-Definition PCR Multiplex Assay for Simultaneous Detection of Tick-Borne Pathogens in Human Clinical Specimens

The incidence of tick-borne infections in the United States has risen significantly in the past decade. Ticks can transmit a variety of pathogens, including bacteria, protozoa, and viruses, that can cause serious illnesses. Therefore, the use of rapid, sensitive, and specific multiplex tests is important to identify the pathogen(s) in the acute phase and determine appropriate treatment to minimize the severity of the disease.

The purpose of this study was to evaluate ChromaCode's research use only (RUO) nine-target high-definition PCR (HDPCR) tick-borne pathogen (TBP) panel using 379 retrospective, remnant whole-blood and synovial fluid specimens previously submitted to Associated Regional and University Pathologists (ARUP) Laboratories and tested by clinically validated real-time PCR assays for *Ehrlichia* spp., *Anaplasma phagocytophilum*, *Babesia* spp., or Lyme *Borrelia* spp. The performance characteristics evaluated included positive percent agreement (PPA) and negative percent agreement (NPA) with the ARUP laboratory-developed tests (LDTs). All tested targets had an initial PPA greater than 97.0%, except *Ehrlichia ewingii*, with a PPA of 88.9%. The NPAs for all targets were between 98.8% and 100%. The TBP panel detected three coinfections, with two of *Babesia microti* and *A. phagocytophilum* and one of *B. microti* and *E. chaffeensis*, which were confirmed by the LDTs.

There were 16 samples with discordant results compared to the LDT results, five of which were resolved by repeat testing on the TBP panel and bidirectional sequencing.

Following discrepant resolution, the final PPA and NPA for the TBP panel were 97.7% (95% confidence interval [CI], 95.2% to 99.0%) and 99.6% (95% CI, 99.3% to 99.8%), respectively, with an overall agreement of 99.5% (95% CI, 99.2% to 99.7%) with the LDTs. Shakir et al. J Clin Microbiol 58:e01655-19. https://jcm.asm.org/content/58/3/e01655-19.

International & General Section

Compassion and Health Care: A Discussion with the Dalai Lama

The calling to be a physician has historically been driven by compassion— that is, the desire to relieve the suffering of others. However, the current health care delivery system in the United States has increasingly limited the ability of physicians to express compassion as they are afforded little time for meaningful interaction with their patients. One of the authors (R.S.) draws on his current focus on developing personalized, proactive, and patient-driven models of care to argue that patient engagement plays a critical role in achieving favorable outcomes.

Believing that compassion is key for establishing the physician–patient relationship needed to foster patient engagement, R.S. sought the advice of one of the world's most recognized thought leaders on this topic, His Holiness the 14th Dalai Lama. This Invited Commentary describes the meeting between the two authors, the Dalai Lama's thoughts about compassion, and his challenge to bring attention to the importance of compassion in medical education, practice, and research. R. Snyderman, MD, Tenzin Gyatso, the 14th Dalai Lama, Academic Medicine, Vol. 94, No. 8. Entire article at: https://journals.lww.com/academicmedicine/Fulltext/2019/08000/Compassion_and_Health_Care__A_Discussion_With_the.9.aspx

Of 82% of children in the UK County of Hampshire with Bell's Palsy tested for Lyme disease, 29% were positive and only 5.4% had a history of a rash

High frequency of paediatric facial nerve palsy due to Lyme disease in a geographically endemic region

Idiopathic facial nerve palsy (FNP) is an uncommon but important presentation in children, with Lyme disease known to be a common cause. The UK county of Hampshire is a high incidence area of Lyme disease. We conducted a retrospective review of the investigation and management of paediatric FNP at a large University hospital, including serologic testing and treatment of Lyme disease. Methods: We conducted a retrospective chart review of children under 18 presenting between January 1st, 2010 and December 31st, 2017 with a diagnosis of FNP. Patients with clear non-Lyme aetiology at presentation were excluded. Data was collected on demographics, initial presentation, investigations including Lyme serology, and management.

A total of 93 children were identified, with an even proportion of male to female and median age 9.3 years (IQR 4.6–12 years). A history of rash was present in 5.4%, tick bite in 14% and recent travel to, or residence in the New Forest in 22.6%. Lyme serology was performed in 81.7% of patients, of which 29% were positive. Antibiotics were prescribed for 73.1% of patients, oral steroids for 44% and aciclovir for 17.2%.

Lyme disease is a significant cause of FNP in this endemic area of the UK, and there was a large degree of variability in management prior to national guideline publication. Areas with endemic Lyme disease should consider introducing local guidelines supporting routine investigation and management for FNP, including empiric treatment for Lyme disease in accordance with NICE guidelines to improve care and reduce variability. Munroa et al. International Journal of Pediatric Otorhinolaryngology, https://doi.org/10.1016/j.ijporl.2020.109905.

