



MISSOURI DEPARTMENT OF
HEALTH &
SENIOR SERVICES

Alpha-gal Syndrome (AGS)

Lyme Disease

Objectives

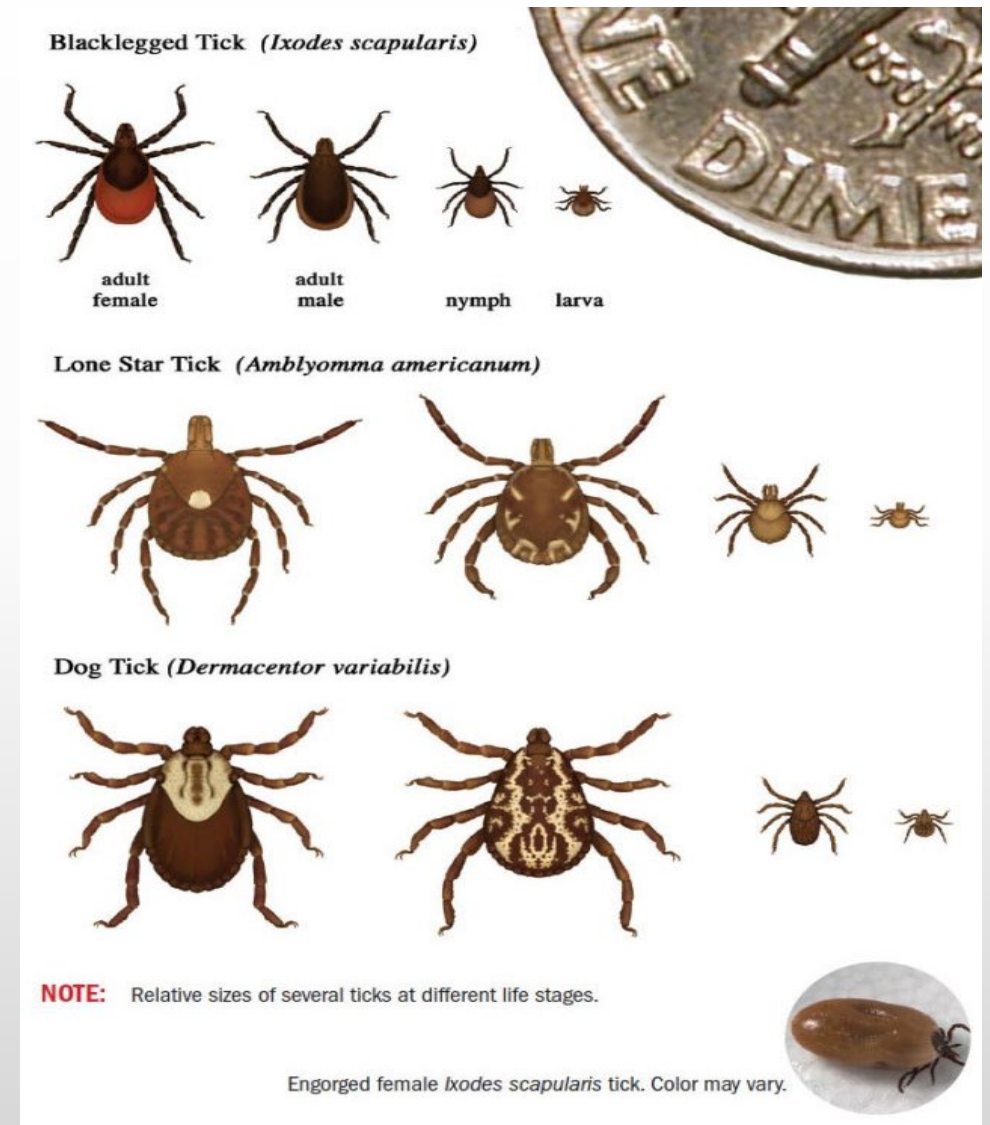
- Brief Overview of Tickborne Illnesses
- AGS and Lyme Disease
 - Epidemiology
 - Surveillance
 - Response/Resources

