DANISH MARITIME AUTHORITY

# The Danish Maritime Authority´s Malaria Strategy -Guidelines on the Prevention and Treatment

2. Edition 2008

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## The Malaria Strategy for the crew on Danish ships

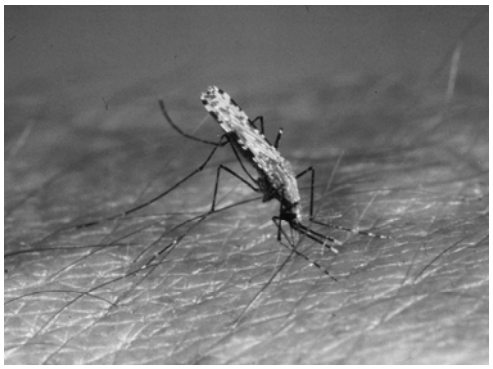
Malaria is a life threatening disease which every year infects millions of people including seamen worldwide. As Danish ships navigate many different places around the world and vary a lot in port of call and stay, the mutual strategy will in many cases remain an overall strategy where advice from the SSI (the State´s Serum Institute) or CMS (the Centre for Maritime Health Service) is sometimes necessary.
In the previous 5-year period, in which the strategy is implemented and used, there has naturally been a development in different fields.
In these guidelines we therefore wish to provide you with a precise and updated view on the guidelines that ought to be followed when sailing to malaria areas.

### Malaria

Malaria causes severe health problems in large parts of the world, primarily in tropical Africa, where more than 90 % of all malaria cases are situated. Especially affected are the poor, young children and pregnant women and scarcely populated areas with poor health coverage. It is estimated that every year 300 - 500 million people are infected with malaria and that 1 – 2 million people die as a result of the disease.

Tourists and travelers (seamen included) have an increased risk of falling *severely ill if* they are infected with virulent malaria, as they have not gained immunity. Every year about 200 cases of mostly virulent malaria (falsiparum) from Africa and benign malaria (vivax) from the Indian subcontinent are imported to Denmark. The mortality rate is approximately 0, 5 - 1 % in Denmark.

### About the mosquito



Malaria is transmitted via the bites of infected mosquitoes called *Anopheles.* It is a small mosquito characterized by flying alone. When the mosquito bites it holds its body in a 45 degree angle to the base. The female mosquitoes need blood to produce eggs and bite from dusk till dawn.
Malaria mosquitoes breed in stagnant fresh water, e.g. swamp areas, rice fields, small ponds, rainwater gathered in hollow trees or tins, or in water gathered in places with no outlet on board ships. Malaria mosquitoes thrive best in humid and warm topical areas- especially in the rainy season. Malaria mosquitoes are seldom able to fly more than 1 nautical mile out to sea.

### About malaria

Malaria is a tropical and subtropical infectious disease caused by parasites called *Plasmodia (P)* that is transmitted from ill to healthy people via mosquitoes (the disease can in principal also be transmitted via a blood transfusion). The mosquito bites into a vein and transmits parasites to the human blood stream from where they quickly enter the hepatic cells. In the hepatic cells the parasites develop and propagate and are then brought back to the blood stream from where they are

absorbed by the red blood cells. Here another change and propagation occurs where after the blood cells burst and new parasites are spread to thousands of new blood cells over and over again.

**Virulent versus benign malaria**
There are four forms of Plasmodia. Three are benign and one is virulent. The benign are P. vivax, P. ovale and P. malariae and are hardly ever lives threatening in their acute form. The virulent is called P. falciparum. P. falciparum is the most severe form of malaria and the main cause of the disease.

**The four forms of malaria**
*Falciparum* (virulent malaria) occurs only in the acute form. Nearly all cases imported to Denmark stem from Africa.
The incubation period, the period between infection and the appearance of the first symptoms, is usually 7 to 14 days. In the following 2 to 4 days, the temperature will rise to approximately 39 - 40 °C. After 4-6 additional days the disease may take a fatal turn.

Vivax, ovale and malariae (benign malaria) occur in both an acute and in a chronic form. Benign malaria often occurs in Middle- and South America and in parts of Asia and has only rarely a fatal outcome.
The incubation period for vivax is usually 12 to 17 days, 15 - 18 days for ovale and 18-40 days for malariae. The first attack may however occur several years after infection.
After the first attack the malaria parasites *can* survive in the liver in a chronic form and cause new malaria attacks later in life. In between the attacks the disease shows no symptoms. There are cases of infected people suffering malaria attacks 30 years after having been to a malaria area. Chronic malaria may cause severe illness but is seldom fatal. Today medicaments can effectively eradicate chronic infections. (Primalein?).

