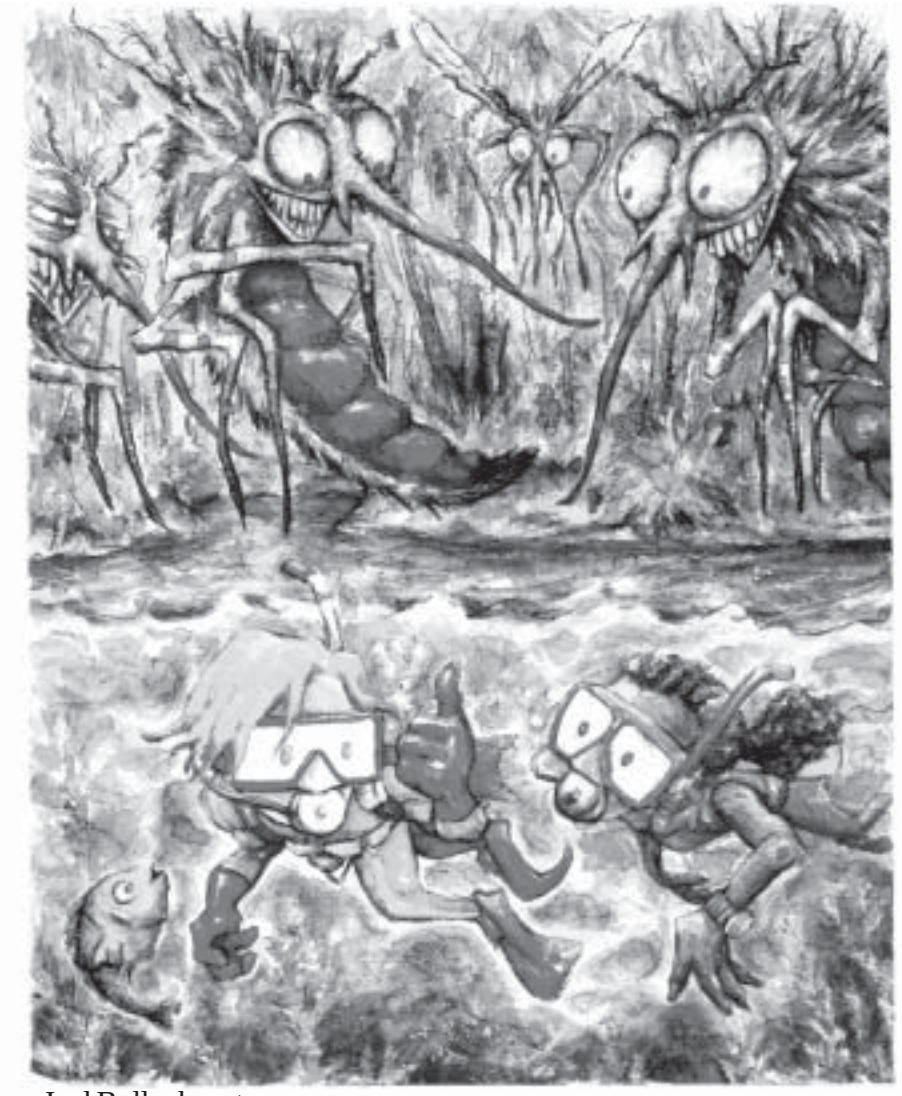
Malaria

By
Dr. Trish Batchelor

Malaria is a microscopic parasite that continues to cause a disproportionate amount of suffering in our world. Despite valiant and effective efforts to eradicate the disease during the 1950's and 1960's, the last twenty years have seen a re-emergence of this deadly parasite, which remains a major health problem in 101 countries world-wide. 650 million infections a year result in 2-3 million deaths annually – the majority who succumb being the young children of Africa. Currently 40% of the world's population live under the daily threat of this potentially fatal illness.



