

2022 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.

- Lyme disease is the most reported tick-borne disease (TBD) among New Yorkers, followed by anaplasmosis and babesiosis. TBD reports have been increasing over time, most notably for anaplasmosis, which increased 92% from 2018 to 2021.
- TBDs are associated primarily with travel outside of New York City to surrounding endemic regions.
- Tick surveillance continues to identify established populations of the blacklegged and lone star ticks in Staten Island and the Bronx, and the emergence of Gulf Coast ticks in Staten Island, all of which have tested positive for several TBD pathogens.
- Locally acquired cases of Lyme disease and babesiosis are reported from Staten Island, with sporadic cases of anaplasmosis and ehrlichiosis. A small number of locally acquired Lyme disease has historically been reported from the Bronx, though none were reported in 2021.
- Refer to the [Centers for Disease Control and Prevention](#) for comprehensive details and guidance on identification, diagnosis, treatment and prevention of several TBDs and [Infectious Disease Society of America \(IDSA\)](#) for [Lyme disease](#) and [babesiosis](#).
- Visit the Department of Health and Mental Hygiene's websites for more information about [ticks](#), [Lyme disease](#), [anaplasmosis](#), [babesiosis](#) and other TBDs.
- To ensure access to care for TBDs and other health issues, you can refer your patients to get free enrollment assistance to sign up for low- or no-cost health insurance, by having them call 311, text CoveredNYC (SeguroNYC for Spanish) to 877877, or visit the GetCoveredNYC webpage at nyc.gov/getcoverednyc.

June 1, 2022

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

NYC Tick-borne Disease Epidemiology

Lyme disease is the most reported TBD among New Yorkers, followed by anaplasmosis and babesiosis, which are all transmitted by the blacklegged tick (Figure 1, Tables 1, 2, 3, 3a). Reports of Lyme disease and babesiosis had been trending upward from 2000 through 2018, when there was a general leveling off. Last year, there was a slight increase in reports for both diseases compared to 2020. Reports of anaplasmosis have continued to trend upward, with a 92% increase of cases from 2018 (n=65) to 2021 (n=125). Reports of ehrlichiosis (Table 4) and Rocky Mountain spotted fever (Table 5) are uncommon. There has been only one report of Powassan virus disease, in a resident who was infected outside of NYC, and no reports of *R. parkeri* rickettsiosis. The TBDs in the table below are reportable in NYC.

TBD Disease	Causative Organism	Tick Vector	Where Endemic in U.S.	Tick Vector Presence in NYC
Lyme disease	<i>Borrelia burgdorferi</i>	<i>Ixodes scapularis</i> (blacklegged or deer tick)	Northeast, mid-Atlantic, and Upper Midwest regions	Blacklegged tick found in Staten Island and northern Bronx; groundhog tick not found in NYC
Babesiosis	<i>Babesia microti</i>			
Anaplasmosis	<i>Anaplasma phagocytophilum</i>			
Powassan virus disease	Powassan or deer tick virus	<i>Ixodes scapularis</i> (blacklegged tick) and <i>Ixodes cookei</i> (groundhog tick)		
Ehrlichiosis	<i>Ehrlichia chaffeensis</i>	<i>Amblyomma americanum</i> (lone star tick)	Southeast and south-central U.S.	Lone star tick found in Staten Island and northern Bronx
Spotted fever group rickettsioses (SFGR)*	Several <i>Rickettsia</i> species, primarily <i>R. rickettsii</i> and <i>R. parkeri</i>	<i>Dermacentor variabilis</i> (American dog tick) for <i>R. rickettsii</i> in NYC. <i>Amblyomma maculatum</i> (Gulf coast tick) for <i>R. parkeri</i> . Varies for other SFGR.	Throughout U.S.	American dog tick found in all boroughs. Gulf coast tick found in Staten Island.

**Rickettsia akari*, the causative agent of rickettsialpox, is transmitted by the mouse mite. It is not transmitted by ticks but is part of SFGR and can cross react on serologic assays with other SFGR.

