Tick-Borne Infections Council of North Carolina, Inc.

NEWSLETTER 2017, Volume 5

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Quote of the season: -

" RMSF was considered the only tick-borne rickettsiosis in the United States for more than 100 years, until Rickettsia parkeri emerged in 2004."

- Nicola M. Parry

See more at: http://www.contagionlive.com/publications/contagion/2017/may2017/tickborne-diseases-continue-to-emerge-and-increase-in-the-united-states#sthash.hvgQaBik.dpuf"

Highlights…

Scroll down to see these features and more!

- Report from the state Vector-Borne Disease Working Group October meeting
- TIC-NC activities since the last newsletter
- North Carolina paper on what is known about disease transmission and tick feeding times
- Tennessee study on the underreporting of Rocky Mountain spotted fever and related rickettsias
- Lyme disease expanding in Iowa
- British Lord discusses Lyme in "Queen's Speech" debate

State Vector-Borne Disease Working Group 2017 Meeting Schedule

Tentative 2018 VBWG meeting dates: January 26th, April 27th, Jul 27th, and October 26th
(Check with us before going to confirm date as they occasionally change.)

Location:
Office of the Chief Medical Examiner
4312 District Drive
Raleigh, NC 27607

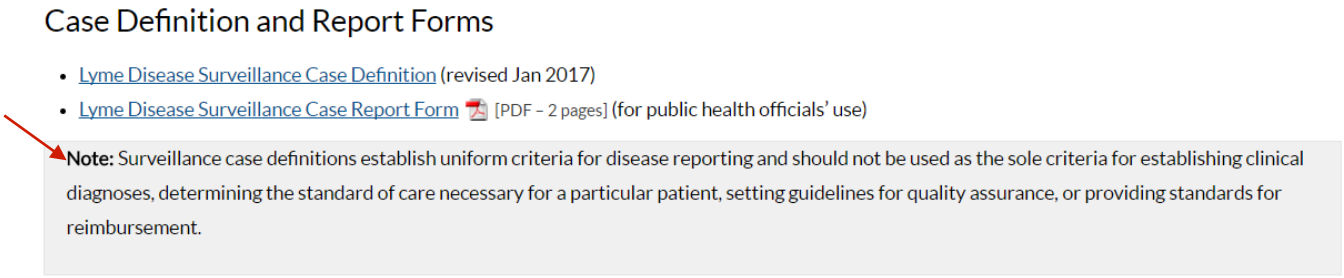
Photo ID required. Location may change in 2018.

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

Links 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 are available on the right side of the home page of http://tic-nc.org.

Where To Find CDC Case Definitions and CDC's Statement that the Surveillance Case Definitions Are "not to be used as the sole criteria when 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.

Disease	Total cases by year of report 2015 Final Confirmed + Probable (Confirmed/Probable/Suspected)	Total cases by year of report 2016 Final Confirmed + Probable (Confirmed/Probable/Suspected)*	2017 to date (Probable/Confirmed)**
Lyme disease	38/192/46		
Rickettsioses	5/454/130	n/a	n/a
Ehrlichioses	16/58/18		
Anaplasmosis	4/15/3		

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

Note: By the *former* CDC definition, six counties had confirmed cases of Lyme disease in two persons who had not traveled out of the county for 30 days after their tick exposure. **Therefore, these counties were endemic for Lyme disease by the former CDC definition: Wake, Guilford, Haywood, Alleghany, Buncombe, and Wilkes).** Counties with one case of locally acquired Lyme disease were: Cleveland (2008), Wilson (2009), Pitt (2009), Carteret (2009), Gates (2011), Perquimans (2011), Rowan (2013), Union (2013), Caldwell (2013), Franklin (2014), Stanley (2014), Duplin 2014.

Report from the State Vector-Borne Disease Work Group meeting

The Meeting took place October 20, 2017 at the State Laboratory of Public Health. Dr. Carl Williams introduced the Communicable Disease branch staff that were present and explained staff changes. Data

were presented on tick and mosquito borne diseases via slides. No paper handouts with case numbers were available. The reports made clear that Lyme disease could be acquired in North Carolina and the problem seems to be growing. A study is being done on the black-legged tick by a graduate student who is collecting ticks and testing them for the Lyme disease bacteria. No data are yet available for the public.