Tickborne Illnesses Missouri



Ticks That Commonly Bite Humans

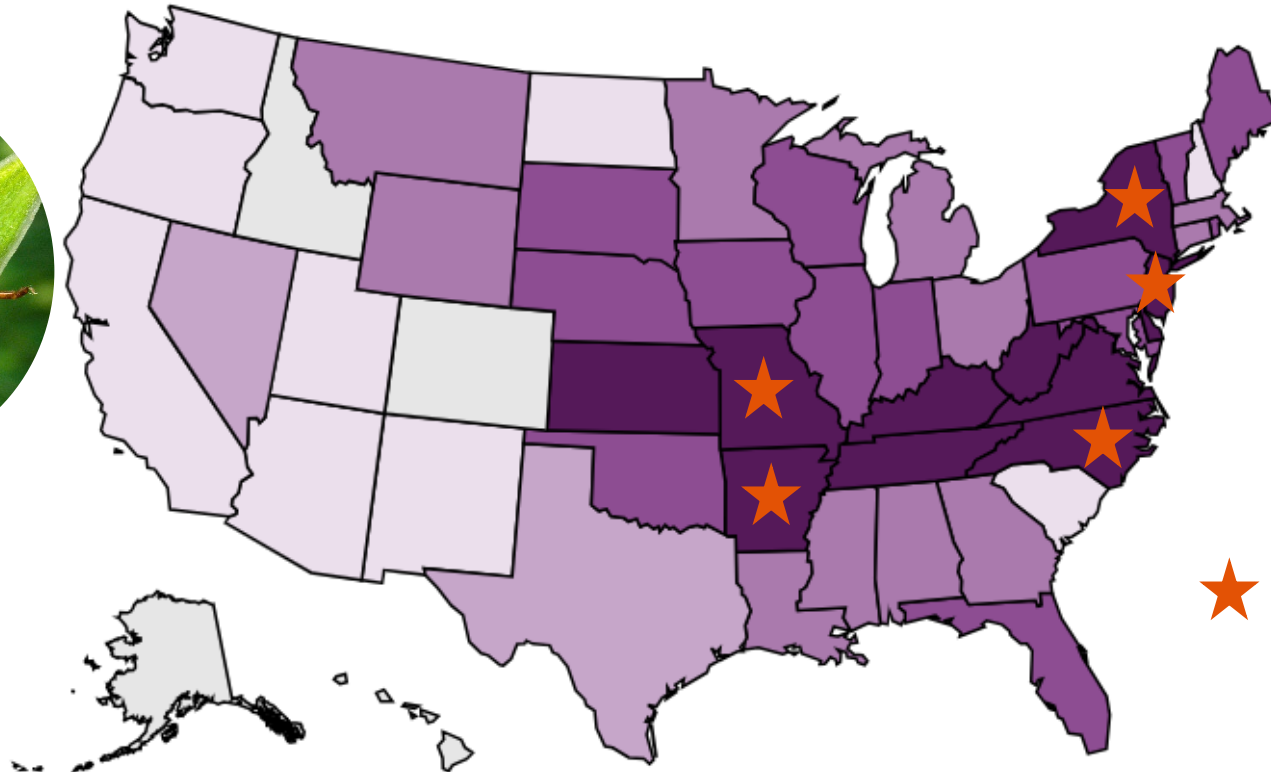
- Lone Star ticks are the most aggressive tick that bite humans.
- Lone Star ticks and American dog ticks are most common in the Midwest.
- Blacklegged ticks can also be found in the Midwest, though less common.



Ehrlichiosis

Annual Incidence (per million population), 2023

● 0 ● 0 to < 0.46 ● 0.46 to < 1.81 ● 1.81 to < 8.9 ● 8.9+ ● Not Notifiable



**MO, AR, NC, NY,
and NJ
accounted for
nearly 50% of
cases of *E.
chaffeensis*
from 2019 – 2023**

*Amblyomma
americanum,*

Lone Star Tick



<https://www.cdc.gov/ehrlichiosis/data-research/facts-stats/index.html>

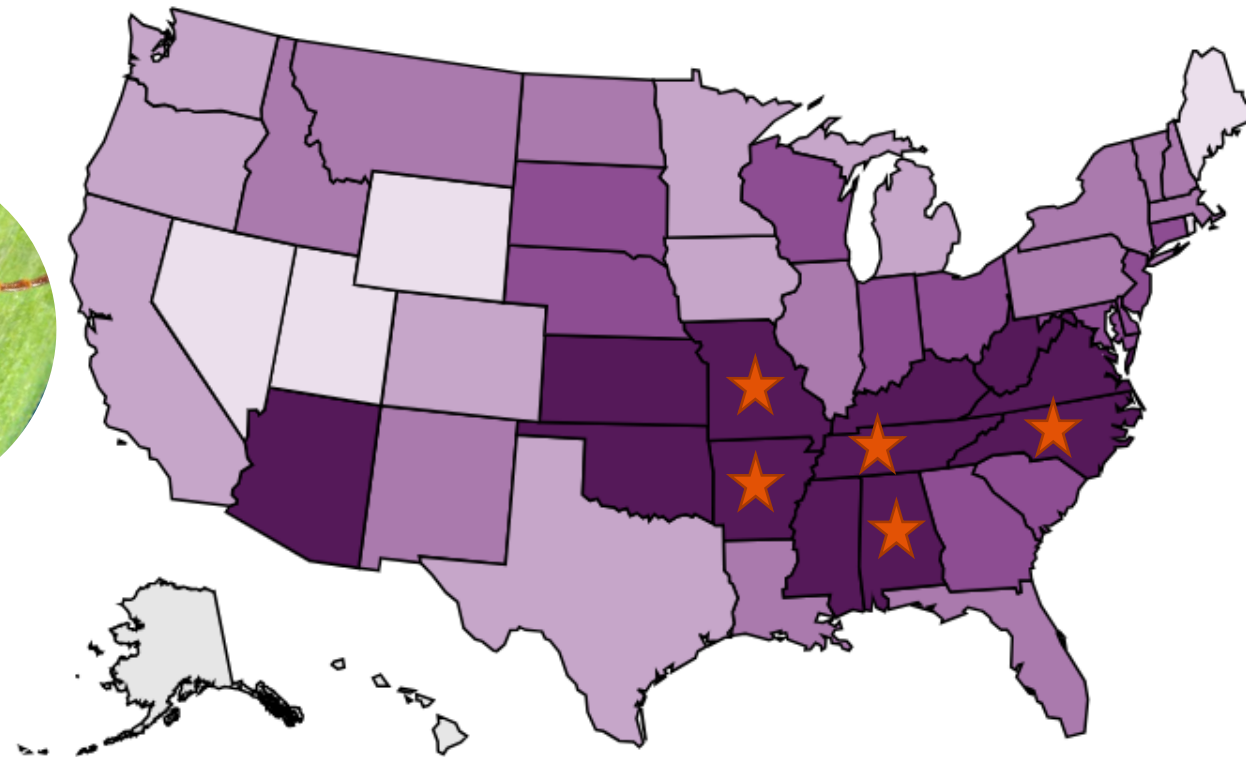
Spotted Fever Rickettsiosis (including Rocky Mountain Spotted Fever)

