MAYO CLINIC LABORATORIES

Test Definition: EHBAP

Ehrlichia/Babesia Antibody Panel, Immunofluorescence, Serum

Overview

Useful For

As an adjunct in the diagnosis of infection with *Anaplasma phagocytophilum*, *Ehrlichia chaffeensis* or *Babesia microti*

Seroepidemiological surveys of the prevalence of the infection in certain populations

Profile Information

Test Id	Reporting Name	Available Separately	Always Performed
ANAP	Anaplasma phagocytophilum Ab, IgG,S	Yes	Yes
EHRC	Ehrlichia Chaffeensis (HME) Ab, IgG	Yes	Yes
BABG	Babesia microti IgG Ab, S	Yes	Yes

Testing Algorithm

For more information see Acute Tick-Borne Disease Testing Algorithm.

Special Instructions

- Acute Tickborne Disease Testing Algorithm

Method Name

Immunofluorescence Assay (IFA)

NY State Available

Yes

Specimen

Specimen Type

Serum

Ordering Guidance

This test may be nonreactive during the acute phase of the infection. For patients presenting with suspected acute infections of *Ehrlichia chaffeensis or Anaplasma phagocytophilum*, consider EPCRB / *Ehrlichia*/*Anaplasma*, Molecular Detection, PCR, Blood.

Specimen Required

Collection Container/Tube:
Preferred: Serum gel
Acceptable: Red top
Submission Container/Tube: Plastic vial
Specimen Volume: 0.6 mL
Collection Instructions: Centrifuge and aliquot serum into a plastic vial.

Forms

If not ordering electronically, complete, print, and send Infectious Disease Serology Test Request (T916) with the specimen.

Specimen Minimum Volume

0.5 mL

Reject Due To

Gross hemolysis	Reject
Gross lipemia	Reject
Gross icterus	Reject
Heat-inactivated specimen	Reject

Specimen Stability Information

Specimen Type	Temperature	Time	Special Container
Serum	Refrigerated (preferred)	14 days	
	Frozen	14 days	

Clinical & Interpretive

Clinical Information

Anaplasma phagocytophilum:
Anaplasma phagocytophilum is an intracellular rickettsia-like bacterium that preferentially infects granulocytes and forms inclusion bodies referred to as morulae. *A phagocytophilum* is transmitted by *Ixodes* species ticks, which also transmit *Borrelia burgdorferi* and *Babesia* species. Infection with *A phagocytophilum* is also referred to as human granulocytic anaplasmosis (HGA) or human granulocytic ehrlichiosis, and symptoms in otherwise healthy individuals are often mild and nonspecific, including fever, myalgia, arthralgia, and nausea. Clues to the diagnosis of anaplasmosis in a patient with an acute febrile illness after tick exposure include laboratory findings of leukopenia or thrombocytopenia and elevated liver enzymes. HGA is most prevalent in the upper Midwest and in other areas of the United States that are endemic for Lyme disease.

Ehrlichia chaffeensis:

Ehrlichia chaffeensis is an intracellular rickettsia-like bacterium that preferentially infects monocytes and is sequestered in parasitophorous vacuoles referred to as morulae. Infections with *E chaffeensis* are also referred to as human monocytotropic ehrlichiosis (HME). *E chaffeensis* is transmitted by *Amblyomma* species ticks, which are found throughout the Southeastern and South-Central United States.

Many cases of HME are subclinical or mild; however, the infection can be severe and life-threatening, particularly in immunosuppressed individuals. Reported mortality rates range from 2% to 3%. Fever, fatigue, malaise, headache, and other "flu-like" symptoms occur most commonly. Leukopenia, thrombocytopenia, and elevated hepatic transaminases are frequent laboratory findings.

Babesia microti:
Babesiosis is a zoonotic infection caused by the protozoan parasite *Babesia microti*. The infection is acquired by contact with *Ixodes* ticks carrying the parasite. The deer mouse is the animal reservoir, and overall, the epidemiology of this infection is much like that of Lyme disease. Babesiosis is most prevalent in the Northeast, upper Midwest, and Pacific Coast of the United States.

Infectious forms (sporozoites) are injected during tick bites, and the organism enters the vascular system where it infects red blood cells (RBC). During this intraerythrocytic stage, it becomes disseminated throughout the reticuloendothelial system. Asexual reproduction occurs in RBC, and daughter cells (merozoites) are formed, which are liberated on rupture (hemolysis) of the RBC.

Most cases of babesiosis are subclinical or mild, but the infection can be severe and life-threatening, especially in older or asplenic patients. Fever, fatigue, malaise, headache, and other flu-like symptoms occur most commonly. In the most severe cases, hemolysis, acute respiratory distress syndrome, and shock may develop. Patients may have hepatomegaly and splenomegaly.

A serologic test can be used as an adjunct in the diagnosis and follow-up of babesiosis, when infection is chronic or persistent, or in seroepidemiologic surveys of the prevalence of the infection in certain populations. Babesiosis is usually diagnosed by observing the organisms in infected RBC on Giemsa-stained thin blood films of smeared peripheral blood. Serology may also be useful if the parasitemia is too low to detect or if the infection has cleared naturally or following treatment.

Reference Values

ANAPLASMA PHAGOCYTOPHILUM
<1:64
Reference values apply to all ages.

EHRLICHIA CHAFFEENSIS
<1:64
Reference values apply to all ages.

BABESIA MICROTI
<1:64
Reference values apply to all ages.

Interpretation

Anaplasma phagocytophilum:
A positive result of an immunofluorescence assay (IFA) test (titer > or =1:64) suggests current or previous infection with human granulocytic ehrlichiosis (anaplasmosis). In general, the higher the titer, the more likely it is that the patient has an active infection.

