NEW YORK CITY DEPARTMENT OF
HEALTH AND MENTAL HYGIENE
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Commissioner

2021 Health Advisory #10: Tick-borne Disease Advisory

Please share with your colleagues in Internal and Family Medicine, Pediatrics, Infectious Disease, Infection Control, Laboratory Medicine, Hematology, Cardiology, Neurology, Rheumatology, Critical Care and Emergency Medicine.

- **Tick-borne diseases (TBD) are associated primarily with travel outside of New York City, with the exception of endemic spotted fever group rickettsial diseases (e.g., Rocky Mountain spotted fever (RMSF) and rickettsialpox, which is endemic to NYC and transmitted by the mouse mite, not ticks).**
- **Locally acquired cases of Lyme disease and babesiosis continue to be reported from Staten Island. A smaller number has historically been reported from the Bronx, though none were reported in 2020. Sporadic isolated cases of locally acquired anaplasmosis and ehrlichiosis have also been reported from Staten Island since 2017.**
- **The overall number of cases of anaplasmosis remains low but has been increasing in recent years with a 60% increase from 2018 to 2020. This increasing trend is also seen in states endemic for TBDs.**
- **Refer to the Centers for Disease Control and Prevention for comprehensive details and guidance on identification, diagnosis, treatment and prevention of tick-borne diseases.**

June 9, 2021

Dear Colleagues,

New York City (NYC) clinicians should be on the alert for patients with tick-borne diseases (TBDs) as people spend time outdoors in tick habitats. This advisory presents key epidemiologic findings and updates on reportable TBDs in NYC. Please refer to the Centers for Disease Control and Prevention for detailed guidance on identification, diagnosis, treatment and prevention of TBDs.

Recent travel to upstate New York, Long Island, and other parts of the northeast, mid-Atlantic and upper Midwest or residing in Staten Island should prompt consideration of TBDs in people with a compatible clinical presentation. A history of a tick bite is not a prerequisite for considering TBDs for patients with compatible illness, since only a small proportion of patients diagnosed with these diseases recall being bitten by a tick. The TBDs in the table below are reportable in NYC:

TBD Disease	Causative Organism	Tick Vector	Where Endemic in US	Tick Vector Presence in NYC
Lyme disease	*Borrelia burgdorferi*	*Ixodes scapularis* (blacklegged or deer tick)	Northeast, mid-Atlantic, and Upper Midwest	Blacklegged tick found in Staten Island and northern Bronx
Babesiosis	*Babesia microti*			
Anaplasmosis	*Anaplasma phagocytophilum*			
Ehrlichiosis	*Ehrlichia chaffeensis*	*Amblyomma americanum* (lone star tick)	Southeast and south-central	Lone star tick found in Staten Island and northern Bronx
Spotted fever group rickettsioses* (SFGR)	Several *Rickettsia* species, primarily *R. rickettsii*	*Dermacentor variabilis* (American dog tick) for *R rickettsii* in NYC. Varies for other SFGR.	Throughout US	American dog tick found in all 5 boroughs

Powassan virus disease	Powassan or deer tick virus	*Ixodes scapularis or Ixodes cookei (groundhog tick)*	Cases reported from MN, WI, MA, NY, NJ, PA, ME, CT, NH, RI NC, VA, ND, & IN	Blacklegged tick (see above); groundhog tick not found in NYC

*_Rickettsia akari,_ the causative agent of rickettsialpox, is transmitted by the mouse mite. It is not transmitted by ticks but is part of the spotted fever rickettsia group and can cross react on serologic assays with other spotted fever group rickettsia.

NYC Tick-borne Disease Epidemiology

The number of people in NYC diagnosed each year with a TBD had been trending upward since 2000, with fluctuations from year to year, and a general leveling off starting in 2018. One exception is anaplasmosis, which has increased 60% from 65 cases in 2018 to 104 cases in 2020, the highest number reported in NYC to date. Anaplasmosis has also been increasing in surrounding states.

The number of cases of TBDs are highest in residents of Manhattan and Brooklyn compared with other boroughs. However, from 2015-2018, Staten Island had the highest incidence rate of Lyme disease in NYC, most likely due to an increase in the number of locally acquired cases. By 2019, the incidence rate of Lyme disease in Staten Island decreased to the lowest rate since 2014 and continued to decrease slightly in 2020.