Annual Incidence (per million population), 2023

● 0 ● 0 to < 0.71 ● 0.71 to < 2.04 ● 2.04 to < 4.85 ● 4.85+ ● Not Notifiable

Dermacentor variabilis,

American
Dog Tick



★ MO, AR, TN, AL, and NC accounted for over 50% of cases between 2019 – 2023

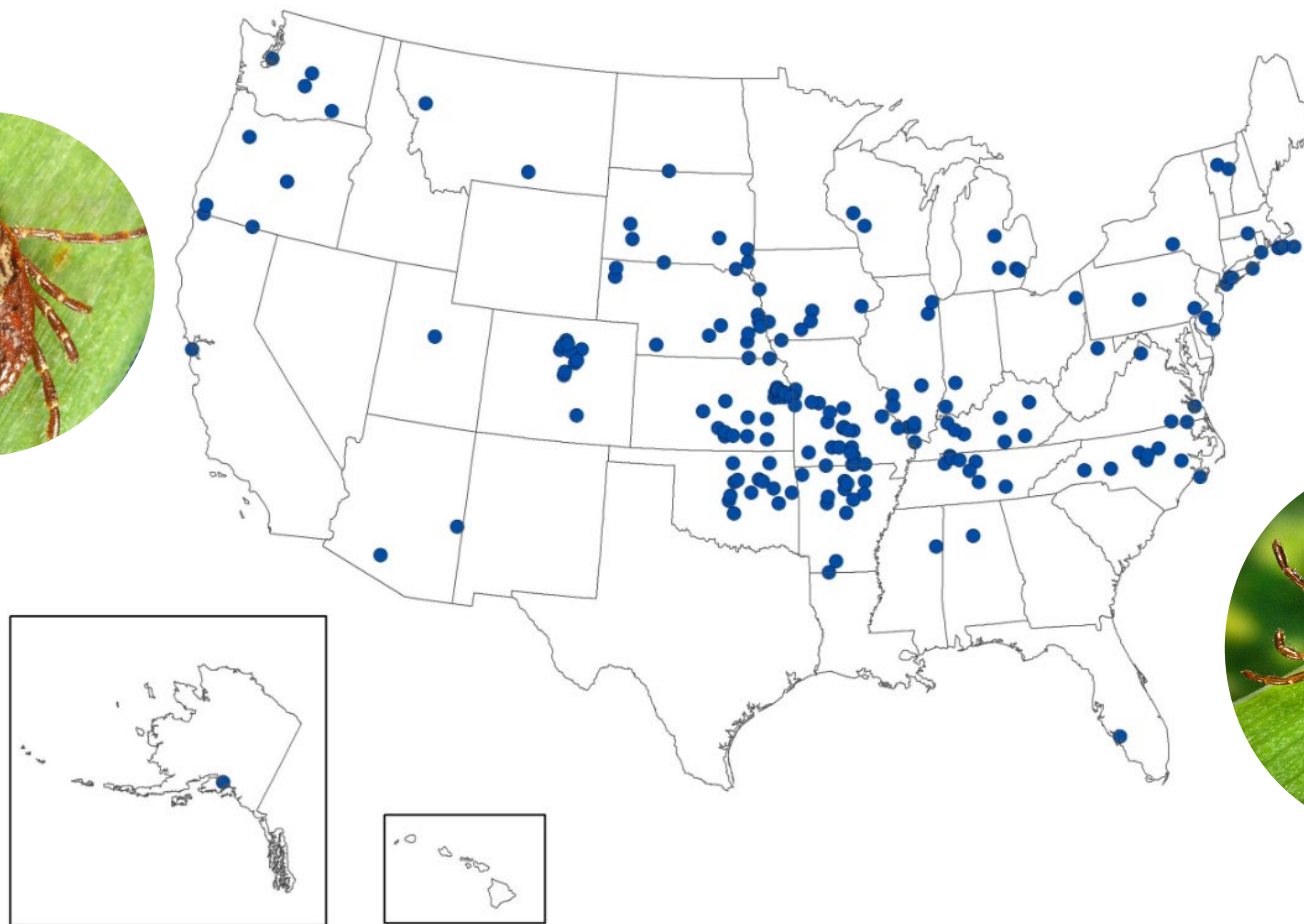
<https://www.cdc.gov/rocky-mountain-spotted-fever/data-research/facts-stats/>

Tularemia

Map of Reported Cases, 2023

Dermacentor variabilis,

American Dog Tick



1 dot placed in state of residence for each reported case

Amblyomma americanum,

Lone Star Tick



<https://www.cdc.gov/tularemia/data-research/index.html>

Alpha-gal Syndrome (AGS)



Alpha-Gal Syndrome (AGS)

- AGS is serious allergy to a sugar molecule (galactose- α -1,3-galactose) found in many mammal products:
 - Pork, beef, rabbit, lamb, venison, etc.
 - Products made from mammals (milk, gelatin).
- Associated with tick bites.
 - Lone Star tick most common in U.S.
 - Other species of tick linked in other countries and U.S.
- Research is ongoing to learn more about the role of ticks, and the exact mechanism, causal relationship and risk factors associated with the development of AGS.

