Fortnightly Review

Malaria prophylaxis: guidelines for travellers from Britain

David J Bradley, David C Warhurst on behalf of a meeting convened by the Malaria Reference Laboratory

Malaria prophylaxis for travellers has to reflect changes in malaria epidemiology, travel habits, and drug resistance of the parasites. A detailed discussion was published in May 1993 with recommendations.¹ Subsequent experience was reviewed at a meeting of British malaria specialists in 1994, and simpler, more prescriptive advice was agreed. This report discusses changes and new issues arising since 1993 and sets out revised recommendations. It should be read together with the previous report for a full understanding of many issues that are not repeated here. Moreover, doctors should beware of simply using the tables of regimens without reading the text of the two reports as background.

Changing issues in malaria prevention

Drug resistance of *Plasmodium falciparum* to chloroquine has increased in both intensity and geographical distribution over the past year. Almost all countries of sub-Saharan Africa now have chloroquine resistant malaria, and it has become a big problem in West Africa as well as East and Central Africa. There are some reports of chloroquine resistant *P. vivax* in Oceania. Resistance to the newer antimalarial, mefloquine, is now a problem in parts of Cambodia, Thailand, and Myanmar.

Confidence in mefloquine has increased. Although neuropsychiatric side effects have continued to trouble some patients, they have not prevented its widespread use for travellers to East Africa, and the committee considered it appropriate for high malaria risk areas throughout sub-Saharan Africa. American travellers taking mefloquine long term have not encountered additional side effects and it seems safe for over a year's continuous use. The data sheet is being changed to reflect this. It also seems safe in the second and third trimesters of pregnancy.

Further experience with halofantrine, previously recommended as a standby drug, has shown adverse effects on the heart. Consequently, the committee no longer recommends its use as a standby drug for travellers.

In areas of mefloquine resistant falciparum malaria and for travellers at high risk of chloroquine resistant falciparum malaria who are unable to take mefloquine, doxycycline has been used effectively and is now recommended by the committee for use in these special circumstances. Some guidelines are given for travellers with concomitant diseases.

Four general issues have become clearer. Firstly, bednets impregnated with pyrethroid insecticides give substantial protection for those sleeping outside screened accommodation. Secondly, more severe

Summary points

- Travellers to malarious areas must avoid mosquito bites, take chemoprophylaxis, and urgently seek early diagnosis and treatment for febrile illness
- The key to preventing malaria is avoiding infective mosquito bites by using repellents, covering up at night, and sleeping with bednets if mosquitos cannot be excluded from the room
- Appropriate chemoprophylaxis is essential when travelling to endemic areas—drug resistance is increasing in many areas so recommended regimens have changed
- Doses and choice of drug may have to be altered in those with concomitant illness
- Standby treatment may be given to those who will be unable to reach medical services for extended periods
- **No prophylaxis is infallible** so all fever and flu-like illnesses occurring within a year of returning from malarious regions need to be urgently investigated with malaria in mind

malaria results from non-compliance with the recommended regimen than from taking the wrong drug. Thirdly, tragedies continue to occur because travellers and their doctors forget that protection is not 100%. Even when all precautions are taken there is still an appreciable risk of malaria. Lastly, there is concern about overprescription of standby drugs. These are intended for travellers who will be far from medical advice during their journeys or in places where access to effective chemotherapy for malaria may be difficult. They are a first aid measure for such people not an alternative to proper medical care.

Principles of prevention

Four principles of malaria prevention should receive attention from both travellers and their advisers.

BE AWARE OF RISK

All travellers to malarious areas must be aware of the malaria risk, act to reduce the risk, and urgently seek medical advice if they get a fever.

AVOID BEING BITTEN BY MOSQUITOES

- Sleep in properly screened rooms and spray the room with a knockdown insecticide before evening to

Malaria Reference Laboratory of the Public Health Laboratory Service, London School of Hygiene and Tropical Medicine, London WC1E 7HT
David J Bradley, *codirector*
David C Warhurst, *codirector*

This report was prepared by Professor Bradley and Dr Warhurst on behalf of the committee listed in the appendix.

