MAYO CLINIC LABORATORIES

VECTOR-BORNE DISEASES

Diagnostic Testing and Clinical Interpretation

OUR VECTOR-BORNE DISEASE DIRECTORS

Bobbi Pritt, M.D.

Dr. Bobbi Pritt is certified by the American Board of Pathology in clinical & anatomic pathology and microbiology. Her research interests include the evaluation and development of novel laboratory methods to aid in the diagnosis of parasitic and vector-borne diseases. Dr. Pritt works collaboratively with academic and public health partners to provide laboratory diagnostics and education in these areas to a global population. Some of her recent work resulted in the implementation of rapid and highly sensitive molecular tests for malaria, microsporidiosis, Lyme disease, and *Borrelia miyamotoi* infection. Dr. Pritt also played a key role in discovering and describing two new tick-borne pathogens: *Ehrlichia muris eauclairensis* and *Borrelia mayonii.* The latter bacterium causes Lyme disease in the upper Midwestern United States.

Elitza Theel, Ph.D.

Dr. Elitza Theel is certified by the American Board of Medical Microbiology. Her research interests include development and evaluation of novel methods for antibody and antigen detection as diagnostics, specifically for vector-borne and fungal diseases. Dr. Theel also spearheads an international laboratory outreach initiative in Belize. This initiative is focused on increasing the in-country diagnostic testing capacity for vector-borne diseases and on enhancing the current quality assurance/quality control practices in clinical laboratories throughout the country.

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Parasitology
Vector-borne diseases
Infectious diseases anatomic pathology

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Molecular virology
Viral infections in transplant recipients
Viral respiratory infections

Andrew Norgan, M.D., Ph.D.
Clinical microbiology
Infectious diseases anatomic pathology

Robin Patel, M.D.
Biofilm-related infections
Molecular bacteriology
Sequencing-based bacteriology

Audrey Schuetz, M.D.
Anaerobic bacteriology
Antibacterial susceptibility testing
Infectious diseases anatomic pathology

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Fungal diseases

Nancy Wengenack, Ph.D.
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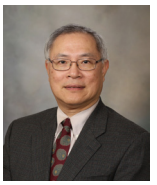
Mycology
Antimycobacterial and antifungal susceptibility testing



Joseph Yao, M.D.
Hepatitis viruses
Human immunodeficiency virus (HIV) infection
Hepatitis and HIV antiviral susceptibility testing

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Clinical microbiology

THE RIGHT TESTS FOR DETECTION AND DIAGNOSIS

Mayo Clinic's internationally renowned clinical microbiology laboratories span all areas of conventional, molecular, and serological medical microbiology, offering a broad selection of tests designed for rapid identification and in-depth characterization of the pathogens associated with infectious diseases.

Mayo Clinic Laboratories offers a full menu of individual tests and panels that aid in the diagnosis of vector-borne diseases (VBD). In addition to our comprehensive testing menu, we developed multiple VBD testing algorithms to help guide and optimize diagnostic testing.

For more information about our VBD testing options and algorithms, visit **mayocliniclabs.com/vectorborne**.

Diagnostic testing for:

Tick-Borne Diseases

Lyme Disease

Babesiosis

Anaplasmosis

Ehrlichiosis

Rocky Mountain Spotted Fever (RMSF)

Borrelia miyamotoi Disease

Mosquito-Borne Diseases

Malaria

West Nile Virus

Eastern Equine Virus

Western Equine Virus

California (La Crosse) Virus

St. Louis Encephalitis Virus

Chikungunya Virus

Zika Virus

Dengue Virus

Other Vector-Borne Diseases

Visceral Leishmaniasis

Parasite Identification (Arthropods)

Chagas Disease

TICK-BORNE DISEASES

Tick-borne diseases (TBDs) occur worldwide, but historically, only certain pockets of the United States posed a risk for infection. However, the geographic range of ticks continues to expand in North America, leading to higher risks of TBD exposure for the public. As a result of increasing exposure and the rising number of potential tick-borne pathogens, it is increasingly important to recognize who to test, when to test, and what test to use for patients who present TBD symptoms.

We offer a full menu of individual tests and panels that aid in the diagnosis of TBDs. In addition to our comprehensive testing menu, we have developed multiple TBD testing algorithms to help guide and optimize diagnostic testing.