Two methods are used to assess local transmission of TBDs in NYC: tick surveillance where ticks are collected and tested for several pathogens that cause TBDs, and human surveillance where cases of TBDs are interviewed and asked about travel and other risk factors or modes of transmission. For Lyme disease, travel history is obtained from either the provider or patient for a subset of cases with a physician-reported erythema migrans (EM) diagnosed between April 1 and October 31. Similar to previous years, in 2020 most people reported a history of travel outside NYC during the incubation period, commonly to upstate New York, Long Island, Massachusetts, Connecticut, Pennsylvania and New Jersey. However, in Staten Island, Lyme disease continues to be locally transmitted: 83% of interviewed Lyme disease patients reported no history of travel during the incubation period (Table 4a). There were 8 people from Staten Island with a confirmed diagnosis of babesiosis and one with a confirmed diagnosis of anaplasmosis who reported no travel. Two patients were reported with *Borrelia miyamotoi,* a rarer tickborne pathogen transmitted by blacklegged ticks; both traveled outside NYC to endemic states.

Babesia microti and *Anaplasma phagocytophilum* have been transmitted via blood transfusion. In 2020, there was one transfusion-associated babesiosis case. The Food and Drug Administration (FDA) approved tests to screen the blood supply for *B. microti* in 2018 and issued guidance to implement screening in endemic states, including New York.

Locally acquired cases of spotted fever group rickettsioses including rickettsialpox and RMSF, while rare, have been reported in the past from all five boroughs. A diagnosis of rickettsialpox, caused by *Rickettsia akari* and transmitted by the mouse mite (*Liponyssoides sanguineus*), is often made based on clinical presentation as no commercial testing is available. Because *R. akari* is closely related to *R. rickettsii* and other spotted fever group rickettsia, cross reactivity can occur with commercial serologic assays. Patients with rickettsialpox typically have an eschar at the bite site along with fever and a rash that can range from vesicular to maculopapular. There is often a history of mice infestation at home or the worksite.

NYC Tick Surveillance Data

Information on tick populations in NYC is limited. Since 2006, tick surveillance is conducted every year by the Health Department in select parks. In 2020, tick drags were conducted monthly in 24 parks in Staten Island and 2 parks in the Bronx and periodically in parks in the other boroughs.

- ***Ixodes scapularis*** (blacklegged tick or deer tick) is widely established in Staten Island, and focal areas of the Bronx including Pelham Bay Park and Hunter Island. It is not known to exist in other areas of NYC.
    - The density of blacklegged ticks in 2020 (0.18 ticks/100m^2) was similar to 2019 (0.14 ticks/100m^2) in areas of Staten Island and less than 2018 (0.61 ticks/100m^2). Similarly, in the Bronx the density in 2020 was near that of 2019, but less than 2018 (from 2.44 in 2018 to 0.58 ticks/100m^2 in 2020).
    - Ticks collected in 2020 tested positive for *Borrelia burgdorferi* from parks in the Bronx (47.4%) and Staten Island (26.6%). A much smaller number of ticks in the Bronx and Staten Island tested positive for *Anaplasma phagocytophilum* (3.6%), *Babesia microti* (4.0%), and the emerging pathogen *Borrelia miyamotoi* (1.6%).
    - Significant numbers of *I. scapularis* ticks are found in counties and states surrounding NYC. Testing of ticks collected from counties outside of NYC by the New York State Department of Health (NYSDOH) found infection rates as high as 40-50% for *Borrelia burgdorferi*, 1-3% for *Babesia microti* and 7-15% for *Anaplasma phagocytophilum*.
    - Two ticks collected in the Bronx tested positive for Powassan virus in 2017; however, no locally acquired human infections have been identified among NYC residents. In NY State, approximately 1 to 3 human cases are reported annually.
- ***Dermacentor variabilis*** (American dog tick) has been detected in all boroughs of NYC. Population density remained low relative to other tick species and decreased slightly from 2019 to 2020 in Staten Island (0.03 to 0.01 ticks/100m^2) and remained the same in the Bronx (0.02 ticks/100m^2).
- ***Amblyomma americanum*** (lone star tick) has become widely established in Staten Island and in focal areas of the Bronx. Population density decreased slightly between 2019 and 2020 in Staten Island (0.33 to 0.28 ticks/100m^2) and remained the same in the Bronx (0.01 ticks/100m^2).
- ***Haemaphysalis longicornis*** (Asian longhorned tick) has become widely established in Staten Island and in focal areas of the Bronx. It has not been shown to transmit human TBD pathogens in the US. High densities of Asian longhorned tick have been observed in Staten Island and Bronx. After a steady increase in its distribution in the last several years, the population has started to stabilize in Staten Island (however, the population is still rising in the Bronx). From 2019 to 2020, Asian longhorned tick density declined in Staten Island from 1.20 to 1.03 ticks/100m^2. In the Bronx, the species' density has significantly increased from 0.1 to 0.6 ticks/100m^2 from 2019 to 2020. In both boroughs, competition between different tick species suggests that Asian longhorned tick species may be driving the decrease in blacklegged ticks.
- ***Amblyomma maculatum*** (Gulf Coast tick). Established populations of this tick were found in New York City in 2020. It can transmit *Rickettsia parkeri* which is closely related to R. rickettsii.