Correspondence to: Professor Bradley.

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kill any mosquitoes that may have entered the room during the day

- When sleeping elsewhere use mosquito nets around the bed at night, checking that there are no holes in the net. The net should be impregnated with pyrethroids—for example, permethrin, 0.2 g/m² of material every six months—and the net should be long enough to fall to the floor all round the bed or be tucked under the mattress
- An electric mat should be used to vaporise synthetic pyrethroids overnight or mosquito coils may be burned. Electronic buzzers, which are sometimes marketed as repellents, are not effective
- Long sleeved clothing and long trousers should be worn if out of doors after sunset
- Preparations containing diethyltoluamide repel mosquitoes effectively and may be applied to exposed skin. Do not exceed the manufacturer's recommendations, particularly with small children. Impregnating cotton garments with 30 ml of diethyltoluamide in 250 ml water makes it repellent. Refined lemon eucalyptus oil is also repellent on skin.

TAKE CHEMOPROPHYLAXIS WHERE APPROPRIATE

- This is the most complex aspect of malaria prevention for travellers, with different recommendations for particular countries. Four principles apply to all chemoprophylaxis:
- Compliance is essential; most deaths are in those who do not comply fully
- Continue to take chemoprophylaxis for four weeks after returning to Britain. Most infections will be prevented by four weeks of continued prophylaxis after leaving malarious areas
- Start chemoprophylaxis one week before departure for the malarious area, because it will get the traveller into the habit of taking antimalarial drugs, may show toxicity in those for whom the drug is unsuitable, and may facilitate a desirable rise in the blood concentra-

tions of some antimalarials. Some favour giving mefloquine for two weeks before departure since most substantial side effects will occur in Britain and alternatives can be considered

- Take antimalarials after meals to minimise minor side effects.

SEEK EARLY DIAGNOSIS AND TREATMENT

Medical advice should be sought promptly for any febrile or flu-like illness occurring within a year, and especially within three months, of returning from an endemic area **even if** all recommended precautions have been taken.

Key drugs for chemoprophylaxis

The usual regimens for chemoprophylaxis for adults and children are given in tables I and II.

PROGUANIL AND CHLOROQUINE

Either of these two drugs gives good protection in areas without chloroquine resistant malaria parasites. The standard prophylaxis is 300 mg chloroquine (base) weekly. In areas of limited to moderate chloroquine resistant *P. falciparum* this dose is combined with 200 mg proguanil daily to provide substantial protection, though less than that provided by mefloquine. Serious side effects are rare (and deaths almost unknown), but minor ones include mouth ulcers, gastrointestinal upsets, occasional skin eruptions, and worsening of psoriasis. There are fewer neuropsychiatric side effects than with mefloquine. The theoretical problem of retinal toxicity from chloroquine when the total dose exceeds 100 g (this amounts to over six years of continuous prophylaxis) is based on high daily doses for treating other diseases and is highly unlikely at antimalarial doses. Efficacy is limited in sub-Saharan Africa and low in South East Asia. Chloroquine is universally available locally in malarious areas but may be of poor quality in some places. Proguanil is not registered everywhere and has limited availability in some tropical areas. Proguanil may affect the dose of anticoagulants needed for those on long term treatment, and it is best to restabilise the anticoagulant dose in the presence of proguanil before going abroad. Both drugs are safe in pregnancy, but the doses need to be reduced in renal failure, or an alternative used. Chloroquine is not appropriate for those with a history of epilepsy when proguanil alone may be used as an alternative to chloroquine alone.

MEFLOQUINE

Experience suggests this is the preferred antimalarial for those at high risk of highly chloroquine resistant *falciparum* malaria who are not in the first trimester of pregnancy, not liable to become pregnant within three months of stopping mefloquine, and not lactating. One 250 mg tablet a week is required as mefloquine is excreted slowly. It gives greater protection than other regimens in sub-Saharan Africa. Until recently the drug has been recommended only for visits of under three months, but there is now sufficient evidence to recommend use for up to a year. Cumulative evidence from those inadvertently given mefloquine during pregnancy has not confirmed initial fears about its effects, and mefloquine may be given during the second and third trimesters with confidence though it is not recommended for the first trimester and, as the drug is excreted slowly, pregnancy is best avoided for three months after stopping prophylactic mefloquine. However, inadvertent pregnancy under these circumstances is not considered an indication for termination of pregnancy.

