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Georgia Epidemiology Report

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Tick-borne diseases in Georgia

The medical and economic importance of ticks has long been recognized due to their ability to transmit disease to humans and animals. Ticks are vectors of a variety of pathogenic agents, including species of bacteria (*Borrelia burgdorferi*, *Rickettsia rickettsii, Ehrlichia ssp.*), viruses (tick-borne encephalitis virus - family Flaviviridae), and parasites (*Babesia microti, Anaplasma marginale*). Five tick-borne diseases are known to occur among humans in the southeastern United States: Rocky Mountain spotted fever (RMSF), human monocytic ehrlichiosis (HME), tularemia, Southern tick associated rash illness (STARI), and Lyme disease. While RMSF and tularemia have long been recognized as causes of human disease in this region, STARI and several forms of human ehrlichiosis have only recently emerged. Alterations in vector-host ecology are at least partly responsible for the emergence of tick-borne diseases. The public health importance of these illnesses will become more significant as human behaviors continue to alter the habitats of tick and reservoir species, resulting in increased transmission of known tick-borne diseases and the emergence of previously unrecognized zoonotic infections in humans.

Diagnosis and treatment:

The prompt diagnosis and early treatment of tick-borne infections is often associated with a reduced risk of severe complications or fatalities. Unfortunately, clinical recognition of most tick-borne diseases is difficult because many cases do not initially present with a rash or other distinguishing clinical feature, and few patients recollect a tick bite (Table 1). Moreover, laboratory tests that are currently available offer little assistance to clinicians in making a prompt and accurate diagnosis because serologic tests are usually negative during the acute stage of disease (Table 2). **Collection of convalescent-phase blood samples from patients with a suspected tick-borne disease is usually required in order to confirm a diagnosis.** While empiric therapy for suspect cases of tick-borne diseases is appropriate because of the potential for chronic disease (as with Lyme disease), or severe or fatal illness (as with RMSF or HME), **the routine administration of prophylactic treatment after a tick bite is not currently recommended**.

Prevention:

The best way to prevent tick-borne disease is to reduce or eliminate exposure to ticks and to promptly remove attached ticks. Studies have shown that transmission of RMSF, HME, or Lyme disease requires at least 10 hours of tick attachment, so the prompt removal of ticks should be emphasized to patients in order to minimize the risk of infection. Patients should also be made aware of the risk factors for tick exposure and should be educated about how to prevent tick bites. An educational brochure for patients is available through the Georgia Division of Public Health (GDPH).
Important teaching points to be made include:

- Avoid overhanging grasses, weeds or brush while hiking, camping, hunting, or doing other activities outdoors.
- Wear light colored long sleeved shirts and pants that are tight at the wrists and ankles (or tuck shirts into pants and pants into socks).
- Use chemical acaricides containing DEET (applied to exposed skin) or permethrin (applied to clothing) to deter tick attachment.
- Inspect yourself and children for attached ticks immediately after spending time outdoors. Ticks are attracted to warm, moist areas, such as the under arms, groin, behind the knees, and scalp.
- Remove attached ticks immediately by grasping them with a tweezers placed as close to the skin as possible and slowly pulling back in a direction perpendicular to the skin surface. Crushing the tick should be avoided. After tick removal, the area of tick attachment and hands should be washed with soap and water.

There is currently no vaccine available in the United States to protect against RMSF, HME, or STARI. Vaccination against tularemia is recommended in the US for people with occupational exposure, such as laboratory workers. Lyme disease vaccine, which was approved for human use in 1998, is recommended only for persons who reside, work or recreate in areas of high risk. Fortunately, all of Georgia is classified as either a low or no risk area.

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Emerging tick-borne diseases:

Since *Ehrlichia chaffeensis* was identified as the cause of HME in 1986, two other species of *Ehrlichia*, both with tropisms for granulocytes, have emerged as causes of human granulocytic ehrlichiosis (HGE). In 1994, an unnamed *Ehrlichia* species that is genetically similar or identical to veterinary pathogens *E. phagocytophila* and *E. equi*, was first identified as an agent of HGE in the Northeast and the Upper Midwest. *Ehrlichia ewingii*, which causes canine ehrlichiosis, was first reported in 1999 to be a cause of HGE in Missouri. While disease caused by these three *Ehrlichia* species cannot be distinguished clinically, they are epidemiologically distinct and they can be differentiated via laboratory techniques. Information regarding testing for human ehrlichiosis can be obtained by contacting the GDPH.

