

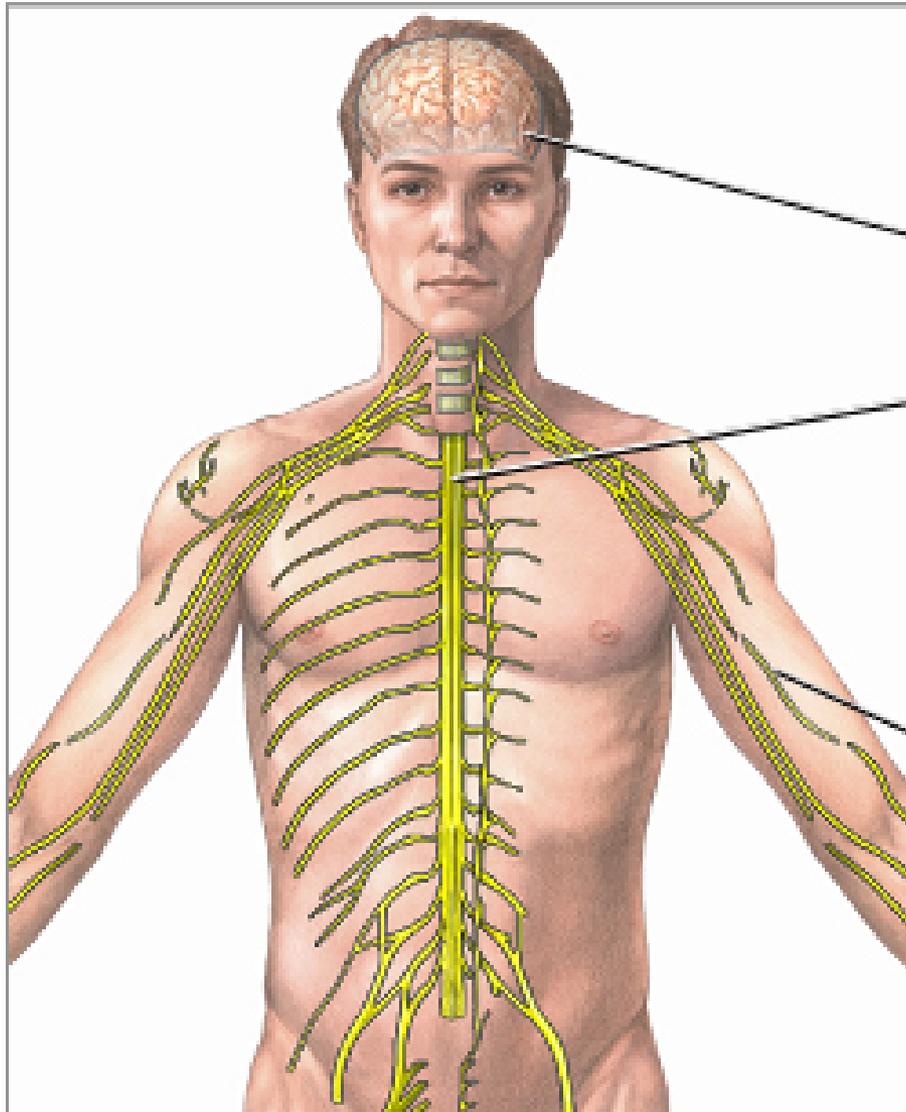
Borrelia and the Brain & Current Research at Columbia

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COLUMBIA UNIVERSITY
IRVING MEDICAL CENTER

Lyme and Tick-Borne
Diseases Research Center



Central nervous system

Brain

Spinal cord

Peripheral nervous system

Peripheral nerve

 ADAM.

Manifestations of Central Nervous System (CNS) Lyme: Meningitis

- ▶ Inflammation of membranes around the brain.
- ▶ Symptoms:
 - Headaches, neck stiffness,
 - Nausea/vomiting
 - Light sensitivity, fever
- ▶ Markers:
 - Cerebrospinal fluid shows elevated white blood cells
 - Elevated Borrelia-specific antibodies in the CSF
 - Sometimes elevated protein