A vector control officer from Fort Bragg made an interesting presentation on what they are doing for mosquito and tick control. Among other things, they have 50,000 acres on a three-year burn cycle. This results in fewer ticks.

TIC-NC Activities

Chatham County Tick Forum

Chatham County Tick Forum, Spring 2017 (see Volume 3 of Newsletter). To learn more about ticks or to watch videos of the Tick Forum presentations, visit **www.chathamnc.org/ticks**.

TIC-NC interviewed by the News & Observer for Lyme disease article

Lyme disease is spreading in NC, but where – and how fast – depends on who you ask

BY SAM KILLENBERG JULY 17, 2017 12:51 PM http://bit.ly/2zjrKd2

Lyme disease, the potentially debilitating tick-borne illness that was once a taboo subject among North Carolina doctors and epidemiologists, is on the rise in the state. For entire article see: http://www.newsobserver.com/news/local/counties/wake-county/article161748448.html

TIC-NC Talks and Materials Distributed

Brochures/booklets:
Piedmont Health received 800 Spanish/English folletos in ten clinics and outreach health programs for migrant workers. Booklets and folletos went to El Centro Hispano, Day Laborers Center, Catholic Charities, NC Farmworker Health Program, Umstead, Eno River and Jordan Lake State Parks, REI in Cary, Durham and Greensboro, Great Outdoors Provision Co, Townsend Bertrand Sporting Goods, Weaver Street Market, and many more outreach locations.

Talks:
Siler City Senior Center
Pittsboro Senior Center

TIC-NC PORCH Activities

PORCH is an all-volunteer, grassroots hunger relief organization whose mission is to collect and distribute food for families going hungry in the Chapel Hill and Carrboro community.
chapelhill.porchcommunities.org

TIC-NC members Joanie Alexander and Fran McCullough present information about preventing tick-borne diseases to Karen and Burmese refugees from Myanmar - with the help of interpreters and their written translations of our Spanish/English brochure.

Another PORCH activity: At an August 14th, at a PORCH food distribution in Chapel Hill, sixty families were served. All got tick info in both English and Spanish, as well as the tick pullers. (Photo used with permission.)

Presentation to Senior Citizens at the Siler City Senior Citizen Center by our scientific adviser Marcia Herman-Giddens

The thirty or so attendees asked a lot of interesting questions and talked about how they remembered when there were no deer in Chatham County. One woman described her recent experience with Rocky Mountain spotted fever and how delayed her diagnosis was because, even though it was July, her doctors treated her for the flu until she became very ill and was admitted to a hospital. Fortunately, she survived. August 2017

From latest in letters to the editor

Tip of the Iceberg 2 Aug 2017

Last week's Triangulator noted the rise in probable Lyme disease cases in North Carolina. In response, **Marcia E. Herman-Giddens,** an adjunct professor at UNC's Gillings School of Public Health and a scientific adviser on the **Tick-borne Infections Council of North Carolina Inc**., writes that the official statistics likely underestimate the scope of the problem.

"No, it is not easy to know how widespread Lyme disease is here in North Carolina," she writes. "There are a number of reasons for this—too many to list in this comment. One important factor is that cases of most reportable diseases that pass the strict requirements to become official CDC numbers are widely acknowledged to represent only the tip of the iceberg as far as representing the true number of cases. For example, for Lyme disease, the CDC recently did a study and released a statement that rather than the approximately thirty thousand cases reported per year in the U.S., the actual number is likely over three hundred thousand per year." Article at: https://www.indyweek.com/indyweek/since-2009-the-number-of-probable-lyme-disease-cases-in-nc-has-jumped-from-39-to-242/Content?oid=7195750

North Carolina and Southeast Section

Babesia from a blood transfusion with blood from another state

Across state lines: Fulminant *Babesia microti* infection in a liver transplant recipient