Pictured above: *Ixodes* tick

Lyme Disease

SYMPTOMS

Fever, headache, fatigue, and a characteristic bull's-eye pattern (e.g., erythema migrans) skin rash, although only 70% or less of patients will present with a classic rash.

In Europe, patients can present with more severe dermatologic manifestations, including acrodermatitis chronica due to *Borrelia. afzelii* infections or more severe neurologic infections as a result of exposure to *B. garinii*.

(!) ***If left untreated, infection can spread to the joints, heart, and nervous system.***

PATHOGEN

Bacteria:
B. burgdorferi, B. mayonii, B. afzelii, and ***B. garinii***

VECTOR

Ixodes ticks (black-legged ticks)

PRIMARY DISTRIBUTION

United States – Northeast, Mid-Atlantic, Northcentral, and Pacific Coast regions

Canada

Asia

Europe

FEATURED TESTING

LNBAB | Lyme Central Nervous System Infection IgG with Antibody Index Reflex, Serum and Spinal Fluid

LYME | Lyme Disease Serology, Serum

LYWB | Lyme Disease Antibody, Immunoblot, Serum

(!) ***Not recommended to be performed without initial positive first-tiered equivocal Lyme enzyme immunoassay.***

ELYME | Lyme Disease European Antibody Screen, Serum

ELYMI | Lyme Disease European Immunoblot, Serum

PBORR | Lyme Disease, Molecular Detection, PCR, Cerebrospinal Fluid, Synovial Fluid, and Tissue

PBORB | Lyme Disease, Molecular Detection, PCR, Blood

(!) ***Not recommended to be performed with concurrent Lyme disease serology testing (Mayo ID: LYME).***

TICKS | Tick-Borne Disease Antibodies Panel, Serum

EHBAP | Ehrlichia/Babesia Antibody Panel, Immunofluorescence, Serum

TKPNL | Tick-Borne Panel, Molecular Detection, PCR, Blood

Babesiosis

SYMPTOMS

Flu-like symptoms, including fever, fatigue, malaise, and headache. Patients may have hepatomegaly and/or splenomegaly.

In severe cases, hemolysis, acute respiratory distress syndrome, or shock may occur without prompt diagnosis and treatment.

PATHOGEN

Protozoan parasites:
Babesia microti, B. duncani, and *B. divergens*-like (MO-1 strain)

VECTOR

Ixodes ticks (black-legged ticks)—*Babesia microti*

PRIMARY DISTRIBUTION

United States – Northeast, Upper Midwest, and Pacific Coast regions

Canada

FEATURED TESTING

BABG | *Babesia microti* IgG Antibodies, Serum

LBAB | *Babesia* Species, Molecular Detection, PCR, Blood

TICKS | Tick-Borne Disease Antibodies Panel, Serum

EHBAP | Ehrlichia/Babesia Antibody Panel, Immunofluorescence, Serum

TKPNL | Tick-Borne Panel, Molecular Detection, PCR, Blood

Anaplasmosis

SYMPTOMS

Fever, headache, muscle pain, malaise, chills, nausea and abdominal pain, cough, and confusion.

Due to the potential for severe symptoms and death, consider presumptive treatment while awaiting test results.

PATHOGEN

Intracellular bacterium:
Anaplasma phagocytophilum

VECTOR

Ixodes ticks

PRIMARY DISTRIBUTION

United States – Northeast, Mid-Atlantic, Northcentral, and Pacific Coast regions

Canada

Europe (less frequent)

FEATURED TESTING

ANAP | *Anaplasma phagocytophilum* (Human Granulocytic Ehrlichiosis Antibody, Serum

EHRL | *Ehrlichia/Anaplasma,* Molecular Detection, PCR, Blood

TICKS | Tick-Borne Disease Antibodies Panel, Serum

EHBAP | Ehrlichia/Babesia Antibody Panel, Immunofluorescence, Serum

TKPNL | Tick-Borne Panel, Molecular Detection, PCR, Blood

Ehrlichiosis

SYMPTOMS

Flu-like symptoms, including fever, fatigue, malaise, myalgias/arthralgias, and headache.

Due to the potential for severe symptoms and death, consider presumptive treatment while awaiting test results.