The main problems with mefloquine have been neuropsychiatric side effects. These may include

TABLE I—Prophylactic regimens against malaria in adults

Regimen	Dose for chemoprophylaxis	Usual amount per table (mg)
<i>Areas of chloroquine resistant P. falciparum:</i>		
Mefloquine*	1 Tablet weekly	250 (228 in United States)
Proguanil plus chloroquine	2 Tablets daily plus 2 tablets weekly	100 150 (base)
Pyrimethamine-dapsone (Maloprim) plus chloroquine	1 Tablet weekly plus 2 tablets weekly	12.5 plus 100 150 (base)
Doxycycline	1 Tablet daily	100
<i>Areas without drug resistance:</i>		
Chloroquine	2 Tablets weekly	150 (base)
Proguanil	2 Tablets daily	100

All antimalarials to be avoided in severe hepatic and renal impairment. Chloroquine doses are given as the base. Folate supplements should be given to those taking proguanil or Maloprim when pregnant.

*Avoid during first trimester of pregnancy, during lactation and avoid pregnancy for three months after stopping it. Do not prescribe mefloquine if there is a history of epilepsy or of severe psychiatric disorder. Appropriate for up to one year abroad.

†Best avoided in the first trimester of pregnancy.

‡Contraindicated during pregnancy and lactation and for children under 12 years.

TABLE II—Doses of prophylactic antimalarials for children

Age	Weight (kg)†	Fraction of adult dose		
		Chloroquine plus proguanil	Maloprim (pyrimethamine-dapsone)	Mefloquine
0-5 Weeks		1/8	Not recommended	Not recommended
6 Weeks		1/4	1/8‡	Not recommended
1-5 Years	10-19	1/2	1/4	Not recommended under age 2 years or 15 kg 1/4 (2-5 years)
6-11 Years	20-39	3/4	1/2	1/2 (6-8 years) 3/4 (9-11 years) up to 45 kg
≥ 12 Years	> 40	Adult dose	Adult dose	Adult dose

*For children aged under 2 years in areas of chloroquine resistance the appropriate drug is chloroquine plus proguanil. Chloroquine is available as a syrup but the proguanil has to be powdered on to jam or food. Antimosquito bite measures specially important. Doxycycline is unsuitable for children under 12 years.

†When both are available weight is a better guide than age for children over 6 months.

‡Not feasible to prepare unless a paediatric formulation is available.

anxiety, depression, sleep disturbances, nightmares, hallucinations, and, in a few people, overt psychotic attacks or convulsions. They usually occur early in the use of the drug, 70% from the first three doses. The frequency of neuropsychiatric effects is unclear. In a survey severe effects occurred in 0.01%, but British experience points to a greater frequency, though not high enough to interfere with recommending mefloquine for areas with a high risk of highly chloroquine resistant falciparum malaria. It should not be given to those with a history of convulsions, epilepsy in first degree relatives, or serious psychiatric disorder. Concern has been expressed that mefloquine may impair precision movements. Mefloquine is unsuitable for those with liver impairment.

DOXYCYCLINE

Doxycycline is becoming useful for prophylaxis in areas of mefloquine resistant falciparum malaria in South East Asia and as a second line drug for those visiting high risk areas but unable to take chloroquine or mefloquine. It has been used with considerable success by United Nations forces in Cambodia. It is unsuitable for children and during pregnancy and lactation and it is expensive. Among side effects, photosensitisation is uncommon but sometimes severe and prolonged. Excessive exposure to sun should be avoided. The drug may provoke diarrhoea, although it provides some protection against the bacterial causes of traveller's diarrhoea. Doxycycline must be taken after meals and with copious quantities of fluid to avoid oesophagitis. Avoid lying down immediately after taking the drug. Use for more than about three months is to be avoided. Use of doxycycline for malaria prophylaxis is not yet on the data sheet.