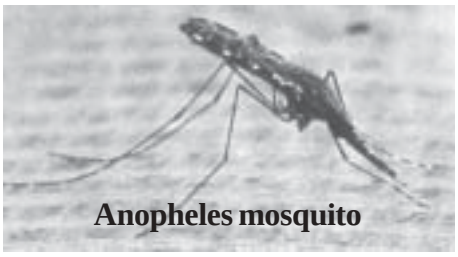
Joel Bullock cartoon

Some of the world's most exciting dive sites are located in countries with very high rates of malaria, for example the Solomon Islands and Papua New Guinea. As divers we are very likely to visit some of the world's malaria endemic countries during our dive holidays or careers. Many of us live in areas without malaria, and so we have no resistance to the parasite –unlike locals who live in regions where malaria remains a problem. Thus we are extremely vulnerable to it's deadly effects – we are just like the children of Africa in our susceptibility to this illness. Unlike the children of Africa, however, we have the means available to us to protect ourselves and prevent this potentially fatal infection.

There are four different species of the malaria parasite – however the majority of infections are caused by just two of these species - *Plasmodium falciparum* and *Plasmodium vivax*. Both species will give similar symptoms in the early stages of disease, but *P. falciparum* is the species that can cause 'cerebral malaria' – a medical emergency that may rapidly result in death if not adequately and promptly treated. 95% of the world's malaria deaths are caused by *P. falciparum*. Different regions of the world have different dominant species – in Oceania and Asia *P. vivax* dominates, whereas in Africa *P.falciparum* is the dominant species.

The *Plasmodium* parasite is transmitted via the bite of an infected female *Anopheles* mosquito. 56 different species of *Anopheles* can carry the malaria parasite and she is a nighttime feeder – hence the emphasis on avoiding bites between dusk and dawn. When the mosquito takes a meal of blood from her unsuspecting victim, she simultaneously injects the malaria parasite. Within 30 minutes the parasite has passed from the bloodstream into the victim's liver where it will spend at least one to two weeks maturing before being ejected back into the blood. It is at this time that infected individuals develop symptoms if they are not taking adequate preventive medication. Some species also have a 'sleeping stage' in the liver, and symptoms may develop many months after leaving the malaria area. The most common symptom of malaria is fever – the rule for doctors is - 'any fever after travel to a malaria area is malaria until proven otherwise'. Divers should be aware that no malaria preventive medication is 100% reliable so, even if you have taken your tablets, you could develop the disease (this is not, however, a reason not to take the medication!). Thus if you become unwell after your trip you should contact your doctor immediately to be checked for malaria – this can only be done by taking a series of blood tests.

Around 800 cases of malaria are diagnosed each year in Australia. Per head of population this is a relatively high rate and reflects the travel habits of Australians – very high risk countries such as Papua New Guinea, the Solomon Islands, Vanuatu and most recently East Timor, are popular destinations. In fact 40% of cases reported in Australia are contracted in either Papua New Guinea or Bougainville. In contrast for American and European travellers, the majority of cases are contracted in Africa. Numerous studies have shown that the overwhelming risk factor for contracting malaria as a traveller is taking no or inadequate preventive medication.



Anopheles mosquito

So how can we prevent malaria? There are a number of strategies – initially ensure you are really at risk (and therefore are motivated to take your medication as directed), use personal protective measures, take the appropriate preventive medication as directed and be aware of the symptoms of malaria so you can receive prompt treatment should you become infected.

Are you actually at risk?

The best way to ensure you are receiving accurate advice is to consult a doctor with postgraduate training in travel medicine before your trip. Such a doctor will take into account your exact destination, the season of your trip, your style of accommodation, your activities (especially diving) and individual medical factors before prescribing medication. Doctors with a special interest may be identified through the International Society of Travel Medicine website (www.istm.org), or in Australia and New Zealand via the website www.traveldoctor.com.au .
It is difficult to get accurate malaria advice directly from the internet – consulting a specialised travel medicine clinic is your best policy.

Personal protection.

