Ehrlichiosis

*Ehrlichia* spp

**DISEASE REPORTABLE WITHIN 24 HOURS OF DIAGNOSIS**

Per N.J.A.C. 8:57, healthcare providers and administrators shall report by mail or by electronic reporting within 24 hours of diagnosis, confirmed cases of ehrlichiosis to the health officer of the jurisdiction where the ill or infected person lives, or if unknown, wherein the diagnosis is made. A directory of local health departments in New Jersey is available at [http://www.state.nj.us/health/lh/directory/lhdselectcounty.shtml](http://www.state.nj.us/health/lh/directory/lhdselectcounty.shtml).

If the health officer is unavailable, the healthcare provider or administrator shall make the report to the Department by telephone to 609.826.5964, between 8:00 A.M. and 5:00 P.M. on non-holiday weekdays or to 609.392.2020 during all other days and hours.
THE DISEASE AND ITS EPIDEMIOLOGY

A. Etiologic Agent

Three categories of ehrlichiosis are recognized in North America as tick-borne diseases and are reportable to New Jersey Department of Health and Senior Services (NJDHSS). Human monocytic ehrlichiosis (HME) is caused by the bacterium *Ehrlichia chaffeensis*. Human granulocytic anaplasmosis (HGA), formerly known as human granulocytic ehrlichiosis or HGE, is caused by *Anaplasma phagocytophilum*. The third category includes cases that cannot be easily classified by available laboratory techniques and cases caused by novel *Ehrlichia* such as *Ehrlichia ewingii*. Sennetsu fever, documented so far only in Japan, is caused by *Ehrlichia sennetsu*.

B. Clinical Description and Laboratory Diagnosis

HGA and HME affect different white blood cells, but the signs, symptoms, and clinical course of the two diseases are similar. Both cause sudden illness, with fever being the predominant sign. The clinical illness is similar to Rocky Mountain spotted fever (RMSF), although patients more often have low white blood cell counts and less often have rash. In addition to fever, patients may have headache, chills, muscle and joint aches, nausea, and, less frequently, vomiting and loss of appetite. The rash varies in appearance and location. Patients with HGE rarely have a rash, whereas about 40% with HME have a rash. Severe, life-threatening complications can occur in persons not treated early in the disease. These complications may affect the lungs, bone marrow, brain, meninges (linings of the brain and spinal cord), kidneys, and blood. Fatal infections have been reported. Both diseases generally last about two weeks, and patients with uncomplicated illness recover completely. Co-
infections with other tick-borne agents, such as the agents of Lyme disease and babesiosis, may complicate the clinical picture.

Laboratory confirmation of ehrlichiosis requires serologic-, molecular-, or culture-based methods. The organisms can be demonstrated in blood smears using routine Giemsa staining. Serological evaluation using indirect immunofluorescence assay (IFA) or enzyme-linked immunosorbent assay (ELISA) can demonstrate specific immunoglobulin M (IgM) and IgG antibodies in the second week of the illness. Amplification of the ehrlichial DNA by polymerase chain reaction (PCR) can detect ehrlichial DNA from clinically ill patients three to five weeks after the onset of symptoms. Direct isolation of organisms from the blood remains the gold standard for confirmatory diagnosis, but it is a difficult and time-consuming approach.

C. Vectors and Reservoirs

The primary vector of HME is *Amblyoma americanum*, the lone star tick. White-tailed deer appear to represent one natural reservoir for *E. chaffeensis*.

The vector for HGE is *Ixodes scapularis* (the deer tick) in New England and north central United States, whereas *Ixodes pacificus* (the black-legged tick) is the principal vector in northern California. *I. scapularis* is the same tick associated with Lyme disease and babesiosis in New Jersey. Natural animal reservoirs for HGE are most probably deer, wild rodents, and elk.

The primary vector for *E. ewingii* is also the lone star tick, and dogs may be reservoirs.

D. Modes of Transmission

HME and HGE are acquired from a tick bite. The duration of time the tick must remain attached before the transmission of *E. chaffeensis* or the agent of HGE occurs is unclear. Because bites from *I. scapularis* are often painless and may occur on parts of the body that are difficult to observe, cases of diagnosed HGE may have no known history of a tick bite.

