

Just the Facts...

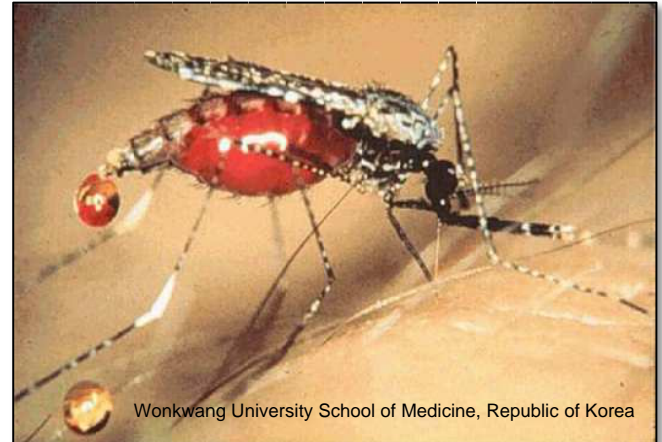
Malaria is a serious mosquito-borne illness that is caused by a microscopic parasite which infects red blood cells. Four kinds of malaria parasites can infect humans: *Plasmodium falciparum*, *P. malariae*, *P. ovale*, and *P. vivax*. The severity of disease depends on the species of *Plasmodium* causing the infection.

How is malaria (including vivax malaria) spread?

Malaria parasites are spread by the bites of infected female mosquitoes of the genus *Anopheles*.

How serious is vivax malaria?

Malaria caused by *Plasmodium vivax* is rarely fatal (in contrast to *P. falciparum* which is extremely lethal and responsible for the majority of malaria deaths worldwide). However, it can still cause significant illness. In addition, some strains of *P. vivax* have the ability to incubate in the liver for 6 – 10 months or longer, thereby delaying the appearance of initial symptoms until long after the actual exposure and infection occurred. In these cases, malaria may initially be overlooked as a diagnosis, resulting in delayed treatment. In other instances, the parasites can remain dormant in the liver and reactivate (“relapse”) months to years later. In addition, *P. vivax* is becoming increasingly resistant to antimalarial drugs in some areas.



An *Anopheles sinensis* mosquito takes a blood meal from a human host

Where does vivax malaria occur?

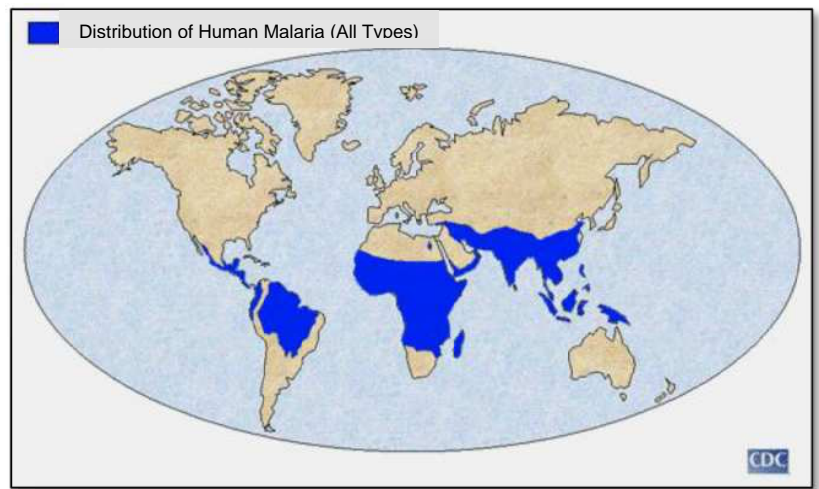
Plasmodium vivax accounts for approximately 70-80 million cases annually (or 20-percent of the global burden of 350-500 million total cases of all human malarias). While *P. falciparum* predominates in warmer regions close to the equator (where transmission is intense because it occurs year-round), *P. vivax* predominates in more temperate regions. Since *P. vivax* can tolerate cooler temperatures, it is more geographically widespread than *P. falciparum*, although transmission is usually low because it is season-dependent. In the Republic of Korea (ROK, where it occurs primarily along the Demilitarized Zone), one hundred percent of the reported malaria cases are due to *P. vivax*. Although *vivax* malaria has been endemic on the Korean peninsula for centuries, the World Health Organization (WHO) declared the ROK malaria-free in 1979. However, in 1993, *P. vivax* reemerged in the ROK. Since that time, cases have been reported annually in U.S. soldiers stationed in, or redeploying from, Korea; ROK soldiers; and Korean citizens. Malaria in the ROK is characterized as unstable, resulting in sporadic epidemics due to changes in climate and socioeconomic conditions (including those in the neighboring Democratic Peoples Republic of Korea). The primary vector (transmitter) of *P. vivax* on the Korean peninsula is *Anopheles sinensis*, which breeds in the fresh, sun-exposed water of rice fields. In the United States, over 1,000 cases of malaria, primarily *vivax*, are diagnosed, most in travelers or immigrants from malaria-risk areas of the world.

Can vivax malaria be transmitted from person-to-person?

No. Malaria (including *vivax* malaria) cannot be transmitted from person-to-person like a cold or the flu. You cannot get malaria through casual contact with an infected person (e.g. touching or kissing a person with the disease). The primary means of contracting malaria is via mosquito bite. Other, rare means of infection include blood transfusion, organ transplant, use of needles or syringes contaminated with blood, or very rarely, congenital transmission (infected mother passing the parasite to her fetus during pregnancy).

What is the basic transmission cycle?