Common Symptoms



Fever
Headache
Neck Pain

Manifestations of CNS Lyme: Encephalitis

- ▶ Inflammation of the brain tissue
- ▶ Symptoms:
 - Sleepiness
 - Neurologic:
 - confusion, cognitive changes, seizures
 - Psychiatric:
 - Mood swings, mood lability, sudden tearfulness
 - Hallucinations
 - Personality or behavior changes
- ▶ Brain Markers:
 - EEG – mild slowing; MRI – focal inflammation
 - PET scan – areas of increased metabolism or flow
 - Spinal fluid – may show oligoclonal bands, Bb antibodies



Manifestations of CNS Lyme: Cranial Neuritis

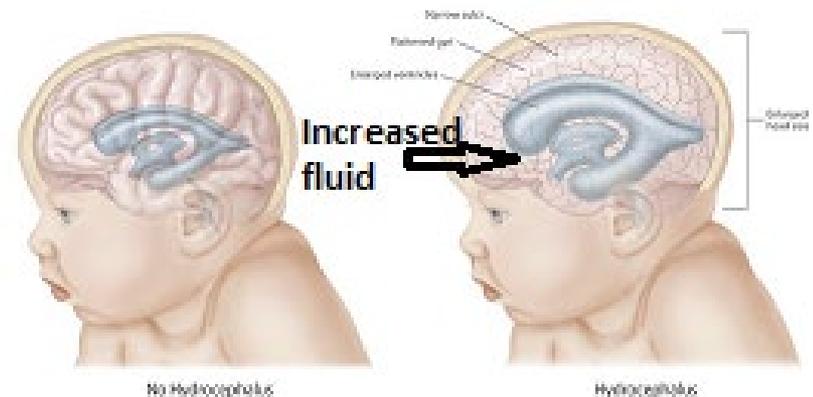
- ▶ Inflammation of cranial nerves
 - Facial nerve palsy CN VII – sudden –
 - suggests a stroke on one or both sides
 - also may have eye tearing, sound sensitivity, altered taste
 - Optic nerve (CN II) – change in vision
 - Involvement of other cranial nerves:
 - changes in facial sensation (CN V – trigeminal)
 - double vision (CN III, IV, VI)
 - hearing loss, ringing in the ears (tinnitus), balance – CN VIII (auditory/balance)



Double Vision
Double Vision
Double Vision
Double Vision
Double Vision
Double Vision

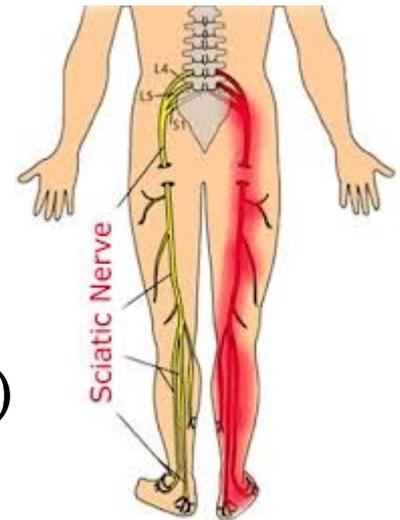
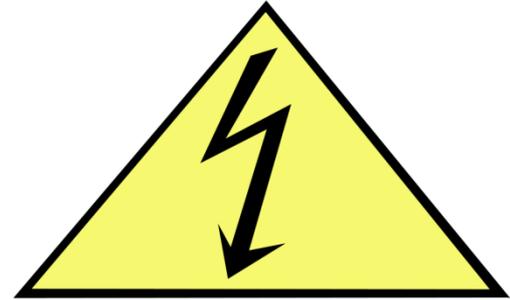
Manifestations of CNS Lyme: Pseudotumor Cerebri

- ▶ Increased intracranial pressure – may lead to compression of the optic nerve.
- ▶ Most common in children & young adults
- ▶ Symptoms:
 - Blurred vision, double vision, loss of vision
 - Feeling dizzy, nausea/vomiting
 - Neck stiffness, Frequent headaches, difficulty walking
 - Persistent ringing in the ears (tinnitus)
 - Forgetfulness, Depression
- ▶ Markers:
 - Swelling of the optic disc
 - Elevated spinal fluid pressure
 - Sometimes increased # of CSF WBC



Other neurologic manifestations: Radiculoneuritis / Radiculopathy

- ▶ Nerve dysfunction due to inflammation of the roots of the spinal nerve.
- ▶ Pain can be the most severe ever
- ▶ Symptoms:
 - **Sensory:**
 - numbness, tingling, increased sensitivity
 - sharp, stabbing, burning or shooting pains that radiate along the nerves.
 - Can be intermittent and worse at night.
 - **Motor:** can get weakness in the areas affected by the inflamed nerve (eg, limbs)



Radiculitis /Radiculopathy



- ▶ **NOTE: In Europe, radicular pain is the most common presentation of Neuroborreliosis (~60%) – and the one that is slowest to recognize.**
- ▶ There may not be fever, cranial neuropathy or severe headaches – this leads to delays in treatment and increased frequency of residual symptoms
- ▶ 44% had residual symptoms if treatment is >1 month after symptom onset vs 16% for those treated within 1 month of symptom onset

(Knudtzen, Clinical Inf Disease, 2017).

