


2017

# Education on Tick Bites, Tick Borne Disease, and Prevention in Middlebury, VT

Florence DiBiase

Follow this and additional works at: <https://scholarworks.uvm.edu/fmclerk>

 Part of the [Animal Diseases Commons](#), [Clinical Epidemiology Commons](#), [Community Health and Preventive Medicine Commons](#), [Infectious Disease Commons](#), [Interprofessional Education Commons](#), [Parasitic Diseases Commons](#), [Primary Care Commons](#), and the [Virus Diseases Commons](#)

---

## Recommended Citation

DiBiase, Florence, "Education on Tick Bites, Tick Borne Disease, and Prevention in Middlebury, VT" (2017). *Family Medicine Clerkship Student Projects*. 264.

<https://scholarworks.uvm.edu/fmclerk/264>

This Book is brought to you for free and open access by the Larner College of Medicine at ScholarWorks @ UVM. It has been accepted for inclusion in Family Medicine Clerkship Student Projects by an authorized administrator of ScholarWorks @ UVM. For more information, please contact [donna.omalley@uvm.edu](mailto:donna.omalley@uvm.edu).

A close-up photograph of a brown tick on a green leaf. The tick is positioned in the center-right of the frame, with its body and legs clearly visible. The leaf is a vibrant green and has a prominent vein running diagonally across it. The background is a soft, out-of-focus green.

# Education on Tick Bites, Tick Borne Disease, and Prevention in Middlebury, VT

**Florence DiBiase, MS3**

**Family Medicine Rotation: May-June 2017**

**Clinical Site: Middlebury Family**

**Health, Middlebury, VT**

**Faculty Mentors: Dr.**

**Andersson-Swayze, Dr. Fuller,**

**Dr. Larson, Dr. Miller, Dr. Puls,**

**Dr. Wilhelm**

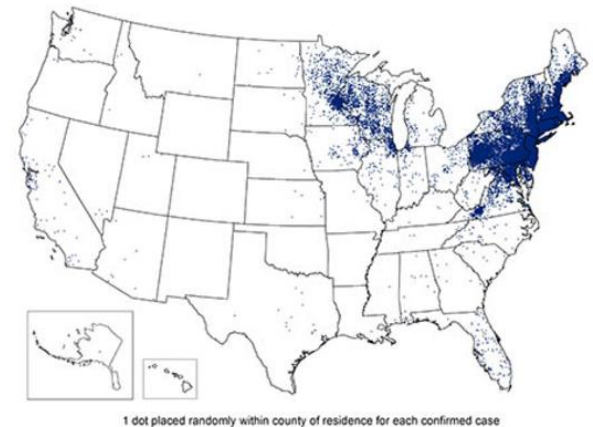
# Problem Identification and Need

- Tick bites and tick borne diseases are increasing in prevalence in Vermont
  - A 2015 study found US cases of Lyme disease had risen 200% since 2005
    - VT is one of 14 states that account for 95% of Lyme disease
    - Incidence of 240,000-440,000 cases/year
  - 2017 has thus far continued this upward trend
  - Over 60% of *I. scapularis* ticks in Vermont carry at least one pathogen, and 52.8% of the ticks tested carried *Borrelia burgdorferi*
- Patient awareness and preventative actions are lacking, especially in regards to more recently identified diseases
  - A 2015 study demonstrated 21% of US respondents had a household member that had found a tick on his or her body in the previous year, but patients were not well informed on endemic areas
  - In the same study, 20.8% of respondents from New England reported they had not heard of any tick borne diseases in their area, and 51.2% of respondents reported they did not routinely take personal prevention steps against ticks
- There is increased need for education of both patients and providers
  - **Patients:** Prevention, how to remove ticks safely, and when to seek medical help
    - This can help to prevent disease, allow patients to enjoy the outdoors safely, and eliminate unnecessary healthcare spending
  - **Providers:** How to educate patients, when to suspect disease, when to treat prophylactically, and how to treat disease
    - This can help prevent disease, eliminate complications of disease, and decrease antibiotic resistance