## "The Strategy"

By applying the recommended strategy, The Maritime Health Service intends to create a sense of safety on board ships in malaria areas, minimize the number of infected seamen and shed light on cases *(where and why)* where seamen are infected.
The Danish strategy deals with *prevention/treatment* and choice of medicaments, the possibility for *diagnosis* and quality control of the strategy on the basis of submitted blood samples for analysis at the SSI.

**Prevention and treatment**
All crewmembers should be familiar with the guidelines on mechanical and medical prevention concerning the ship. It is emphasized that one does not exclude the other. Mechanical prevention reduces the risk of mosquito bites and subsequent risk of infection by approximately 50 %.
For further information see section *prior to departure* p 5.
Medical prevention is recommended in high-risk areas, primarily in tropical Africa. (For further information see section *geography, high-risk*) In case of doubt please contact Lasse Vestergård (lav@ssi.dk) at SSI for individual advice.
Treatment is in accordance with existing rules in Inventory, Control Document and User

Instructions regarding medicaments and medical equipment. A. (pp 28-29).

**Diagnosis**
Ships that navigate in malaria areas – no matter where in the world- must carry at least 2 ready-sets. Each set contains 3 tests that, if used correctly, with almost 100 % accuracy will be able to tell if someone has been infected with the life threatening parasite Plasmodium falciparum. To increase the chances of detecting a virus we have chosen only to test for the most dangerous of the four forms of malaria. By using a ready-set, the ill seaman will, in counsel with Radio Medical Denmark, receive a swift treatment.
**It is stressed that the test cannot and must not be used as an alternative preventive measure** (for contents and procedure see the Ready-set on board).
When ordering Ready-sets from pharmacies in Denmark and abroad make sure that they contain the following:

- Note of contents
- Directions for use
- 3 tests (Pl. falciparum)
- Surgical spirit swab and finger pricker
- Reagent fluid for the test
- Directions for use in "thick blood specimen"
- 2 specimen tubes for "thick blood specimen"(in a transport box)
- Note of information for the SSI
- Pre-addressed envelope for the SSI
- Small spatula for securing blood drops

**Quality control**
Internationally there are no reports to shed light on malaria and seamen despite a number of deaths at sea. The Maritime Health Service commits anyone who uses a Ready-set to take a *"thick blood specimen"*.
The laboratory that carries out the microscopic analysis reports all cases of malaria (the State´s Serum Institute), as there is a duty of notification.
Take a *"thick blood specimen"* from the finger in which there has already been pricked a hole (see procedure p 8).
The *"thick blood specimen"* can be kept in a refrigerator for several months. The *"thick blood specimen"* and the attached note of information must be sent to the State´s Serum Institute in the pre-addressed envelope at a suitable port of call. Unsuitable ports of call and mail services have not rendered us with the results we expected. Please take great care in forwarding the*"thick blood specimen"* as it is of the utmost importance to the quality control.
The State´s Serum Institute examines the specimen by microscope. The results of the blood test do not interfere with the treatment of an acutely ill seaman, but if Pl. vivax is found, future attacks can be prevented with medical treatment.
Collaboration between the State´s Serum Institute and the Maritime Health Service ensures that the seaman and his own doctor will be informed of the results.

## Guidelines prior to, during and after a stay in malaria areas.

**Prior to**

Prior to any journey in malaria areas the shipping company, the ship and seaman have a responsibility.

The shipping company and the ship are obligated to examine and in that way try to predict the risks connected with the journey that lies ahead. They will make a risk assessment after considering the destination, the length of stay in the malaria area, at sea or in port, on rivers, in and out of the area, and time of year.

It is the ship management´s responsibility to decide whether or not the crew members may go ashore, for how long and at which time of day. Malaria mosquitoes bite all day but are most active at dusk and at dawn.

If you have any questions, the State´s Serum Institute can be of help.

### General information

The purpose of the general information is to inform the crew of malaria and the best means of protection. The purpose is also to make everyone aware of the fact that they must report any cases of malaria.

The general information could consist of a notice that is posted every time the ship approaches a malaria area. If the notice is posted only when there is an actual risk, it raises the crew´s awareness. Table 1 shows a notice containing the most important information.

### Personal information

The purpose of the personal information in the form of a conversation with each member of the crew is to ensure a sufficient level of information.