Acute & Chronic Neuropsychiatric Symptoms

- ▶ **Cognitive changes**
 - verbal fluency, memory, processing speed
- ▶ **Mood changes:**
 - Mild to moderate depressed mood is common
 - Anxiety and panic attacks
 - Suicidal thoughts in 20% when symptoms are chronic
- ▶ **Sensory hyperarousal (light, sound, touch)**
- ▶ **Excessive sleepiness, fatigue, & pain**
- ▶ **Less common or rare:**
 - Mania, hallucinations, dementia

Is the Spinal Fluid useful? Yes, but...

- ▶ PCR of the CSF is + only 25–38% of the time
- ▶ The CSF may not show intrathecal antibody production using the routine Lyme tests.
 - In our study, 12.5% were positive using the standard ELISA in the CSF....but 60% were positive using the C6 Peptide ELISA as the CSF test.
- ▶ The CSF may be the only fluid that shows a positive test for Lyme disease
 - In a recent Danish study, 15% of the patients with spinal fluid positive neurologic Lyme disease had negative blood tests for Lyme disease (Clinical Infectious Disease 2017)

Selected Current Research

▶ Epidemiologic Study

- Danish National Cohort Study to assess risk of Psychiatric Disorders & Suicidality after Lyme

▶ Coinfection Study (with Tokarz Tick Serochip)

▶ Clinical Studies seeking Patients:

- Powassan Virus Study
- Disulfiram Treatment Study
- Meditation and Yoga Treatment Study

Powassan Virus Study

- ▶ NIH Grant – PI: Margaret MacDonald, MD, PhD (Rockefeller University).
Site PI: Brian Fallon, MD, MPH (Columbia)
- ▶ **Goals:** a) an improved diagnostic test
b) development of a treatment

How can you help? You can help TODAY.

Come to our blood draw research screening clinic at the Hudson Valley Healing Arts Health Center for a free Lyme and Powassan Virus test. Results will be sent to you by mail.