Reports of TBDs are highest in residents of Manhattan and Brooklyn. 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. Since 2019, the incidence rate of Lyme disease for Staten Island has been decreasing, and in 2021 Staten Island had the lowest incidence rate since 2014.

Two methods are used to assess local transmission of TBDs in NYC: (1) tick surveillance, where ticks are collected, speciated and tested for several pathogens that cause TBDs, and (2) human surveillance, where people diagnosed with a TBD are interviewed and asked about travel and other risk factors or modes of transmission. For Lyme disease, travel history is obtained for a subset of cases who have a physician-reported erythema migrans (EM) diagnosed between April 1 and October 31. Similar to previous years, almost all patients diagnosed in 2021 reported a history of travel outside NYC during the incubation period, most commonly to upstate New York, Long Island, Massachusetts, Connecticut, Pennsylvania and New Jersey. However, 50% of interviewed Lyme disease patients residing in Staten Island reported no history of travel during the incubation period, suggesting Lyme disease continues to be locally transmitted in this borough (Table 4a). In addition, five people from Staten Island with babesiosis reported no travel, suggesting their infections were locally acquired.

Locally acquired cases of spotted fever group rickettsioses, including rickettsialpox and RMSF, while rare, have been reported in the past from all five boroughs. Rickettsialpox, a disease caused by *Rickettsia akari*, is transmitted by the mouse mite (*Liponyssoides sanguineus*), and diagnosis is often made based on clinical presentation as no commercial testing is available. 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. Because *R. akari* is closely related to *R. rickettsii* and other spotted fever group rickettsia, cross reactivity can occur with commercial serologic assays. *R. parkeri* and *R. akari* rickettsiosis have similar signs and symptoms, including fever, headache, and the appearance of an inoculation eschar at the site of tick or mite attachment.

Several new and emerging TBDs have been identified in recent years in New York State. *Borrelia miyamotoi* has been detected in a small number of blacklegged ticks from Staten Island and the Bronx. Additionally, Heartland and Bourbon viruses have been detected in ticks collected in parts of New York State, but not ticks collected in NYC or among NYC residents.

Babesia microti and *Anaplasma phagocytophilum* have been transmitted via blood transfusion. 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. In 2021, two potential transfusion-associated babesiosis cases were identified and are under investigation.

NYC Tick Surveillance Data

Information on tick populations in NYC is limited. Since 2006, tick surveillance is conducted every year in select parks. In 2021, tick drags were conducted monthly in 24

parks in Staten Island, 2 parks in the Bronx, 1 park in Brooklyn and periodically in parks in Manhattan and Queens.

- ***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 be established in other areas of NYC.
 - The density of blacklegged ticks in 2021 (0.4 ticks/100m²) increased compared with 2020 (0.18 ticks/100m²) in Staten Island. The tick density in the Bronx remained stable in 2021 (0.5 ticks/100m²) compared with 2020 (0.58 ticks/100m²).
 - Ticks collected in 2021 tested positive for *Borrelia burgdorferi* from parks in the Bronx (47.2%) and Staten Island (27.8%). A much smaller number of ticks in the Bronx and Staten Island tested positive for *Anaplasma phagocytophilum* (1.2%, 0.9%, respectively), *Babesia microti* (2.4%, 3.4%, respectively), and the emerging pathogen *Borrelia miyamotoi* (7.1%, 1.6%, respectively).
 - Significant numbers of *I. scapularis* ticks are found in counties and states surrounding NYC. Testing of ticks collected from counties outside of NYC (Rockland, Suffolk, and Westchester) by the [New York State Department of Health](#) (NYSDOH) has found infection rates as high as 60-70% for *Borrelia burgdorferi*, 23-26% for *Babesia microti* and 21-28% for *Anaplasma phagocytophilum*.
 - One tick collected from the Bronx tested positive for Powassan virus in 2021; 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: Staten Island (0.04 ticks/100m²) and the Bronx (0.06 ticks/100m²).
- ***Amblyomma americanum*** (lone star tick) has become widely established in Staten Island and in focal areas of the Bronx. Population density increased between 2020 and 2021 in Staten Island (0.28 to 0.9 ticks/100m²) and remained the same in the Bronx (0.01 ticks/100m²).
- ***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 U.S. Extremely high densities of Asian longhorned tick have been observed in Staten Island and the Bronx and appear to be displacing blacklegged ticks. From 2020 to 2021, Asian longhorned tick density increased in Staten Island from 1.03 to 4 ticks/100m² and in the Bronx, from 0.6 to 6.4 ticks/100m².