MALOPRIM

This fixed dosage combination of pyrimethamine (12.5 mg) and dapsone (100 mg) has provided considerable protection against chloroquine resistant falciparum malaria in the western Pacific and Papua New Guinea, where it has been used at a dose of one tablet weekly together with chloroquine 300 mg base weekly. It has now been superseded by mefloquine but remains a second line drug for Oceania and elsewhere when other drugs are not usable. The therapeutic ratio is low, and the adult dose must not exceed one tablet weekly because of the risk of agranulocytosis.

OTHER ANTIMALARIAL DRUGS

The following drugs are no longer recommended in chemoprophylaxis of malaria: pyrimethamine alone, because resistance to it is so widespread; amodiaquine because of the high risk of agranulocytosis; and pyrimethamine-sulfadoxine (Fansidar) because of the risk of severe and sometimes fatal Stevens-Johnson syndrome or toxic epidermal necrolysis. The last two drugs may have a role in treatment and Fansidar is useful for standby treatment.

Standby treatment

Travellers who will be unable to get to medical advice within 24 hours of becoming ill may be provided

with a standby course of antimalarials for self treatment (and similar provision may help those with access to advice where suitable drugs are unavailable). Criteria for providing standby drugs should be quite restrictive, and clear instructions for their use should be provided in writing. These drugs are not needed for those overseas for less than a week.

Standby drugs for areas without chloroquine resistance are chloroquine if no prophylaxis is being taken and Fansidar for those taking chloroquine prophylaxis. In areas with chloroquine resistance, Fansidar, mefloquine, or quinine (alone or with another drug) is appropriate. Halofantrine, which seemed a promising and convenient standby drug, has been found to lengthen the QT interval, especially in those taking prophylactic mefloquine. Sudden deaths have occurred, and it is no longer appropriate for standby treatment.

Table III details the recommended standby regimens. Quinine alone can be used for seven days but few will persevere with quinine for the full course because of increasing side effects. There is a significant risk of neuropsychiatric side effects with a therapeutic dose of mefloquine, but the hazards of untreated malaria are greater. Pregnant women should avoid situations where standby treatment may be needed; the only appropriate drug in necessity is quinine. Those who use standby treatment should subsequently seek medical advice. In areas with multidrug resistance where mefloquine or doxycycline is being used for prophylaxis, quinine with tetracycline or with Fansidar is appropriate. Smaller doses of quinine have been suggested as more appropriate after mefloquine, but malaria breakthrough in those taking mefloquine poses the greater risk. In areas of low risk but malaria highly resistant to chloroquine and other drugs, where no chemoprophylactic drug is being taken, quinine plus tetracycline, or mefloquine alone, would be the most suitable standby treatment.

Malaria prophylaxis in those with concomitant illnesses

Other illnesses or the drugs they require can affect the appropriate antimalarial precautions. Many need specialist advice, but epilepsy and renal failure are two common problems.

Epilepsy—Both mefloquine and chloroquine are unsuitable. For malarious areas without chloroquine resistance, proguanil alone (200 mg daily) is recommended. For areas with a high risk of chloroquine resistant malaria, such as sub-Saharan Africa, doxycycline should be considered despite its side effects. However, there is evidence that phenytoin, carbamazepine, and barbiturates shorten the half life of doxycycline, so in theory the dose should be increased for patients taking these drugs. There is, however, little experience with an increased dose against malaria. Maloprim is an alternative.