The potential for transmission of *Babesia microti* by blood transfusion is well recognized. Physicians may be unaware that products used for transfusion may be collected from geographically diverse regions. We describe a liver transplant recipient in South Carolina who likely acquired *B. microti* infection from a unit of blood collected in Minnesota. Meissner et al.
https://www.ncbi.nlm.nih.gov/pubmed/28644910

Rocky Mountain spotted fever and related rickettsioses found underreporting in Tennessee study, including fatalities

Evaluation of a Spotted Fever Group *Rickettsia* Public Health Surveillance System in Tennessee

Spotted fever group (SFG) rickettsioses are endemic in Tennessee, with ~2,500 cases reported during 2000–2012. Because of this substantial burden of disease, we performed a three-part evaluation of Tennessee's routine surveillance for SFG rickettsioses cases and deaths to assess the system's effectiveness. Tennessee Department of Health (TDH) SFG rickettsioses surveillance records were matched to three patient series: 1) patients with positive serologic specimens from a commercial reference laboratory during 2010–2011, 2) tertiary medical center patients with positive serologic tests

during 2007–2013, and 3) patients identified from death certificates issued during 1995–2014 with SFG rickettsiosis–related causes of death. Chart reviews were performed and patients were classified according to the Council of State and Territorial Epidemiologists' case definition. Of 254 SFG *Rickettsia*–positive serologic specimens from the reference laboratory, 129 (51%) met the case definition for confirmed or probable cases of rickettsial disease after chart review. The sensitivity of the TDH surveillance system to detect cases was 45%. Of the 98 confirmed or probable cases identified from the medical center, the sensitivity of the TDH surveillance system to detect cases was 34%. Of 27 patients identified by death certificates, 12 (44%) were classified as confirmed or probable cases; four (33%) were reported to TDH, but none were correctly identified as deceased. Cases of SFG rickettsioses were underreported and fatalities not correctly identified. Efforts are needed to improve SFG rickettsiosis surveillance in Tennessee. Fill et al. 2017, The American Society of Tropical Medicine and Hygiene, https://www.ncbi.nlm.nih.gov/pubmed/28722610

From NC authors; The current analysis of published literature reveals knowledge gaps in the duration of tick feeding time required for pathogen transmission.

Do Tick Attachment Times Vary between Different Tick-Pathogen Systems?

Improvements to risk assessments are needed to enhance our understanding of tick-borne disease epidemiology. We review tick vectors and duration of tick attachment required for pathogen transmission for the following pathogens/toxins and diseases: (1) Anaplasma phagocytophilum (anaplasmosis); (2) Babesia microti (babesiosis); (3) Borrelia burgdorferi (Lyme disease); (4) Southern tick-associated rash illness; (5) Borrelia hermsii (tick-borne relapsing fever); (6) Borrelia parkeri (tick-borne relapsing fever); (7) Borrelia turicatae (tick-borne relapsing fever); (8) Borrelia mayonii; (9) Borrelia miyamotoi; (10) Coxiella burnetii (Query fever); (11) Ehrlichia chaffeensis (ehrlichiosis); (12) Ehrlichia ewingii (ehrlichiosis); (13) Ehrlichia muris; (14) Francisella tularensis (tularemia); (15) Rickettsia 364D; (16) Rickettsia montanensis; (17) Rickettsia parkeri (American boutonneuse fever, American tick bite fever); (18) Rickettsia ricketsii (Rocky Mountain spotted fever); (19) Colorado tick fever virus (Colorado tick fever); (20) Heartland virus; (21) Powassan virus (Powassan disease); (22) tick paralysis neurotoxin; and (23) Galactose-α-1,3-galactose (Mammalian Meat Allergy-alpha-gal syndrome). Published studies for 12 of the 23 pathogens/diseases showed tick attachment times. Reported tick attachment times varied (<1 hour to seven days) between pathogen/toxin type and tick vector. Not all studies were designed to detect the duration of attachment required for transmission. Knowledge of this important aspect of vector competence is lacking and impairs risk assessment for some tick-borne pathogen. Richards et al. *Environments* 2017, 4, 37; http://www.mdpi.com/2076-3298/4/2/37