PATHOGEN

Rickettsiales bacteria:
Ehrlichia chaffeensis, E. ewingii, and *E. muris* subsp. *eauclairensis*

VECTOR

Amblyomma ticks for *E. chaffeensis* and *E. ewingii.*

Ixodes scapularis for *E. muris* subsp*. eauclairensis*

PRIMARY DISTRIBUTION

United States – Southeast and Southcentral regions

Europe (less frequent)

FEATURED TESTING

EHRCP | *Ehrlichia* Antibody Panel, Serum

EHRL | *Ehrlichia/Anaplasma,* Molecular Detection, PCR, Blood

EHRC | *Ehrlichia chaffeensis* (HME) Antibody, IgG, Serum

TICKS | Tick-Borne Disease Antibodies Panel, Serum

EHBAP | Ehrlichia/Babesia Antibody Panel, Immunofluorescence, Serum

TKPNL | Tick-Borne Panel, Molecular Detection, PCR, Blood

Rocky Mountain Spotted Fever (RMSF)

SYMPTOMS

High fever, chills, severe headache, muscle aches, nausea, vomiting, and fatigue.

Due to the potential for severe symptoms and death, consider presumptive treatment while awaiting test results.

PATHOGEN

Intracellular, coccobacillus bacteria:
Spotted Fever Group Rickettsia (e.g., *Rickettsia rickettsii*)

VECTOR

Dermacentor and *Rhipicephalus* ticks

PRIMARY DISTRIBUTION

United States – Southeast region

Canada

Central America

FEATURED TESTING

SFGP | Spotted Fever Group Antibody, IgG and IgM, Serum

For tick-borne pathogens other than *Rickettsia* species:

TICKS | Tick-Borne Disease Antibodies Panel, Serum

EHBAP | Ehrlichia/Babesia Antibody Panel, Immunofluorescence, Serum

TKPNL | Tick-Borne Panel, Molecular Detection, PCR, Blood

Borrelia miyamotoi Disease

SYMPTOMS

High fever, headache, myalgias, fatigue, and arthralgias. Note that symptoms—specifically fever—may occur in a biphasic manner.

PATHOGEN

Spirochete bacterium:
Borrelia miyamotoi

VECTOR

Ixodes ticks

DISTRIBUTION

North America

Europe

Japan

FEATURED TESTING

BMIYB | *Borrelia miyamotoi* Detection PCR, Blood

BMIYC | *Borrelia miyamotoi* Detection PCR, Spinal Fluid

TKPNL | Tick-Borne Panel, Molecular Detection, PCR, Blood

Tick-Borne Coinfections Testing Options

Tick-borne pathogen coinfections are more widespread than commonly recognized by medical professionals and the public. Ticks can transmit multiple infectious agents through a single bite to the host. In studies reported in *Clinical Microbiology* reviews, coinfections appear with the greatest frequency among people with Lyme disease (LD). Approximately 4–5% of patients with LD are coinfected with either human anaplasmosis or babesiosis where LD is endemic.[6]

Mayo Clinic, a recognized center of excellence for vector-borne diseases, offers combined expertise with consultancy, integration of serologic and molecular testing, and enhanced reports with interpretation support.

Serological Testing

A tick-borne testing panel can assist in the detection of coinfections, even if they are not initially suspected by the provider. Such tests can evaluate patients who present with fever, myalgia, headache, nausea and other symptoms and have a history or suspicion of tick exposure. Importantly, this testing is useful in patients presenting with more than seven days of symptoms.

COMPREHENSIVE PANEL

TICKS | Tick-Borne Disease Antibodies Panel, Serum

INCLUDED TESTS

EHRC | *Ehrlichia chaffeensis* (HME) Antibody, IgG, Serum

ANAP | *Anaplasma phagocytophilum* (Human Granulocytic Ehrlichiosis) Antibody, Serum

BABG | *Babesia microti* IgG Antibodies, Serum

LYME | Lyme Disease Serology, Serum

REFLEX TEST (IF INDICATED)

LYWB | Lyme Disease Antibody, Immunoblot, Serum

ADJUNCT PANEL

EHBAP | Ehrlichia/Babesia Antibody Panel, Immunofluorescence, Serum

Molecular Testing

While two-tiered serological testing best identifies Lyme disease caused by *B. burgdorferi,* molecular amplification assays are the best detectors for acute ehrlichiosis, anaplasmosis, babesiosis, and *B. miyamotoi* infections within the first 7 days following symptom onset. This tick-borne panel offers sensitive, specific, and rapid detection of agents that cause these four diseases. Consider ordering this panel when systemic symptoms, such as fever, chills, and sepsis, are present.