Renal failure—Chloroquine and proguanil are excreted by the kidney and their prophylactic use is liable to be affected by renal failure. Two approaches are possible, to reduce the dose of proguanil (table IV) or to use an alternative drug. In areas of high risk of

TABLE III—Standby treatment for adults away from medical facilities for over a week

Standby treatment regimen	Usual amount per tablet	Dose
Pyrimethamine-sulfadoxine (Fansidar)	25 mg plus 500 mg	3 Tablets in one dose
Mefloquine	250 mg	15 mg/kg, not exceeding 4 tablets in split dose
Quinine plus Fansidar	300 mg quinine and 3 tablets of Fansidar	Quinine 2 tablets 3 times a day for 3 days followed by 3 tablets of Fansidar once
Quinine plus tetracycline	300 mg quinine and 250 mg tetracycline	Quinine 2 tablets 3 times a day for 3 days accompanied by 1 tablet of tetracycline 4 times daily for 7 days
Chloroquine*	150 mg base	4 Tablets on days 1 and 2, 2 tablets on day 3

*Only in chloroquine sensitive areas.

chloroquine resistant malaria mefloquine or doxycycline may be used since they are largely metabolised and excreted through the liver. The dose is unchanged even when patients are on dialysis.

TABLE IV—Doses of proguanil in adults with renal failure

Creatinine clearance (ml/min/1.73m ²)	Dose
>60	200 mg daily
20-60	100 mg daily
10-20	50 mg daily
<10	50 mg alternate days

Splenectomy—Travellers who are asplenic are at particular risk of severe malaria and need to take meticulous precautions against contracting the disease. This involves careful use of antimosquito measures, strict compliance with appropriate chemoprophylaxis, and avoiding unnecessary visits to malarious areas.

Pregnancy—Pregnant women are at particular risk of severe malaria and should avoid visiting endemic areas if feasible. Chloroquine and proguanil have a long history of safe use during pregnancy and mefloquine can also be used in the second and third trimesters.

Recommendations by area

Advice is given by continent in the tables. One main recommendation is usually given for each place (for each country whenever possible), but an alternative is given for those who are unable or unwilling to follow the recommended regimen. Measures to avoid mosquito bites are always applicable. If transmission is seasonal or local the months or places with risk are indicated. Space does not permit details of localised transmission in each country. Those visiting parts of a country where transmission is patchy and who will be off the tourist routes should visit a travel clinic or

consult the Malaria Reference Laboratory giving their precise itinerary.

NORTH AFRICA AND THE MIDDLE EAST (TABLE V)

Malaria risk is very low in the areas most visited by tourists and advice for many areas is to avoid mosquito bites and remember the remote possibility of malaria in the event of fever within a year of returning to Britain. This applies to all North Africa (except for the El Faiyum area of Egypt south west of Cairo) and to Turkish tourist areas as far east as Antalya. Eastwards along the coast from Antalya to the Syrian border and inland in south east Turkey, and in parts of Syria and Iraq, chloroquine prophylaxis is recommended against vivax malaria. In Oman, some emirates, Yemen, Iran, and Afghanistan, falciparum malaria occurs and is often resistant to chloroquine.

SUB-SAHARAN AFRICA (TABLE VI)

All travellers to this area should have adequate protection against biting mosquitoes and chemoprophylaxis as the risk is high, except in the extreme south, and chloroquine resistant *P. falciparum* common. Deaths from malaria in British travellers are usually from malaria contracted in Africa, especially Kenya. Breakthroughs occur on all regimens so it is essential to investigate all fevers and flu-like illnesses occurring within a year of visiting Africa as a matter of emergency. Mefloquine is now recommended for most of sub-Saharan Africa but proguanil plus chloroquine also gives substantial protection and is an alternative (especially for those at risk of or in early pregnancy). In the infected areas of South Africa, Namibia, and Botswana proguanil plus chloroquine is recommended. Some highland areas of Ethiopia and Kenya are malaria free, as is central Nairobi, but the surroundings are malarious.