Novel targets and strategies to combat borreliosis

Lyme borreliosis is a bacterial infection that can be spread to humans by infected ticks and may severely affect many organs and tissues. Nearly four decades have elapsed since the discovery of the disease agent called Borrelia burgdorferi. Although there is a plethora of knowledge on the infectious agent and thousands of scientific publications, an effective way on how to combat and prevent Lyme borreliosis has not been found yet.

There is no vaccine for humans available, and only one active vaccine program in clinical development is currently running. A spirited search for possible disease interventions is of high public interest as surveillance data indicates that the number of cases of Lyme borreliosis is steadily increasing in Europe and North America.

This review provides a condensed digest of the history of vaccine development up to new promising vaccine candidates and strategies that are targeted against Lyme borreliosis, including elements of the tick vector, the reservoir hosts, and the Borrelia pathogen itself. Strnad et al. Applied Microbiology and Biotechnology, /doi.org/10.1007/s00253-020-10375-8. Entire article free of charge.

An overview of tick-borne infections in pregnancy and outcomes in the newborn: the need for prospective studies

Tick-borne infections are an ever-increasing issue internationally, many factors contribute to this including a changing climate. Pregnant women represent the single largest vulnerable group in populations due to a relative immune deficiency status. Infections in pregnant women have the added gravity of potential infection in the developing fetus which may have catastrophic consequences including death in-utero or lifelong debilitation.

Currently there is a paucity of data surrounding tick-borne infections in pregnancy and long-term outcomes for mother and infant for conditions like Lyme disease and co-infections. At present there are no established international surveillance systems to identify and gain understanding of these infections in pregnancy. Furthermore, the removal of Congenital Lyme Disease from ICD-11 codes hampers dialogue and characterization of borreliosis in pregnancy and stifles future developments of this

understudied domain. This review makes the case for further study and re-opening a dialogue of tick-borne infections in pregnancy. Lambert JS. Front. Med. 7:72. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7069275/

Is doxycycline appropriate for routine treatment of young children with erythema migrans?

The frequency of permanent staining of teeth of young children from doxycycline is thought to be lower than from older tetracyclines, but the precise risk is uncertain. Until more definitive data become available, doxycycline should not be used routinely to treat young children with erythema migrans, a manifestation of Lyme disease for which other antimicrobials are highly effective. Wormser et al. Pediatr Infect Dis J 2019;38:1113–1114. https://www.ncbi.nlm.nih.gov/pubmed/31626045

Lyme disease is as controversial still in Europe as in the United States

Emergence of Lyme disease as a social problem: analysis of discourse using the media content

Chronic Lyme disease (LD) is a matter of debate worldwide and has emerged as a social problem. We aim to analyze the media content and describe the transformation process of a collective pain into a social problem in France.

Using social science methodology, a corpus of articles from 20 newspapers and videos from seven major TV stations from 1987 to 2017 were analyzed for discourse content. The speaking times and the frequency of interventions between doctors supporting the official guidelines and those against them were compared using the Mann–Whitney test and the Chi-square test, respectively.

In France, the media discourse is carried through testimonials from patient organizations and a professor of infectiology who acted as a whistleblower (WB). We showed that the emergence of the LD alert in the media corresponds to the process described by social sciences as ‘naming, blaming, claiming’. Since his first article in 2014, the WB has featured in 24% (22/89) of newspaper articles compared with 20% (18/89) for doctors defending the official guidelines ($P = 0.52$). Since his first appearance on a TV newscast in 2014, the WB has appeared in 45% (22/49) of news reports on LD with 24% of the speaking time compared with 22% (11/49) for doctors defending the official guidelines ($P = 0.018$).

Media coverage of LD has been unbalanced since 2014 and promotes associations as well as the WB, who seems to be better identified than any of the different doctors defending the official guidelines. Pascal et al. *European Journal of Public Health*, doi.org/10.1093/eurpub/ckz198

From article, “Ticks, from which *Spiroplasma ixodetis* has been isolated, are abundant sources of *Spiroplasma*.”

Ocular *Spiroplasma ixodetis* in Newborns, France know

Cataract and uveitis are rare in newborns but potentially blinding. Three newborns with cataract and severe interior uveitis underwent cataract surgery. *Spiroplasma ixodetis* was detected in lands aspirates using bacterial 16 S-rRNA PCR and transmission electron microscopy. These findings, which

suggest maternal-fetal infection, are consistent with previous experimental *Spiroplasma*-induced cataract and uveitis. Matet A, et al. Emerg Infect Dis. 2020 Feb. https://www.frontiersin.org/articles/10.3389/fmed.2020.00072/full

Western blacklegged ticks do not transmit the Lyme disease bacteria as efficiently as the Eastern species