Reported Cases of Lyme Disease -- United States, 2001

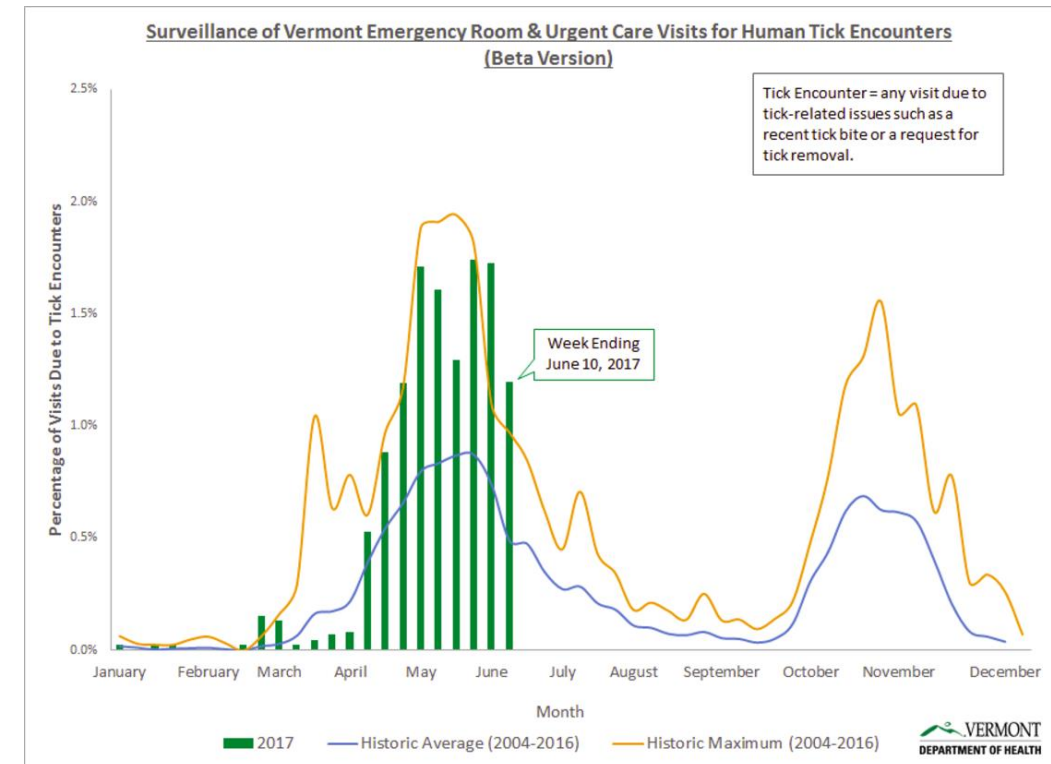


Reported Cases of Lyme Disease -- United States, 2015



# Public Health Cost and Unique Cost Considerations in Host Community

- Burden of diseases- chronic multisystem complications and can even be fatal
  - Lyme Disease
    - Patient with Lyme disease spend on average \$2,968 higher total healthcare costs and 87% more outpatient visits over the course of 1 year in comparison to matched controls with no evidence of Lyme exposure
    - Testing for Lyme disease alone costs \$492 Million annually
  - Anaplasmosis
  - Erlichiosis
  - Babesiosis
  - Powassan Virus
    - No cure, 10% fatality rate
- Antibiotic resistance due to excessive prophylactic treatment
- Threatening enjoyment of rural living, working in natural habitats, and maintaining an active lifestyle
  - Farmers, owners of sugarwoods, and outdoor leisure enthusiasts make up a significant portion of the community in Addison county





# Community Perspective on Issue and Support for Project

- Community Interviews:

- Dr. Chris Grace, MD, FIDSA- Medical Director of Infectious Disease at UVMMC
- Jeffrey Heath, RN- Public Health Nurse Supervisor at Middlebury Office of Local Health
- Sydney White, BSN, RN- Public health Nurse at Vermont Department of Health

- Interview Takeaways:

- Addison County is both identifying tick borne diseases and testing for tick borne diseases more frequently, esp. Lyme Disease and Anaplasmosis
  - Likely a combination of increased prevalence as well as increased awareness/clinical suspicion
  - Tick panels have increased ease of testing
- Warmer winters, fluctuations in populations of animal hosts, and migration of new diseases northward suggest these issues will continue to rise
- The most vital changes for providers to make
  - Continuing to research and share information on these diseases
  - Self-educate regarding presenting disease symptoms
  - Educate patients whenever possible
  - Standardize prophylaxis and treatment regimens based on evidence based guidelines

# Intervention and Methodology

- A 6-page educational guide was created by combining information from online articles, the CDC, the VT Department of Health, and community interviews:
- **Provider Handout (pg. 1-5)**
  - *Fast Facts:* Recent statistics on VT tick borne diseases
  - *Recognizing VT Native Ticks:* color images, diseases transmitted, and peak seasons
  - *Tick borne diseases Cheat Sheet:* Signs and symptoms, lab findings, diagnostic testing, and treatment
- **Patient Education Handout (pg. 6)**
  - Attachable PDF handout created to be implemented into electronic health record patient education materials
    - Contains a 2 in x 3 in card that patients can cut out and keep handy in wallet

## TICK BITES, TICK BORNE DISEASE, AND PREVENTION IN VERMONT

A Provider and Patient Guide  
Hudson Valley, VT  
Nativity Medical Community Project, June 2017

### Fast Facts: Tick Borne Disease in Vermont

Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Lyme Disease	74	108	136	140	123	175	276	308	473	462	491
Anaplasmosis	3	3	3	3	3	10	17	17	17	17	14

Ticks have been present at a rate of 10 cases per year since 2006. There has been one confirmed case of babesiosis in VT in 2016.

	Prevalence of Tick Bites	Prevalence of Tick Borne Diseases
Female	1.0%	
Male	0.8%	
Age	10.0%	



### TICK BORNE DISEASES CHEAT SHEET (Ed.)

Disease Name	Signs and Symptoms	Lab Findings	Testing the Diagnosis	Treatment
<b>Babesiosis</b>	Flu-like illness, fever, muscle aches, fatigue, weakness, dark urine, jaundice, hemolytic anemia, splenomegaly, hepatomegaly, leukopenia, thrombocytopenia, renal insufficiency, acute respiratory distress syndrome	Decreased hemoglobin, decreased hematocrit, decreased hematology, decreased platelets, decreased leukocytes, decreased neutrophils, increased reticulocytes, increased bilirubin, increased lactate dehydrogenase (LDH)	Microscopic examination of peripheral blood smear showing characteristic "bamboo" appearance of infected red blood cells. Serologic testing for Babesia microti and Babesia divergens. PCR testing for Babesia microti and Babesia divergens.	Antibiotics (doxycycline + clindamycin) and transfusion if severe. Supportive care.
<b>Ehrlichiosis</b>	Fever, chills, headache, muscle aches, fatigue, weakness, nausea, vomiting, diarrhea, cough, sore throat, chest pain, confusion, delirium, coma	Leukopenia, thrombocytopenia, elevated liver enzymes, elevated creatinine, elevated lactate dehydrogenase (LDH)	Microscopic examination of peripheral blood smear showing characteristic "apple core" appearance of infected white blood cells. Serologic testing for Ehrlichia ewingii and Ehrlichia granovorum. PCR testing for Ehrlichia ewingii and Ehrlichia granovorum.	Antibiotics (doxycycline) and supportive care.
<b>Anaplasmosis</b>	Fever, headache, vomiting, and generalized weakness, muscle aches, fatigue, weakness, nausea, vomiting, diarrhea, cough, sore throat, chest pain, confusion, delirium, coma	Leukopenia, thrombocytopenia, elevated liver enzymes, elevated creatinine, elevated lactate dehydrogenase (LDH)	Microscopic examination of peripheral blood smear showing characteristic "pearl chain" appearance of infected white blood cells. Serologic testing for Anaplasma phagocytophilum. PCR testing for Anaplasma phagocytophilum.	Antibiotics (doxycycline) and supportive care.

