



# FACT SHEET

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## Malaria: A Mosquito-borne Infectious Disease

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### What is malaria?

Malaria is an infectious disease that is transmitted by female mosquitoes. If left untreated, malaria can result in complications and eventually death. Malaria is also called a plasmodium infection. This is because the Plasmodium parasite causes the disease. There are over 150 species of the malaria parasite. Five (5) species of the Plasmodium parasite infect humans and cause malaria of these, ***Plasmodium falciparum* (P. falciparum) poses the greatest risk to humans and is the deadliest.**

In the United States, about 2,000 malaria cases are identified each year<sup>1</sup>. Though most U.S. malaria cases are imported by persons traveling from areas where malaria is common, small local outbreaks can occur in subtropical regions within the US. Most recently, a small number of malaria cases were reported in Texas and Florida.

### How does malaria infection occur?

Malaria does not spread from person to person, meaning ***it is not a contagious disease***. Malaria infection is commonly caused when a mosquito infected with the malaria protozoan parasite bites its victim.

When the malaria parasite is present in a person's bloodstream, the parasite infects the liver where it grows and multiplies. The malaria parasite then leaves the liver and infects the red blood cells where it matures eventually killing the cell and thus repeating the process infecting other blood cells around it.

Malaria infection can spread in other ways, which include the following<sup>2</sup>:

- Malaria infection transmitted from mother to unborn child.
- Malaria infection transmitted through blood transfusions.
- Malaria infection transmitted by sharing needles used to inject drugs.

<sup>1</sup> Malaria Cases - <https://www.cdc.gov/parasites/malaria/index.html>

<sup>2</sup> Symptoms and causes - <https://www.mayoclinic.org/diseases-conditions/malaria/symptoms-causes/syc-20351184>



# FACT SHEET

## What are the signs and symptoms of malaria?

An individual infected with malaria may not experience symptoms immediately. The symptoms may appear as early as seven (7) days to two (2) weeks after infection. In some extreme cases, symptoms may take as long as one (1) year<sup>3</sup> to appear. The malaria parasite may remain dormant or inactive in the liver until it is activated.

Once the parasite is activated, malaria signs and symptoms begin to appear. Mild symptoms include fever, chills, and headaches which are most common during the early stages of malaria infection. However, some people may experience symptoms in cycles called “malaria attacks” which often start with shivering and chills, a high fever, then followed by sweating, and a return to normal body temperature. The cycles can occur every two (2) to three (3) days in most cases. Severe symptoms include<sup>4</sup> :

- Loss of consciousness
- Multiple convulsions
- Difficulty breathing
- Dark or bloody urine
- Jaundice
- Abnormal bleeding
- Extreme tiredness and fatigue

## What symptoms indicate a need for immediate medical attention?

Malaria complications that may severely impact a person’s survival include<sup>5</sup>:

- Cerebral malaria: swelling or damage to the brain due to the parasite-filled blood blocking small blood vessels in the brain.
- Breathing problems or pulmonary edema resulting from the accumulation of fluids in the lungs.
- Organ failure due to kidney or liver damage or even spleen rupture.
- Anemia can occur due to the lack of enough red blood cells to supply adequate amounts of oxygen to the body’s tissues.
- Low blood sugar or hypoglycemia, resulting in coma or death.

## What test can be taken to determine if I am infected?

The most reliable and effective method of diagnosing malaria is by taking a blood smear for microscopic evaluation which can take up to 24 hours for diagnosis. Various rapid diagnostic tests (RDTs) are available to detect antigens from malaria parasites. These tests provide results in 15 minutes or less.

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<sup>3</sup> Malaria onset - <https://www.cdc.gov/malaria/about/faqs.html>

<sup>4</sup> World Health Organization (WHO). Malaria. - <https://www.who.int/news-room/fact-sheets/detail/malaria>

<sup>5</sup> Symptoms and causes - <https://www.mayoclinic.org/diseases-conditions/malaria/symptoms-causes/syc-20351184>



# FACT SHEET

## Can Malaria infection from mosquito bites be prevented?

Malaria prevention primarily deals with mosquito elimination and bite prevention. Below are recommendations by the Centers for Disease Control and Prevention (CDC) and Environmental Protection Agency (EPA) to help protect yourself from being bitten by an infected mosquito.