◘◘ National Section ◘◘

CDC no longer publishing weekly and monthly Lyme disease case numbers, only annually

Until the definition for Lyme disease case reported was changed this year (see Volume II of our newsletter), Lyme disease case numbers were reported in their *Morbidity and Mortality Weekly Report*

(MMWR) publication. See, for example: www.cdc.gov/mmwr/volumes/66/wr/mm6630md.htm?s_cid=mm6630md_e

We recently learned this change was part of the new CSTE case definition (which the CDC adopts) 16-ID-10: http://c.ymcdn.com/sites/www.cste.org/resource/resmgr/2016PS/16_ID_10.pdf

> "We also propose that final Lyme disease case numbers be included in the MMWR annual surveillance reports and omitted from the weekly MMWR surveillance tables. Lyme disease cases are complex to classify and reporting of reliable case numbers is often delayed, making weekly case numbers of limited utility when comparing week to week or to that week in previous years. A large proportion of case numbers reported in the weekly MMWR tables are deleted after case review so these numbers do not accurately reflect Lyme disease trends and are inconsistent with final data."

Ed. note: Between getting rid of 'endemic' areas (as part of the new 2017 definition) and now only reporting case numbers annually, the CDC has changed the data-driven face of Lyme disease considerably.

Black-legged tick and risk of Lyme disease expanding in Iowa

Range Expansion and Increasing Borrelia burgdorferi Infection of the Tick Ixodes scapularis (Acari: Ixodidae) in Iowa, 1990–2013

A passive surveillance program monitored ticks submitted by the public in Iowa from 1990–2013. Submitted ticks were identified to species and life stage, and *Ixodes scapularis* Say nymphs and adults were tested for the presence of *Borrelia burgdorferi*. An average of 2.6 of Iowa's 99 counties submitted first reports of *I. scapularis* per year over the surveillance period, indicating expansion of this tick species across the state. The proportion of vector ticks infected by *B. burgdorferi* increased over time between 1998 and 2013. In 2013, 23.5% of nymphal and adult *I. scapularis* were infected with *B. burgdorferi*, the highest proportion of any year. Active surveillance was performed at selected sites from 2007–2009. *Ixodes scapularis* nymphs collected at these sites were tested for the presence of *B. burgdorferi*, *Anaplasma phagocytophilum*, and spotted fever group *Rickettsia* spp. (likely representing *Rickettsia buchneri*). Nymphs tested were 17.3% positive for *B. burgdorferi*, 28.9% for *A. phagocytophilum*, and 67.3% for *Rickettsia* spp. The results of these surveillance programs indicate an increasing risk of disease transmission by *I. scapularis* in Iowa. Oliver at al. J Med Entomol June 2017. https://www.ncbi.nlm.nih.gov/pubmed/28633503

Fatal Deer Tick Virus Infection in Maine

Deer tick virus (DTV), a genetic variant (lineage II) of Powassan virus, is a rare cause of encephalitis in North America. We report a fatal case of DTV encephalitis following a documented bite from an *Ixodes scapularis* tick and the erythema migrans rash associated with Lyme disease. Cavanaugh, et al. *Clinical Infectious Diseases*, cix435, https://doi.org/10.1093/cid/cix435

Itching after tick bites explained: has protective qualities probably for more than Lyme disease

Hypersensitivity to Ticks and Lyme Disease Risk

Although residents of Lyme disease–endemic regions describe frequent exposure to ticks, Lyme

disease develops in relatively few. To determine whether people who experience cutaneous hypersensitivity against tick bite have fewer episodes of Lyme disease than those who do not, we examined several factors that might restrict the incidence of Lyme disease among residents of Block Island, Rhode Island. Of 1,498 study participants, 27% (95% confidence interval [CI] 23%–31%) reported >1 tick bites, and 17% (95% CI 13%–21%) reported itch associated with tick bite in the previous year. *Borrelia burgdorferi* infected 23% (95% CI 20%–26%) of 135 nymphal *Ixodes scapularis* (*I. dammini*) ticks. The likelihood of Lyme disease infection decreased with >3 reports of tick-associated itch (odds ratio 0.14, 95% CI 0.94–0.03, p = 0.01). Prior exposure to vector ticks protects residents of disease-endemic sites from Lyme disease. Burke at al., Tick-borne Infection Study Group. Hypersensitivity to ticks and Lyme disease risk. Emerging infectious diseases. 2005 Jan;11(1):36. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3294369/