## Recognizing Vermont Native Ticks

**Blacklegged tick (Ixodes scapularis)**

- Transmits Lyme disease, Anaplasmosis, Babesiosis, Powassan virus, Borrelia burgdorferi
- Peak activity: March through September, particularly May and June, October and November

**Deer tick (Ixodes ricinus)**

- Transmits Lyme disease, Babesiosis, Anaplasmosis
- Peak activity: April-September

**Rocky Mountain wood tick (Dermacentor variator)**

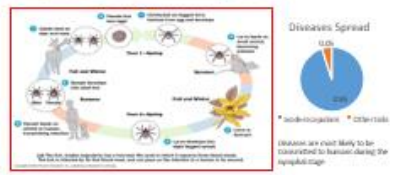
- Transmits Rocky Mountain spotted fever, ehrlichiosis, anaplasmosis
- Peak activity: April-September

**Winter tick (Parasitus americanus)**

- Transmits E. coli
- Peak activity: April-September

**Scrub tick (Ixodes trianguliceps)**

- May be active throughout the year



## Preventing Tick Bites and Tick Borne Disease

**Prevent Tick Bites & Tick Borne Disease**

- Ticks are usually found in brushy or wooded areas
- They crawl onto you, but do not climb tall grasses or shrubs unless they are disturbed at a fault
- **Prevention:**
  - Use repellents that contain DEET, picaridin, or IR3535 on exposed skin for protection
  - Treat clothing and gear with products containing permethrin
  - Avoid ticks and ticks for ticks
  - Check for ticks every day. Don't forget under your arms, around your ears, in your hairy places, behind the knees, between the legs, and on the hands and scalp. Ask someone for assistance if available
  - Shower soon after being outdoors
- **Tick Removal (Largest Tick Centers for Disease Control information)**
  - Should you find a tick, remove it as soon as possible. Note whether the tick is engorged when you remove it
  - Use the tip of tweezers to grasp the tick as close to the skin surface as possible
  - Pull upward with steady, firm pressure
  - Don't twist or jerk the tick. This can cause the mouth parts to break off and remain in the skin
  - If you are unable to remove the mouth parts easily, leave them alone and let them fall off
  - After removing the tick, thoroughly clean the bite area and your hands with rubbing alcohol or soap and water
  - Dispose of the tick by submerging it in alcohol, placing it in a sealed bag/container, or flushing it down the toilet. Never crush a tick with your fingers
- **When to call the doctor**
  - The tick is a blacklegged tick
  - The tick is engorged
  - The tick has been embedded for 36 hours
  - You have any of the following symptoms (with or without a history of a tick bite)
    - A rash (most commonly looks like a bull's-eye)
    - Flu-like symptoms: headache, fever, muscle aches, joint pains and swelling, swollen lymph nodes

# Results



Samples from Different Sections of Educational Guide:

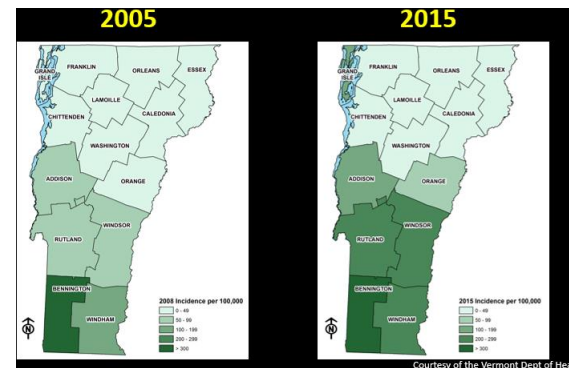
- Educational materials compiled and presented to Middlebury Family Health in guide
  - Help providers make clear and educated decisions in patient care
  - Help patients avoid tick bites and when bitten, know the next steps
- Results of this intervention should be more apparent over time and are something to watch for beyond the end of this clinical rotation

### Blacklegged tick (*Ixodes scapularis*)

- Transmits: Lyme Disease, Anaplasmosis, Babesiosis, Powassan virus, Borrelia miyamotoi disease
- Peak activity: March through November, particularly May and June, October and November