E. Incubation Period

The period between infection and the first symptoms of HME or HGE appears to be one to three weeks, with an average of 12 days.

F. Period of Communicability or Infectious Period

Ehrlichiosis is not communicable from person-to-person.

G. Epidemiology

Because human ehrlichiosis has been recognized as a disease in North America only within the past decade, information about the epidemiology of the disease, its range, and the associated animal hosts and tick vectors is incomplete. Most cases of HME have been
Communicable Disease Service Manual

reported from south-central and southeastern states. Most cases of HGE have been reported in Wisconsin, Minnesota, and the Northeast. On average, nine cases annually are reported to NJDHSS. Most cases occur between April and October, when the risk of contact with ticks is the greatest.

The occurrence mirrors the geographic distributions and seasonal activities of the tick vectors. Most patients with ehrlichiosis are infected in the spring and summer when they are more commonly exposed to the vector ticks. Accordingly, 80% to 90% of all ehrlichiosis cases occur between April and September, and approximately 55% to 70% of all cases occur during May through July. This period is the season for adult *A. americanum* and nymphal *I. scapularis* ticks. A history of tick bite or exposure to tick-infested habitats is reported in 50% to 90% of cases.

The types of ehrlichiosis are distinct from several other well-described tick-transmitted diseases in the United States with respect to age-specific incidence. In general, reported rates of ehrlichiosis increase with age, most patients being older than 40 years. This pattern contrasts with age-specific incidences of Lyme disease and RMSF, which occur most frequently in children. Age-specific host factors may account for severity of disease; however, severe and even fatal ehrlichial infections have occurred in otherwise healthy young adults and children.

2 CASE DEFINITION

A. Clinical Description

- A tick-borne illness characterized by acute onset of fever, headache, myalgia, and/or malaise. Nausea, vomiting, or rash may be present in some cases.
- Clinical laboratory findings may include thrombocytopenia, leukopenia, and/or elevated liver enzymes. Intracytoplasmic bacterial aggregates (morulae) may be visible in the leukocytes of some patients.
- Three categories of confirmed or probable ehrlichiosis should be reported: human ehrlichiosis caused by *E. chaffeensis* (HME), human ehrlichiosis caused by *A. phagocytophilum* (HGA), and human ehrlichiosis (other or unspecified agent), which includes cases that cannot be easily classified by available laboratory techniques and cases caused by novel *Ehrlichia* species such as *E. ewingii*.

B. Laboratory Criteria for Diagnosis

1. HME

Demonstration of a four-fold change in antibody titer to *E. chaffeensis* antigen by indirect IFA in paired serum samples, OR

Positive PCR assay and confirmation of *E. chaffeensis* DNA, OR
Identification of morulae in leukocytes AND a positive IFA titer to *E. chaffeensis* antigen (based on cutoff titers established by the laboratory performing the assay), OR

Immunostaining of *E. chaffeensis* antigen in a biopsy or autopsy sample, OR

Culture of *E. chaffeensis* from a clinical specimen.

2. **HGA**

Demonstration of a four-fold change in antibody titer to *A. phagocytophilum* antigen by IFA in paired serum samples, OR

Positive PCR assay and confirmation of *A. phagocytophilum* DNA, OR

Identification of morulae in leukocytes AND a positive IFA titer to *A. phagocytophilum* antigen (based on cutoff titers established by the laboratory performing the assay), OR

Immunostaining of *A. phagocytophilum* antigen in a biopsy or autopsy sample, OR

Culture of *A. phagocytophilum* from a clinical specimen.

3. **Ehrlichiosis, Human, Other, or Unspecified Agent**

Demonstration of a four-fold change in antibody titer to more than one *Ehrlichia* species by IFA in paired serum samples, in which a dominant reactivity cannot be established, OR

Identification of an *Ehrlichia* species other than *E. chaffeensis* or *A. phagocytophilum* by PCR, immunostaining, or culture.

4. **Case Classification**

NJDHSS case definition and the Centers for Disease Control and Prevention (CDC) case definition are the same.