### Remove Mosquito Habitats

- Eliminate standing water in rain gutters, old tires, buckets, plastic covers, toys, or any other container where mosquitoes can breed.
- Empty and change the water in bird baths, fountains, wading pools, rain barrels, and potted plant trays at least once a week to destroy potential mosquito habitats.
- Drain or fill temporary pools of water with dirt.
- Keep swimming pool water treated and circulating.

### Use Appropriate Pesticides

- Control mosquito larvae and adult mosquitoes using the appropriate insecticides.

### Use Structural Barriers

- Cover all gaps in walls, doors, and windows to prevent mosquitoes from entering.
- Make sure window and door screens are in good working order.
- Completely cover baby carriers and beds with netting.

### Avoid Getting Bitten

- Keep mosquitoes away from exposed skin by wearing long-sleeved shirts, long pants, and socks.
- Tuck shirts into pants and pants into socks to cover gaps in your clothing where mosquitoes can get to your skin.
- Stay indoors, when possible, especially if there is a mosquito-borne disease warning in effect.
- Use [EPA-registered mosquito repellents](#)<sup>6</sup> when necessary and follow label directions and precautions closely.
- Use head nets, long sleeves, and long pants if you venture into areas with high mosquito populations, such as salt marshes.
- Replace your outdoor lights with yellow "bug" lights, which tend to attract fewer mosquitoes than ordinary lights. The yellow lights are NOT repellents, however.

## What treatment options are available?

Treatment recommendations for malaria vary by species and severity.

- **Artemether-lumefantrine (Coartem®)** is the preferred option, if readily available, for the initial treatment of uncomplicated Malaria from *P. falciparum* or other unknown species of malaria acquired in areas of chloroquine resistance.

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<sup>6</sup> EPA-registered mosquito repellents - <https://www.epa.gov/insect-repellents/find-repellent-right-you>



# FACT SHEET

- **IV Artesunate** is the first-line drug for the treatment of severe malaria in the United States. Artesunate for Injection™ is approved by the FDA for treating severe malaria and is commercially available.
- **Atovaquone-proguanil (Malarone®)** is another recommended option.
- **Chloroquine or hydroxychloroquine** should be prescribed for *P. vivax* malaria infections acquired from regions other than Papua New Guinea or Indonesia.

## What employers should be doing?

### General Protections

Although Malaria is primarily spread through the bites of infected mosquitos, exposure to an infected person's blood may also result in transmission. Employers should train workers about their risks of exposure to Malaria through mosquito bites and contact with infectious blood and other potentially infectious materials and how to protect themselves. Employers should also provide information about the risk of Malaria exposure and infection to workers who are at increased risk because of their job tasks. For workers with potential exposure, this should include information on modes of transmission and the adverse health outcomes caused by infection. Depending on workers' exposure, job tasks and the controls necessary to protect them, employers must comply with the provisions of applicable OSHA requirements, including:

- the Personal Protective Equipment (PPE) standards (29 CFR 1910 Subpart I and, for construction, 29 CFR 1926 Subpart E), such as when workers need wearable mosquito netting or other PPE;
- the Bloodborne Pathogens (BBP) standard (29 CFR 1910.1030), when workers have exposure to blood or other potentially infectious materials;
- paragraph (b)(4) of the Safety Training and Education standard (29 CFR 1926.21) when construction workers are in job site areas where harmful animals are present (e.g., mosquitoes that could spread Malaria); and

[29 CFR 1910.141\(a\)\(5\)](#)<sup>7</sup> under Subpart J, General Environmental Controls. This applies to vermin control at permanent places of employment. The standard states that “every enclosed workplace shall be constructed, equipped, and maintained, so far as reasonably practicable, as to prevent the entrance or harborage of rodents, insects, and other vermin. A continuing and effective extermination program shall be instituted where their presence is detected” [\(1910.141\(a\)\(5\)\)](#)<sup>8</sup>. The standard also indicates the need for effective housekeeping measures “to the extent that the nature of the work allows” [\(1910.141\(a\)\(3\)\(i\)\)](#)<sup>9</sup>. The employer should make efforts to eliminate the presence of stagnant water acts as a breeding ground for mosquitoes.