Erythema migrans-like rashes that are associated with tick bites occur in the southeastern portion of the US; however, studies have failed to implicate *Borrelia burgdorferi* as the etiologic agent . It is believed that STARI is caused by a yet uncultivable species of *Borrelia* called *B. lonestari* carried by *Amblyomma americanum* (Lone Star tick), the most common human-biting tick in the Southeast. STARI is a very mild illness with no known chronic manifestations.

Surveillance of tick-borne diseases in Georgia:

Lyme disease, RMSF, HME, and tularemia are all physician and laboratory reportable diseases in the state of Georgia. Currently, surveillance data is incomplete and unreliable because convalescent blood samples are seldom obtained to confirm diagnoses, and there has been little follow-up with reporting physicians to encourage collection of convalescent blood and to obtain clinical information. For these reasons, it has been difficult to estimate the true morbidity and mortality associated with tick-borne infections in Georgia. In an effort to enhance surveillance for tick-borne diseases the GDPH will be initiating several projects. The objectives of these projects will be to enhance physician and patient awareness of the diseases, to better understand the epidemiology of these diseases, and to detect the emergence of new tick-borne diseases in Georgia. Data will also be used to target public health interventions to populations at greatest risk. Projects include:

1) An active physician-based surveillance system for Lyme disease and STARI.

Dermatologists and healthcare providers at clinics in three distinct regions of Georgia will be asked to participate in this project. Clinic patients at participating facilities will be eligible for study admission if they have, 1) acute onset of an annular, erythematous, expanding EM-like rash that is at least 5 cm in diameter and, 2) a history of a tick bite at the rash site, or potential exposure to ticks within 14 days prior to rash onset. All participants will have a skin biopsy of the rash, urine, whole blood, and acute- and convalescent- sera obtained for testing at CDC.

2) Active surveillance for HME and RMSF in the coastal region of Georgia.

Healthcare providers in parts of coastal Georgia will be asked to participate in this project. All patients at participating hospitals and clinics will be eligible for study admission if they have, 1) a fever (temperature $\geq 37.5^{\circ}C$) of unknown etiology or, 2) a skin rash plus thrombocytopenia. Patients will be excluded if laboratory tests or procedures obtained within 72 hours of hospital admission or clinic visit provide an explanation for their illness. Acute- and convalescent-phase sera (collected 4-6 weeks apart) will be sent to the CDC for testing.

3) Identification of infectious agents in ticks that have been attached to Georgia residents.

Public health professionals throughout the state will be asked to encourage Georgia residents who have removed an attached tick to call the Georgia Poison Control Center. Callers will be asked to send the tick to the CDC to be identified and tested for the presence of the agents of Lyme disease, HME, and RMSF. A brief questionnaire that includes questions about tick exposures and current health status will be administered two weeks after study enrollment, and symptomatic participants will be encouraged to seek medical attention. Participants will receive the results of tick testing when they are available.

Recommended reading:

1. Walker DH. Tick-transmitted infectious diseases in the United States. Annual Review of Public Health 1998;19:237-69.
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3. Fritz CL, Glaser CA. Ehrlichiosis. Infectious Disease Clinics of North America 1998;12:123-36.
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6. Barbour AG. Does Lyme disease occur in the South?: a survey of emerging tick-borne infections in the region. *Am J Med Sci* 1996;311:34-40.
7. Warshafsky S, Nowakowski J, Nadelman R, et al. Efficacy of antibiotic prophylaxis for prevention of Lyme disease. J Gen Intern Med 1996;923-933.
8. CDC. Recommendations for the use of Lyme disease vaccine: recommendations of the Advisory Committee on Immunization Practices (ACIP). MMWR 1999;48(RR-7):1-25.
9. Kirkland KB, Klimko TB, Meriwether RA, et al. Erythema migrans-like rash illness at a camp in North Carolina. A new tick-borne disease? Arch Intern Med 1995;157:2635-2641.
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Rocky Mountain spotted fever

Pathogen: *Rickettsia rickettsii*
Vector: *Dermacentor variabilis* (American dog tick)
Incubation: 5-7 days (range 2 to 14)
Clinical description: Classic triad of fever, rash, and history of tick bite in 60-70% at initial presentation. Acute onset of fever (100%), malaise (95%), severe frontal headache (90%), myalgia (80%), and vomiting (60%). Rash on wrists and ankles spreads centrally and becomes petechial, papular or purpuric (60-90%). Other symptoms may include: conjunctivitis, abdominal pain, nausea, cough, renal dysfunction, meningismus, and mental confusion.
Case fatality: 13-25% in absence of specific therapy, otherwise 3-5%