The conversation will consist of the following:

- That the ship will call at ports in malaria areas
- The duties of each crew member in this connection
- How each crew member protects himself against malaria
- In case of illness you need to contact the medical-officer immediately

**GUIDELINES DURING STAY IN MALARIA AREAS**

We are approaching an area with a high risk of malaria and we recommend the following precautions:
The air-conditioning must run at full speed
Your accommodation must be kept closed
Keep your accommodation mosquito free with mosquito repellant spray
Cover your skin as much as possible from dusk till dawn
? Avoid dark clothes
? Thin-haired people should wear hats
? Finely woven clothes do not offer protection

Use mosquito repellant every 6 hours on unprotected skin (avoid the eye area)
Start use of preventive medicaments 1-2 days prior to arrival
If you feel ill or are aware of others who are ill, you must contact the medical-officer immediately
If you have any questions about conduct, prevention or illness, contact the medical-officer

**Table 1**

*Figur 1*

Besides mechanical prevention of mosquito bites (mosquito nets, spray and air-conditioning), all crew members are recommended to take preventive malaria medicaments during stay in areas with a high risk of malaria. The Maritime Health Service still recommends Malarone as a fist choice but Malarone (atovaquone-proguanil) or Doxycyklin are equally effective as preventive medicaments, also when dealing with chlorochine resistant malaria.

In Denmark, *Malarone* is so far only registered for use in periods of 28 days but there are no indications that longer use of the medicament (up to 6 months) is connected with any risk of serious side effects or influence on the treatment. In the United States and in several European countries, Malarone has been approved for use in periods of 3-6 months and or longer. Malarone should not be used by pregnant or nursing women.

*Doxycyclin* has been approved for use in periods of up to 6 months. Avoid direct or artificial sun exposure during the use of Doxycyclin and at least one week after taking the last tablet as Doxycyclin enhances the skin´s sensitivity to sunlight. Doxycyclin should not be used by pregnant or nursing women and children under the age of 12.
Numerous tests have documented that both medicaments are connected with few and mild side effects.

**Preventive medicaments:**
Irrespective of whether you decide to use Malarone or Doxycyclin tablets, both medicaments must be taken daily 1-2 days prior to arrival in a malaria area (see Inventory, Control Document).

**During**
As general information the crew needs to be informed that action must be taken if illness occurs at sea. Not everyone defines the term illness in the same manner, and it is therefore stressed that **a slight headache, fever and flu like symptoms are reasons for contacting the medical-officer.**

Attire as mentioned before. Attention to malaria notice on board.

The Malarone tablets must be taken at the same time every day and in connection with a meal.

The Doxycyclin tablets must be taken with a generous amount of fluid at the same time every day (not with dairy products).

**After**
After stay in malaria areas, the restrictions mentioned above still apply. The incubation period differ from parasite to parasite but the virulent form of malaria can develope in a period of 7-14 days.
Follow-up medicaments depend on which medicament has been used during the stay in the malaria area.
You must continue use of Malarone for 7 days after departure from the malaria area whereas you must continue use of Doxycyclin for 4 weeks after departure from the malaria area.

## In case of illness or doubt about malaria

**Symptoms**
Malaria is an infectious disease. As in all other cases of infectious diseases, the first symptoms are mild: You feel unwell, run a slight temperature, have a slight headache and maybe a slight pain in the muscles, joints or stomach. It is therefore not possible to distinguish malaria from other forms of infectious diseases like the common flu unless specific tests are run to diagnose the disease.

The general symptoms are as follows:

- Fever
- Headache
- Flu like state
- Tenderness of joints and muscles
- Stomach pain
- Blood in the urine

Virulent malaria (falciparum) can develop from what is perceived as harmless to a life threatening disease in a matter of days.
Therefore, one must pay attention to every case of disease no matter how trite it seems and contact the medical-officer.

**Examination of the patient**
Start by filling in a medical report. Use the Danish Maritime Authority´s Radio Medical Denmark Records that will guide you through all organ systems via flow diagrams so that no important symptoms, that might indicate another illness, are overlooked. It is important to enquire if the patient has been in a malaria area, perhaps before his engagement on this ship.

The most important examinations are (see The Danish Maritime Authority´s Medical Manual):
1. Temperature measurement every 8 to 12 hours.
2. Recording changes in the patient´s general condition and level of consciousness.
3. Recording breathing frequency, pulse, blood pressure and fluid balance (observe the colour of the urine).

## Screening of the patient´s urine

Follow the instructions given in The Danish Maritime Authority´s Medical Manual.
Ask the patient for a urine test (e.g. in a disposable cup).
Inspect the colour of the urine. If it is very dark, it may indicate dehydration.
Examine the urine for blood and protein with Multistixs® 5. (G.1, see the Control Document).

