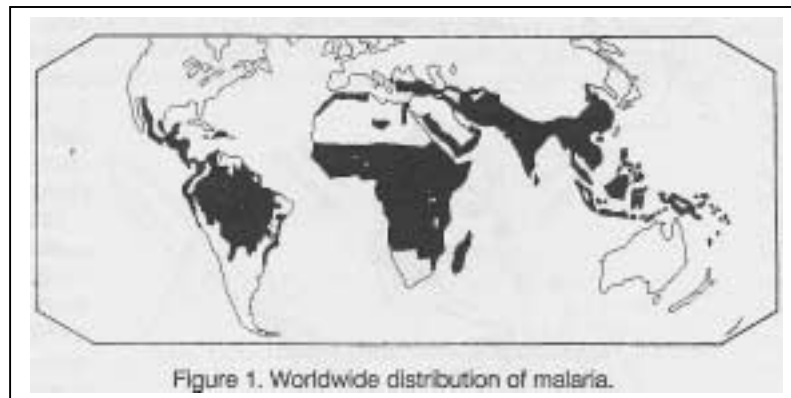

A Florida Mosquito Control Fact Sheet

HUMAN MALARIA

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In June 1990, a human case of *Plasmodium vivax* malaria acquired in Florida occurred in a woman camping in the panhandle's Gulf County. This is the first, and only, acquired infection from a mosquito in Florida in 42 years. This fact sheet was prepared in response to this case.

Although malaria disappeared as a significant problem in the US by the mid-1950's, it is still one of the most important communicable diseases on a worldwide basis. There were an estimated 489 million cases worldwide in 1986, of which 2.3 million were fatal (Struchler, Parasitology Today 5:39).



Malaria in humans is a disease caused by any one of four species of microscopic protozoan parasites in the genus *Plasmodium* (*P. vivax*, *P. falciparum*, *P. malariae* and *P. ovale*) distributed throughout the world.

Overall symptoms may start with headache, aching in the bones, anorexia, and some times vomiting. One may feel like the flu is coming on. This is followed by chills, teeth chattering and then sensations of great heat with high fever and sweating, usually in a repeating cycle. If you experience these symptoms and have been in an area where malaria was reported, see your doctor immediately. Malaria can be treated effectively, particularly in the early stages.

Clinically, the malaria infection varies from a moderately severe to highly fatal illness, depending on the species of parasite, the human's condition, and how soon the patient receives treatment. Malaria caused by *P. falciparum* is particularly severe and often fatal in infants and young children. *P. vivax* generally causes a less severe illness and a lesser

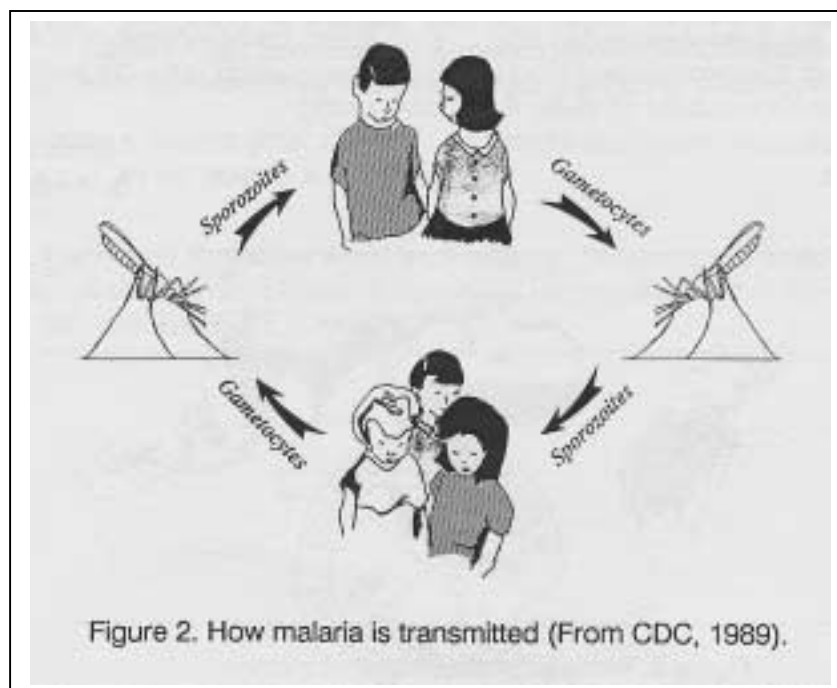
rate of mortality. Persons may be infected over and over again, usually developing a tolerance for the parasite which prevents severe illness from reoccurring.

If insufficiently treated, a malaria infection may persist in a person for many months or years and have a continuing or periodically renewed ability to infect mosquitoes, often in the absence of symptoms or with a less severe illness. For *P. vivax* and *P. ovale*, parasites may persist in the liver cells for years and give rise to relapses of the disease by reinvading the red cells during times of stress.