Seroconversion may also be demonstrated by a significant increase in IFA titers.

During the acute phase of the infection, serologic tests are often nonreactive, polymerase chain reaction (PCR) testing is available to aid in the diagnosis of these cases (see EPCRB / *Ehrlichia*/*Anaplasma*, Molecular Detection, PCR, Blood).

Ehrlichia chaffeensis:
A positive IFA result (titer > or =1:64) suggests current or previous infection. In general, the higher the titer, the more likely the patient has an active infection. Four-fold rises in titer also indicate active infection.

Previous episodes of ehrlichiosis may produce a positive serology result although antibody levels decline significantly during the year following infection.

Babesia microti:
A positive result of an indirect fluorescent antibody test (titer > or =1:64) suggests current or previous infection with *Babesia microti*. In general, the higher the titer, the more likely it is that the patient has an active infection. Patients with documented infections have usually had titers ranging from 1:320 to 1:2560.

Cautions

Performance characteristics have not been established for hemolyzed or lipemic specimens.

Anaplasma phagocytophilum:
Previous episodes of human granulocytic ehrlichiosis (anaplasmosis) may produce a positive serologic result.

In rare instances, clinical evidence of infection may also be derived by direct microscopic examination of Giemsa- or Diff-Quik-stained peripheral blood buffy coat smears, which may reveal clusters of round, dark-purple stained, small dots (morulae) in the cytoplasm of polymorphonuclear cells. However, this is a very insensitive method.

Ehrlichia chaffeensis:
Serology results for IgG may be negative during the acute phase of infection (<7 days post-symptom onset), during which time detection using targeted nucleic acid amplification testing (eg, polymerase chain reaction: PCR) is recommended.

Detectable IgG-class antibodies typically appear within 7 to 10 days post-symptom onset.

IgG-class antibodies may remain detectable for months to years following prior infection. Therefore, a single time point-positive titer needs to be interpreted alongside other findings to differentiate recent versus past infection.

Other members of the *Ehrlichia* genus (eg, *Ehrlichia ewingii*) may not be detected by this assay.

Babesia microti:
Previous episodes of babesiosis may produce a positive serologic result.

In selected cases, documentation of infection may be attempted by animal inoculation or PCR methods (BABPB / *Babesia* species, Molecular Detection, PCR, Blood)

Clinical Reference

Centers for Disease Control and Prevention (CDC). Tickborne Diseases of the United States: A Reference Manual for Healthcare Providers. 6th ed. US Department of Health and Human Services; 2022. Accessed September 29, 2022. Available at www.cdc.gov/ticks/tickbornediseases/TickborneDiseases-P.pdf

Performance

Method Description

Anaplasma phagocytophilum and *Ehrlichia chaffeensis*:
The patient's serum is diluted and is placed in microscopic slide wells that have been coated with *Anaplasma phagocytophilum* or *Ehrlichia chaffeensis*-infected cells. After incubation, the slides are washed and a fluorescein-isothiocyanate conjugate is added to each well. The slides are then read using a fluorescence microscope and significant fluorescent staining of intracellular organisms constitutes a positive reaction.(Dumler JS, Asanovich KM, Bakken JS, Richter P, Kimsey R, Madigan JE. Serologic cross-reactions among Ehrlichia equi, Ehrlichia phagocytophila, and human granulocytic Ehrlichia. J Clin Microbiol. 1995;33[5]:1098-1103; Pancholi P, Kolbert CP, Mitchell PD, et al. Ixodes dammini as a potential vector of human granulocytic ehrlichiosis. J Infect Dis. 1995;172[4]:1007-1012; Dawson JE, Fishbein DB, Eng TR, Redus MA, Green NR. Diagnosis of human ehrlichiosis with the indirect fluorescent antibody test: kinetics and specificity. J Infect Dis. 1990;162[1]:91-95; package insert: Ehrlichia chaffeensis IFA IgG. DiaSorin; 08/2016)

Babesia microti:
The patient's serum is diluted and is placed in microscopic slide wells which have been coated with *Babesia microti*-infected red blood cells from Syrian hamsters. After incubation, the slides are washed and a fluorescein-isothiocyanate conjugate is added to each well. The slides are then read using a fluorescence microscope and significant fluorescent staining of intraerythrocytic organisms constitutes a positive reaction.(Krause PJ, Telford III SR, Ryan R, et al. Diagnosis of babesiosis: Evaluation of a serologic test for the detection of *Babesia microti* antibody. J Infect Dis. 1994;169[4]:923-926; package insert: Babesia IFA IgG. DiaSorin Molecular; 08/12/2016)

PDF Report

No

Day(s) Performed

Monday through Friday

Report Available

Same day/1 to 3 days

Specimen Retention Time
14 days

Performing Laboratory Location
Rochester

Fees & Codes

Fees
- Authorized users can sign in to Test Prices for detailed fee information.
- Clients without access to Test Prices can contact Customer Service 24 hours a day, seven days a week.
- Prospective clients should contact their account representative. For assistance, contact Customer Service.

Test Classification
This test was developed using an analyte specific reagent. Its performance characteristics were determined by Mayo Clinic in a manner consistent with CLIA requirements. This test has not been cleared or approved by the US Food and Drug Administration.

CPT Code Information
86666 x 2
86753

LOINC® Information

Test ID	Test Order Name	Order LOINC® Value
EHBAP	Ehrlichia/Babesia Ab Panel, S, IFA	101409-1

Result ID	Test Result Name	Result LOINC® Value
81157	Anaplasma phagocytophilum Ab, IgG,S	23877-4
81128	Babesia microti IgG Ab, S	16117-4
81478	Ehrlichia Chaffeensis (HME) Ab, IgG	47405-6