This involves doing your utmost to avoid being bitten by mosquitoes – and as a bonus these actions will help you to avoid other irritating bug bites. As the *Anopheles* is dominantly a nighttime feeder you should ensure your accommodation has a mosquito net, is screened and ideally is air-conditioned. **At dusk you should change into light-coloured, loose, long-sleeved clothing.** Mosquitoes are attracted to dark colours, perfumes, after shaves and jewellery – stay unadorned! **Mosquito repellants should be applied to all exposed skin** – the active ingredient to look for is DEET (di-ethyl-M-toluamide), ideally at a concentration of 30-40%. Children should use a lower concentration – the American Academy of Paediatrics recommends a 10% formula for young children. Finally, if you are visiting a high risk destination, you can use an insecticide called 'permethrin' to impregnate mosquito nets and clothing. It is now possible to buy pre-impregnated nets through many travel medicine clinics or from the internet. There are a variety of permethrin products available that can be applied to clothing to act as a

knockdown insecticide. This product can be particularly useful for children's clothes.

Preventive medications

As previously mentioned, the greatest risk factor for catching malaria is not taking adequate preventive medication. Fear of side effects, ignorance of the risk and cultural issues are the main reasons that people travel without adequate protection. All malaria preventive medications have potential side effects – however they are generally mild, and pose much less of a risk than the disease. However, this only holds true if you are travelling to an area that truly has disease risk – hence the importance of getting accurate advice. It is crucial that your doctor spends the time with you to ensure you get the medication that is most appropriate for you. This may involve negotiating what is most reasonable in terms of cost, convenience and potential side effects. **As long as you are taking adequate prophylaxis, what you take is less important than the fact that you take it as directed!**

There are a variety of preventive medications available – the most commonly used are Chloroquine, Proguanil, Mefloquine (Lariam), Doxycycline and Malarone. **Remember that no anti-malaria tablet is 100% effective in preventing malaria, but certainly some are more effective than others.** In most instances 'adequate' prophylaxis will involve taking either Mefloquine, Doxycycline or Malarone.

The introduction of Chloroquine in the 1950's seemed to be the answer to the world's malaria problem. Unfortunately, the malaria parasite soon developed partial and then complete resistance to the drug and there are now only very few areas of the world in which Chloroquine is still a useful preventive medication (essentially Central America and parts of the Middle East).

Proguanil (Paludrine) has been used for many years in combination with Chloroquine and these medications have been particularly popular in the UK. Once again increasing drug resistance means these drugs provide less than adequate protection in most parts of the world. It is also a relatively inconvenient option as it involves taking both a daily and a weekly medication – with potentially serious complications if the tablets are confused.

Mefloquine is a very popular drug in the US and Europe but has been received less enthusiastically in the UK and Australia. This is a very effective medication that offers the convenience of once weekly dosing. There is however controversy over the side effect profile of Mefloquine. Although it has not been supported by controlled studies, anecdotal evidence suggests an increased risk of 'neuropsychiatric' side effects such as sleep disturbance, nightmares, and in very rare cases, mood disturbances such as depression, anxiety and hallucinations. There is also controversy about its use in divers. In Australia and New Zealand it is rarely prescribed for divers as there have been problems with first time Mefloquine users being evacuated from countries such as Papua New Guinea and the Solomons with what was thought to be DCI, only to find that their symptoms do not improve with chamber treatment. In fact their symptoms were side effects of Mefloquine. The New Zealand Navy went as far as writing to the New Zealand Journal of Medicine requesting doctors not to prescribe Mefloquine to divers after a number of such incidents. There is however no international consensus on this issue and if you have taken Mefloquine in the past without side effects, or have taken a trial of drug for four weeks prior to you trip you may have no problems. There are however other options available, so as a general rule, we avoid using Mefloquine in divers.

Doxycycline is a very popular option in Australia and New Zealand, and is increasingly being used in the UK, Europe and the US. It is an antibiotic as well as an effective anti-malarial, and must be taken daily. One of the big advantages of Doxycycline is that it can help prevent or treat other tropical diseases such as Leptospirosis, and is particularly useful for treating coral cuts. The main side effects are nausea, thrush in women and a propensity to become more easily sunburnt (known as photosensitivity).