COMPREHENSIVE PANEL

TKPNL | Tick-Borne Panel, Molecular Detection, PCR, Blood

INCLUDED TESTS

LBAB | *Babesia* Species, Molecular Detection, PCR, Blood

EHRL | *Ehrlichia/Anaplasma,* Molecular Detection, PCR, Blood

BMIYB | *Borrelia miyamotoi* Detection, PCR, Blood

MOSQUITO-BORNE DISEASES

Worldwide, mosquito-borne diseases (MBDs) cause millions of deaths each year, earning mosquitoes the title of the world's deadliest animal.[5]

We offer a comprehensive menu of individually orderable tests and panels for MBDs. Additionally, our algorithmic approaches to MBD testing help reduce costs and optimize patient care.

Pictured above: *Anopheles* mosquito

Malaria

SYMPTOMS

Fever, headache, chills, nausea, vomiting, muscle pain, fatigue, sweating, chest or abdominal pain, and cough.

If not treated within 24 hours, malaria can lead to death from one or more serious complications,[7,8] including:

- ***Cerebral malaria***
- ***Breathing problems***
- ***Organ failure***
- ***Anemia***
- ***Low blood sugar***

PATHOGEN

Protozoan parasite:

Plasmodium species

- *P. falciparum*
- *P. vivax*
- *P. ovale*
- *P. malariae*
- *P. knowlesi*

VECTOR

Anopheles mosquitoes

DISTRIBUTION

Sub-Saharan African

Southeast Asia

Eastern Mediterranean (less frequent)

Western Pacific

South America

North America (less frequent)

- Dominican Republic
- Haiti

Oceania

- Papua New Guinea

FEATURED TESTING

LCMAL | Malaria, Molecular Detection, PCR Only

LMALP | Malaria PCR with Parasitemia Reflex

MAL | Rapid Malaria/*Babesia* Smear

West Nile Virus

SYMPTOMS

Mild infection:
Fever, headache, body aches, vomiting, diarrhea, fatigue, and skin rash.

Neurological infection:
High fever, severe headache, stiff neck, disorientation or confusion, stupor or coma, tremors or muscle jerking, seizures, partial paralysis, or muscle weakness.

If neurological symptoms are left untreated, patients may develop encephalitis or meningitis. Approximately 1 out of 10 people who develop severe central nervous system (CNS) illnesses die.[1,4]

PATHOGEN

Positive-stranded ribonucleic acid (RNA) virus:
Flavivirus genus, *Flaviviridae* family

VECTOR

Primarily *Culex* mosquitoes

DISTRIBUTION

Africa

Europe

Middle East

West Asia

Oceania

North America (less frequent)

FEATURED TESTING

WNS | West Nile Virus Antibody, IgG and IgM, Serum

WNC | West Nile Virus Antibody, IgG and IgM, Spinal Fluid

LCWNV | West Nile Virus, Molecular Detection, PCR, Spinal Fluid

WNVP | West Nile Virus, Molecular Detection, PCR, Plasma

PCR tests are recommended to be used in conjunction with serological tests.

Eastern Equine Encephalitis Virus

SYMPTOMS

Systemic infection:
Chills, fever, malaise, arthralgia, and myalgia.

Encephalitic infection:
Fever, headache, irritability, restlessness, drowsiness, anorexia, vomiting, diarrhea, cyanosis, convulsions, and coma.

PATHOGEN

Arbovirus:
Alphavirus genus, *Togaviridae* family

VECTOR

Culiseta mosquitoes

DISTRIBUTION

North America

Central America

South America

Caribbean

FEATURED TESTING

EEEP | Eastern Equine Encephalitis Antibody, IgG and IgM, Serum

EEPC | Eastern Equine Encephalitis Antibody Panel, IgG and IgM, Spinal Fluid

FEATURED PANELS

ARBOP | Arbovirus Antibody Panel, IgG and IgM, Serum

ABOPC | Arbovirus Antibody Panel, IgG and IgM, Spinal Fluid

Western Equine Encephalitis Virus

SYMPTOMS

Malaise, fever, headache, nausea, vomiting, vertigo, photophobia, sore throat, respiratory symptoms, abdominal pain, and myalgia.