**CONFIRMED**

A clinically compatible illness that is laboratory confirmed.

**PROBABLE**

A clinically compatible illness with either a single positive IFA titer (based on cutoff titers established by the laboratory performing the test) or the visualization of morulae in leukocytes.

**POSSIBLE**

Not used.
LABORATORY TESTING SERVICES AVAILABLE

1. Commercial laboratories offer serology by IFA and ELISA and sometimes PCR for the \textit{Ehrlichia} and \textit{Anaplasma} DNA.

2. Clinical pathology laboratories are capable of identifying morulae in leukocytes, if requested.

3. The Public Health and Environmental Laboratories (PHEL) currently provide testing of clinical specimens (serum) for human granulocytic ehrlichiosis and human monocytic ehrlichiosis. PHEL also provides tick identification. For additional information on submission of samples, contact the Special Immunology Laboratory at 609.292.5819.

The mailing address is:

NJDHSS
Division of Public Health and Environmental Laboratories
Specimen Receiving and Records
PO Box 361
John Fitch Plaza
Trenton, NJ 08625-0361

PURPOSE OF SURVEILLANCE AND REPORTING REQUIREMENTS

A. Purpose of Surveillance

- To identify where ehrlichiosis occurs
- To focus preventive education
- To target tick-control measures

B. Laboratory and Healthcare Provider Reporting Requirements

The New Jersey Administrative Code (NJAC 8:57-1.8) stipulates that healthcare providers and laboratories report (by telephone, confidential fax, over the Internet using the Communicable Disease Reporting and Surveillance System [CDRSS], or in writing) all cases of ehrlichiosis to the local health officer having jurisdiction over the locality in which the patient lives, or, if unknown, to the health officer in whose jurisdiction the healthcare provider requesting the laboratory examination is located.
C. Local Department of Health Reporting and Follow-up Responsibilities

The New Jersey Administrative Code (NJAC 8:57-1.8) stipulates that each local health officer must report the occurrence of any case of ehrlichiosis, as defined by the reporting criteria in section 2A.

Current requirements are that cases be reported to the NJDHSS Infectious and Zoonotic Diseases Program (IZDP) using the **CDC Tick-Borne Rickettsial Disease Case Report Form** and to electronically enter the case in the confidential and secure CDRSS.

5 CASE INVESTIGATION

A. Form

It is the local health officer’s responsibility to complete the **CDC Tick-Borne Rickettsial Disease Case Report Form** by interviewing the patient and others who may be able to provide pertinent information. This form will help obtain information to be entered in CDRSS (see 5C) and when complete should be forwarded to NJDHSS Communicable Disease Service. Although much of the information required on the form can be obtained from the patient’s healthcare provider or the medical record, timeliness in completion of the form may dictate speaking with the ICP or a family member.

The form asks whether the suspected diagnosis is HGA or HME. The vast majority of cases diagnosed in New Jersey will be HGA. If the laboratory reports clearly state that the patient was diagnosed with HGA or HME, then check the appropriate box on the case report form. Otherwise, leave this section blank.

B. Laboratory Reports

- If the local health department receives the laboratory or provider report, the local health department should investigate the case by contacting the patient, a family member, or the healthcare provider to complete the information requested on the Ehrlichiosis Case Report form. In addition, the local health department should then enter the information in CDRSS as instructed below.
- If the laboratory or provider report is received by NJDHSS and includes the patient’s address, the report will be entered in CDRSS as “PENDING” and not mailed to the local health department.
- If the laboratory or provider report received by NJDHSS does not include the patient’s address, the report will be returned to the sending laboratory or healthcare provider or they will be telephoned to obtain a complete address. Once it is received, the report will be entered in CDRSS as “PENDING.”
C. CDRSS

The mandatory fields in CDRSS include: disease, last name, county, municipality, gender, race, ethnicity, case status, report status.

The following table can be used as a quick reference guide to determine which CDRSS fields need to be completed for accurate and complete reporting of ehrlichiosis cases. The “CDRSS Screen” column includes the tabs which appear along the top of the CDRSS screen. The “Required Information” column provides detailed explanations of what data should be entered.