TABLE V—Malaria in North Africa and Middle East

	Country		Preferable regimen*	Alternative regimen*
Risk very low	Abu Dhabi Algeria Egypt (tourist areas) Libya	Morocco Tunisia Turkey (most tourist areas)	Avoid mosquito bites	Proguanil
Risk low	Azerbaijan (southern border areas) Egypt (El Faiyum only, June-October) Iraq (rural north, May-November)	Syria (north border May-October) Turkey (plain around Adana, Side, south east Anatolia; March-November) Tajikistan (south border areas)	Chloroquine	
Risk present, chloroquine resistance present	Afghanistan (below 2000 m, May-November) Iran (March-November), Oman, Saudi Arabia (except northern, eastern and central provinces, Asir plateau, and western border cities, where very little risk)	United Arab Emirates (northern rural only) Yemen	Chloroquine plus proguanil	

*See table I for details of regimens.

TABLE VI—Malaria in sub-Saharan Africa

	Country			Preferable regimen*	Alternative regimen*
Risk very high, or locally very high. Chloroquine resistance very widespread	Angola Benin Burkina Faso Burundi Cameroon Central African Republic Chad Comoros Congo Djibouti Eritrea Equatorial Guinea Ethiopia Gabon	Gambia Ghana Guinea Guinea-Bissau Ivory Coast Kenya Liberia Madagascar Malawi Mali Mozambique Niger Nigeria	Principe Rwanda São Tomé Senegal Sierra Leone Somalia Sudan Swaziland Tanzania Togo Uganda Zaire Zambia	Mefloquine	Chloroquine plus proguanil
Risk in parts of country. Some chloroquine resistance	Botswana (only in the northern half of the country, November-June) Mauritania (year round in the south; in north July-October) Namibia (northern third only, November-June) South Africa (north east, low altitude areas of north and eastern Transvaal, and eastern Natal down to 100 km north of Durban) Zimbabwe (areas below 1200 m, November-June; all year in Zambezi valley where mefloquine is preferable)			Chloroquine plus proguanil	Mefloquine or Maloprim
Low risk	Cape Verde (remember low risk if fever) Mauritius (except rural areas where chloroquine prophylaxis is appropriate)			Avoid insect bites	

*See table I for details of regimens.

TABLE VII—*Malaria in south Asia*

	Country	Preferable regimen*	Alternative regimen*
Risk variable. Chloroquine resistance usually moderate	Bangladesh (except east; no risk in Dhaka city) Bhutan (southern districts only) India (no risk in mountain states of north) Nepal (below 1300 m; no risk in Kathmandu) Pakistan (below 2000 m) Sri Lanka (no risk in and just south of Colombo)	Chloroquine plus proguanil	Will vary locally
Risk high. Chloroquine resistance high	Bangladesh (only in the east, including Chittagong Hill Tracts)	Mefloquine	Chloroquine plus proguanil

*See table I for details of regimens.

TABLE VIII—*Malaria in South East Asia*

	Country	Preferred regimen*
Risk very low, remember malaria possible if fever	Bali Brunei† China, main tourist areas Hong Kong Malaysia (except Sabah where mefloquine, and deep forests where chloroquine plus proguanil) Sarawak Singapore† Thailand, Bangkok, and main tourist centres	Avoid mosquito bites
Risk substantial, drug resistance common	Cambodia (except no risk in Phnom Penh, and see below) China (only in Yunnan and Hainan; chloroquine in other remote areas of China) Irian Jaya Laos (except no risk in Vientiane) Myanmar (formerly Burma) Vietnam (except no risk in cities and delta area) Thailand (backpacking in rural areas) Sabah	Mefloquine
Risk variable, some chloroquine resistance	Indonesia (other than Bali and cities where low risk, and Irian Jaya where mefloquine) Philippines (rural below 600 m; no risk in Cebu, Leyte, Bohol, Catanduanes) Deep forests of peninsular Malaysia and Sarawak	Chloroquine plus proguanil
Risk great, mefloquine resistance prevalent	Cambodia, western provinces Thailand, borders with Cambodia and Myanmar (but not for routine backpackers)	Doxycycline

*See table I for details of regimens.

†No risk in these countries.