- ***Amblyomma maculatum*** (Gulf Coast tick). Established populations of this tick were found in New York City in 2020. Tick testing detected the presence of *R. parkeri*, which is closely related to *R. rickettsii* and *R. akari*.

Clinical and Testing Guidelines

Detailed guidance on how to identify, diagnose and treat TBDs is available in reference manuals for health care providers from the [NYC Health Department](#), the [Centers for Disease Control and Prevention](#) (CDC), and from the IDSA practice guidelines for [Lyme disease](#), and [babesiosis](#).

TBD DISEASE	PREFERRED METHODS OF DIAGNOSIS	
Lyme disease	<ul style="list-style-type: none"> • Erythema migrans (EM); often present before antibodies are detectable • Two-step serological testing: Enzyme immunoassay (EIA) followed by Western blot or FDA-cleared second EIA (modified 2-tier test). Overall result is positive if first test is positive or equivocal and Western blot is positive or modified 2-tier test is positive or equivocal. 	
Babesiosis	<ul style="list-style-type: none"> • Blood smear and polymerase chain reaction (PCR) on whole blood. 	
Anaplasmosis and Ehrlichiosis	<ul style="list-style-type: none"> • PCR on whole blood within the first week of illness • Serology demonstrating a four-fold change in IgG by immunofluorescence assay (IFA) among acute and convalescent specimens 	<ul style="list-style-type: none"> • IgM antibodies are less specific than IgG antibodies and more likely to generate false positives. IgM results alone should not be used for lab diagnosis • Antibody titers are frequently negative in the first 7 to 10 days of illness. Acute antibody results cannot be independently relied upon for confirmation
Spotted fever group rickettsioses (SFGR)	<ul style="list-style-type: none"> • Serology demonstrating a four-fold change in IgG by IFA among acute and convalescent specimens • PCR performed on whole blood is less sensitive than serology and a 	

	<p>negative result does not rule out the diagnosis</p> <ul style="list-style-type: none"> • Antibodies to spotted fever group rickettsioses (SFGR) other than RMSF may reflect past exposures to a wide variety of SFGR species, including <i>R. akari</i> • PCR of skin biopsy of rash is available at CDC for detection of rickettsial DNA 	
Powassan virus disease	<ul style="list-style-type: none"> • Serum or cerebrospinal fluid: A positive IgM ELISA test should be confirmed by neutralized antibody testing (plaque-reduction neutralization test [PRNT]) of serum specimens at a state public health lab or CDC 	
Rare and emerging TBDs	<ul style="list-style-type: none"> • Testing for rare or emerging TBDs, particularly viral diseases, may not be available at commercial labs. For diagnostic assistance, call 866-692-3641 • <i>Borrelia miyamotoi</i> testing is available at several commercial diagnostic labs • RMSF antibody tests often cross-react with <i>R. akari</i> and <i>R. parkeri</i> • PCR of eschar swab and skin biopsy of rash available for detection of rickettsial DNA 	

Testing ticks for pathogens is generally not recommended. Even if a tick tests positive for a pathogen, the tick may not have been attached long enough to transmit the pathogen. Conversely, a negative test result might provide a false sense of security, as a patient might have unknowingly been bitten by a different tick. However, advise patients to save the tick in a sealed bag or container for species identification and to determine the degree of tick engorgement, which can help determine eligibility for Lyme disease prophylaxis. Patients can kill an unattached live tick by putting it in rubbing alcohol.

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, as demonstrated in the [NYS DOH tick removal tutorial](#). 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 *Ixodes scapularis* (blacklegged tick or deer tick)
- Patient does not have any contraindications to receiving doxycycline

See Figure 6 on page e20 of the (IDSA) [Lyme disease practice guidelines for visual reference of ticks and tick engorgement](#).

