Malaria

Plasmodium 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 malaria 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.

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.

CDS Communicable Disease Service

NEW JERSEY DEPARTMENT of HEALTH and SENIOR SERVICES

June 2008

1 THE DISEASE AND ITS EPIDEMIOLOGY

A. Etiologic Agent

There are four *Plasmodium* species (sporozoan parasites) that cause malaria in humans. They are *Plasmodium vivax*, *Plasmodium malariae*, *Plasmodium ovale*, and *Plasmodium falciparum*.

B. Clinical Description and Laboratory Diagnosis

The classic symptoms of malaria are high fever with chills, sweats, and headache, which may be paroxysmal (involving recurrence or intensification of symptoms). The fever and paroxysms generally occur in a cyclic pattern. Depending on the infecting species, fever may appear every other or every third day. Other symptoms can include malaise, nausea, vomiting, diarrhea, cough, arthralgia (joint aches), respiratory distress, and abdominal and back pain. Pallor and jaundice may also be present. Enlargement of the liver and spleen (hepatosplenomegaly) may occur and is more prominent in chronic infections. Infection with *P. falciparum* is potentially fatal and most commonly manifests as a febrile illness without specific or localizing signs. Falciparum malaria may present with coagulation defects, shock, renal and liver failure, acute encephalopathy, pulmonary and cerebral edema, and coma. The case-fatality rate is 10% to 40% in the absence of prompt treatment. The duration of an untreated primary attack can vary from a week to a month or longer. Relapses of *P. vivax* and *P. ovale* infections can occur at irregular intervals for up to five years. *P. malariae* infections may persist for life (chronic infections), with or without recurrent episodes of fever.

Laboratory diagnosis is based on microscopic demonstration of malaria parasites in blood smears. Diagnosis by polymerase chain reaction (PCR) is the most sensitive method available, but it is not generally available in diagnostic laboratories.

C. Reservoirs

Humans are the only important reservoir of human malaria. Nonhuman primates are naturally infected by many malarial species that can potentially infect humans, but natural transmission from nonhuman primates to humans is extremely rare.

D. Modes of Transmission

Malaria is transmitted by the bite of an infective female *Anopheles* mosquito. Transmission can also rarely be congenital (via the placenta) and can occur through blood transfusions or the use of contaminated needles.

E. Incubation Period

The time between the infective bite and the appearance of clinical symptoms is approximately seven to 14 days for *P. falciparum*, eight to 14 days for *P. vivax* and *P. ovale*, and seven to 30 days for *P. malariae*. With some strains of *P. vivax*, mostly from temperate areas, there may be a prolonged incubation period of eight to ten months; even longer incubations may occur with *P. ovale*. With infections acquired by blood transfusion, the incubation period depends on the number of parasites infused; it is usually short, but may range up to two months.

F. Period of Communicability or Infectious Period

Malaria is not directly communicable from person-to-person except for congenital transmission; however, during parasitemia, the disease may be transmitted to other persons through blood transfusion or through shared contaminated needles. Infected human hosts remain infectious for *Anopheles* mosquitoes for prolonged periods of time (one to three years, or longer, depending on the species) if they are not adequately treated.

G. Epidemiology

Malaria is endemic throughout the tropical areas of the world. About half of the world's population lives in areas where transmission occurs. Areas with the highest prevalence include sub-Saharan Africa, parts of Central and South America, India, and parts of Oceania and Southeast Asia. Transmission is also possible in more temperate climates such as the United States, where *Anopheles* mosquitoes are present. Mosquitoes in airplanes flying from tropical climates have been the source of occasional cases in persons working or living near international airports. However, nearly all of the malaria cases reported annually in the United States (~1000) are acquired abroad. *P. vivax* and *P. falciparum* are the most common species worldwide. The worldwide spread of strains of chloroquine-resistant *P. falciparum* and *P. vivax* is of increasing importance. Resistance to other antimalarial drugs is now occurring in many areas where the drugs are widely used. In New Jersey, an average of 62 travel-related cases of malaria per year are reported to the New Jersey Department of Health and Senior Services (NJDHSS).

2 CASE DEFINITIONS

A. New Jersey Department of Health and Senior Services (NJDHSS) Case Definition

1. Clinical Description

The classic symptoms of malaria are high fever with chills, sweats, and headache, which may be paroxysmal (involving recurrence or intensification of symptoms). The fever and paroxysms generally occur in a cyclic pattern. Depending on the infecting species, fever may appear every other or every third day. Other symptoms can include malaise, nausea, vomiting, diarrhea, cough, arthralgia (joint aches), respiratory distress, and abdominal and back pain. Pallor and jaundice may also be present. Enlargement of the liver and spleen (hepatosplenomegaly) may occur and is more prominent in chronic infections. Infection with *P. falciparum* is potentially fatal and most commonly manifests as a febrile illness without specific or localizing signs. Falciparum malaria may present with coagulation defects, shock, renal and liver failure, acute encephalopathy, pulmonary and cerebral edema, and coma. The case-fatality rate is 10% to 40% in the absence of prompt treatment. The duration of an untreated primary attack can vary from a week to a month or longer. Relapses of *P. vivax* and *P. ovale* infections can occur at irregular intervals for up to five years. *P. malariae* infections may persist for life (chronic infections), with or without recurrent episodes of fever.