SOUTH ASIA (TABLE VII)

Visitors to all parts of the Indian subcontinent, except for the high mountains, are at risk of malaria, both in rural areas and some cities. *P. vivax* predominates, but falciparum malaria is also present and often resistant to chloroquine; mixed infections occur. Immigrants to Britain and their families are at special risk when revisiting friends and relations in Asia as many left during the malaria eradication campaigns and may be unaware that the areas are now malarious. Measures against mosquito bites protect against malaria and other mosquito borne diseases, and the appropriate chemoprophylaxis is proguanil plus chloroquine.

SOUTH EAST ASIA (TABLE VIII)

Malaria transmission varies greatly, with low risk in many areas, but multidrug resistant falciparum malaria predominates and transmission is intense in some hilly forested areas along international borders. Mefloquine resistance is prevalent on the Thai-Cambodian and Thai-Burmese borders. For many areas no chemoprophylaxis is necessary, but travellers should take measures to avoid being bitten by mosquitoes, particularly at night, and if in remote areas should carry standby treatment. The major cities of the region and the tourist sites in Thailand such as Bangkok, Pattaya, Phuket, and Chiangmai are malaria free but some of the places of interest in northern Thailand are forested, with some risk. Those backpacking should use impregnated bednets, repellents, and mefloquine. Other tourists need not take prophylaxis but should seek immediate medical advice in the

event of a fever. Adults visiting areas of highly mefloquine resistant transmission in Thailand, Cambodia, and neighbouring countries should use doxycycline prophylaxis.

OCEANIA (TABLE IX)

In Papua New Guinea, Solomon Islands, and Vanuatu transmission of chloroquine resistant falciparum malaria is intense. There are some reports of chloroquine resistant vivax malaria. Mefloquine is now the recommended regimen, with Maloprim plus chloroquine as an alternative for those unable to take mefloquine.

LATIN AMERICA AND CARIBBEAN (TABLE X)

A high risk of highly chloroquine resistant malaria exists in the basin of the river Amazon, chiefly the area of Brazil comprising the "legal Amazon" (the Amazon region, Mato Grosso, and Maranhão) but also affecting adjacent countries to the north and west. Mefloquine is the most suitable antimalarial for the Amazon valley and other malarious areas of Colombia.

Other South American countries have patchy transmission with a predominance of *P. vivax* but some chloroquine resistant falciparum malaria. Central America, where vivax also predominates, is free of chloroquine resistance. There is no malaria risk in most of the Caribbean islands, but the island that includes Haiti and the Dominican Republic has predominantly falciparum malaria sensitive to chloroquine. The risk is substantial in Haiti and, although much lower in the Dominican Republic, the chloroquine regimen should be followed.

Surveillance and further advice

Doctors diagnosing malaria must report all cases of imported malaria to the Malaria Reference Laboratory and also report adverse effects of antimalarials to the Committee on Safety of Medicines, as these reports provide part of the basis for sound recommendations.

TABLE IX—*Malaria in Oceania*

	Country	Preferable regimen*	Alternative regimen*
Risk high. Chloroquine resistance high	Papua New Guinea, below 1800 m Solomon Islands Vanuatu	Mefloquine	Maloprim plus chloroquine

*See table I for details of regimens.

TABLE X—*Malaria in Latin America and Caribbean*

	Country	Preferred regimen*	Alternative regimen*
Risk high, marked chloroquine resistance	Brazil ("legal Amazon" area, Amazon basin, Mato Grosso, and Maranhão only; very low risk and no chemoprophylaxis elsewhere)	Mefloquine	Chloroquine plus proguanil
	Colombia (most areas below 800 m)		
	French Guiana		
	Guyana (all interior regions)		
	Surinam (except Paramaribo and coast)		
Risk variable or high, chloroquine resistance present	Amazon basin area of Bolivia and Venezuela	Chloroquine plus proguanil	Mefloquine or Maloprim
	Bolivia (rural areas below 2500 m)		
	Ecuador (areas below 1500 m)		
	Panama, east of canal		
	Peru (rural areas below 1500 m)		
Risk variable to low, no chloroquine resistance	Venezuela (rural areas other than coast, Caracas free of malaria)	Chloroquine	Proguanil
	Argentina (small area in north west only)		
	Belize (rural except Belize district)		
	Costa Rica (rural below 500 m)		
	Dominican Republic		
	El Salvador		
	Guatemala (below 1500 m)		
	Haiti		
	Honduras		
	Mexico (in some rural areas not regularly visited by tourists)		
	Nicaragua		
	Panama (west of canal)		
	Paraguay (rural October–May)		

*See table I for details of regimens.