	Incubation Period	Signs and Symptoms	Lab Findings	Testing for Diagnosis	Treatment
Lyme Disease	3-30 days	<b>Localized Stage</b> - Erythema Migrans (classic rash not present in all cases) - Flu-like symptoms- malaise, headache, fever, myalgia, arthralgia - Lymphadenopathy <b>Disseminated Stage:</b> - Multiple secondary annular rashes - Flu-like symptoms - Lymphadenopathy <b>Rheumatologic:</b> migratory arthritis and effusion in one or multiple joints, migratory pain in tendons, bursae, muscle, and bones, Bakers cyst <b>Cardiac:</b> Conduction abnormalities, myocarditis, pericarditis <b>Neurologic:</b> Bell's Palsy, cranial neuropathy, meningitis, motor and sensory radiculoneuropathy, moneuritis multiplex, subtle cognitive difficulties, encephalitis/pseudotumor cerebri (rare) <b>Additional:</b> Conjunctivitis, keratitis, uveitis, mild hepatitis, splenomegaly	- Elevated ESR - Mildly elevated hepatic transaminases - Microscopic hematuria or proteinuria - CSF shows lymphocytic pleocytosis, slightly elevated protein, and normal glucose in meningitis	<b>- Two tier testing protocol:</b> Demonstration of diagnostic IgM or IgG antibodies in serum. EIA or IFA should be performed first, if positive or equivocal is followed by a western blot - Isolation of an organism from a clinical specimen - If testing for Lyme meningitis, intrathecal IgM or IgG antibodies Notes: - Serologic tests are insensitive during the first few weeks of infection, can dx clinically with EM rash - With illness >1mo. Only IgG testing should be performed	Treatment duration= 14-21 days <b>Adults:</b> Doxycycline 100mg BID orally OR Cefuroxime axetil 500mg TID orally OR Amoxicillin 500mg TID orally <b>Children:</b> Amoxicillin 50mg/kg per day orally, divided into 3 doses (max 500mg/dose) OR Doxycycline 4mg/kg per day orally, divided into 2 doses (max 100mg/dose) OR Cefuroxime axetil 30mg/kg per day orally, divided into 2 doses (max 500mg/dose)
	1-2 weeks	- Fever, shaking, chills - Severe headache - Malaise - Myalgia - GI: nausea, vomiting, diarrhea, anorexia - Cough - Rash (rare)	- Mild anemia - Thrombocytopenia - Leukopenia- relative and absolute lymphopenia with left shift - Mild to moderate elevations in hepatic transaminases - Visualization of morulae in cytoplasm of granulocytes	- Detection of DNA by PCR of whole blood (within first week of illness) - Demonstration of 4x change in IgG-specific antibody titer by IFA assay in paired serum samples (first sample in first week of illness, second 2-4 wks later) * Do not delay treatment until after laboratory confirmation*	Treatment duration= 10-14 days <b>Adults:</b> Doxycycline 100mg BID, orally or IV <b>Children &lt;100lbs:</b> Doxycycline 2.2mg/kg per dose BID (max 100mg/dose), orally or IV