Protecting pollinators when applying biocontrol or pesticides to landscapes

Management of Arthropod Pathogen Vectors in North America: Minimizing Adverse Effects on Pollinators

Tick and mosquito management is important to public health protection. At the same time, growing concerns about declines of pollinator species raise the question of whether vector control practices might affect pollinator populations. We report the results of a task force of the North American Pollinator Protection Campaign (NAPPC) that examined potential effects of vector management practices on pollinators, and how these programs could be adjusted to minimize negative effects on pollinating species. The main types of vector control practices that might affect pollinators are landscape manipulation, biocontrol, and pesticide applications. Some current practices already minimize effects of vector control on pollinators (e.g., short-lived pesticides and application-targeting technologies).

Nontarget effects can be further diminished by taking pollinator protection into account in the planning stages of vector management programs. Effects of vector control on pollinator species often depend on specific local conditions (e.g., proximity of locations with abundant vectors to concentrations of floral resources), so planning is most effective when it includes collaborations of local vector management professionals with local experts on pollinators. Interventions can then be designed to avoid pollinators (e.g., targeting applications to avoid blooming times and pollinator nesting habitats), while still optimizing public health protection.

Research on efficient targeting of interventions, and on effects on pollinators of emerging technologies, will help mitigate potential deleterious effects on pollinators in future management programs. In particular, models that can predict effects of integrated pest management on vector-borne pathogen transmission, along with effects on pollinator populations, would be useful for collaborative decision-making. Ginsberg et al. Journal of Medical Entomology, https://academic.oup.com/jme/article/doi/10.1093/jme/tjx146/4036212/Management-of-Arthropod-Pathogen-Vectors-in-North

Italian Wall Lizards are vectoring tick-borne pathogens

Importance of Common Wall Lizards in the Transmission Dynamics of Tick-Borne Pathogens in the Northern Apennine Mountains, Italy

During the investigations on ticks and tick-borne pathogens (TBP) range expansion in the Northern Apennines, we captured 107 *Podarcis muralis* lizards. Sixty-eight animals were infested by immature *Ixodes ricinus*, *Haemaphysalis sulcata* and *H. punctata*. *Borrelia burgdorferi* s.l. was detected in 3.7% of *I. ricinus* larvae and 8.0% of nymphs. Together with the species-specific *B. lusitaniae*, we identified *B. garinii*, *B. afzelii* and *B. valaisiana*. *Rickettsia* spp. (18.1% larvae, 12.0% nymphs), namely *R. monacensis*, *R. helvetica* and *R. hoogstraalii*, were also found in *I. ricinus*. *R. hoogstraalii* was detected in *H. sulcata* nymphs as well, while the two *H. punctata* did not harbour any bacteria. One out of 16 lizard tail tissues was positive to *R. helvetica*. Our results support the hypothesis that lizards are involved in the epidemiological cycles of TBP. The heterogeneity of *B. burgdorferi* genospecies mirrors previous findings in questing ticks in the area, and their finding in attached *I. ricinus* larvae suggests that lizards may contribute to the maintenance of different genospecies. The rickettsiae are new findings in the study area, and *R. helvetica* infection in a tail tissue indicates a systemic infection. *R. hoogstraalii* is reported for the first time in *I. ricinus* ticks. Lizards seem to favour the bacterial exchange among different tick species, with possible public health consequences. Tomassone, L., Ceballos, L.A., Ragagli, C. et al. Microb Ecol (2017). https://www.ncbi.nlm.nih.gov/pubmed/28540487

Unusual presentation of *Ehrlichia canis* infection treated with 3 years of doxycycline