Plasmodium vivax parasites are carried by an infected human in his/her bloodstream. Malaria is spread when a mosquito ingests blood from an infected person. The parasite develops into an infective stage within the mosquito and later is injected into another person when that infected mosquito feeds again.



What are the symptoms of vivax malaria?

After an incubation period of 12-18 days, the symptoms of *vivax* malaria begin. They are similar to those of other types of malaria and include recurring (cyclical) bouts of fever and shaking chills, sweats, headache, weakness, and nausea. Enlargement of the spleen and anemia may also occur. *Vivax* malaria is rarely fatal. Some strains of *P. vivax* have dormant liver stage parasites ("hypnozoites") which can reactivate ("relapse") and cause repeated bouts of malaria several months or years after the infecting mosquito bite. In some cases, initial symptoms may not even appear for 6-10 months.

How is vivax malaria diagnosed?

All types of malaria are diagnosed by observing the parasites in blood smears. Because the blood density of parasites fluctuates, repeated microscopic examinations may be necessary every 12-24 hours. Additional diagnostic tests, such as rapid diagnostic tests (RDTs) and polymerase chain reaction (PCR) are being developed and evaluated, but are not yet widely available.

What is the treatment for vivax malaria?

Vivax malaria has classically been treated with chloroquine or primaquine. Primaquine acts against the liver stage parasites, decreasing the risk of relapse. In different geographic locations, the parasites are becoming resistant to these drugs, so alternative drugs and combinations are being used and explored.

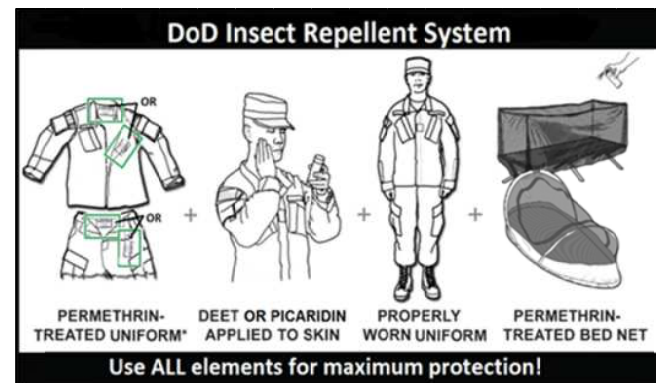
Is a vaccine against vivax malaria available?

No vaccine is available for any type of human malaria. Therefore, it is critical for any person traveling to areas where malaria occurs to consult with their physician about the current recommendations/requirements for preventive medications ("chemoprophylaxis") against the parasites in that location.

What can I do to reduce my risk of becoming infected with vivax malaria?

You can help prevent all types of malaria, and other mosquito-borne diseases, by protecting yourself from mosquito bites.

- Stay inside well-screened areas at dawn, dusk, and nighttime. This is when *Anopheles* mosquitoes are most active.
- Wear long-sleeved shirt, long pants, and socks whenever you are outdoors.
- Wear loose-fitting clothing to prevent mosquito bites through thin fabric.
- Use both skin and clothing repellents that have been approved by the Environmental Protection Agency (EPA). They are safe and effective.
 - For your skin, use a product that contains 20-50% **DEET** (N,N-diethyl-meta-toluamide). **DEET** in higher concentrations is no more effective.
 - Use **DEET** sparingly on children, and don't apply to their hands, which they often place in their eyes and mouths.
 - Apply **DEET** lightly and evenly to exposed skin; do not use underneath clothing. Avoid contact with eyes, lips, and broken or irritated skin.
 - To apply to your face, first dispense a small amount of **DEET** onto your hands and then carefully spread a thin layer.
 - Wash **DEET** off when your exposure to ticks, mosquitoes, and other arthropods ceases.
 - For your clothing, use a product that contains **permethrin**. **Permethrin** will prevent mosquitoes from being able to bite through the fabric. **Permethrin** is available commercially as 0.5% spray formulations. Clothing that is factory-impregnated with permethrin may also be purchased commercially.
 - Permethrin will withstand numerous launderings.
 - **Permethrin** should only be used on clothing, never on skin.
 - When using any insect repellent, always FOLLOW LABEL DIRECTIONS. Do not inhale aerosol formulations.
- For optimum protection, soldiers should utilize the **DOD INSECT REPELLENT SYSTEM**. In addition to proper wear of the military combat uniform (e.g. ACUs, BDUs) (pants tucked into boots, sleeves down, undershirt tucked into pants), this system includes the concurrent use of both skin and clothing repellents:
 - Standard military skin repellent: 33% **DEET** lotion, long-acting formulation, one application lasts up to 12 hours, **NSN 6840-01-284-3982**.
 - Standard military clothing repellents: either aerosol spray, 0.5% **permethrin**, one application lasts through 5-6 washes, **NSN 6840-01-278-1336**; or IDA (impregnation kit), 40% **permethrin**, one application lasts the life of the uniform (approx. 50 washes), **NSN 6840-01-345-0237**. Factory permethrin-treated ACUs are also available via contract [Contact the Armed Forces Pest Management Board (AFPMB) for details, DSN 295-7476; CM (301) 295-7476].



- **Take malaria chemoprophylaxis pills as directed by the medical authority. This is CRITICAL.**
- Eliminate mosquito-breeding sites by cleaning birdbaths routinely, and emptying water from old tires and other outdoor containers or debris.
- Make sure that door and window screens do not have holes.
- Vitamin B, ultrasonic devices, and "bug zappers" are NOT effective in preventing mosquito bites.