<sup>7</sup> OSHA Standard – Sanitation: Subpart J, Environmental Controls (29 CFR 1910. 141): <https://www.osha.gov/laws-regs/regulations/standardnumber/1910/1910.141>

<sup>8</sup> OSHA Standard – Sanitation: Subpart J, Environmental Controls (29 CFR 1910. 141): <https://www.osha.gov/laws-regs/regulations/standardnumber/1910/1910.141>

<sup>9</sup> OSHA Standard – Sanitation: Subpart J, Environmental Controls (29 CFR 1910. 141): <https://www.osha.gov/laws-regs/regulations/standardnumber/1910/1910.141>



# FACT SHEET

OSHA's general duty clause (Section 5(a)) specifies the need for employers to take measures to prevent recognized hazards in the workplace. Therefore, employers must take control measures that protect workers from workplace conditions that increase the likelihood of a malaria infection.

## Outdoor workers:

Inform workers about their risks of exposure to Malaria through mosquito bites and train them on how to protect themselves.

- Provide insect repellents designed for use against the Malaria carrying mosquito (female mosquitoes of the genus Anopheles), encourage their use, and train workers to use them.
  - Choose a repellent that will protect against mosquito bites for the amount of time that workers will be outdoors. In general, the more active ingredient (higher concentration) a repellent contains, the longer it will protect against mosquito bites. For example, the more DEET a repellent contains, the longer it can protect from mosquito bites. If using DEET-containing products, choose one with at least 20 percent DEET as its active ingredient and re-apply every four hours. Note: Products with more than 50 percent DEET may not offer a marked increase in protection
  - Products that combine sunscreen and repellent are not recommended, because sunscreen may need to be reapplied more often and in larger amounts than needed for the repellent component to provide protection from biting insects.
- Ensure that workers wear clothing that covers their hands, arms, legs, and other exposed skin. Employers may need to provide workers with hats with mosquito netting to protect the face and neck.
- In warm weather, encourage workers to wear lightweight, loose-fitting clothing. This type of clothing protects workers against the sun's harmful rays and can help prevent (although it may not fully prevent) mosquitoes from biting bare skin. Always provide workers with adequate water, rest, and shade, and monitor workers for signs and symptoms of heat illness.
- Periodically inspect worksites to identify and get rid of sources of standing water (e.g., tires, buckets, cans, bottles, barrels, clogged gutters) whenever possible to reduce or eliminate places where mosquitoes lay their eggs. Train workers about the importance of eliminating these areas at the worksite.



# FACT SHEET

## Healthcare and Laboratory Workers:

In healthcare and when workers are handling human remains (regardless of suspected or confirmed Malaria infection status), standard precautions are used to expand the universal precautions required by the BBP standard (29 CFR 1910.1030) whenever workers may be exposed to human blood or other potentially infectious materials. CDC-recommended standard precautions include hand hygiene, injection safety and the use of PPE to avoid direct contact with blood and other potentially infectious materials, including laboratory specimens/samples. PPE may include gloves, gowns, masks, and eye protection.

## Mosquito control workers:

When working outdoors, follow the same precautions recommended above for general outdoor workers for protection against mosquito bites. Workers entering or working around areas with dense mosquito populations likely will need enhanced skin protection to prevent mosquito bites. Employers should assess such workers' risks of mosquito bites, provide any additional protective clothing or equipment to protect workers' exposed skin and ensure workers wear or use it correctly.

Workers who mix, load, apply or perform other tasks involving wide-area (or area) insecticides may need additional protection to prevent or reduce exposure to hazardous chemicals. These protections include pesticide safety training, notification of pesticide applications, PPE (potentially including respirators), restricted entry intervals after pesticide application, decontamination supplies and access to emergency medical assistance. The EPA Agricultural Worker Protection Standard (WPS), which regulates pesticide safety, and the EPA WPS page provide more information about these types of protections. Although the WPS is a regulation for agricultural pesticides aimed at reducing the risk of pesticide poisonings and injuries among agricultural workers and pesticide handlers, its requirements may provide a model for protecting workers using insecticides in mosquito control operations.

## Additional Information and Resources

- OSHA - <https://www.osha.gov/healthcare/infectious-diseases>
- EPA - <https://www.epa.gov/mosquitocontrol>
- EPA- Agricultural Worker Protection Standard <https://www.epa.gov/pesticide-worker-safety/agricultural-worker-protection-standard-wps>
- CDC - <https://www.cdc.gov/parasites/malaria/index.html>
- CDC Malaria Fact Sheets - [https://www.cdc.gov/malaria/references\\_resources/fsp2.html](https://www.cdc.gov/malaria/references_resources/fsp2.html)
- National Pesticide Information Center (NPIC) - <http://npic.orst.edu/factsheets/repellents.html>

For more information, contact the Teamster Safety and Health Department at (202) 624-6960 and visit <https://teamstersafety.org>