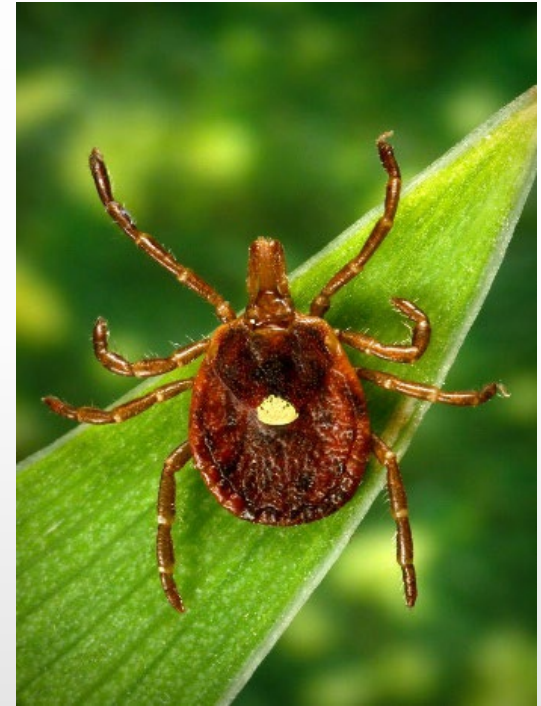
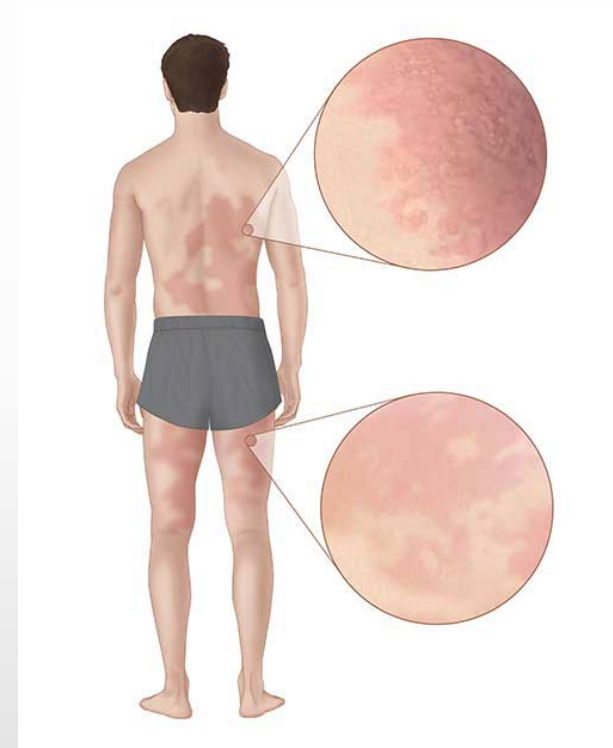


Image courtesy of CDC

Alpha-Gal Syndrome (AGS)

- Alpha-gal is a molecule (galactose- α -1,3-galactose) is naturally produced in the bodies of most mammals but not in people.
- Allergic reactions can vary from mild to severe and some can be life threatening.
- Reaction commonly occurs 2-6 hours after eating meat or dairy products or exposure to products containing alpha-gal:
 - Hives/itchy rash
 - Nausea, vomiting, diarrhea, stomach pain
 - Cough, shortness of breath, difficulty breathing
 - Swelling of lips, throat, tongue, etc.
- Severe allergic reactions, including anaphylaxis, can require urgent medical attention.

Rash from AGS



<https://www.cdc.gov/alpha-gal-syndrome/about/>

Alpha-Gal Syndrome Diagnosis

- Diagnosis: typically made by an allergy specialist or other healthcare provider.
 - Detailed patient history and physical examination.
 - Blood test: for alpha-gal sIgE antibodies produced in response to alpha-gal.
 - Follow-up evaluation after the alpha-gal exposure has been removed.
 - Allergy skin testing may also be used.