PATHOGEN

Arbovirus:
Alphavirus genus, *Togaviridae* family

VECTOR

Culex, Culiseta, and *Aedes* mosquitoes

DISTRIBUTION

North America
- Western Canada
- Western United States

South America
- Argentina

FEATURED TESTING

WEEP | Western Equine Encephalitis Antibody, IgG and IgM, Serum

WEEPC | Western Equine Encephalitis Antibody Panel, IgG and IgM, Spinal Fluid

FEATURED PANELS

ARBOP | Arbovirus Antibody Panel, IgG and IgM, Serum

ABOPC | Arbovirus Antibody Panel, IgG and IgM, Spinal Fluid

California (La Crosse) Encephalitis

SYMPTOMS

Fever, headache, nausea, vomiting, fatigue, and lethargy. More severe symptoms, including seizures, coma, and paralysis, often lead to encephalitis.

PATHOGEN

Serogroup virus:
Bunyavirus genus, *Bunyaviridae* family

VECTOR

Aedes and *Culex* mosquitoes

DISTRIBUTION

United States – Midwestern, Mid-Atlantic, and Southeast regions

FEATURED TESTING

CAVP | California Virus (La Crosse) IgG and IgM, Serum

CAVPC | California Virus (La Crosse) Encephalitis Antibody Panel, IgG and IgM, Spinal Fluid

FEATURED PANELS

ARBOP | Arbovirus Antibody Panel, IgG and IgM, Serum

ABOPC | Arbovirus Antibody Panel, IgG and IgM, Spinal Fluid

St. Louis Encephalitis Virus

SYMPTOMS

Mild infections:
Fever, headache, dizziness, nausea, and malaise.

CNS infections:
Stiff neck, confusion, disorientation, dizziness, tremors, and unsteadiness.

PATHOGEN

Positive-stranded ribonucleic acid (RNA) virus:

Flavivirus genus, *Flavivirdae* family

VECTOR

Culex mosquitoes

DISTRIBUTION

United States – Eastern, central, and rural western regions

FEATURED TESTING

STLP | St. Louis Encephalitis Antibody, IgG and IgM, Serum

STLPC | St. Louis Encephalitis Antibody Panel, IgG and IgM, Spinal Fluid

FEATURED PANELS

ARBOP | Arbovirus Antibody Panel, IgG and IgM, Serum

ABOPC | Arbovirus Antibody Panel, IgG and IgM, Spinal Fluid

Chikungunya Virus

SYMPTOMS

Fever, joint pain, fatigue, muscle pain, headache, and rash.

PATHOGEN

Single positive-stranded RNA alphavirus:
Alphavirus genus, *Togaviridae* family

VECTOR

Aedes mosquitoes

DISTRIBUTION

Africa

Asia

Europe

Islands in the Caribbean, Indian, and Pacific Oceans

FEATURED TESTING

CHIKV | Chikungunya IgM and IgG, Antibody, Serum

CHIKS | Chikungunya Virus, PCR, Molecular Detection, Serum

CHIKC | Chikungunya Virus, PCR, Molecular Detection, Spinal Fluid

Zika Virus

SYMPTOMS

Mild fever, rash, joint or muscle pain, headache, and conjunctivitis. The Zika virus may cause other neurological disorders such as Guillain-Barre syndrome.

Birth defects:
Severe microcephaly with a partly collapsed skull, brain damage, reduced brain size, eye damage, joint problems—including limited motion—and reduced body movement caused by too much muscle tone after birth.

PATHOGEN

Single-stranded RNA virus:
Flavivirus genus, *Flavivirdae* family

VECTOR

Aedes aegypti and *Aedes albopictus* mosquitoes

DISTRIBUTION

Africa

Southeast Asia

South America

Central America

FEATURED TESTING

MZIKV | Zika Virus IgG Antibody Capture MAC-ELISA, Serum

RZIKU | Zika Virus, PCR, Molecular Detection, Random, Urine

RZIKS | Zika Virus, Virus, PCR, Molecular Detection, Serum

PNZIK | Prenatal Zika Virus IgM Antibody Capture MAC-ELISA, Serum

Dengue Virus

SYMPTOMS

Mild infection:
High fever, headache, muscle, bone and joint pain, nausea, vomiting, pain behind the eyes, swollen glands, and rash.

Dengue hemorrhagic fever, severe dengue, or dengue shock syndrome:
Severe abdominal pain, persistent vomiting, bleeding from gums or nose, bleeding under the skin (which might look like bruising), difficult or rapid breathing, cold or clammy skin (shock), fatigue, irritability, and restlessness.

Symptoms of dengue hemorrhagic fever, severe dengue, or dengue shock syndrome signal life-threatening emergencies.