Cerebral haemorrhage as a clinical manifestation of human ehrlichiosis

A 16-year-old young man presented to the emergency room with new-onset generalised tonic-clonic seizures. Examination showed a Glasgow score of 13 and predominantly crural left hemiparesis. Imaging demonstrated a right frontoparietal haemorrhage of non-vascular origin with perilesional oedema. Surgical drainage was carried out, but rebleeding occurred within 24 hours following surgery, and again 1 week after discharge. On reinterrogation and examination, *Ehrlichia canis* infection was suspected and empirical management with doxycycline was begun. Improvement was evident 72 hours after antibiotic initiation, and PCR confirmed the diagnosis; thus, doxycycline was continued for 6 months. After 2 years, seizures recurred and treatment was reinstated with good clinical response. However, seizures reappeared whenever treatment discontinuation was attempted. Lacking alternatives, doxycycline was maintained up to the third year following the initial episode. Subsequently, the patient showed complete resolution without neurological sequelae up to his last follow-up visit, 12 months following treatment cessation. Garcia-Baena et al. *BMJ Case Reports* 2017; http://casereports.bmj.com/content/2017/bcr-2016-219054.abstract
http://casereports.bmj.com/content/2017/bcr-2016-219054.abstract

Vaccination of horses with Lyme vaccines for dogs induces short-lasting antibody responses.

Borrelia burgdorferi can induce Lyme disease. Approved Lyme vaccines for horses are currently not available. In an effort to protect horses, veterinarians are using Lyme vaccines licensed for dogs. However, data to assess the response of horses to, or determine the efficacy of this off-label vaccine use are missing. Here, antibodies against outer surface protein A (OspA), OspC, and OspF were quantified in diagnostic serum submissions from horses with a history of vaccination with canine Lyme vaccines. The results suggested that many horses respond with low and often short-lasting antibody responses. Subsequently, four experimental vaccination trials were performed. First, we investigated antibody responses to three canine vaccines in B. burgdorferi-naïve horses. One killed bacterin vaccine induced antibodies against OspC. OspA antibodies were low for all three vaccines and lasted less than 16weeks. The second trial tested the impact of the vaccine dose using the OspA/OspC inducing bacterin vaccine in horses. A 2mL dose produced higher OspA and OspC antibody values than a 1mL dose. However, the antibody response again quickly declined, independent of dose. Third, the horses were vaccinated with 2 doses of a recombinant OspA vaccine. Previous vaccination and/or environmental exposure enhanced the magnitude and longevity of the OspA antibody response to about 20weeks. Last, the influence of intramuscular versus subcutaneous vaccine administration was investigated for the recombinant OspA vaccine. OspA antibody responses were not influenced by injection route. The current work highlights that commercial Lyme vaccines for dogs induce only transient antibody responses in horses, which can also be of low magnitude. Protection from infection with B. burgdorferi should not be automatically assumed after vaccinating horses with Lyme vaccines for dogs.

. Guarino et al. Vaccine. 2017 Jun 28. https://www.ncbi.nlm.nih.gov/pubmed/28668566

British Lord discusses Lyme in "Queen's Speech" debate, June 2017

This week has been a momentous time in the UK. Amidst a lot of pomp and pageantry, the annual Queen's Speech marks the State Opening of Parliament and presents a list of laws that the government hopes to get approved by Parliament in the coming year. After the Queen has presented it, Members of Parliament discuss it over the following five days. Today, as part of that discussion, Lord Astor of Hever, whose daughter has Lyme disease, made the following remarks.

"My Lords, I want to speak briefly on the specific health issue of Lyme disease, which is a rapidly increasing health risk in the United Kingdom. If Lyme disease is not treated early, it can cause significant illness and devastate affected patients' lives. This is what life has been like for my daughter, and I declare this personal interest.

Many noble Lords will be aware that ticks harbour Lyme disease, as well as many other equally serious infections. These infections are passed to humans and animals via the bite of an infected tick, due to and during their method of feeding. The danger is no longer confined to rural areas, with ticks now being found in every county of the United Kingdom, and increasingly so in urban parks and people's gardens.