<table>
<thead>
<tr>
<th>CDRSS Screen</th>
<th>Required Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient Info</td>
<td>Enter the disease name (“EHRLICHIOSIS/ANAPLASMOSIS”), patient demographic information, illness onset date, and the date the case was reported to the local health department (LHD). Select the appropriate subgroup: if the lab assay is for Anaplasma or Ehrlichia equi, select “ANAPLASMA PHAGOCYTOPHILIUM (PREVIOUSLY HGE)”; if the lab assay is for Ehrlichia chaffeensis select “EHRLICHIA CHAFFEENSIS (PREVIOUSLY HME)”; if the lab assay is for Ehrlichia ewingii or another Ehrlichia species, select “EHRLICHIOSIS/ANAPLASMOSIS – EHRLICHIOSIS EWINGII”; and if the lab assay is undetermined or does not specify a species, select “EHRLICHIOSIS/ANAPLASMOSIS, UNDETERMINED.”</td>
</tr>
<tr>
<td>Addresses</td>
<td>Enter any alternate address (e.g., a camp attended, work address or summer home). Use the Comments section in this screen to record any pertinent information about the alternate address (e.g., the dates or the times per week the case-patient was there). Entering an alternate address will allow other disease investigators access to the case if the alternate address falls within their jurisdiction.</td>
</tr>
<tr>
<td>Clinical Status</td>
<td>Enter any treatment that the patient received and record the names of the medical facilities and physician(s) involved in the patient’s care. If the patient received care from two or more hospitals, be sure that all are entered so the case can be accessed by all infection control professionals (ICPs) covering these facilities. If the patient is alive, select “NO” in the Mortality section. If the patient died, select “YES” in the Mortality section, with date of death.</td>
</tr>
<tr>
<td>Signs/Symptoms</td>
<td>Check appropriate boxes for signs and symptoms and indicate their onset. Make every effort to get complete information by interviewing the physician, the case patient, family members, ICP, or others who might have knowledge of the patient’s illness. Also, information regarding the resolution of signs and symptoms should be entered.</td>
</tr>
<tr>
<td>CDRSS Screen</td>
<td>Required Information</td>
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<td>-----------------------</td>
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</tr>
<tr>
<td>Risk Factors</td>
<td>Enter complete information about risk factors (i.e., known tick exposures) to facilitate study of ehrlichiosis in New Jersey. Focus on one to three weeks before onset and note tick bite and travel history (exposure history).</td>
</tr>
<tr>
<td>Laboratory Eval</td>
<td>Select the appropriate lab assay from the drop down list, being careful to IgG or IgM as needed. The titer for a serologic test result should be entered into the “VALUE” field (entries into this field can be observed on the summary tab). Other pertinent information, especially negative laboratory results can be documented in the Comments section.</td>
</tr>
<tr>
<td>Contact Tracing</td>
<td>Information regarding contacts is not required for this disease.</td>
</tr>
<tr>
<td>Case Comments</td>
<td>Enter general comments (i.e., information that is not discretely captured by a specific topic screen or drop-down menu) in the Comments section. <strong>NOTE:</strong> Select pieces of information entered in the Comments section CANNOT be automatically exported when generating reports. Therefore, whenever possible, record information about the case in the fields that have been designated to capture this information; information included in these fields CAN be automatically exported when generating reports.</td>
</tr>
<tr>
<td>Epidemiology</td>
<td>Information regarding contacts is not required for this disease.</td>
</tr>
<tr>
<td>Case Classification</td>
<td>Case status options are: “REPORT UNDER INVESTIGATION (RUI),” “CONFIRMED,” “PROBABLE,” “POSSIBLE,” and “NOT A CASE.”</td>
</tr>
<tr>
<td>Report Status</td>
<td>• All cases entered by laboratories (including LabCorp electronic submissions) should be assigned a case status of “REPORT UNDER INVESTIGATION (RUI).”</td>
</tr>
<tr>
<td></td>
<td>• Cases still under investigation by the LHD should be assigned a case status of “REPORT UNDER INVESTIGATION (RUI).”</td>
</tr>
<tr>
<td></td>
<td>• Upon completion of the investigation, the LHD should assign a case status on the basis of the case definition. “CONFIRMED,” “PROBABLE” and “NOT A CASE” are the only appropriate options for classifying a case of Ehrlichiosis (see section 2A).</td>
</tr>
</tbody>
</table>
|                       | Report status options are: “PENDING,” “LHD OPEN,” “LHD REVIEW,” “LHD CLOSED,” “DELETE,” “REOPENED,” “DHSS
• Cases reported by laboratories (including LabCorp electronic submissions) should be assigned a report status of “PENDING.”
• Once the LHD begins investigating a case, the report status should be changed to “LHD OPEN.”
• The “LHD REVIEW” option can be used if the LHD has a person who reviews the case before it is closed (e.g., health officer or director of nursing).
• Once the LHD investigation is complete and all the data are entered into CDRSS, the LHD should change the report status to “LHD CLOSED.”
• “LHD CLOSED” cases will be reviewed by DHSS and be assigned one of the DHSS-specific report status categories. If additional information is needed on a particular case, the report status will be changed to “REOPENED” and the LHD will be notified by e-mail. Cases that are “DHSS APPROVED” cannot be edited by LHD staff (see Section C below).