PATHOGEN

Single positive-stranded RNA virus:
Flavivirus genus*, Flaviviridae* family

VECTOR

Aedes aegypti and *Aedes albopictus* mosquitoes

DISTRIBUTION

North America

South America

Central America

Africa

Eastern Mediterranean

Southeast Asia

Western Pacific

FEATURED TESTING

DENGM | Dengue Virus Antibody, IgG and IgM, Serum

DENVP | Dengue Virus Antibody/Antigen Panel, Serum

DNSAG | Dengue Virus NS1 Antigen, Serum

DENGC | Dengue Virus, Molecular Detection, PCR, CSF

DENGS | Dengue Virus, Molecular Detection, PCR, Serum

FEATURED PANELS

ARBOP | Arbovirus Antibody Panel, IgG and IgM, Serum

ABOPC | Arbovirus Antibody Panel, IgG and IgM, Spinal Fluid

INSECT-BORNE DISEASES

Our laboratories test for various diseases carried by insect species. The tsetse fly spreads sleeping sickness, which affects 36 countries of sub-Saharan Africa and places 55 million people at risk. Sand flies spread the leishmaniasis group of diseases, which affects 88 countries and places 350 million people at risk. Household bugs spread Chagas disease and place 100 million people at risk in Latin America. Other insects spread filarial diseases, including lymphatic filariasis, loiasis, and onchoceriasis.

Pictured above: *Phlebotomus papatasi* sand fly[10]

Visceral Leishmaniasis

SYMPTOMS

Cutaneous leishmaniasis:
One or more sores on the skin, papules (bumps), nodules (lumps), ulcers with crust or scabs, and swollen glands near the sores. Patients may also be asymptomatic.

Visceral leishmaniasis:
Fever, weight loss, enlargement of the spleen and liver, and abnormal blood tests with anemia, leukopenia, or thrombocytopenia.

PATHOGEN

Parasite:
Leishmania genus

VECTOR

Female phlebotomine sand flies

DISTRIBUTION

Asia

Middle East

Africa – tropical and northern regions

Southern Europe

Mexico

Central America

South America

FEATURED TESTING

LEIS | Leishmaniasis (Visceral) Antibody, Serum

Test is NOT appropriate for diagnosing cutaneous leishmaniasis.

Parasite Identification (Arthropods)

SYMPTOMS

Arthropods serve as disease vectors and cause disease by tissue damage and blood loss.

VECTOR

Ticks

Fleas

Mites

Lice

Reduvlid bugs

DISTRIBUTION

Varies with arthropod

FEATURED TESTING

PARID | Parasite Identification, Varies

Tick identification can be used to guide prophylaxis for Lyme disease[11] and predict the risk for other tick-borne diseases. The report includes tick genus, species, gender, life cycle stage, degree of engorgement, and presence—or absence—of mouthparts.

Trypanosoma cruzi Infection (Chagas Disease)

SYMPTOMS

Acute phase:
Often asymptomatic. Mild signs include swelling at the infection site, fever, fatigue, rash, body aches, eyelid swelling, headache, loss of appetite, nausea, diarrhea, vomiting, swollen glands, and enlargement of the liver or spleen.

Chronic phase:
Irregular heartbeat, congestive heart failure, sudden cardiac arrest, difficulty swallowing due to enlarged esophagus, abdominal pain, and constipation due to enlarged colon.

If left untreated, the infection persists and advances to the chronic phase. Symptoms may occur 10–20 years after initial infection and may be life threatening.[3]

PATHOGEN

Protozoan hemoflagellate:
Trypanosoma cruzi

VECTOR

Reduviid ("kissing bugs") *Triatoma*

DISTRIBUTION

Rural regions of Mexico

Central America

South America

FEATURED TESTING

CHAG | *Trypanosoma cruzi* IgG Antibody ELISA, Serum

Test is preferred for diagnosis of chronic Chagas disease.

THE MAYO CLINIC DIFFERENCE

Our clinicians and laboratorians focus on maintaining high-quality, cost-effective, and efficient care by using algorithmic, evidence-based approaches that lead to correct diagnoses and treatment, while minimizing unnecessary testing.

More importantly, physicians and scientists manage our laboratories with expert knowledge regarding the clinical implications of each test result and how it impacts patient care.

For more information about our vector-borne disease testing and algorithms, visit **mayocliniclabs.com/vectorborne**.

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