

Malaria Information for Pilots

Please note: This paper supersedes 10MEDBL01 - Malaria Information for Pilots

SUMMARY

Malaria is a serious and sometimes fatal disease caused by a parasite which can be spread to humans through the bites of infected mosquitoes. People with malaria typically become very sick with flu-like symptoms including high fever, shaking, headache, abdominal pain, sweats, and chills. Although malaria can be serious, fatal outcomes are usually preventable.

The need for prophylactic medication depends on the areas to be visited and the risk that the traveler has of being exposed to mosquitoes and of developing malaria. Pilots should be aware that the drug mefloquine is not suitable for use because of its central nervous system side-effects, but atovaquone plus proguanil and doxycycline are usually suitable. However, no chemoprophylaxis is 100% effective; avoiding mosquito bites is more important than using preventive drugs.

It is important that pilots who suspect they may have malaria seek medical advice without delay. When seeing a doctor because of symptoms of infectious diseases, pilots should remember to advise the doctor if they have been to tropical areas.

MALARIA PARASITE

Human malaria is an infectious disease caused by five species of Plasmodium parasite.

Malaria is transmitted to humans by the bite of an infected female Anopheles mosquito. The parasites enter via the bloodstream to the liver, where they multiply and mature. The parasites leave the liver to the bloodstream and invade red blood cells and multiply again until the cells burst, and more red blood cells are invaded. This cycle is repeated, causing fever each time parasites break free and invade blood cells.

P. falciparum and sometimes *P. knowlesi* are the species of malaria-causing parasites associated with severe morbidity and mortality because they can infect all the red blood cells. The other three species cause milder illness because they infect only young or old red blood cells.

P. ovale and *P. vivax* may relapse months later because they may stay in the liver for months if appropriate treatment is not provided.

THE MOSQUITO VECTOR

Mosquitoes from the Anopheles family are one of the species responsible for transmitting malaria. With ideal hot conditions the larval stage may be as short as five to seven days and adults may survive for three to four weeks. Water is essential for larval survival.