HOW MALARIA IS TRANSMITTED BY MOSQUITOES

The parasite is transmitted from person to person by the bite of *Anopheles* mosquitoes, and ONLY *Anopheles* mosquitoes. The malaria parasite inhabits the human red blood cells, where it multiplies asexually. After reaching maturity in 48-72 hours, the red blood cells burst and release large numbers of new parasites most of which enter new red blood cells; thus, reinitiating the cycle. Others enter liver cells. Before the asexual cycle in the human red cells is established, the parasite must complete at least a 5-10 day period of multiplication in the liver cells. The typical malaria symptoms, chills and fever, are associated with this rupturing of infected red cells.

In addition to these asexual forms in humans, some of the parasites develop into sexual forms: the male and female gametocytes. Infection of the mosquito takes place when an *Anopheles* female feeds on an infected person who is carrying gametocytes. The parasite then undergoes a sexual cycle in the mosquito for the next 7-20 days. Numerous microscopic, spindle-shaped forms, known as sporozoites, then invade the mosquito salivary glands. The human infection is initiated when sporozoites are injected during the bite of the infected mosquito.



INTRODUCED MALARIA

Up to now, the only hazard of malaria transmission in Florida stems from people who have relapses, or cases recently acquired in foreign countries where malaria is common. This is referred to as introduced malaria. Despite the widespread presence of *Anopheles* mosquitoes in the US, a highly susceptible human population, and the importation of thousands of cases of malaria acquired over seas, there are relatively few cases reported in the US each year, and very few of those reported were actually infected in the US.

The CDC Annual Summary of Malaria for 1988 (issued in November 1989) reports a total of 1,023 malaria cases in the US. Only 32 of these acquired the infection in this country, none in Florida. Six were fatal. This compares to 932 cases reported in the US in 1987. In 1988, 49 cases of malaria were reported in Florida. However, unlike the case reported in 1990, all the infections were acquired outside the US. They didn't become ill until returning to Florida.

The largest outbreak of introduced malaria since 1952 recently occurred in San Diego County, California. Of the 30 cases between July 24 and September 18, 1988, 28 were in migrant workers and 2 were in local residents who had no apparent malaria risk factors.

FLORIDA'S ANOPHELES MOSQUITOES

Of the 70 species of mosquitoes occurring in Florida, 13 are in the genus *Anopheles*. It is easy to recognize adult *Anopheles* mosquitoes by the way they rest on a flat surface, like the skin. Unlike mosquitoes of other genera, *Anopheles* rest with their heads pointed downward and their bodies slanted at a steep angle upward. Other mosquitoes hold their bodies parallel to the resting surface. *Anopheles* adults also have 3 long mouth parts protruding from the head. Other mosquitoes have 1 long and 2 short mouth parts. The immature stages of *Anopheles* are not easily recognized in the water, as the larvae lie near the surface and are easily confused with floating debris.

While all *Anopheles* may be able to transmit malaria, historically, those belonging to the *Anopheles quadrimaculatus* complex of 4 species are considered the important carriers of the disease in the eastern US.

Anopheles quadrimaculatus adults are dark with 4 spots on each wing. They typically breed in permanent bodies of fresh water, e.g. lakes, containing emergent or floating vegetation. The eggs are laid singly on the surface and breeding is continuous if the temperature permits. During cold periods adult females hibernate in protected sites. They feed primarily on large mammals, including humans, mostly at dusk and during the night. They typically do not fly more than 4 miles from their breeding sites. Although species of this complex are most abundant in the northern and panhandle sections of the state, one or more species probably occur in all Florida counties.

AVOIDING MALARIA MOSQUITOES

To avoid the risk of malaria, avoid mosquito bites – it is that simple. Humans cannot get malaria from wild animals, domestic animals or pets. Transmission of malaria from human to human is accomplished by reuse of needles contaminated with the blood of an infected person.

Avoid mosquito bites by staying out of mosquito-infested areas, securing window screens, and by applying a repellent containing DEET. Most repellents on today's market contain DEET. **DO NOT OVER-APPLY DEET** containing repellent, as this may cause side effects. Some adults have skin reactions to overexposure to DEET, and, in rare cases, children dosed heavily have experienced serious neurological problems, including slurred speech, confusion, seizures and comas. Misapplication of DEET can lead to symptoms similar to malaria and the result could be worse than malaria.

PLEASE USE DEET WITH CAUTION.

NEED MORE INFORMATION...

...on malaria in Florida? Contact the Florida Department of Health and Rehabilitative Services.

...on mosquito control in the state? Contact the mosquito control program in your county, or **Dr. Roxanne Rutledge at the Florida Medical Entomology Laboratory, IFAS – University of Florida, 200 9th Street, SE Vero Beach, FL 32962, 561/778-7200**

Sponsored by the Florida Medical Entomology Laboratory, IFAS-University of Florida and Entomology Services, Mosquito Control Section, Florida Department of Health and Rehabilitative Services
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