If a case is inappropriately entered (e.g., a case of HGE was erroneously entered as a case of HME) the case should be assigned a report status of “DELETE.” A report status of “DELETE” should NOT be used if a reported case of ehrlichiosis simply does not meet case definition. Rather, it should be assigned the appropriate case status, as described above.

D. Other Reporting/Investigation Issues

1. It is not always possible to obtain all the information necessary to classify a case. A minimum of three attempts (not necessarily to the same person, and only one of which is mail) should be made to obtain necessary information. If information can not be obtained after these three requests, the case should be entered into CDRSS if it hasn’t already been and the number of attempts, including dates and outcomes of the attempts documented in the comments section. The case status should be changed to “NOT A CASE” and the report status changed to “LHD CLOSED.”

2. Every effort should be made to complete the investigation within three months of opening a case. Cases which remain open for three months or more and have no investigation or update notes will be closed by NJDHSS and marked as “NOT A CASE.”
CONTROLLING FURTHER SPREAD

A. Isolation and Quarantine Requirements (NJAC 8:57-1.10)

None.

B. Protection of Contacts of a Case

None.

C. Managing Special Situations

None.

D. Preventive Measures

1. Environmental Measures

To prevent ehrlichiosis, advise residents to make their yard less attractive to ticks through

• Removing leaf litter and brush from around the home
• Pruning low-lying bushes to let in more sunlight
• Mowing lawns regularly
• Keeping woodpiles in sunny areas off the ground
• Following label instructions of acaracides (pesticides that specifically target ticks) and never using them near streams or other bodies of water

2. Personal Preventive Measures and Education

The best preventive measure is to avoid tick-infested areas. In areas where contact with ticks may occur, individuals should be advised of the following:

• Wear long-sleeved shirts and long, light-colored pants tucked into socks or boots.
• Stay on trails when walking or hiking and try to avoid areas with high grass.
• Use insect repellents properly. Repellants that contain DEET (diethyltoluamide) should be used in concentrations no higher than 15% for children and 30% for adults. Remember, repellents should never be used on infants. Permethrin is a repellent that can be applied only to clothing, not exposed skin.
• After each day spent in tick-infested areas, check self, children, and pets for ticks. Parts of the body ticks like most include the back of the knee, armpit, scalp, groin, and back of the neck. Promptly remove any attached tick using fine-point tweezers. The tick should not be squeezed or twisted, but grasped close to the skin and pulled straight out with steady pressure.

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Additional Information

An *Ehrlichiosis Fact Sheet* can be obtained from the NJDHSS Web site at [www.state.nj.us/health](http://www.state.nj.us/health). Click on the “Topics A to Z” link and scroll down to the subject “Ehrlichiosis.”

The formal CDC surveillance case definition for ehrlichiosis is the same as the criteria outlined in section 2A of this chapter. CDC case definitions are used by state health departments and CDC to maintain uniform standards for national reporting. Always refer to section 2A for the criteria in reporting a case to NJDHSS.

References