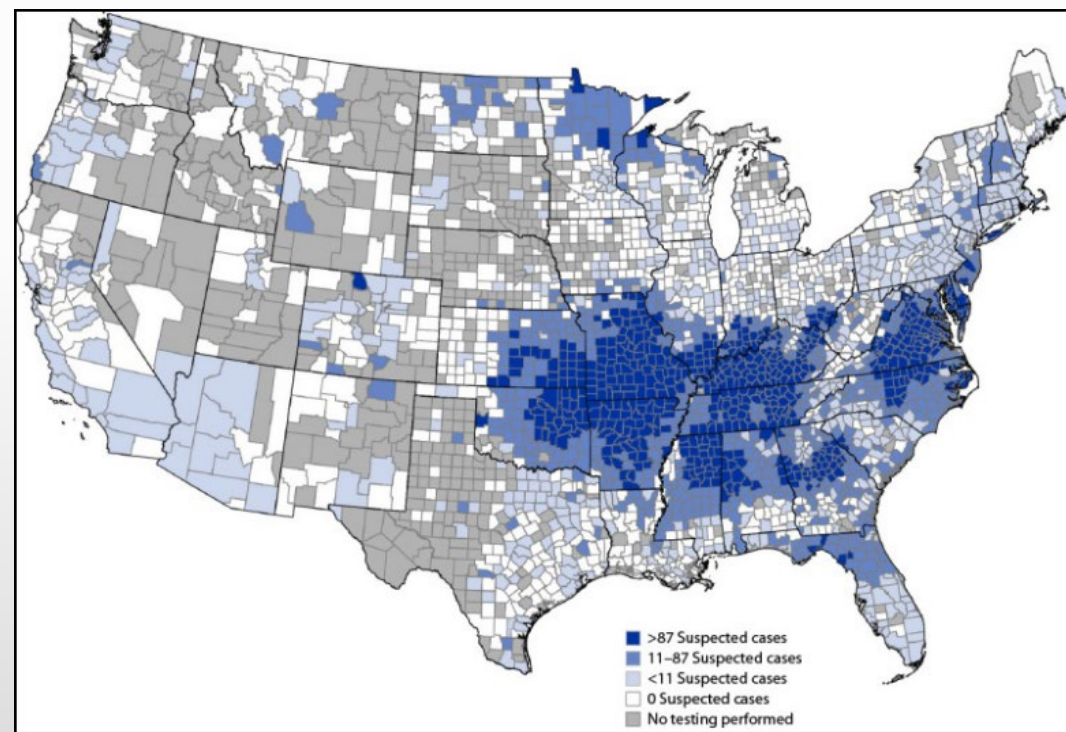
Alpha-Gal Syndrome Diagnosis

- Blood test:
 - Alpha-gal sIgE of ≥ 0.1 kU/L are considered positive.
 - No definitive sIgE level that confirms AGS diagnosis.
 - The sIgE levels do not directly correlate with symptoms of disease or disease severity.
 - Positive results may occur in people who do not have AGS, particularly in regions with lone star ticks. Not all persons who test positive will have AGS.
- Sensitization:
 - Tick bite is thought to be a key event in the development of AGS.
 - Tick bites can result in the development of sIgE in absence symptoms of AGS.
 - Sensitization rates 15 – 22% have been reported in North Carolina and Tennessee.

Alpha-Gal Syndrome Prevalence

- U.S. - The actual number of cases may exceed 450,000.
- Missouri is expected to be among the states with the highest prevalence of AGS.
 - A recent analysis estimates 7,300-34,400 Missourians may have been affected by AGS since 2021.
 - It is plausible that 5,000 or more Missourians may test positive for alpha-gal (sIgE) ≥ 0.1 IU/mL or ≥ 0.1 kU/L annually.

Geographic distribution of suspected AGS cases* per 1 million population per year — U.S, 2017–2022



Thompson et. al. *MMWR Weekly* / July 28, 2023 / 72(30);815–820

Alpha-Gal Syndrome Case Definition (2022)

- Clinical Criteria: Acute onset of any one or more of the following allergic and/or gastrointestinal symptoms that occur 2–10 hours after ingestion of pork, beef, lamb, any other mammalian meat, or any mammalian-derived product (e.g. gelatin), OR within two hours after intramuscular, intravenous, or subcutaneous administration of alpha-gal-containing vaccination or medication:
 - Symptoms: Abdominal pain, Nausea, Diarrhea, Vomiting, Heartburn/indigestion, Hives, Itching, Shortness of breath, Cough, Wheezing, Acute episode of hypotension, Anaphylaxis as diagnosed by a provider, Swelling of one or more of the following: lips, tongue, throat, face, eyelids, or other associated structures.
 - AND the absence of a clear alternative diagnosis.
- Laboratory Criteria:
 - Confirmatory lab evidence: Serum or plasma immunoglobulin E specific to alpha-gal (sIgE) ≥ 0.1 IU/mL or ≥ 0.1 kU/L.
 - Presumptive lab evidence: An allergy skin test result that is interpreted by the ordering provider as consistent with alpha-gal allergy based on sensitivity to one or more mammalian meats (e.g., pork, beef, lamb) or other mammalian-derived products.

Alpha-Gal Syndrome Case Definition (2022)

Case Classification:

- Suspect: Meets confirmatory laboratory evidence with no clinical information available.
- Probable: Meets clinical criteria AND presumptive laboratory evidence.
- Confirmed: Meets clinical criteria AND confirmatory laboratory evidence.

Note: Surveillance of reportable conditions - Confirmed and Probable cases are typically counted as cases. Suspect cases are not typically included.

Alpha-Gal Syndrome Surveillance

- AGS is not nationally notifiable and not currently a reportable condition in Missouri. AGS is now reportable in 10 states.
- Continue to evaluate various approaches to determine data quality and public health impact/cost.
 - AGS positive laboratory results and reports from providers reported and Investigated: All reports are investigated by LPHAs to determine if symptoms are present; case classification determined.
 - AGS positive Laboratory results reported only. No clinical information available; all positives classified as suspects.
 - Other:
 - All AGS positive laboratory results reported and a subset of reports are investigated.
 - The reporting of diagnosed cases by medical providers.

Alpha-Gal Syndrome Provider Knowledge/Awareness

- CDC found that despite the potential life-threatening reactions associated with AGS, most patients perceive that health care providers (HCPs) have little or no knowledge of AGS.
- CDC surveyed HCP nationally and found the following:
 - 42% of surveyed HCPs had never heard of AGS.
 - Among HCP who had, fewer than one third knew how to diagnose the condition.
 - Limited awareness and knowledge of AGS among HCPs likely contributes to underdiagnosis of this condition and inadequate patient management.

The infographic features a dark blue header with the text 'Have you heard?' in white. To the right, in a dark red box, it says 'Alpha-gal syndrome is an allergy to red meat associated with tick bites*'. Below this is a light blue section with a white box containing a photograph of a person's back with a red, circular rash. A magnifying glass is positioned over the rash. To the right of the photograph, a dark blue box contains the text 'Clinicians: When patients have symptoms† 2–6 hours after eating meat or dairy products, **consider testing** for alpha-gal IgE'. At the bottom left is the CDC logo, and at the bottom right is the MMWR logo. The URL 'cdc.gov/ticks/alpha-gal' and the date 'JULY 28, 2023' are also present.

Have you heard? Alpha-gal syndrome is an allergy to red meat associated with tick bites*

Clinicians: When patients have symptoms[†] 2–6 hours after eating meat or dairy products, **consider testing** for alpha-gal IgE

cdc.gov/ticks/alpha-gal
JULY 28, 2023

*Primarily lone star ticks in the United States
†Hives, rash, upset stomach, or diarrhea

MMWR

Source: CDC https://www.cdc.gov/mmwr/volumes/72/wr/mm7230a1.htm?s_cid=mm7230a1_w

DHSS Educational and Outreach Efforts

By end of Spring, DHSS State Epidemiologist and Chief Medical Officer will have presented and promoted AGS awareness to various healthcare providers at 19 different conference, symposiums, meeting, etc.