### Tick Identification Card

**Blacklegged Tick (*Ixodes scapularis*)**

adult female    adult male    nymph    larva

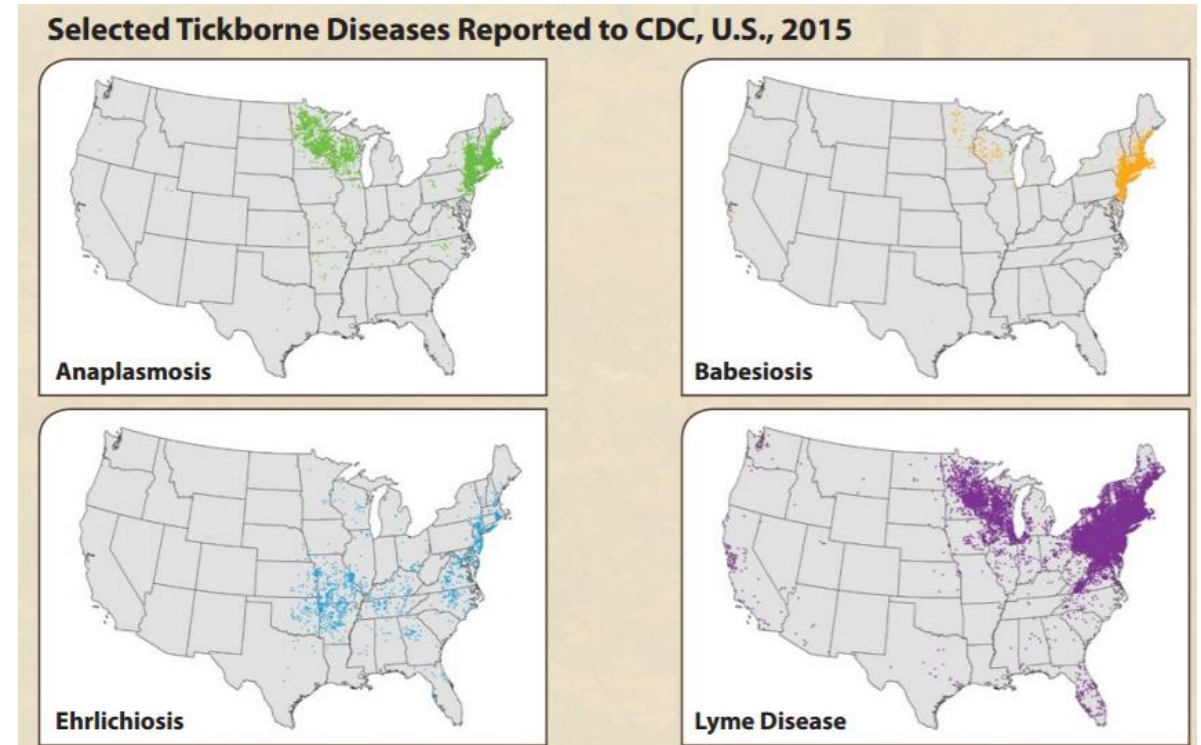
**Easy ways to prevent tick bites:**

- Wear long sleeves and pants in light colors
- Use insect repellent containing  $\geq 20\%$  DEET
- Do whole-body tick checks every day
- Shower as soon as possible

Tick removal technique:

# Evaluation of Effectiveness and limitations

- In the process of sharing pamphlet with MFH staff and obtaining feedback
- Limitations:
  - No matter how educated we become, these issues are unlikely to disappear
  - This project is just one way to spread awareness and educate patients and providers
  - It would be helpful to discuss handout with patients presenting for tick bites and obtain their input on its usefulness
  - Results could be strengthened using additional resources from the Vermont Department of Health and the CDC, especially the “Be Tick Smart” program material



**BE TICK  
SMART**  
REPEL • INSPECT • REMOVE



# Recommendations for Future Interventions and Projects

- MFH could continue to order Be Tick Smart pamphlets and tick identification cards for the waiting room/office
- Hosting a class in the community to increase awareness of disease rates and prevention strategies
  - Before and after surveys to determine benefit
- Surveying Providers about use of prophylactic Doxycycline for Lyme Disease
- Streamlining the triage process for patients calling or using the online portal for complaints of tick bites
- Working with UVMHC, Middlebury College, and other academic institutions in the state to improve research, understanding, and treatments available
- Learn more about new research efforts for a Lyme Vaccine (new clinical trial in the U.S. and Belgium as of 2017)