Comparative vector competence of North American Lyme disease vectors

Understanding the drivers of Lyme disease incidence at broad spatial scales is critical for predicting and mitigating human disease risk. Previous studies have identified vector phenology and behavior, host community composition, and landscape features as drivers of variable Lyme disease risk. However, while the Lyme disease transmission cycles in the eastern and western USA involve different vector species (*Ixodes scapularis* and *Ixodes pacificus*, respectively), the role of vector-specific differences in transmission efficiency has not been directly examined. By comparing the performance of traits involved in vector competence between these two species, this study aims to identify how vector competence contributes to variable Lyme disease risk…

We found *I. pacificus* had significantly higher host attachment success and engorgement weights, but significantly lower pathogen transmission efficiency relative to *I. scapularis*. Molting success and pathogen acquisition did not differ between these two species. However, pathogen acquisition efficiency was significantly higher for both sympatric vector and pathogen strains than the allopatric pairings. Couper, L.I. *et al.* Comparative vector competence of North American Lyme disease vectors. *Parasites Vectors* **13,** 29 (2020) https://parasitesandvectors.biomedcentral.com/articles/10.1186/s13071-020-3893-x

For the scientists interested in the new world of microbiome examination in ticks and its association with pathogens

Cross-kingdom analysis of nymphal-stage Ixodes scapularis microbial communities in relation to Borrelia burgdorferi infection and load

The tick microbiota may influence the colonization of Ixodes scapularis by Borrelia burgdorferi, the Lyme disease bacterium. Using conserved and pathogen-specific primers we performed a cross-kingdom analysis of bacterial, fungal, protistan and archaeal communities of I. scapularis nymphs (N = 105) collected from southern Vermont, USA.

The bacterial community was dominated by a Rickettsia and several environmental taxa commonly reported in I. scapularis, as well as the human pathogens B. burgdorferi and Anaplasma phagocytophilum, agent of human granulocytic anaplasmosis. With the fungal primer set we detected primarily plant- and litter-associated taxa and >18% of sequences were Malassezia, a fungal genus associated with mammalian skin. Two 18S rRNA gene primer sets, intended to target protistan communities, returned mostly Ixodes DNA as well as the wildlife pathogen Babesia odocoilei (7% of samples), a Gregarines species (14%) and a Spirurida nematode (18%).

Data from pathogen-specific and conserved primers were consistent in terms of prevalence and identification. We measured B. burgdorferi presence/absence and load and found that bacterial beta diversity varied based on B. burgdorferi presence/absence. Load was weakly associated with bacterial

community composition. We identified taxa associated with B. burgdorferi infection that should be evaluated for their role in vector colonization by pathogens. Landesman et al. FEMS Microbiology Ecology, 95, 2019, fiz167 https://academic.oup.com/femsec/article-abstract/95/12/fiz167/5625072

Histological features of Rickettsia-like organisms in the European flat oyster (Ostrea edulis L.)

The European flat oyster (Ostrea edulis L.) represents an economically important oyster production in Southern Italy, widespread in natural beds along the coast. The practice to be eaten raw is an everlasting concern for possible health risk with a need to stringently monitor the health of aquatic environment. A screening survey using histopathological examination was undertaken by harvesting O. edulis from different sites along the Apulian coast of Italy… .

O. edulis were found positive for Rickettsia-like organisms in wild oysters from Manfredonia, while the other sites were found free of pathological inclusions. Thus, we present the first report of a Rickettsia-like infection in the Apulian wild oyster (O. edulis) from Italy, including an ultrastructural description and pathological characterization. Tinelli et al. Environ Sci Pollut Res Int. 2019 Dec 9.. See doi for complete abstract. https://www.ncbi.nlm.nih.gov/pubmed/31820245

Migration of deer one factor in the increase of ticks and infected hosts in this Canadian study

Modeling of Lone Star Ticks with Deer Migration to Canada

Due to climate change and an increase of favourable habitat, ticks and tick-borne diseases are reported to expand to northern areas in north America. One main factor for lone star ticks to be established in Canada is due to the migration of white-tailed deers from US. In this work, we formulate a compartmental model to study the dynamics of lone star ticks and whitetailed deer… Numerical results show that migration rate of white-tailed deer is one crucial parameter that increases the populations of (infected) ticks and (infected) hosts. Sadiku et al. Journal of Nonlinear Modeling and Analysis| https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5877023/.2019.425. Entire article free of charge.

Who knew - sea snakes with ticks?

First record of the sea snake tick *Amblyomma nitidum* Hirst and Hirst, 1910 (Acari: Ixodidae) from Taiwan

The sea snake tick (*Amblyomma nitidum*) is a host specialist of snakes in the genus *Laticauda* and is one of the few ticks which could be regarded as semi-marine. Yet despite the attention this species has received due to its bizarre ecology, its distribution remains poorly known as geographic records of its occurrence through the Asia-Pacific are highly fragmentary. For the first time this species is recorded from Taiwan based on specimens collected from the yellow-lipped sea krait (*Laticauda colubrina*). Kwak et al. Ticks and Tick-borne Diseases, https://www.sciencedirect.com/science/article/abs/pii/S1877959X19302675

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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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