Human monocytic ehrlichiosis

Pathogen: *Ehrlichia chaffeensis*
Vector: *Amblyomma americanum* (Lone star tick)
Incubation: 7 days (range 1 to 28)
Clinical description: Symptoms from hospital cohort: fever (97%), malaise (84%), headache (81%), myalgia and arthralgias (68%), chills (61%), nausea (48%), cough (26%), and confusion (20%). Non-specific rash (30%). Laboratory: thrombocytopenia (74%), leukopenia (72%), and elevated AST/ALT (80%).
Case fatality: Up to 5%

Tularemia

Pathogen: *Francisella tularensis*
Vector: *Amblyomma americanum* (Lone star tick) and *Dermacentor variabilis* (American dog tick)
Incubation: 3 to 5 days (range 1 to 14)
Clinical description: Tick-borne tularemia typically presents with ulcer at site of tick bite, and painful regional lymphadenopathy. Rarely can present with typhoidal form: fever, chills headache, abdominal pain, and prostration.
Case fatality: Rare cases of fulminant septic shock

Lyme disease

Pathogen: *Borrelia burgdorferi*
Vector: *Ixodes scapularis* (Black-legged tick)
Incubation: 7 to 14 days (range 3 to 30)
Clinical description: Erythema migrans (EM) rash (an expanding, erythematous, bulls eye-shaped rash) 60-90% of cases. Acute onset of fever, headache, malaise, arthralgias, and/or myalgias. If not adequately treated may become disseminated disease: multiple secondary EM lesions (25-50%), arthritis (60%), CNS manifestations (including facial palsy and meningitis) (15%) and carditis (5%).
Case fatality: Rarely, if ever, fatal

Southern tick-associated rash illness

Pathogen: Probably *Borrelia lonestari* (thus far uncultivated)
Vector: Probably *Amblyomma americanum* (Lone Star tick)
Incubation: Approximately 12 days (range 2 to 21)
Clinical description: Tick bite-associated annular, expanding, erythematous, EM-like lesions. Symptoms other than a rash are rare and are usually very mild, but may include headache, musculoskeletal pain, fatigue, and nausea. Fever is not a characteristic feature of the illness.
Case fatality: No deaths have been reported

Diagnostic Criteria for Tick-borne Diseases in Georgia	Specimen Requirements
Rocky Mountain spotted fever (*Rickettsia rickettsii*)	
Probable case A clinically compatible case with single sera antibody titer: • IFA ≥ 1: 64 ***OR*** • CF ≥ 1:16 ***OR*** • LA, IHA or MA ≥ 1:128 ***OR*** • Proteus OX-19 or OX-2 test ≥ 1:320 ***OR*** a four-fold rise in titer in paired sample using same test • Serum: 5 mL (in red-top tube) collected both at disease onset and ≥3 weeks later	Whole blood: 5 mL (in purple-top tube) Skin biopsy: 2-4 mm skin lesion in transport media collected in acute phase of the illness Clinical specimen: (skin biopsy or whole blood) see instruction above
Confirmed case A clinically compatible case with either: • Serum: 4-fold or greater rise in antibody titer in paired samples to *R. rickettsii* by IFA, CF, LA, IHA, or MA ***OR*** • Whole blood: positive PCR assay to *R. rickettsii* ***OR*** • Skin biopsy: positive IFA to *R. rickettsii* ***OR*** • Clinical specimen: isolation and culture of *R. rickettsii*	
Human Monocytic Ehrlichiosis (*Ehrlichia chaffeensis*)	
Probable case A clinically compatible case with either: • Serum: single antibody titer ≥ 1: 64 by IFA ***OR*** • Intracytoplasmic morulae identified in white blood cells	Serum: 5 mL (red-top tube) collected both at disease onset and 4 to 6 weeks later Whole blood: 5 mL (purple-top tube) Skin biopsy: 2-4 mm skin lesion in transport media collected in acute phase of the illness Clinical specimen: (skin biopsy or whole blood) see instruction above
Confirmed case A clinically compatible case with either: • Serum: 4-fold or greater rise in antibody titer in paired samples to *Ehrlichia* species by IFA ***OR*** • Whole blood: positive PCR assay to *Ehrlichia* species ***OR*** • Skin biopsy: positive IFA to *Ehrlichia* species ***OR*** • Clinical specimen: isolation and culture *Ehrlichia* species ***OR*** • Serum: single antibody titer ≥ 1: 64 by IFA plus intracytoplasmic morulae identified in white blood cells	
Tularemia (*Francisella tularensis*)	
Probable case A clinically compatible case with either: • Serum: single elevated antibody titer ≥1:160 to *F. tularensis* in patient without previous tularemia vaccination ***OR*** • Clinical specimen: FA positive for *F. tularensis*	Serum: 5 mL (red-top tube) collected both at disease onset and 4 to 6 weeks later Clinical specimen: (ulcer exudate or lymph node aspirates) collect in a sterile vial *Confirmed case*
Confirmed case A clinically compatible case with either: • Serum: 4-fold or greater rise in antibody titer to *F. tularensis* ***OR*** • Clinical specimen: isolation of *F. tularensis*	
Lyme disease (*Borrelia burgdorferi*)	
Probable case A clinically compatible case with an erythema migrans rash and history of tick exposure.	Serum: 5 mL serum (red-top tube) collected both at disease onset and 4 to 6 weeks later Skin biopsy: 2-4 mm skin lesion in transport media collected in acute phase of the illness CSF: 5-10 mL in sterile tube Synovial fluid: 5-10 mL in sterile tube
Confirmed case A clinically compatible case with an erythema migrans rash or a late manifestation history of tick exposure plus: • Serum: **2-step process for early disease:** 1) EIA or IFA –IgG and IgM 2) if positive, do Western blot – IgG and IgM. **If late disease**: IgG Western blot. **If neuroborreliosis,** EIA-IgG serum and CSF. Calculate index if EIA elevated. • Skin biopsy: isolation and culture of *B. burgdorferi* ***OR*** • CSF: isolation and culture of *B. burgdorferi* ***OR*** • Synovial fluid: isolation and culture of *B. burgdorferi* ***OR***	