2. Laboratory Criteria for Diagnosis

Laboratory diagnosis is based on microscopic demonstration of malaria parasites in blood smears. Diagnosis by polymerase chain reaction (PCR) is the most sensitive method available, but it is not generally available in diagnostic laboratories.

3. Case Classification

CONFIRMED
Microscopically confirmed malaria parasitemia in any person (symptomatic or asymptomatic) regardless of whether the person experienced previous episodes of malaria while outside of the country.

PROBABLE
Not used.

POSSIBLE
Not used.

NOTE: A subsequent attack experienced by the same person but caused by a different Plasmodium species is counted as an additional case. A subsequent attack experienced by the same person and caused by the same species in the United States may indicate a relapsing infection or treatment failure caused by drug resistance.

B. Differences from Centers for Disease Control and Prevention (CDC) Case Definition

The formal CDC surveillance case definition for malaria is the same as the criteria outlined in section 2A. CDC case definitions are used by state health departments and CDC to maintain uniform standards for national reporting. For reporting a case to NJDHSS, always refer to the criteria in section 2A.

3 LABORATORY TESTING SERVICES AVAILABLE

Giemsa-stained thin and thick blood smears can be submitted to NJDHSS for confirmation and speciation of *Plasmodium* at the following address: NJDHSS, Division of Public Health and Environmental Laboratories (PHEL), Specimen Receiving and Records, PO Box 361, John Fitch Plaza, Trenton, NJ 08625-0361. For additional information, contact the Enteric Laboratory at 609.292.7368.

4 PURPOSE OF SURVEILLANCE AND REPORTING REQUIREMENTS

A. Purpose of Surveillance

- To identify imported cases of malaria.
- To ensure that cases are appropriately contained and treated to prevent the introduction of malarial parasites into native mosquito populations.
- To identify locally acquired cases, if they occur, so appropriate active surveillance and mosquito control interventions can be implemented.
- To provide travelers with appropriate preventive health information.

B. Laboratory and Healthcare Provider Reporting Requirements

The New Jersey Administrative Code (NJAC 8:57-1.8) stipulates that laboratories report (by telephone, confidential fax, or in writing) all cases of malaria 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. Healthcare Provider Reporting Requirements

The New Jersey Administrative Code (NJAC 8:57-1.8) stipulates that healthcare providers report (by telephone, confidential fax, over the Internet using the Communicable Disease Reporting and Surveillance System [CDRSS], or in writing) all cases of malaria 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.

D. Health Officer 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 malaria, as defined by the reporting criteria in section 2A. Current requirements are that cases be reported to the NJDHSS Infectious and Zoonotic Diseases Program using the official CDC Malaria Case Surveillance Report Form. A report can be filed electronically over the Internet using the confidential and secure CDRSS.

5 CASE INVESTIGATION

A. Forms

It is the local health officer's responsibility to complete the reporting form by interviewing the patient and others who may be able to provide pertinent information. Much of the information required on the form can be obtained from the patient's healthcare provider or the medical record.

Use the following guidelines for assistance in completing the form:

1. Accurately record the demographic information, date of symptom onset, pregnancy status, healthcare provider information, and whether hospitalized (including location and associated dates). **Enter patient street address, municipality, and telephone number on the back of the form**.

2. Accurately record laboratory results, particularly the species of malaria, and the laboratory that performed the testing.

3. Record information about whether and where the patient has spent time out of the country in the past four years, including duration of stay and date of return.

4. Indicate whether the patient took malaria prophylaxis and, if so, what kind.

5. Record whether the patient has had a history of malaria within the preceding 12 months.

6. Record whether the patient has had a blood transfusion within the preceding 12 months.

NOTE: If the patient is a recent blood donor, this information should be provided to the Surveillance Program as soon as possible so CDC and other appropriate agencies can be notified.

7. Be sure to record all clinical complications and whether the illness was fatal.

8. Indicate which therapy was given for this illness.

9. Check if the laboratory diagnosing malaria submitted the blood smear to PHEL. There is a "Continuation" section on the back of the form that can be used to document other relevant aspects of the investigation that are not captured elsewhere on the form (e.g., other risk information, such as recent history of injection drug use or perinatal transmission, history of malaria prior to the preceding 12 months, any medical care received abroad).

10. If several attempts have been made to obtain case information (e.g., the patient or healthcare provider does not return calls or does not respond to a letter, or the patient does not divulge information or is too ill to be interviewed), fill out the form with as much information as possible. Note on the form the reason why it could not be filled out completely. If CDRSS is used to report, enter collected information in the "Comments" section.

After completing the form, it should be mailed (in an envelope marked "Confidential") to the NJDHSS Infectious and Zoonotic Diseases Program, or the report can be filed electronically over the Internet using the confidential and secure CDRSS. The mailing address is:

NJ DHSS
Division of Epidemiology, Environmental and Occupational Health
Infectious and Zoonotic Diseases Program
PO Box 369
Trenton, NJ 08625-0369

Institution of disease-control measures is an integral part of case investigation. It is the local health officer's responsibility to understand, and, if necessary, institute the control guidelines listed in section 6, "Controlling Further Spread."