The latest drug to become available is Malarone. This is perhaps the ideal medication for divers. It is very effective and works on both the liver and blood stages of the parasite, so only needs to be taken for one week after leaving the malaria area, unlike the other medications that must be taken for four weeks. Side effects are uncommon and usually mild. Headache and nausea sometimes occur. It is a daily tablet and the main disadvantage is cost – around AUS $9 daily. However, in the context of the cost of many dive trips, this is negligible, when one considers the effectiveness of the drug and the decreased risk of side effects that may spoil your trip. Malarone is still in the process of being licensed in Australia for use as a preventive medication, but it can be prescribed on an individual patient basis. It has been licensed in the United States, New Zealand and many European countries for some time now.

Be aware of the symptoms of malaria and seek prompt advice if you become unwell.

The incubation period of malaria is a minimum of 5 days, but may be many months. Most cases of the more serious form of the disease, *P. falciparum*, will appear within a month of leaving the malarious area, however any feverish illness that occurs up to one year after leaving could potentially be malaria. **Ensure you inform your doctor that you have been travelling in a malaria area – malaria is not a common diagnosis and unless you reveal your travel history it may not be considered as an option.** In the initial stages of infection the symptoms can be deceptively mild and may mimic the common flu. Fever is the most consistent symptom and it may or may not be accompanied by any of the following -headache, nausea, muscle aches, chills, cough or diarrhoea. *P. falciparum* can cause a rapid deterioration resulting in multi-organ failure, coma and death within a couple of days - so early diagnosis is essential. The earlier the diagnosis is made, the easier the disease is to treat as there are fewer parasites in the bloodstream. The only way to accurately diagnose malaria is by doing a series of blood tests. If you are over the age of 40 it is even more important that you receive rapid treatment. An analysis of over 4000 cases in travellers showed a death rate of 1% in people under the age of 40 but a death rate of nearly 6% in those over 40.

Malaria remains a serious disease in much of the tropical world and there is a good chance that your diving life will, at some stage, take you to a country with malaria risk. Malaria should be respected, but not feared so much that you miss the excitement of visiting many of the world's amazing landscapes (both on land and under the water) – just ensure you get good advice before you travel, and, that you follow it!

Useful websites

www.cdc.gov
www.who.int/health-topics/malaria.htm
www.who.int/ith/
www.fitfortravel.scot.nhs.uk/
www.tripprep.com
www.traveldoctor.co.nz
www.vnh.org/Malaria/Malaria.html
www.malaria.org.za

HOW TO PREVENT MALARIA

- Ensure you really need to take malaria preventive medication – consult a doctor who specialises in travel medicine (see *www.traveldoctor.com.au*)
- Use personal protective measures
- Take the anti-malaria medication you have been prescribed as directed
- Be aware that any feverish illness that occurs even up to one year after leaving the malaria area could be malaria – seek prompt medical advice

PERSONAL PROTECTION

- Ensure your accommodation has mosquito nets, screens and ideally is air-conditioned.
- Use an insect repellant containing 30-40% DEET on all exposed skin, especially at dusk and dawn. Wash off before going to bed. Children should use 10% DEET.
- Wear loose, light-coloured, long clothing between dusk and dawn.
- Avoid perfumes, after-shave, jewellery and dark colour.
- Use permethrin to impregnate mosquito nets and clothing if you are visiting a high risk area.

ABOUT THE AUTHOR

Dr Trish Batchelor has specialised in travel medicine for the last 10 years. Until recently she was National Medical Director of the Travel Doctor TMVC group of travel medicine clinics in Australia and New Zealand. She is currently based in Kathmandu, Nepal, at the CIWEC Travel Medicine Centre, pursuing her passion for travel medicine, high altitude medicine and tropical medicine. ●