# References

- Adrion ER, Aucott J, Lemke KW, Weiner JP. Health Care Costs, Utilization and Patterns of Care following Lyme Disease. Brissette CA, ed. *PLoS ONE*. 2015;10(2):e0116767. doi:10.1371/journal.pone.0116767.
- Hinckley, AF, Connally, NP, Meek, JI, Johnson, BJ, Kemperman, MM, Feldman, KA, White, JL, Mead, PS. Lyme Disease Testing by Large Commercial Laboratories in the United States. *Clin Infect Dis* 2014; 59 (5):676-681. doi: 10.1093/cid/ciu397
- Centers for Disease Control. How to Remove a Tick. June 1, 2015. [https://www.cdc.gov/ticks/removing\\_a\\_tick.html](https://www.cdc.gov/ticks/removing_a_tick.html) (image also obtained from this page)
- Grace, C. Tick Borne Illnesses in Vermont: Science and Controversies. 43<sup>rd</sup> Vermont Family Medicine Review Course, 8 June 2017.
- Grace, C. (2017, June 7). Email interview.
- Heath, Jeffrey, RN. Middlebury Office, VT Department of Health. (2017, June 12). Phone interview.
- Hook, S., Nelson, C.A., Mead, P.S. U.S. Public's experience with ticks and tick-borne diseases: results from national HealthStyles surveys. *Ticks and Tick Borne Diseases*. June 2015. 6(4): 483-488. <https://doi.org/10.1016/j.ttbdis.2015.03.017>
- Hu, Linden, MD. Evaluation of a tick bite for possible Lyme disease. In: UpToDate, Post TW (Ed), UpToDate, Waltham, MA. (Accessed on June 9 2017). [https://www.uptodate-com.ezproxy.uvm.edu/contents/evaluation-of-a-tick-bite-for-possible-lyme-disease?source=see\\_link&sectionName=Efficacy%20and%20rationale&anchor=H7#H7](https://www.uptodate-com.ezproxy.uvm.edu/contents/evaluation-of-a-tick-bite-for-possible-lyme-disease?source=see_link&sectionName=Efficacy%20and%20rationale&anchor=H7#H7)
- U.S. Department of Health and Human Services Center for Disease Control and Prevention. Tickborne Disease of the United States: A Reference Manual for Health Care Providers, 4<sup>th</sup> edition. 2017. <https://www.cdc.gov/lyme/resources/TickborneDiseases.pdf>
- Vermont Department of Health. Information on ticks in Vermont. 2017. <http://www.healthvermont.gov/immunizations-infectious-disease/mosquito-tick-zoonotic-diseases/types-ticks-vermont>
- White, Sydney. (2017, June 13). Email interview.
- Wormser, G. P., Dattwyler, R. J., Shapiro, E. D., Halperin, J. J., Steere, A. C., Klempner, M. S., Krause, P. J., Bakken, J. S., Strle, F., Stanek, G. et al. The clinical assessment, treatment, and prevention of Lyme disease, human granulocytic anaplasmosis, and babesiosis: Clinical practice guidelines by the infectious Diseases Society of America. *Clinical Infectious Disease* 2006, 43 (9): 1089-1134. DOI: <https://doi.org/10.1086/508667>

## IMAGES:

- Images of Blacklegged tick with dime, Life cycle, Insect repellent, embedded tick, engorged tick, and erythema migrans rash all obtained from Dr. Grace's lecture (cited above)
- Images of Ticks Species: Centers for Disease Control and Prevention, National center for Emerging and Zoonotic Infectious Diseases. "Geographic distribution of ticks that bite humans." June 1, 2015. [https://www.cdc.gov/ticks/geographic\\_distribution.html](https://www.cdc.gov/ticks/geographic_distribution.html)
- Michigan Emerging Disease Issues, Treatment and Prevention. "Protect yourself against Lyme disease in spring, summer, and fall." 2017.
- "Dotted Line Clip Art." ClipartAll. 2017. <http://clipartall.com/img/clipart-171908.html>

# Interview Consent Form

- Thank you for agreeing to be interviewed. This project is a requirement for the Family Medicine clerkship. It will be stored on the Dana Library ScholarWorks website. Your name will be attached to your interview and you may be cited directly or indirectly in subsequent unpublished or published work. The interviewer affirms that he/she has explained the nature and purpose of this project. The interviewee affirms that he/she has consented to this interview. Yes  / No  If not consenting as above: please add the interviewee names here for the department of Family Medicine information only.