Abbreviations: **IFA** – indirect fluorescent antibody test, **CF** - compliment fixation, **LA** - latex agglutination, **IHA** – indirect hemagglutination, **MA** – microagglutination, **PCR** - polymerase chain reaction, **EIA** - enzyme-linked immunosorbent assay, **WB** - Western immunoblot.

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Reported Cases of Selected Notifiable Diseases in Georgia Profile* for December 1999

Selected Notifiable Diseases	Total Reported for December 1999	Previous 3 Months Total Ending in December			Previous 12 Months Total Ending in December		
	1999	1997	1998	1999	1997	1998	1999
Campylobacteriosis	32	232	189	142	766	769	715
Chlamydia genital infection	1792	4227	7841	7763	16164	25508	30653
Cryptosporidiosis	9	24	47	38	74	152	167
E. *coli* O157:H7	5	7	17	14	46	84	41
Giardiasis	109	313	337	357	916	1215	1355
Gonorrhea	1382	5065	5426	5686	18525	20832	21153
Haemophilus influenzae (invasive)	6	12	24	21	41	69	80
Hepatitis A (acute)	17	224	233	76	763	879	478
Hepatitis B (acute)	11	52	36	48	224	209	203
Legionellosis	0	4	0	2	6	8	4
Lyme Disease	0	3	0	0	9	5	0
Meningococcal Disease (invasive)	10	17	22	19	107	103	72
Mumps	0	1	1	0	11	2	4
Pertussis	3	2	8	7	18	38	46
Rubella	0	0	0	0	0	0	0
Salmonellosis	123	363	501	476	1380	1839	1959
Shigellosis	16	491	204	52	1204	1138	280
Syphilis - Primary	22	50	46	52	259	125	141
Syphilis - Secondary	34	100	81	92	703	230	283
Syphilis - Early Latent	92	327	236	198	1864	795	703
Syphilis - Other	121	333	241	236	1156	799	733
Syphilis - Congenital	3	1	6	3	24	29	19
Tuberculosis	107	171	172	200	694	629	657

* The cumulative numbers in the above table reflect the date the disease was first diagnosed rather than the date the report was received at the state office, and therefore are subject to change over time due to late reporting. The 3 month delay in the disease profile for a given month is designed to minimize any changes that may occur. This method of summarizing data is expected to provide a better overall measure of disease trends and patterns in Georgia.

** Other syphilis includes latent (unknown duration), late latent, late with symptomatic manifestations, and neurosyphilis.

AIDS Profile Update

Report Period	Total Cases Reported*	Percent Female	Risk Group Distribution (%)						Race Distribution (%)		
			MSM	IDU	MSM&IDU	HS	Blood	Unknown	White	Black	Other
Latest 12 Months:											
1/99 - 12/99	1693	25.8	33.4	13.1	3.2	17.6	1.4	31.4	19.3	78.5	2.2
Five Years Ago:											
1/94 - 12/94	2352	18.2	44.2	22.9	6.1	13.3	1.6	11.8	32.7	65.7	1.6
Cumulative:											
7/81 - 12/99	21477	16.1	49.8	18.9	5.8	13	1.9	10.7	36.9	61.1	2.1

MSM - Men having sex with men **IDU - Injection drug users** **HS - Heterosexual**

* Case totals are accumulated by date of report to the Epidemiology Section