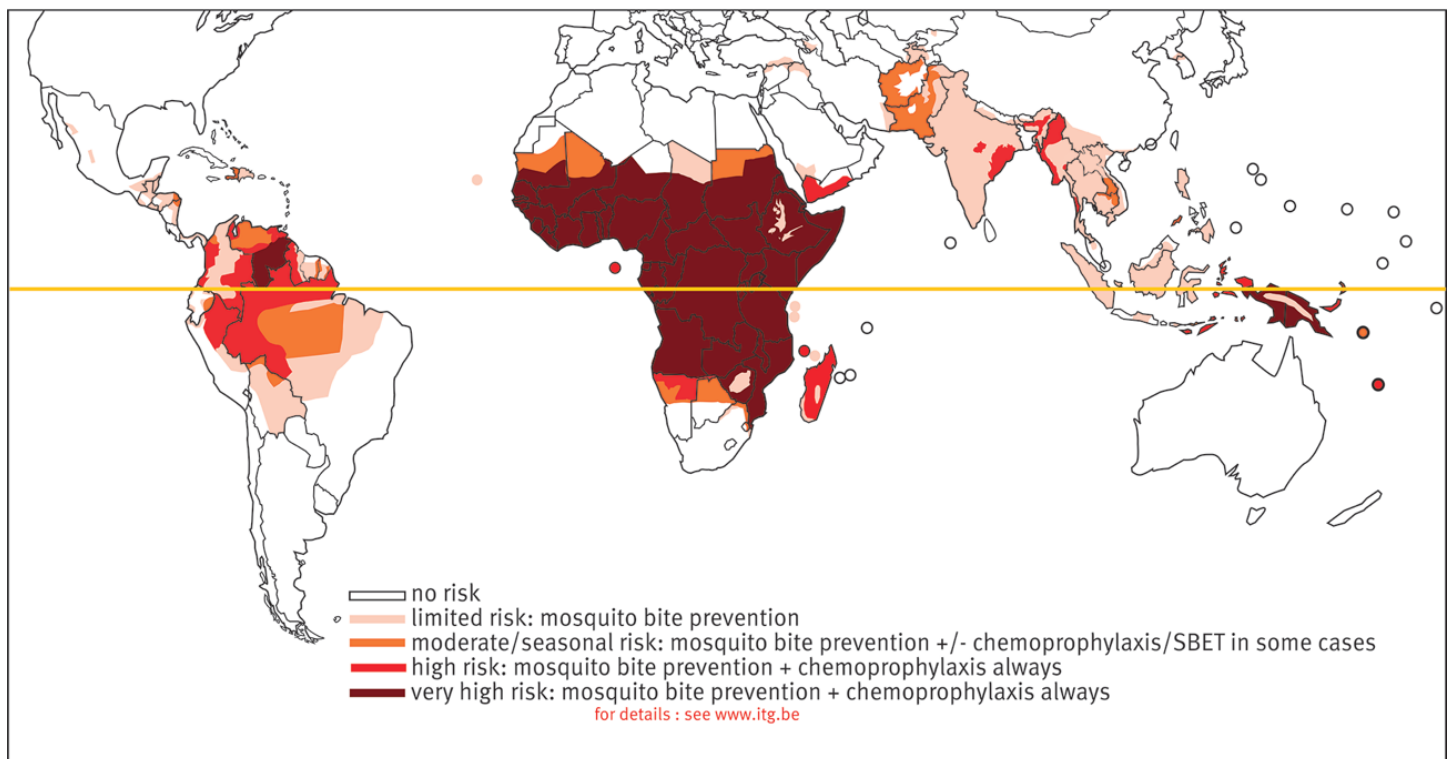
Features of the Anopheles Mosquito

- They are relatively small, about 8mm long with dark-spotted or dappled wings.
- They fly more quietly and bite more subtly than other mosquitoes.
- They prefer resting indoors. This results in residual household spraying being more effective in eradication.
- They generally feed only between sunset and dawn.
- Anopheles prefer to feed near ground level, often selecting the lower leg and foot of the human, rather than the arms or upper body. It is especially important that insect repellent is applied to these parts of the body.

Malaria 2019 (source WHO 2018, World Malaria Report 2017)



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Probable geographical malaria locations (Figure 1)

In many malaria-endemic countries, malaria transmission does not necessarily occur in all regions and the areas vary by the season or year to year. Pilots should always check the latest information from the World Health Organization (WHO)¹ or Centers for Disease Control (CDC)² websites.

Even within tropical and subtropical areas, risk of transmission is significantly lower in the following circumstances:

- At very high altitudes
- During colder seasons in some areas
- In deserts (excluding oases)

“Airport malaria” refers to malaria caused by infected mosquitoes that are transported rapidly by aircraft from a malaria-endemic country to a non-endemic country. If the local conditions allow their survival, the mosquitoes may bite residents who may then contract malaria without ever having traveled abroad. For this reason, aircraft disinsection is very important.

CLINICAL PRESENTATION

Symptoms and signs of malaria may present as early as seven days after exposure, with a usual range of 10-21 days elapsing after being bitten by an infected mosquito before symptoms are noticed. Longer incubation periods may occur in patients who have been on chemoprophylaxis or certain antibiotics. Malaria due to infections with *P. vivax*, *P. ovale* or *P. malariae* can take up to 12 months to first manifest clinically.

Malaria classically presents with fever, rigors, headache, and body pains, but the clinical features are non-specific and may be confused with many other diseases, in particular influenza. Therefore, a high level of suspicion is critical.

Malaria can be divided into uncomplicated and severe malaria, and the symptoms are presented in table 1.

TABLE 1. SYMPTOMS OF MALARIA	
UNCOMPLICATED MALARIA	SEVERE MALARIA
Fever	Fever
Sore throat	Confusion
Headache	Sever Prostration
Diarrhea	Impaired Consciousness
Rigors (cold shivers and hot sweats)	Persistent vomiting
Nausea and vomiting, abdominal pain	Convulsions
Loss of appetite	Pallor
Muscular Pain	Extreme weakness
Weakness, dizziness	Abnormal bleeding

1 <https://www.who.int/malaria/en/>

2 <https://www.cdc.gov/parasites/malaria/index.html>

The diagnosis and management of malaria is urgent. Delayed diagnosis and inappropriate treatment are associated with significantly increased morbidity and mortality.

Malaria should be suspected in any person presenting with any of the above symptoms who has a history of travel to, or residence in, a malaria transmission area. It is therefore vitally important to inform your physician about your travel history.

DIAGNOSIS

A diagnosis of malaria cannot be confirmed or excluded clinically. Since the clinical presentation is non-specific and may mimic many other diseases, the patient's blood should be examined immediately to confirm or exclude the diagnosis.

In most malaria cases, examination of correctly stained blood smears will reveal malaria parasites. However, a negative smear does not exclude the diagnosis. Repeat specimens should be examined regularly and urgently without waiting for fever peaks until the diagnosis is confirmed, the patient has recovered, or another definitive diagnosis is made.

Several commercial rapid diagnostic tests (RDTs) are available for early diagnosis in health facilities where microscopy is not immediately available. The majority of the tests will only detect *P.falciparum* while some will detect the other malaria species but are less sensitive for these. These tests should be used only for diagnosis of acute malaria infections, and not for follow-up, as they may remain positive for several weeks even after successful treatment. The test may be negative early in the disease, and false positives may be encountered, but rarely.