B. Entry into 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 malaria cases. The "Tab"

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.

CDRSS Screen	Required Information
Patient Info	Enter the disease name ("MALARIA") in patient demographic information, illness onset date, and the date the case was reported to the local health department (LHD). There are no subgroups for malaria.
Addresses	Enter any alternate address (e.g., a daycare address). Use the Comments section in this screen to record any pertinent information about the alternate address (e.g., the times per week the case-patient attends daycare). Entering an alternate address will allow other disease investigators access to the case if the alternate address falls within their jurisdiction.
Clinical Status	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 immunization status is known, it should also be entered here. If the patient died, date of death should be recorded under the Mortality section.
Signs/Symptoms	Check appropriate boxes for signs and symptoms and indicate their onset. Make every effort to get complete information by interviewing the physician, 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.
Risk Factors	Enter complete information about risk factors, including travel to a malaria-endemic country to facilitate study of malaria in New Jersey.
Laboratory Eval	Select the appropriate laboratory test that indicates what type of test was performed, and when appropriate, include what was found or observed, such as "*Plasmodium falciparum*" in the value box.
Contact Tracing	Information regarding contacts is not required for this disease.

CDRSS Screen	Required Information
Case Comments	Enter general comments (i.e., information that is not discretely captured by a specific topic screen or drop-down menu) in the Comments section. **NOTE:** 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.
Epidemiology	Under the Other Control Measures section, indicate if the patient falls into any of the categories listed under Patient Role(s)/Function(s) (e.g., "DAYCARE ATTENDEE," "DAYCARE PROVIDER"). Record name of and contact information for case investigators from other agencies (e.g., CDC, out-of-state health departments). Document communication between investigators in the Comments section.
Case Classification Report Status	Case status options are: "REPORT UNDER INVESTIGATION (RUI)," "CONFIRMED," "PROBABLE," "POSSIBLE," and "NOT A CASE." • All cases entered by laboratories (including LabCorp electronic submissions) should be assigned a case status of "REPORT UNDER INVESTIGATION (RUI)." • Cases still under investigation by the LHD should be assigned a case status of "REPORT UNDER INVESTIGATION (RUI)." • Upon completion of the investigation, the LHD should assign a case status on the basis of the case definition. "CONFIRMED" and "NOT A CASE" are the only appropriate options for classifying a case of malaria (see section 2A). Report status options are: "PENDING," "LHD OPEN," "LHD REVIEW," "LHD CLOSED," "DELETE," "REOPENED," "DHSS OPEN," "DHSS REVIEW," and "DHSS APPROVED." • 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

CDRSS Screen	Required Information
	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).

6 CONTROLLING FURTHER SPREAD

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

1. Minimum Period of Isolation of Patient

No restrictions except for exclusion from blood donation.

2. Minimum Period of Quarantine of Contacts

No restrictions.

B. Protection of Contacts of a Case

None.

C. Managing Special Situations

1. Locally Acquired Case

A locally acquired case of malaria is possible but would be unusual (*Anopheles* mosquitoes are present in New Jersey, but infected humans are rare). If it is determined during the course of an investigation that a patient does not have a recent travel history to an endemic country, measures such as investigating local areas visited by the patient to locate the focus of infection and surveillance of other people for illness may be necessary. Contact the NJDHSS Infectious and Zoonotic Diseases Program (IZDP). The program staff can help determine a course of action to prevent further cases and can perform surveillance for cases that may cross several jurisdictions and, therefore, could be difficult to identify at a local level.

2. Reporting Locally Acquired Case or Suspected Outbreak

If a locally acquired case of malaria is diagnosed in a city or town, or if an outbreak is suspected, investigate to determine the source of infection and mode of transmission. Contact NJDHSS IZDP. The program staff can help determine a course of action to prevent further cases and can perform surveillance for cases that may cross several jurisdictions and, therefore, be difficult to identify at a local level.

D. Preventive Measures

1. International Travel

- People traveling to malaria-endemic parts of the world should be notified of their risk of contracting the disease and control measures they can take to protect themselves from mosquitoes. Travelers can use repellents, wear protective clothing, and use mosquito nets when rooms are not screened.
- Detailed recommendations for preventing malaria are available 24 hours a day from the CDC Malaria Hotline, which can be accessed by telephone at 770.488.7788, by fax at 888.232.3299, or CDC's Web site at http://www.cdc.gov/travel.
- Travelers and recent immigrants from malaria-endemic regions with symptoms suggestive of malaria should be referred to a healthcare provider for prompt testing and treatment. Failure to treat individuals with malaria could lead to their becoming a local source of malaria transmission to mosquitoes if bitten, then to other people bitten by those mosquitoes.

Additional Information

A *Malaria Fact Sheet* can be obtained at the NJDHSS Web site at http://www.state.nj.us/health.

References

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