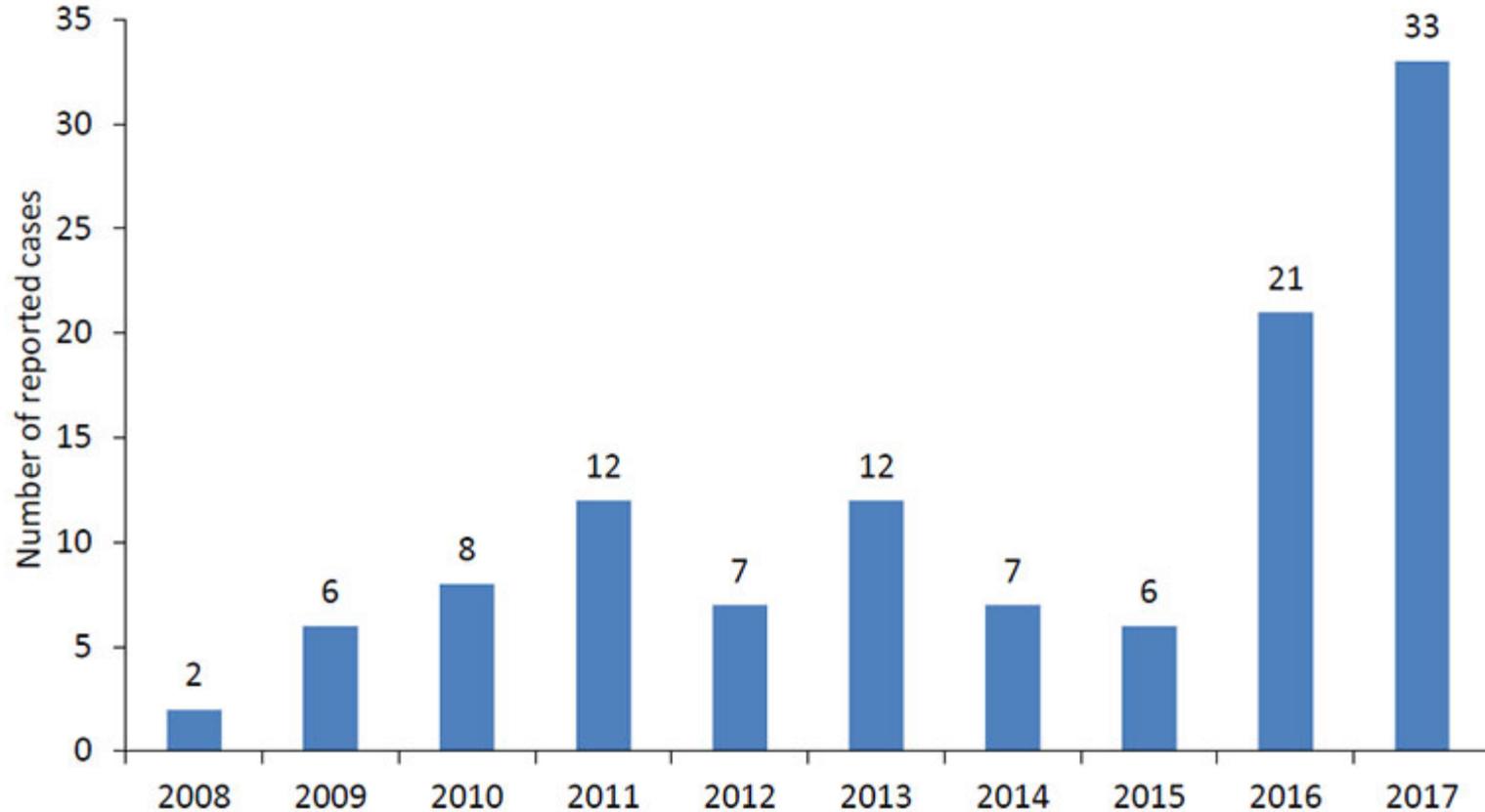
Office of Dr. Richard Horowitz
4232 Albany Post Rd, Hyde Park, NY 12538