## Malaria screening of the patient´s blood

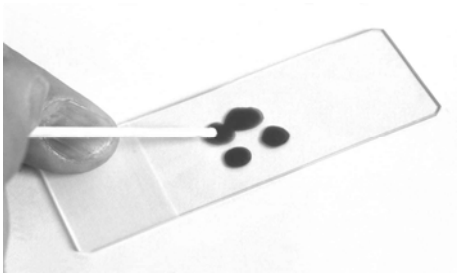
The Ready-set is able to detect a virulent form of malaria at an early stage when symptoms are mild and sometimes even before a microscope is able to show the presence of malaria.
Follow the instructions in your Ready-set.

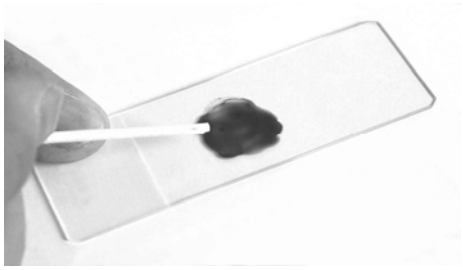

It is stressed that a negative test does not exclude infection with other forms of malaria. Therefore a more thorough examination is recommended, as other forms of malaria also require treatment. This is especially important if the patient has persistent symptoms, especially fever.

## Blood test for *"thick specimen"*

Two very important steps are taken when the "*thick specimen"* has been made and sent to the State´s Serum Institute:
1) The "*thick specimen"* will first of all show what kind of parasite the blood contains. Secondly, the results will be reported to the patient through the Maritime Health Sevice. Both pl. Vivax and pl.Ovale can survive for many years in the body, but there is a medical treatment able to eradicate the parasite.
2) We want to learn and collect knowledge on prevention, malaria and seafarers.

The ready-set contains a glass plate, a so-called "slide", which is to be used for the "*thick specimen"*. Make 2 "*thick blood specimen"* at a minimum.
Follow the guidelines in the **ready-set,** or see below:
Put on gloves. Clean the patient´s finger with spirit, wait until the spirit has vaporized and prick another hole.





"Milk" 3 to 4 big drops of blood onto the slide. Stir the blood thoroughly for 1 minut. Let the specimen dry. Place it in the plastic transport container. The specimen and note of information are placed in the envelope. Store in a refrigerator and send to the State´s Serum Institute.

## Treatment

Treatment must take place in concert with Radio Medical Denmark. If you are at port, you can use local doctors and hospitals. All previously mentioned procedures must be followed even though local doctors provide treatment.
The medical guidelines concerning treatment are in accordance with the Inventory, Control Document and User Instructions.
The patient must be placed under observation and regular contact with Radio Medical Denmark must be maintained during treatment. During the course of 2-3 days and nights, the patient must show considerable improvement. He must gain a better general condition and a normal body temperature.
The patient must consult a doctor when the ship docks.

***Doubt about the diagnosis***
Doubt about the diagnosis arises if the test shows no reaction to falsiparum in area T (when using the test shown above) or when the patient does not recover despite treatment. In both cases you must contact Radio Medical Denmark.

**Evacuation**
The decision to evacuate is made in concert with Radio Medical Denmark.

General information on geography, definition of high risk areas, formalities on contacting SSI and CMS.

## Tropical and subtropical areas divided according to relative risk

The following areas are listed according to the risk you are exposed to when calling at port for a maximum stay of one week. In case of travel further inland, the ship/ shipping company should seek individual guidance (see section on this).
Even though an area is declared malaria free, the situation may change locally as the mosquitoes that can carry the malaria parasites are still found in some of the areas. In some areas, malaria does not occur during the droughts.

# No or minor risk of malaria

### Africa
North Africa from West Africa to Egypt and the Suez canal, the Cape Verde Islands, South Africa, Namibia, the Seychelles and Mauritius.

### Middle- and South America
All areas, except Amazonas.

### Asia
All areas except: Pakistan, parts of India, Myanmar/Burma, Indonesia (except Bali, Cambodia, Yunnan and the Hainan province in China).

# Risk of malaria

### Africa

Mauretania (the northern ports are malaria free all year long).

### Middle- and South America

Amazonas

### Asia

Pakistan, parts of India, Myanmar/Burma, the Mekong River, Indonesia (except Bali, Cambodia, Yunnan and the Hainan province in China).