Clinical and Testing Guidelines

Detailed guidance on how to identify, diagnose and treat TBDs is available online in reference manuals for health care providers from the NYC Health Department (here), the Centers for Disease Control and Prevention (CDC) (here), and from the Infectious Diseases Society of America (IDSA), practice guidelines for Lyme disease (here), and babesiosis (here). Blood smear and polymerase chain reaction (PCR) using whole blood should be used to diagnose babesiosis. Anaplasmosis and ehrlichiosis are best diagnosed using PCR on whole blood during the first week of illness as antibodies may not be detectable for up to 10 days after illness onset. Paired serology demonstrating a four-fold change in IgG by immunofluorescence assay (IFA) can be used to diagnose recent anaplasmosis, ehrlichiosis, and RMSF. Antibodies may persist for several years, and if detected, may not be indicative of current illness. *R. rickettsii* infect the endothelial cells lining blood vessels and may not circulate in large numbers in the blood; if PCR is performed it should be done using whole blood and providers should be aware that a negative result does not rule out the diagnosis. False-positive serologic results may occur with RMSF. Antibodies to spotted fever group rickettsioses (SFGR) other than RMSF may reflect past exposures to a wide variety of SFGR species, including *R. akari*, and do not reflect incident cases of RMSF. *R. parkeri* rickettsiosis and RMSF have similar signs and symptoms, including fever, headache, and rash, but also typically include the appearance of an inoculation eschar at the site of tick attachment, similar to *R. akari*, but which is not common in cases of RMSF. At this time, no cases of *R. parkeri* rickettsiosis have been reported among NYC residents. *R.*

akari and *R parkeri* testing is available at the CDC. A clinical diagnosis of Lyme disease can be made in patients who present with an erythema migrans (EM) rash, which is often present before antibodies are detectable. CDC recommends a two-step process for Lyme disease serological testing, in which an enzyme immunoassay (EIA) that is positive or equivocal is followed by a Western blot test. In July 2019, new serologic assays were approved by the FDA to use a second EIA in place of a Western blot as described here.

Testing ticks for pathogens is generally not recommended because results may be unreliable as laboratories that test ticks are not required to meet the same quality standards as clinical laboratories. A positive test does not mean that the tick was attached long enough to transmit the pathogen, and a negative test might provide a false sense of security as a patient might have unknowingly been bitten by a different tick. However, patients can be advised to save the tick for species identification and to determine the degree of tick engorgement to help determine eligibility for Lyme disease prophylaxis. Patients can kill a live tick by putting it in rubbing alcohol or placing it in a sealed bag/container.

Tick Bite Management and Lyme Disease Prophylaxis

Attached ticks should be removed promptly with fine-tipped tweezers, ensuring that mouthparts have not been left in the skin. Advise patients to watch for symptoms including fever and rash and consider prescribing prophylaxis to prevent Lyme disease. Guidelines support limited use of a single dose of doxycycline for adults (200 mg orally) and children weighing less than 45 kg (4.4 mg/kg orally not to exceed 200 mg) as prophylaxis for Lyme disease when all of the following conditions are met:

- Patient has traveled to a Lyme-endemic region
- Tick has been attached for ≥36 hours, based on engorgement or history
- Prophylaxis can be started within 72 hours of tick removal
- Tick can be reliably identified as *I. scapularis***
- Patient does not have any contraindications to receiving doxycycline

**Doctors in endemic areas often learn to recognize deer ticks. For visual reference, refer to the DOHMH website.

Resources on the DOHMH and other websites

City Health Information: Preventing, Diagnosing, and Managing Tick-borne Diseases (June 2020)

DOHMH Zoonotic and Vector-borne Provider Information

DOHMH Ticks

Download or call 311 to order copies:

- Tickborne Diseases in the NYC Area: A Physician's Reference Manual, 3rd edition (2017)
- NYC Tick ID and Removal Wallet Card (also in Spanish, Russian, Italian)
- Ticks taking over? Take back your yard (also in Spanish)
- All About Ticks: A Workbook for Kids and Their Parents (also in Spanish)

CDC Information about Ticks

CDC Clinical Practice Guidelines

- https://www.cdc.gov/ticks/tickbornediseases/index.html
    - Disease specific guidance
    - Webinars on novel and emerging tickborne diseases
    - CDC videos on Medscape
- Guidance for Clinicians: Recommendations for Patients After a Tick Bite

IDSA Clinical Practice Guidelines

- Lyme disease https://www.idsociety.org/practice-guideline/lyme-disease/
- Babesiosis https://www.idsociety.org/practice-guideline/babesiosis/

APHL Suggested Reporting Language, Interpretation and Guidance Regarding Lyme Disease Serologic Results

Tick Encounter Resource Center of the University Of Rhode Island

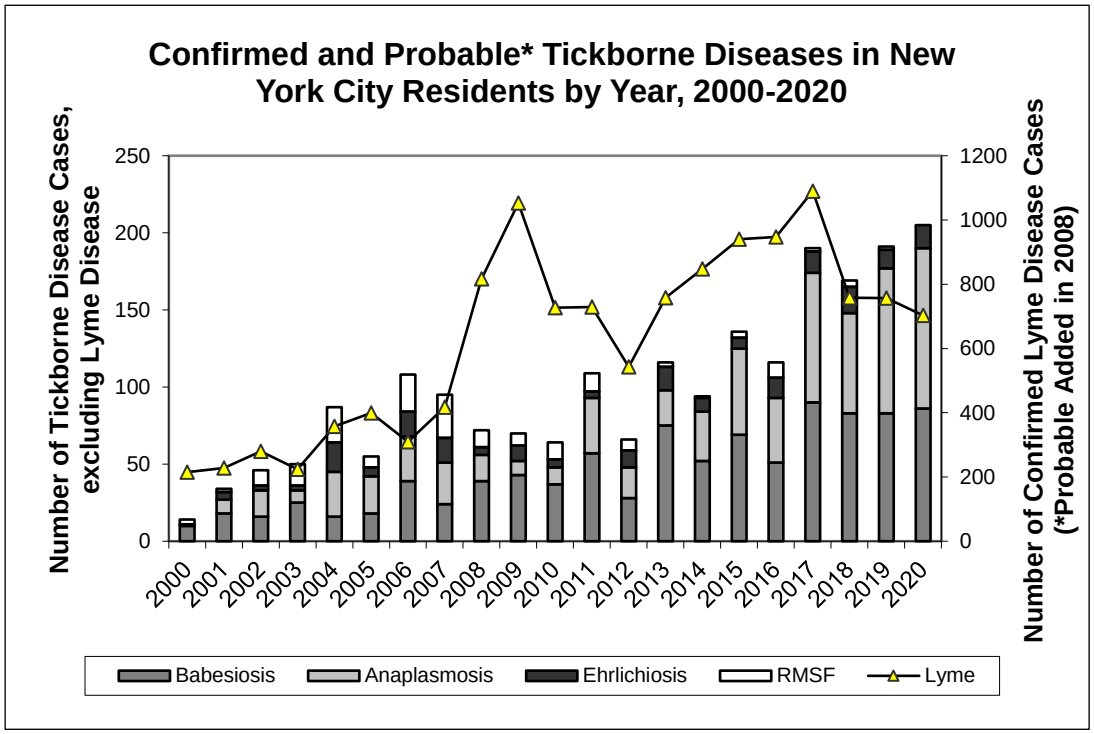
NYS DOH Tick removal videos

Reporting Cases

Commercial and hospital laboratories report all positive laboratory results for diagnostic assays for Lyme disease, babesiosis, RMSF, ehrlichiosis, anaplasmosis, and Powassan virus to the NYC Health Department. Providers are reminded to report suspect cases based on clinical suspicion for Lyme disease in patients with an erythema migrans lesion and for rickettsialpox. Cases of transfusion-associated tickborne diseases must also be reported to the NYSDOH Blood and Tissue Resources Program at 518-485-5341 and your hospital's transfusion service.