If Lyme is diagnosed and treated early, the chances of a full recovery are good. However, failure to diagnose early and treat adequately can result in serious consequences to the patient. Tick-borne diseases that are misdiagnosed or neglected result in complicated infections, which have devastating and multi-systemic consequences. Patients can be left with extremely debilitating and chronic

symptoms, needing a wheelchair or completely bedridden, enduring intense and relentless suffering.

Despite the increasing threat that Lyme disease poses to public health, there remain no suitable UK official guidelines for diagnosis or treatment. What we do have is outdated National Health Service guidance, relying on guidelines written by the Infectious Diseases Society of America and supported by the CDC. According to the National Guideline Clearinghouse of America, the IDSA-CDC guidelines are not fit for purpose. They are outdated and do not take into account recent developments in the understanding of these complex infections.

The absence of adequate guidelines is closely linked to the fact that insufficient levels of training are available to our doctors. Even if a positive test is obtained, expertise is seriously lacking, both in value of interpretation and in dealing appropriately with the illness. That stark statement is in accordance with multiple testimonies from patients. Expert patient input is crucial in turning the situation into a positive solution, not only for patients themselves but for the National Health Service as a whole.

Failure to meet the challenges of Lyme disease has led to unknown numbers of people becoming infected, but not diagnosed or treated. It could amount to tens or even hundreds of thousands of people. The UK now finds itself in a situation where patients with diverse illnesses and symptoms might actually have unrecognised Lyme disease.

In these patients, the infection could have reached a stage where treatment will be difficult and lengthy and will require the supervision of expert physicians, trained and experienced in this complex disease and the frequently occurring co-infections.

The cost to the Exchequer in terms of numbers of patients unable to work and using the NHS for serious health problems must be a truly staggering amount. Neither this country, nor affected patients, can afford this. Early recognition of symptoms and early treatment would save our National Health Service a great deal of money.

Given the huge cost, both in terms of the impact on the patient's quality of life and, in practical terms, on our health service, it is clear how important it is to prevent as many cases as possible reaching this stage. Improvements in the training available to our doctors should be made a top priority. However, awareness among the general public of the risk posed by ticks should also be prioritized.

There are some very simple measures that can be taken to reduce one's chance of becoming infected with Lyme disease. However, few people have any knowledge of this. How can we safely, and with a clear conscience, encourage children to play outside and make the most of the outdoors if we are carelessly allowing them to risk their health by contracting one of these insidious, infectious diseases?

Outdated guidelines, unreliable blood tests, insufficient training for doctors, a lack of tick-borne specialists of calibre and a widespread lack of awareness among the general public of preventive measures are all factors that are leaving us alarmingly ill-equipped to tackle a problem that poses a rapidly increasing risk to every UK citizen. In the light of this, I ask my noble friend what his department is doing to ensure that GPs receive training in Lyme disease that is mandatory and thorough enough to allow them to make clinical diagnoses. Proper awareness will prevent the number of Lyme disease sufferers growing.

Lyme patients want to regain their health. They want to get back to work. They wish for nothing more than to regain control over their lives and take part in all the activities they enjoyed before they became

ill. Most Lyme patients have the will and determination to achieve this.

But none of these aims can happen if they are sidelined and hobbled by misguided opinion—which includes the current health system situation, with its constraints and limitations."

And for cat lovers in Britain - a low proportion of ticks on cats carry Lyme disease or Babesia.

Prevalence of ticks and tick-borne pathogens: *Babesia* and *Borrelia* species in ticks infesting cats of Great Britain

278 veterinary practices in Great Britain examined 1,855 cats. Six-hundred and one cats were found to have attached ticks (6.6%). Ixodid ticks was the only genus of ticks identified on cats in Great Britain. 1.8% of the ticks were positive for Lyme group bacteria and 1.1% for babsia. Veterinary Parasitology, Davies et al.
https://doi.org/10.1016/j.vetpar.2017.07.033

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

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

Disclaimer

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

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

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