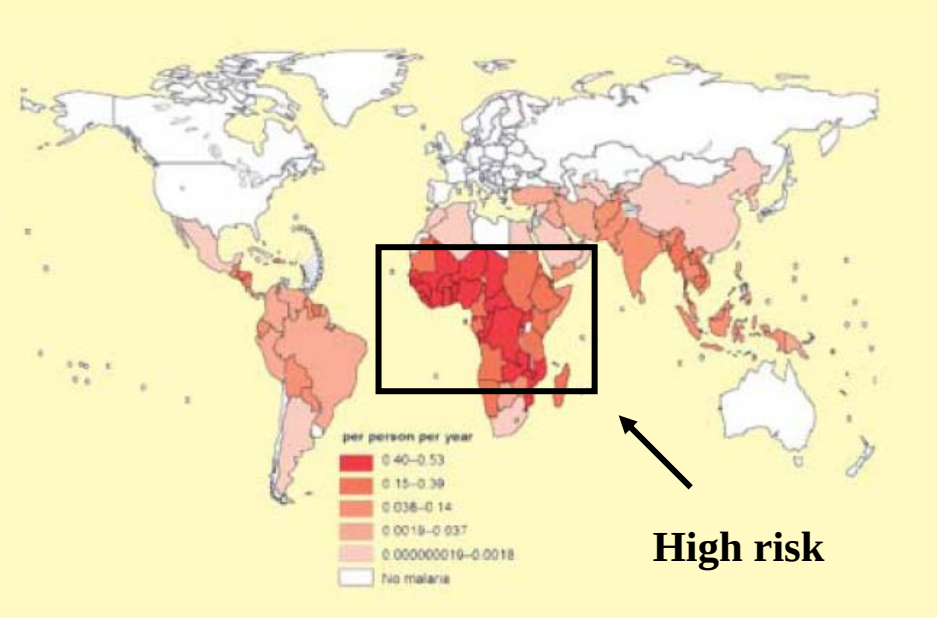
### Oceania

Papua New Guinea, the Salomon Islands and Vanuatu.

# High risk of virulent malaria

### Africa

From Senegal to Angola in the west, from Port Sudan to Maputo in the east, Madagascar and the Comoro Islands.



## More good advice

### How to keep your accommodation mosquito free

On board ships with air-conditioning and closed doors, windows and port-holes, it is possible to keep your accommodation mosquito free. Therefore no further precautions are needed. All ventilation ducts must be fitted with finely-meshed wire and the filters of the air-conditioning must be impenetrable to mosquitoes.

Mosquitoes are most active at night. During the day, they hide on vertical surfaces, preferably in dark places; e.g. behind curtains and lockers.

If there are mosquitoes in the accommodation, spray with a mosquito repellant. If it is not possible to keep the accommodation mosquito free, mosquito nets can be used as an alternative. Mosquito nets should be coated with synthetic pyrethroid, e.g. *Permethrin, Deltametrin or Lambda-cyhalothrin.*
During stay in hotel rooms with no air-conditioning or fully closed doors and windows, a mosquito net is recommended.

### How to protect yourself from mosquito bites

Malaria mosquitoes are able to bite through thin or loose-woven fabric. Therefore, long-sleeved high-necked blouses or shirts, long trousers and closed shoes are recommended. The clothes should fit as tightly as possible around the neck, wrists and ankles. It is important to protect your ankles, e.g. in the form of long socks, as the mosquitoes fly close to the ground. Thin-haired people should wear hats.
In areas with a high risk of malaria it is advisable to coat your clothes with *permethrin*. Permethrin is mixed with water (see directions for use), the clothes are soaked in the mixture and hung to dry. Permethrin offers an effective protection for at least six weeks. Permethrin is considered non-poisonous to humans.

**Mosquito repellant**
The most effective repellants contain DEET (N, N-diethyl-meta-toluamid) and are not marketed in Denmark. They are for sale abroad as gel, crème and “roll on” with a DEET-content of 20-35 %. In Sweden the product "US 622" with a DEET-content of 20% from the company Cederroth A/S is sold. Repellants with a DEET-content of more than 30-35 % may cause skin problems and should therefore not be used.
The repellants are effective the first 4 hours after application. Apply the repellant to the face, neck, hands and ankles. Avoid contact with eyes or on damaged skin.

### Advice on securing your accommodation

The Danish Maritime Occupational Health Service gives ships and shipping companies advice on how to ensure a mosquito free accommodation. Please contact:
The Danish Maritime Occupational Health Service, 33B Amaliegade, DK-1263 København K.
Tlf. (+45) 33 11 18 33 Fax. (+45) 33 11 14 60 E-mail: info@seahealth

### Statens Serums Institut v/Lasse Vestergård email: lav@ssi.dk tlf. +4532683695

Link: vaccination: travel and infectious diseases**:** http://www.ssi.dk/rejser/

**The Maritime Health Service, cms@dma.dk, April 2008**

Center for det Maritime Sundhedsvæsen