Reporting Cases

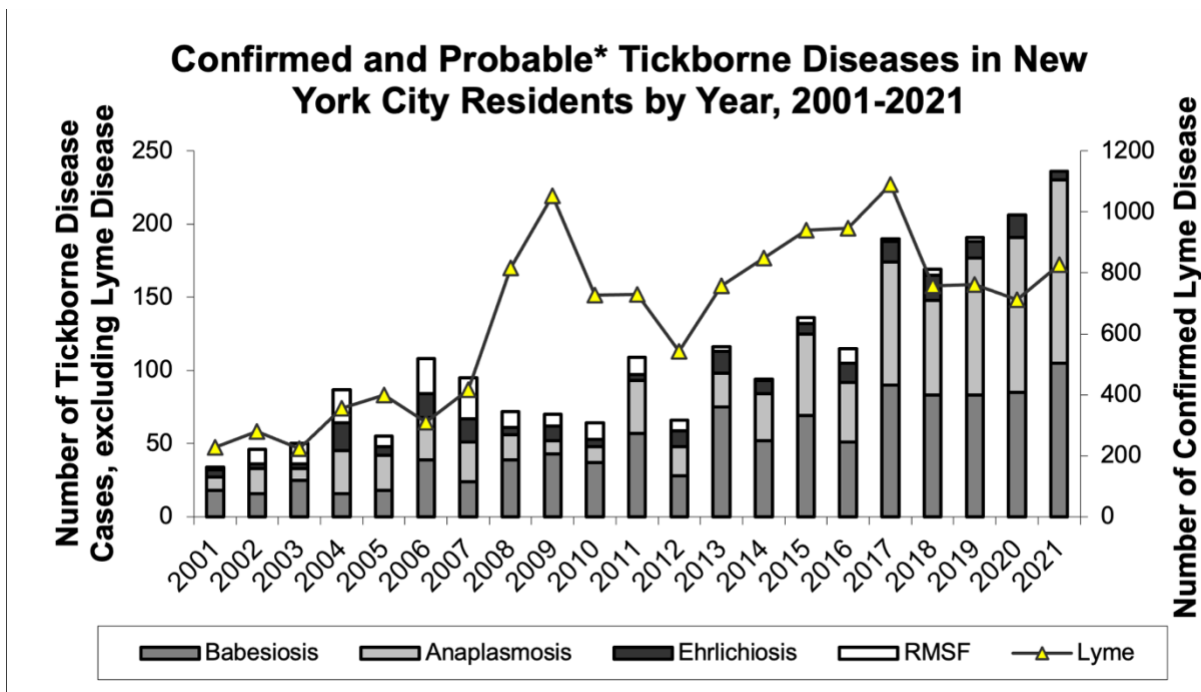
Commercial and hospital laboratories report all positive laboratory results for diagnostic assays for Lyme disease, babesiosis, SFGR, ehrlichiosis, anaplasmosis, and Powassan virus to the NYC Health Department. Providers are reminded to report suspect cases based on clinical suspicion for Lyme disease 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 (preferred), or [complete the Universal Reporting Form](#) and mail the form to the NYC Department of Health and Mental Hygiene, 42-09 28th Street, CN-22A, Long Island City, NY 11101, fax to 347-396-2632, or call the Provider Access Line at 1-866-692-3641. Providers who do not already have a NYCMED account can 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](#).

Access to Health Care

Ensuring that all New Yorkers have access to health care when they need it is a top priority of the NYC Health department. Refer your patients to get free enrollment assistance to sign up for low- or no-cost health insurance, by having them call 311, text CoveredNYC (SeguroNYC for Spanish) to 877877, or visit the GetCoveredNYC webpage at nyc.gov/getcoverednyc. To connect with a Health Department Certified Application Counselor, visit nyc.gov/health/healthcoverage.

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 1-6. 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).