Report cases to DOHMH by logging into **Reporting Central** via NYCMED, or complete the Universal Reporting Form and mail to this form to the NYC Department of Health and Mental Hygiene, 42-09 28th Street, CN-22, Long Island City, NY 11101, OR fax to 347-396-2632, or call the Provider Access Line at 1-866-692-3641. If a provider does not already have a NYCMED account, register at the NYCMED link above. Once logged in, Reporting Central can be found in the 'My Applications' section. See Reporting Central New User Guide .

FIGURE 1. Tickborne Diseases in New York City Residents by Year of Diagnosis



*Probable added to Lyme disease case definition in 2008: Physician diagnosis with positive lab results and no erythema migrans or late manifestations

TABLES 1-5. Number of NYC Confirmed and Probable Tickborne Disease Cases by Borough and Year

Minor variations in data presented here, and that presented elsewhere (including other publications of the NYC Department of Health and Mental Hygiene) may be due to several factors, including reporting delays, census data availability, corrections, and data-processing refinements (for example, the removal of duplicate reports)

1. Anaplasmosis

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Bronx	1	0	0	1	2	0	1	4	2	6	1
Brooklyn	0	6	6	2	7	9	5	14	12	20	37
Manhattan	9	28	12	19	19	43	29	62	40	61	57
Queens	1	2	0	1	4	4	6	2	8	5	7
Staten Island	0	0	1	0	0	0	0	2	3	2	2
Total	11	36	19	23	32	56	41	84	65	94	104

2. Babesiosis

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Bronx	1	4	1	12	7	4	5	12	10	7	2
Brooklyn	5	10	5	5	6	9	9	19	11	13	13
Manhattan	21	28	16	45	24	40	23	41	38	41	49
Queens	9	14	6	12	12	16	11	10	11	14	11
Staten Island	1	1	0	1	1	2	3	8	13	8	11
Total	37	57	28	75	50	71	51	90	83	83	86

3. Ehrlichiosis

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Bronx	0	0	0	0	0	0	0	1	0	0	0
Brooklyn	0	0	1	1	1	2	2	0	5	3	2
Manhattan	4	3	9	13	7	4	10	11	9	6	9
Queens	0	1	1	1	1	0	1	1	2	2	1
Staten Island	1	0	0	0	0	1	0	1	1	0	3
Total	5	4	11	15	9	7	13	14	17	11	15

4. Lyme Disease*

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Bronx	57	40	33	48	49	46	51	47	34	25	23
Brooklyn	157	181	125	253	285	335	322	384	283	281	279
Manhattan	364	352	264	313	338	327	322	385	267	288	242
Queens	119	117	89	107	104	116	128	150	87	110	111
Staten Island	34	45	34	41	76	121	123	124	87	53	48
Total	731	735	545	762	852	945	946	1090	758	757	703

4a. Lyme disease erythema migrans study: Cases by travel history*

	2014		2015		2016		2017		2018		2019		2020	
	No travel	Travel	No travel	Travel	No travel	Travel	No travel	Travel	No travel	Travel	No travel	Travel	No travel	Travel
Bronx	0	9	5	12	0	6	1	9	2	5	1	1	0	2
Brooklyn	9	72	5	98	3	79	0	101	1	45	1	62	3	36
Queens	2	32	2	34	3	24	3	31	0	11	4	25	2	16
Staten Island	11	13	24	15	25	21	13	15	9	5	8	4	7	1
Total	22	126	36	159	31	130	17	156	12	66	14	92	12	55

*Residents of outer boroughs diagnosed with erythema migrans Apr. 1-Oct. 31 interviewed about travel during 3-30 day incubation period prior to onset. Manhattan residents excluded because previous study showed 97% traveled and borough has fewer potential blacklegged tick habitats.

5. Rocky Mountain spotted fever

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Bronx	2	3	0	0	0	0	0	1	1	1	0
Brooklyn	6	3	3	0	1	3	2	0	0	1	0
Manhattan	2	4	2	0	0	1	5	1	3	1	0
Queens	1	1	0	0	0	0	0	0	0	0	0
Staten Island	0	1	2	0	0	0	3	0	0	0	0
Total	11	12	7	0	1	4	10	2	4	3	0

6. Rickettsialpox

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Bronx	7	12	3	9	4	5	5	3	3	0	0
Brooklyn	1	1	4	1	0	1	1	0	1	0	0
Manhattan	11	6	4	5	1	4	1	5	2	0	0
Queens	0	0	2	0	0	1	1	1	1	1	0
Staten Island	1	0	0	0	0	0	0	0	0	0	0
Total	20	19	13	15	5	11	8	9	7	1	0