2026:

- School Nurse Webinar
- University of Missouri Extension developed materials focused on food or nutrition interventions for persons with AGS.

2025:

- Social media outreach (3 social media videos and YouTube complements).
- Tick bite prevention efforts and campaign.
- AGS added to DHSS Tick Bite Story Map
- Partnered to develop a projection of AGS using Medicaid claims data.
- AGS landing page on DHSS website.

2024 : Comprehensive Health Advisory: for Missouri Healthcare and Public Health Providers

DHSS AGS Webpage

What Is Alpha-Gal Syndrome (AGS)?

Alpha-Gal Syndrome (AGS) is an allergy that some people get after being bitten by certain ticks, especially the lone star tick. These ticks are common in Missouri. When a tick bites you, it can put a tiny molecule called alpha-gal into your body. Some people's immune systems react to this molecule and make antibodies. This can cause allergic reactions when they eat red meat or other foods from mammals like cows or pigs.

What are the symptoms?

People with AGS can have different symptoms. Some might get hives, stomach problems, swelling or even a serious allergic reaction called anaphylaxis. Diagnosing AGS can be hard. Doctors usually look at your medical history, do a physical exam, and order a blood test to check for alpha-gal antibodies.

How common is AGS?

Recent studies show that AGS is becoming more common, especially in Missouri and nearby states. It's possible that more than 450,000 people in the U.S. have AGS. In Missouri, between 7,300 and 34,400 people may have been affected since 2021.



What should you do to protect yourself?

- Try to avoid tick bites by using repellent and checking for ticks after being outside.
- Learn about AGS and talk to your doctor if you think you have symptoms.

DHSS continues to collect and study information about ticks and tickborne diseases and is working to educate health care providers and the public about prevention and diagnosis. View some of our resources below.

Helpful resources

- [Alpha-Gal Overview](#)
- [DHSS Health Advisory: Alpha-Gal Syndrome](#)
- [Missouri Tickborne Disease Story Map](#)
- [CDC Alpha-Gal Syndrome Information](#)
- [AGS Case Definition](#)

[Environmental Factors](#)

[Food Programs](#)

[Genetic Disease & Early Childhood](#)

[Healthy Families](#)

[Healthy Moms, Healthy Babies](#)

[Immunizations](#)

[Local Public Health Agencies](#)

[Organ/Tissue Donation and Registry](#)

[Overdose Prevention & Response](#)

[Wellness & Prevention](#)

[Women, Infants & Children \(WIC\)](#)

Contact

Bureau of Communicable Disease Control and Prevention

Missouri Department of Health and Senior Services
PO Box 570
Jefferson City, MO 65102-0570

Telephone: 573-751-6113

Fax: 573-526-0235

Email: info@health.mo.gov

Lyme Disease



Lyme Disease

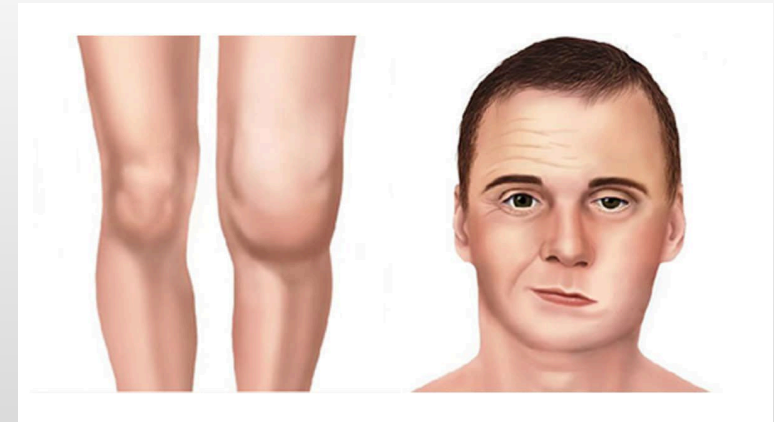
- Causative agent: *Borrelia burgdorferi* (and rarely *B. mayonii*).
- Most common tickborne disease in the U.S.
 - Greatest in the Northeast and Upper Midwestern states; not very common in Missouri.
 - Missouri is a “Low-incidence jurisdiction” ~10-15 cases/year.
 - Many of Missouri’s cases report travel to “High-incidence” jurisdictions.
- Associated vectors:
 - Blacklegged Tick (*Ixodes scapularis*)
 - Western blacklegged tick, *Ixodes pacificus*
- Incubation period: 3-30 days.
- Treatment: 10-14 days of antibiotics for most cases.

The appearance of the erythema migrans rash can vary widely.



<https://www.cdc.gov/lyme/signs-symptoms/index.html>

Later signs of illness (joint swelling, facial palsy)