Blacklegged Tick Associated Diseases

1. Anaplasmosis

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Bronx	0	0	1	2	0	1	4	2	5	1	11
Brooklyn	6	6	2	7	9	5	14	12	20	38	21
Manhattan	28	12	19	19	43	29	62	40	61	58	72
Queens	2	0	1	4	4	6	2	8	5	7	19
Staten Island	0	1	0	0	0	0	2	3	2	2	2
Total	36	19	23	32	56	41	84	65	93	106	125

2. Babesiosis

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Bronx	4	1	12	7	4	5	12	10	7	2	11
Brooklyn	10	5	5	6	8	9	19	11	13	12	14
Manhattan	28	16	45	24	39	23	41	38	41	49	55
Queens	14	6	12	12	16	11	10	11	14	11	16
Staten Island	1	0	1	1	2	3	8	13	8	11	6
Total	57	28	75	50	69	51	90	83	83	85	102

3. Lyme Disease

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Bronx	40	33	48	49	46	51	47	34	25	23	31
Brooklyn	181	125	253	285	335	322	384	283	284	285	340
Manhattan	352	264	313	338	327	322	385	267	290	242	284
Queens	117	89	107	104	116	128	150	87	112	114	114
Staten Island	45	34	41	76	121	123	124	87	53	48	57
Total	735	545	762	852	945	946	1090	758	764	712	826

3a. Lyme Disease erythema migrans study: Cases by travel history*

	2015		2016		2017		2018		2019		2020		2021	
	No travel	Travel	No travel	Travel	No travel	Travel	No travel	Travel	No travel	Travel	No travel	Travel	No travel	Travel
Bronx	5	12	0	6	2	8	1	6	1	1	0	2	0	5
Brooklyn	5	98	3	79	0	101	1	47	1	62	3	37	1	56
Queens	2	34	3	24	3	31	0	11	4	25	2	18	4	19
St. Island	24	15	25	21	13	15	9	5	8	4	7	1	5	5
Total	36	159	31	130	18	155	11	69	14	92	12	58	10	85

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

Lone Star Tick Associated Diseases

4. Ehrlichiosis

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Bronx	0	0	0	0	0	0	1	0	0	0	0
Brooklyn	0	1	1	1	2	3	0	5	3	2	3
Manhattan	3	9	13	7	4	10	11	9	7	9	3
Queens	1	1	1	1	0	1	1	2	2	1	0
Staten Island	0	0	0	0	1	0	1	1	0	3	0
Total	4	11	15	9	7	14	14	17	12	15	6

American Dog Tick Associated Diseases

5. Rocky Mountain spotted fever

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Bronx	3	0	0	0	0	0	1	1	0	0	0
Brooklyn	3	3	0	1	3	2	0	0	1	0	0
Manhattan	4	2	0	0	1	5	1	3	1	0	0
Queens	1	0	0	0	0	0	0	0	0	0	0
Staten Island	1	2	0	0	0	3	0	0	0	0	0
Total	12	7	0	1	4	10	2	4	2	0	0

Other

6. Rickettsialpox

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Bronx	12	3	9	4	5	5	3	3	0	0	0
Brooklyn	1	4	1	0	1	1	0	1	0	0	0
Manhattan	6	4	5	1	4	1	5	2	0	0	2
Queens	0	2	0	0	1	1	1	1	1	0	1
Staten Island	0	0	0	0	0	0	0	0	0	0	0
Total	19	13	15	5	11	8	9	7	1	0	3

Additional Resources

NYC Health Department

- [Zoonotic and Vector-borne Provider Information](#)
- [Ticks webpage – Download or call 311 to order copies of the following resources:](#)
 - [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

- [CDC Information about Ticks](#)
- [Tickborne Disease Continuing Education](#)
- [CDC Clinical Practice Guidelines](#)

APHL

- [Suggested Reporting Language, Interpretation and Guidance Regarding Lyme Disease Serologic Results](#)

Access to Health Care

- Refer your patients to get free enrollment assistance to sign up for low- or no-cost health insurance, by having them call 311, text CoveredNYC (SeguroNYC for Spanish) to 877877, or visit the GetCoveredNYC webpage at nyc.gov/getcoverednyc.
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