If the diagnosis of malaria cannot be confirmed (laboratory tests unavailable, or negative tests), the decision to commence malaria therapy should be made on clinical grounds based on whether exposure to malaria parasites was possible and the severity of the clinical features.

PREVENTATIVE MEASURES

The following factors should be taken into consideration prior to entering an area where malaria is prevalent. These factors determine the likelihood of acquiring malaria and should aid a traveler in determining whether chemoprophylaxis is needed in addition to stringent non-drug measures:

- The malaria risk in the area being visited.
- The length of stay in the area.
- The time of the year or time of day of the visit.
- The intensity of transmission and prevalence of drug resistant malaria in the area.
- Type of accommodation (e.g. air-conditioned rooms, camping).
- Mode of travel (e.g. backpacking, motoring, flying)
- Whether destination is rural or urban.
- Activities (safaris/jungle expeditions), especially between dusk and dawn.
- Access to timely medical care.

PROPHYLACTIC MEDICATION

When deciding on the need for prophylactic medication, it must be remembered that all medicines have adverse effects and that the risk of developing a serious adverse effect must be weighed against the risk of developing malaria. No prophylactic medication is 100% effective. Pilots should seek medical advice regarding the use of prophylactic medication. The most reliable way of preventing malaria is to avoid mosquito bites.

All the antimalarials should be started before entering a malaria area, should be taken with unfailing regularity for the duration of exposure and some medication is required for four weeks after leaving the malaria area.

ADVERSE REACTIONS

Mefloquine

Adverse effects associated with Mefloquine include insomnia, strange dreams, mood changes, nausea, diarrhea, and headache. Mefloquine may also cause spatial disorientation and lack of fine co-ordination. **Mefloquine is not suitable for pilots.**

Malarone (Atovaquone plus Proguanil)

Atovaquone plus proguanil is usually well tolerated. Side-effects include mild nausea, headache or rash. **Malarone is suitable for pilots.**

Doxycycline

This drug affects bone formation in the first 8 years of life. It should not be given during pregnancy. Adverse effects include gastrointestinal symptoms and candida infection of the gut and vagina. Severe skin sensitivity to sunburn may develop. Other symptoms include dizziness, headache, and blurred vision. **Doxycycline is suitable for pilots.**

Chloroquine plus Proguanil

Chloroquine resistance is widespread in Africa. Serious side effects are rare but may occur with long-term use. Mild reversible side effects include headache, gastrointestinal effects, skin rashes, and mouth ulcers. **Chloroquine plus Proguanil is suitable for pilots.**

PERSONAL PROTECTION MEASURES

The following precautions are recommended to avoid mosquito bites:

- wear clothing (preferably light-coloured) that covers as much of the body as possible;
- use insect repellent, particularly on the lower legs and feet;
- use physical barriers such as screens, closed doors and windows;
- sleep under mosquito nets;
- remain indoors between dusk and dawn, when mosquitoes are more active;
- ceiling fans and air conditioners are very effective;
- spray inside the room with an aerosol insecticide at dusk after closing the windows;
- use mosquito mats impregnated with an insecticide or burn mosquito coils in living areas at night.
- treat clothing with an insecticide registered for this purpose, such as a pyrethroid.

Precautions regarding the use of repellent

- Repellents with a concentration of DEET that ranges from 25-50% are the most effective.
- Concentrations of DEET in products that are designed for application to skin range from 4% to 100%. Higher concentrations of DEET may have a longer repellent effect, however, concentrations over 50% provide no added protection.
- Use just enough repellent to cover exposed skin and/or clothing. Avoid over-application of the product.
- Some persons who used products containing a high concentration of DEET or who were exposed to excessive amounts of DEET have experienced skin rashes, blisters, and skin and mucous membrane irritation.
- Repeat applications at intervals of four to six hours according to the manufacturer's instructions.
- If you use sunscreen, apply the sunscreen first and the repellent after.
- Re-apply more frequently after bathing, showering, sweating, etc.
- Mosquitoes are attracted by the smell of sweat and sweaty clothing. Shower or wash frequently and wear clean clothing.

SOURCES

World Health Organization - Malaria, <https://www.who.int/malaria/en/>

Centers for Disease Control and Prevention - Malaria, <https://www.cdc.gov/parasites/malaria/index.html>

Collaborative Arrangement for the Prevention and Management of Public Health Events in Civil Aviation, CAPSCA.org

New England Journal of Medicine 2002; Comparative Efficacy of Insect Repellents against Mosquito Bites, <https://www.nejm.org/doi/full/10.1056/NEJMoa011699>

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