Powassan Virus primer

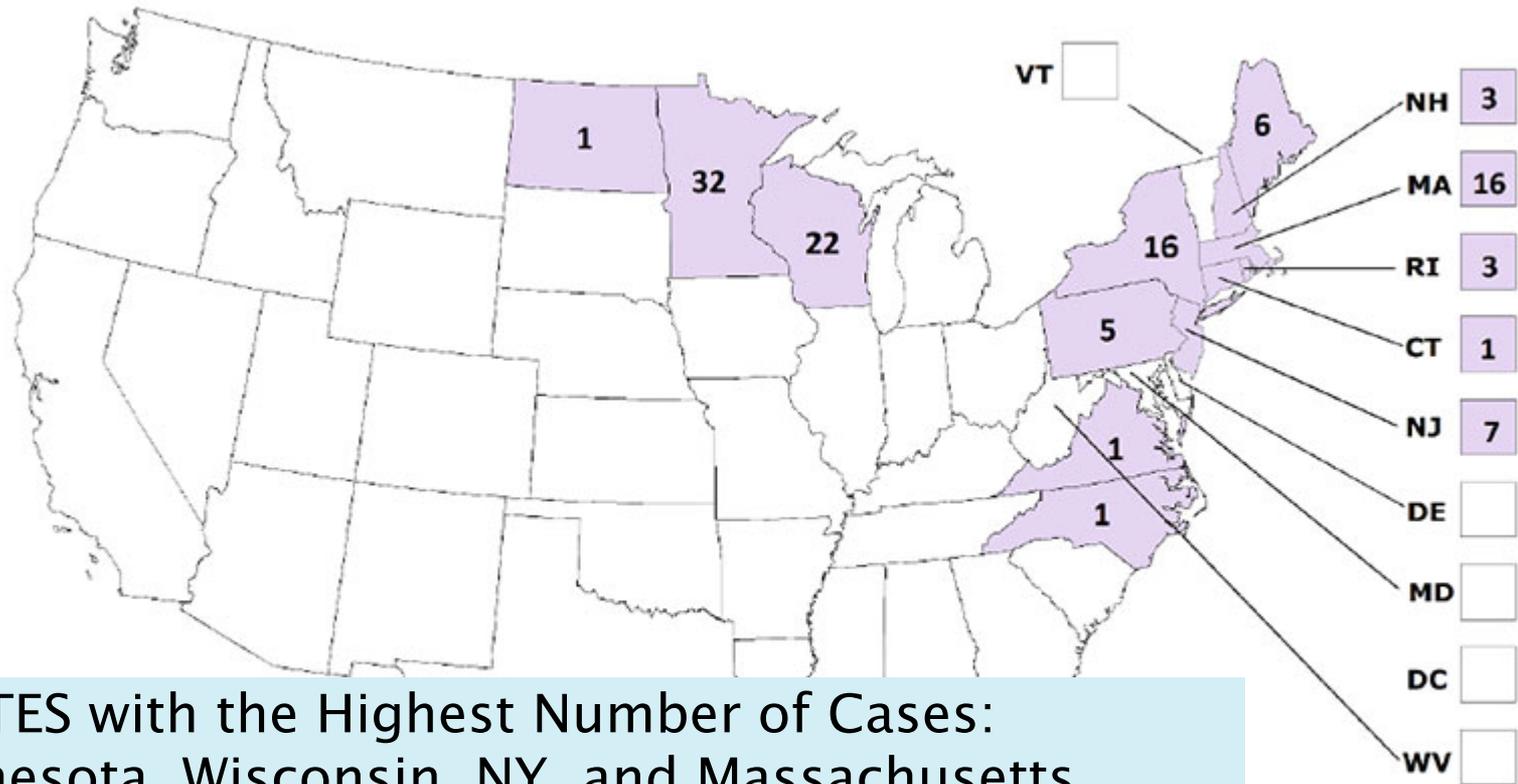
- ▶ Found in 3–4% of ticks in lower NYS
- ▶ Can be transmitted within 15 minutes of bite
- ▶ Most POWV infections do not cause symptoms
- ▶ CNS Manifestations: **encephalitis & meningitis**
 - fever, headache, vomiting, weakness, confusion, loss of coordination, speech difficulties, and seizures.
- ▶ Neuroinvasive Powassan Virus
 - **10% death. 50% of survivors have permanent neurological symptoms**, such as recurrent headaches, muscle wasting and memory problems
 - Treatment: none, other than supportive measures

Powassan virus neuroinvasive disease case rates are increasing: 2008–2017, CDC

Source: ArboNET, Arboviral Diseases Branch, Centers for Disease Control and Prevention



Powassan Virus Neuroinvasive Cases CDC 2008–2017



STATES with the Highest Number of Cases:
Minnesota, Wisconsin, NY, and Massachusetts

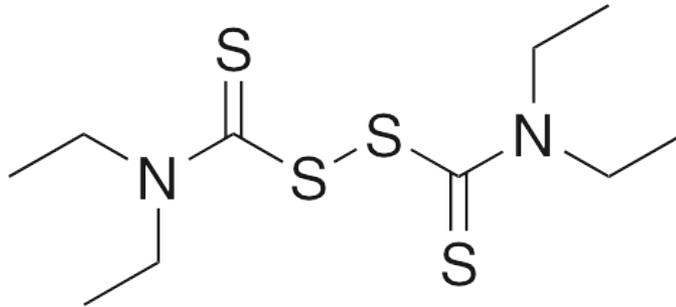
NY had 6 cases in 2017

Who is eligible – blood screening clinic today – Lyme & Powassan tests

- ▶ Two Groups (age 18–75):
 - **Lyme Group (n=160):** Diagnosed with LD in the past 5 years
 - **Healthy Control Group (n=40):** no diagnosis of Tick-borne illness, no tick bite or flu-like illness in the last 6 months, and medically healthy
- ▶ Willing to complete questionnaires, sign consent, and have blood drawn. The first 200 will be eligible.
- ▶ Location: **Hudson Valley Healing Arts Health Center, 4232 Albany Post Rd, Hyde Park, NY (3:30–8:30)**

Disulfiram (“Antabuse”) Treatment

- ▶ Based on laboratory research at Stanford Univ and Northeastern University
 - Disulfiram kills both **actively replicating Borrelia** and the more dormant “**persisters**”



- ▶ Disulfiram has been in use for over 70 years for the treatment of alcoholism
- ▶ Initial clinical reports (Dr. Liegner) among patients with persistent Lyme symptoms are encouraging

Goals of this Disulfiram Study

- To assess symptom change
 - Do patients improve?
 - Which clinical symptoms respond best?
 - What is the magnitude of the clinical improvement?
 - Does duration of treatment make a difference?
 - Is improvement sustained when off of disulfiram
- To assess side effect profile, tolerance and compliance.
- This is a research study. There will be no financial cost for participation.