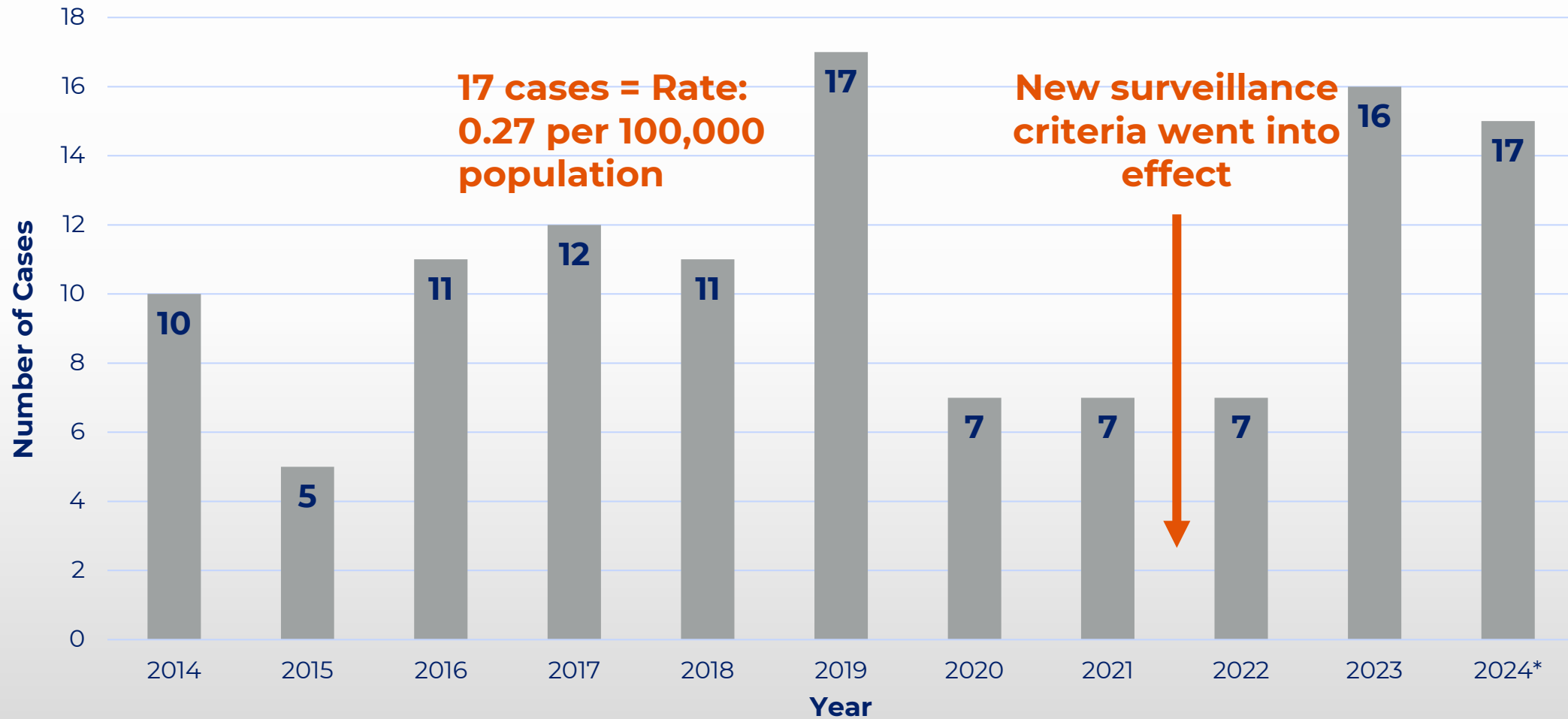


<https://www.cdc.gov/lyme/signs-symptoms/index.html>

Lyme Disease Surveillance

- Lyme disease: Nationally notifiable and reportable in Missouri.
 - MO 19 CSR 20.20.020 (3): Reportable within 3 calendar days of first knowledge or suspicion to local health authority or DHSS.
- Public Health Investigations:
 - All reports from providers/labs are investigated by LPHAs.
 - LPHA completes the Lyme/Lyme-Like Disease Case Report Form and enters data into ShowMeWorldCare (SMWC).
 - All data is reviewed by DHSS Bureau of Communicable Disease Control and Prevention Epidemiologists for completeness and ensure accurate case classification per National Case Definition. <https://ndc.services.cdc.gov/case-definitions/lyme-disease-2022/>
- Reporting: Data for all confirmed and probable cases is deidentified and reported to CDC.

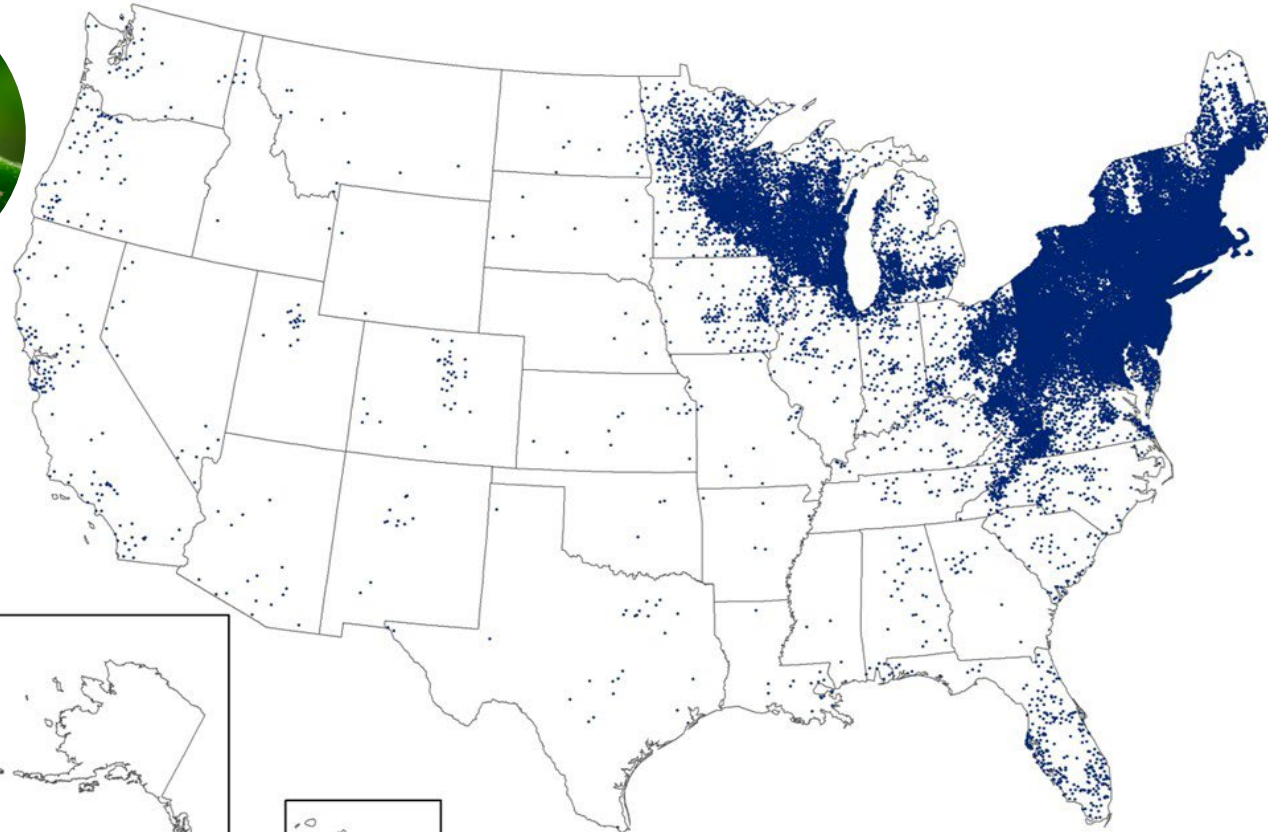
Lyme Disease Cases, Missouri 2014 – 2024



Reported Lyme Disease Cases, U.S. in 2023

Ixodes pacificus

Western
Blacklegged
Tick



Ixodes scapularis,
Blacklegged
Tick



2022 Case Def:

- **High-incidence jurisdiction: \geq 10 confirmed cases per 100,000 population.**

<https://www.cdc.gov/lyme/data-research/facts-stats/lyme-disease-case-map.html>

Tickborne Disease Resources



Tickborne Disease Story Map

https://storymaps.arcgis.com/stories/298b7a6bf3dc4d079a57332c264c62f3


WebSurv ELC Hub DHSS Printing, Desi... Blood Donor Facility... SMWC Test SMWC Production SMWC User Guide SMWC Hub & Ticke... SMWC Resources CDC Test Directory Sub... Bed Bugs Entomolo... UF Bed Bugs CDC - Domestic Ani... Other favorites

MISSOURI DEPARTMENT OF HEALTH & SENIOR SERVICES Missouri Tickborne Disease Story Map

Missouri Tickborne Disease Story Map

Missouri Department of Health and Senior Services
– Bureau of Communicable Disease Control and Prevention, Zoonotic Disease Program

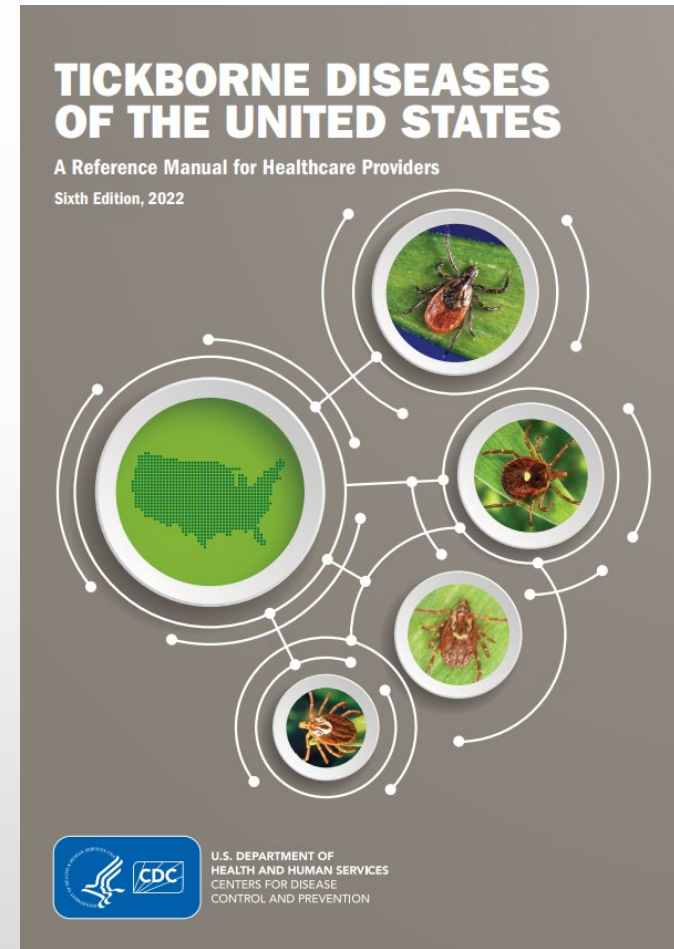
Last Update:
June 9, 2025



<https://storymaps.arcgis.com/stories/298b7a6bf3dc4d079a57332c264c62f3>

Tickborne Diseases of the U.S. Reference Manual

- Tick ID:
 - Photos and pathogens transmitted.
- Overview of common tick-borne diseases in the U.S.
- Tick-borne diseases from abroad.
- Tick bites/prevention.
- Tick bite prophylaxis.



https://www.cdc.gov/ticks/media/pdfs/2025/03/tickborne-diseases-manual-508.pdf?CDC_AAref_Val=https://www.cdc.gov/ticks/tickbornediseases/TickborneDiseases-P.pdf

[PDF - 52 pages]



MISSOURI DEPARTMENT OF
**HEALTH &
SENIOR SERVICES**

**PROTECTING HEALTH AND
KEEPING PEOPLE SAFE**