Advice on malaria prevention for travellers may be obtained from the Malaria Reference Laboratory and other centres listed in the *BNF*. Doctors and practice nurses requiring more detailed advice than is given in this paper, for specific problems, may ring 0171 927 2437. Travellers can obtain advice from the helpline 0891 600350 (calls are charged at 49p per minute, standard rate and at 39p per minute cheap rate).

Contributors to the recommendations were P Barrett, R Behrens, M Blaze, C J Box, A Breckenridge, A Bryceson,

N Byrne, L Calvert, B Carroll, P Chiodini, P Clarke, C Conlon, C Dow, J Dunlop, C Ellis, C Facer, H Gilles, A Geddes, P Golightly, A Green, M Janosi, F Jones, G Lea, J Leese, K McAdam, B Mandal, A Miller, M Molyneux, G Pasvol, W Peters, T Peto, P Phillips-Howard, V Smith, B Southgate, J Stewart, G Targett, E Walker, D Warrell, W Weir, J Whitworth, G Wyatt, M J World.

1 Bradley DJ. Prophylaxis against malaria for travellers from the United Kingdom. *BMJ* 1993;306:1247–52.

An Ethical Debate

Elective ventilation of potential organ donors

Hany Riad, Anthony Nicholls

Elective ventilation describes the procedure of transferring selected patients dying from rapidly progressive intracranial haemorrhage from general medical wards to intensive care units for a brief period of ventilation before confirmation of brain stem death and harvesting of organs. This approach in Exeter has led to a rate of kidney retrieval and transplant higher than has been achieved elsewhere in the United Kingdom, with a stabilisation of numbers on patients on dialysis. Recently doubt has been cast on the legality of our practice of elective ventilation on the grounds that relatives are not permitted to consent to treatment of an incompetent person when that treatment is not in the patient's best interests. We are thus faced with the dilemma of a protocol that is ethical, practical, and operates for the greater good but which may be illegal. This article explores various objections to the protocol and calls for public, medical, and legal debate on the issues.

It is four years since the Exeter protocol for elective ventilation of potential organ donors was published.¹ Briefly, patients admitted to general medical wards with rapidly deepening coma from irremediable intracranial haemorrhage are considered for organ donation. After assessment by a senior doctor suitability as a donor is established with the transplant team, and the intensive care unit is approached about bed availability.

The relatives are informed of the poor prognosis and near inevitability of death, and organ donation is then discussed, focusing on the wishes of the dying patient. If donation is agreed in principle, it is mentioned that for this to be feasible death must occur in the intensive care unit so that artificial ventilation can start when natural breathing ceases, thus allowing the organs to be preserved in a state suitable for transplantation. As a result of this approach to organ harvesting we have achieved the highest rate of organ donation in the United Kingdom, and the number of patients on dialysis has been stable for four years.

Our approach has attracted wide professional and media interest, but unfortunately neither the Intensive Care Society² nor some other anaesthetists^{3,4} have supported us. Various objections have been raised, all of which have been rebutted.^{5–8} On the other hand our protocol is endorsed by the ethics committee of the Royal College of Physicians,⁹ the British Transplantation Society, the BMA,¹⁰ and the Royal College of Nursing.¹¹

The ethical defence hinges both on the benefit that accrues to all parties and the lack of harm, distress, or indignity caused to the dying and bereaved. Patients awaiting transplantation benefit from an increased retrieval rate from donors; society gains as fewer resources are spent on dialysis; the bereaved family gains comfort in the knowledge that their relative's death led to help for someone else; and the donor dies with the wish (and right) to donate organs respected.

Correspondence to:
Mr Riad.

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