Assessments: Disulfiram Study

- ▶ **Borrelia and Babesia** for screening. Other coinfection tests done experimentally.
- ▶ **Neurologic studies:**
 - Autonomic function
 - Heart rate variability
 - Sweat gland function
 - Sensory Sensitivity (light, touch, sound, heat)
 - Full Neurologic exam
 - Neurocognitive testing
 - Functional brain imaging (if you participate in imaging study)
- ▶ **Clinical measures:** fatigue, pain, physical and mental function, cognition, quality of life.
- ▶ **Microbiome:** fecal matter studies



Who might be eligible for the disulfiram study?

- ▶ Age 18–65
- ▶ Persistent moderate to severe fatigue after well-documented Lyme within the last 8 years
- ▶ Willing to avoid:
 - antibiotics for 3 months prior and during the study
 - all alcohol & cannabis
- ▶ Patients with unstable other medical illness or history of cardiac or liver disease are excluded

Meditation and Yoga Study

- ▶ Last chance to enroll.
- ▶ Group session weekly for 8 weeks
- ▶ Location: Fairfield CT
- ▶ Leader: Dr. Charles Alexander
- ▶ Eligible:
 - Age 18–65
 - **Prior treatment for Lyme disease but still have persistent pain and/or fatigue**
 - Willing to do daily meditation/yoga for 8 weeks and attend group session 1x week.



Summary

- ▶ **Please participate in the blood screening clinic today** (until 8:30 pm for first 160 patients and 40 healthy controls) at Dr. Horowitz' office at
4232 Albany Post Rd, Hyde Park
- ▶ **Please contact us if interested in our Treatment Studies**
Disulfiram study 646-774-6491 (Jess)
Meditation/Yoga study 646-774- 8100 (Lilly)

Enrolling NOW!

For More Information about Lyme & Tick-borne Diseases

Website: www.columbia-lyme.org

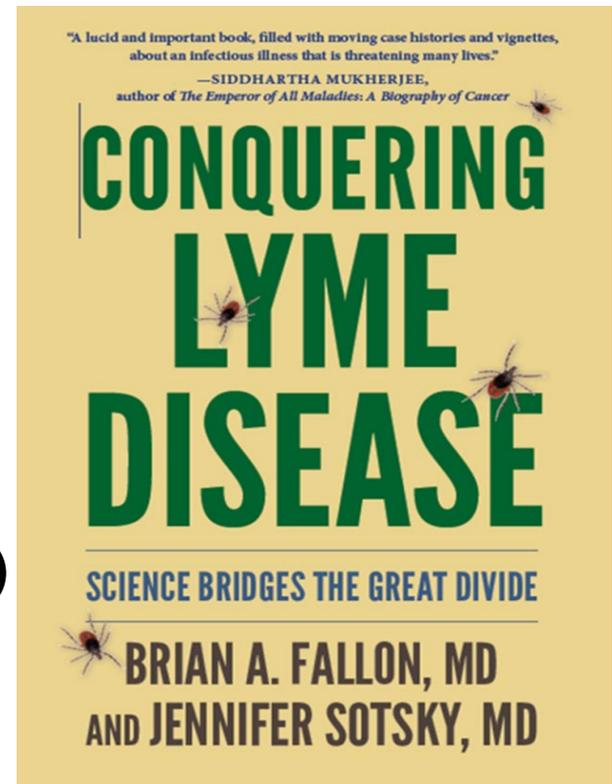
Book:

Conquering Lyme Disease

(Columbia Press, paperback)

Winner, 2019 Choice Award

(All Proceeds support research)



Thank you

- ▶ Dutchess County Legislature
- ▶ Dr. Richard Horowitz, Dr. Ken Liegner
- ▶ NIH, FDC Foundation, Cohen Foundation, Global Lyme Alliance, New York State
- ▶ Our team:

