

## 14 EXPEDITION MEDICINE

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Expeditions and fieldwork in remote and challenging places are likely to expose members to greater environmental extremes and to more unusual hazards than do other types of travel. The aims of expedition or wilderness medicine are to improve, through knowledge, planning and skills, the confidence, enjoyment and achievements of the people who participate in these expeditions.

### **RISKS OF EXPEDITIONS: REAL AND PERCEIVED**

The risks of exotic infections, such as a viral haemorrhagic fever, plague, rabies or sleeping sickness, attacks by large or venomous animals and even of meeting cannibals, may loom large in the imagination of expedition members. However, the reality is much more mundane. Travellers' diarrhoea and other gastrointestinal disturbances are now recognised to be the main cause of expedition illness, whereas the leading causes of expedition mortality are falls and other injuries, road traffic accidents, altitude sickness, heat stroke, infections such as malaria, drowning and homicide. Overall, the health risks of participating in a well-planned expedition are similar to those encountered during normal active life (Anderson and Johnson, 2000). However, some expedition activities carry much higher mortality rates: 16 per cent of those attempting to reach the summit of Everest will die, 2.9 per cent of Himalayan mountaineers and 1 per cent of those over-wintering in Antarctica, compared with 0.83 per cent of expedition participants in general, 0.014 per cent of Himalayan trekkers and 0.013 per cent of low-altitude joggers (Anderson and Johnson, 2000).

### **REDUCTION OF HEALTH RISKS BY PLANNING**

Health risk assessment demands consideration of the terrain, altitude, climate, and endemic fauna and diseases of the area to be visited, and the intended aims of the expedition. Much of this information may be available beforehand. During selection

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of the expedition team, it is important to identify those with special problems (Table 14.1). Depending on the type of expedition, many of these may be accommodated by careful planning. However, the stress of travel in remote areas can destabilise chronic medical conditions and this could, in certain circumstances, cause danger to everyone in the group.

**TABLE 14.1 EXPEDITION MEMBERS' SPECIAL PROBLEMS**

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| Pregnancy<br>Immunosuppression (by drugs or diseases)<br>Chronic illness (diabetes, epilepsy, asthma, ischaemic heart disease, etc.)<br>Psychiatric problems<br>Physical/mental handicap<br>Alcohol/drug abuse |
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All expeditions should have a designated medical officer, who, in most cases, will not be medically qualified. All members should attend first-aid training, which, ideally, should be aimed at the particular needs of the expedition. Essential first-aid skills for all expeditions are clearing the airway and resuscitation, controlling blood loss, treating shock, relieving pain and ensuring the safe evacuation of injured people. Prevention of medical problems on an expedition depends on awareness of local diseases (based on up-to-date information from journals, books, websites and telephone advice services), appropriate immunisations and chemoprophylaxis, a pre-expedition dental check-up and, if possible, resolution of known surgical and medical problems well in advance of the expedition's departure. Explicit instructions should be given to expedition members about safe and sensible behaviour: in the use of equipment and techniques; and about food and water hygiene; protection from climatic and environmental hazards; as well as safe sex.

Expedition medical kits need to be much more comprehensive than those carried by ordinary tourists. Local medical back-up must be arranged in advance through the expedition's local agent. Hospitals or other medical facilities nearest to the site of the expedition must be identified, contacted and, if possible, assessed in advance. Emergency evacuation of severely ill or injured expedition members must be anticipated and planned well in advance and medical insurance cover should be generous to allow for in-country medical care (especially expensive in North America) and, if need be, repatriation of the sick or injured person. Many newer technical aids have improved safety through communication (radio/satellite telephones) and navigation (satellite location systems).

## THE EXPEDITION MEDICAL OFFICER

This is an essential and responsible role. The expedition medical officer must take the lead in planning and organising pre-expedition medical education, as well as deciding the location of the base camp, making arrangements for food, and providing for the psychological and pastoral needs of the expedition members. Depending on the particular circumstances, expeditions may feel some responsibility for helping with medical problems of the indigenous peoples of the area. This can be a difficult issue because time, equipment and drugs are always in short supply.

## ROAD TRAFFIC ACCIDENTS

It is astonishing that people who have spent much time and money in preventing illness during an expedition should, on arrival at the destination, entrust their lives to untried crazy-looking drivers and unsound vehicles. The risk is much greater in less developed countries, where there has been an epidemic increase in road traffic accident fatalities over the past 20 years and where 85 per cent of these deaths now occur (*British Medical Journal*, 2002). The risk of accidents can be reduced by avoiding driving at night outside cities, ensuring that the driver is not tired or under the influence of alcohol, antihistamines or other sedative (or recreational) drugs, avoiding driving alone, watching the driver for signs of fatigue, taking regular breaks and checking the basic functions of the vehicle (steering, lights, brakes, tyres, etc.) before setting off. Using seatbelts reduces the risk of death by 65 per cent.

## IMMUNISATIONS/VACCINATIONS

The current wave of dangerously misinformed criticism of immunisations (MMR, Gulf War syndrome, etc.) must not discourage travellers from this most effective form of disease prevention. Do not assume that everyone has received a standard childhood course of immunisations (in the UK: diphtheria, pertussis, tetanus, mumps, measles, rubella [MMR], *Haemophilus influenzae* b [Hib], meningococcus C). Even if the traveller received a childhood primary course, boosters will be needed for diphtheria, tetanus and polio (eliminated from the Americas and Europe but still present elsewhere) after 10 years. Other basic immunisations recommended for travellers to almost every less developed country are BCG (for tuberculosis/leprosy), and those for hepatitis A, typhoid and rabies. Special immunisations for travellers to certain parts of the world include yellow fever (equatorial Africa and Latin America), Japanese encephalitis (Asia and New Guinea), meningococcus A (meningitis belt of sub-Saharan Africa and new epidemic areas) and tick-borne encephalitis (central Europe and Scandinavia). Yellow fever is the only immunisation for which a certificate is a statutory requirement for travellers from and to endemic areas (Monath and Cetron, 2002), e.g. you will not be allowed to fly from Ecuador to Brazil without a valid yellow fever

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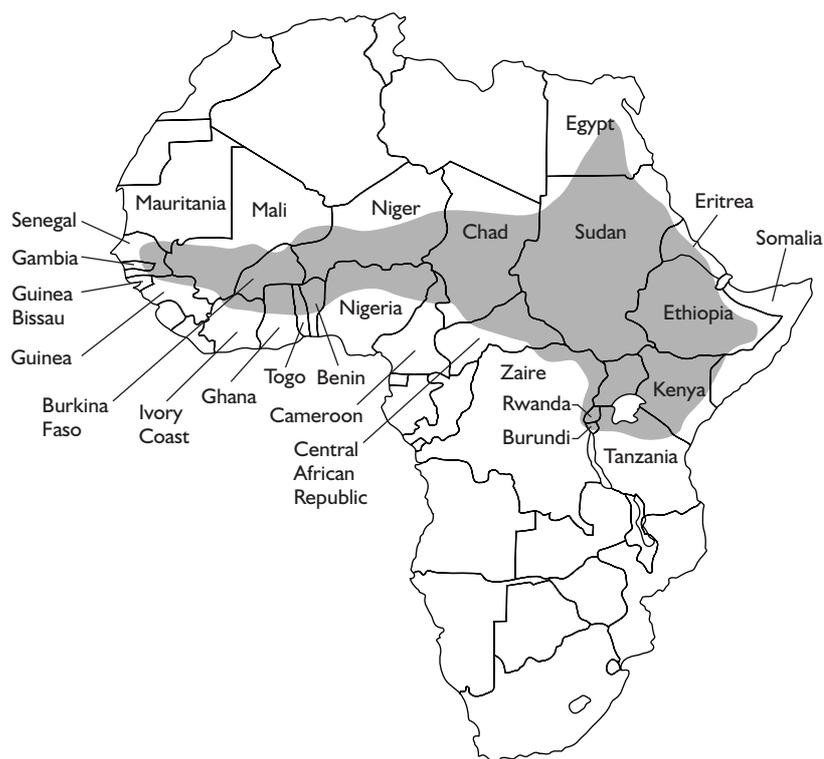


Figure 14.1 *Distribution of meningococcal meningitis in Africa*

immunisation certificate. Recent deaths from yellow fever in tourists to West Africa and Latin America emphasise the continuing importance of this immunisation. Cholera vaccine is no longer recommended by the World Health Organization because its adverse effects outweigh its usefulness, although a new oral vaccine is promising. The risk of hepatitis A, acquired from infected food/water, in less developed countries ranges from 300/100,00 to 2000/100,000 unprotected travellers per month of stay. Active immunisation is safe, effective and durable, and there is no longer any justification for short-term protection with immunoglobulin. Epidemic meningococcal meningitis occurs in the cool, dry season (December–February) most years in countries of the sub-Saharan “meningitis belt” of Africa (from Senegal and the Gambia in the west to Sudan in the east) (Molesworth et al., 2002) (Figure 14.1). Travellers to this area, and to other new sites of epidemics, should be given meningococcal group A + C (or ACYW) vaccine. The meningococcal group C vaccine now given to children in the UK does not provide adequate cover in these areas.

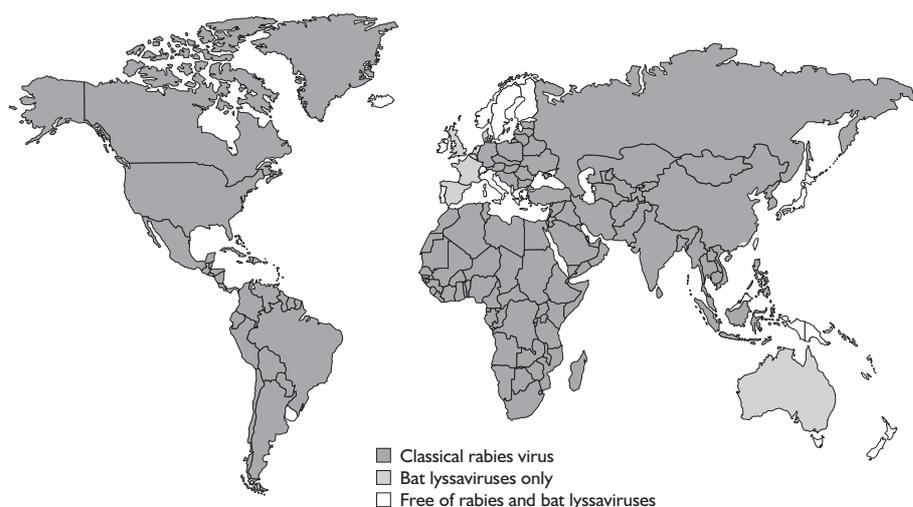


Figure 14.2 *Global distribution of rabies and the rabies-related bat lyssaviruses, 2003*

Pre-exposure immunisation against classical rabies and the European and Australian rabies-related bat lyssaviruses (Figure 14.2) is being used increasingly in travellers. (These bat lyssaviruses are related to classical rabies virus and produce clinical effects identical to classical rabies in infected people.) Although the risk of transmission is low, the lack of effective treatment for rabies encephalitis and the fear engendered by a dog bite justifies immunisation now that safe and potent vaccines are available. Cost can be reduced if an ampoule of vaccine is divided among ten vaccinees, each being given one-tenth of the dose by intradermal injection.

Plague and anthrax vaccines cause serious side effects and, if there is real risk of infection, antibiotic prophylaxis or post-exposure treatment should be considered (doxycycline for plague, ciprofloxacin for anthrax). Japanese (B) encephalitis (Figure 14.3) and European tick-borne encephalitis vaccines should be considered in travellers to the endemic areas, especially during the seasons of transmission. Hepatitis B is a risk for medical staff whose work involves contact with human blood, to those receiving unscreened blood transfusions in some less developed countries and to those who take the high risk of unprotected sexual activity and intravenous drug abuse.

Typhoid is still prevalent in many less developed countries, especially in the Indian subcontinent. Effective injectable and oral vaccines are available that do not have the serious side effects associated with the old "TAB" immunisation.

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Figure 14.3 *Geographical distribution of Japanese encephalitis, by endemic countries and regions of South-east Asia, 2003*

## INFECTIONS STILL PREVALENT IN SOME TROPICAL/LESS DEVELOPED COUNTRIES

### Travellers' diarrhoea

This is by far the most common health problem experienced by expedition members. Many different kinds of food- and water-borne organisms can cause acute and debilitating diarrhoea, usually associated with colicky pain and prostration, and sometimes with vomiting, fever, bloodstained motions (dysentery) and even kidney failure. Enterotoxigenic *Escherichia coli* bacteria are responsible for about 50 per cent of cases. Other important infections are giardiasis and cryptosporidiosis (in which there is explosive watery diarrhoea, abdominal distension, nausea, weakness and passage of exceptionally foul-smelling gas), salmonellosis (especially from undercooked

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chicken, eggs and milk products), amoebic and bacillary dysentery and campylobacter infections (blood in the stool), and viruses. Travellers' diarrhoea is very rarely fatal but can ruin an expedition.

**Prevention of travellers' diarrhoea: food and water hygiene**

Drinking water should be filtered, boiled, treated with sterilising tablets or commercially bottled. Beware of ice in drinks because this is frequently made from tap water. The rule for eating is "cook it, peel it or forget it", but this rule can be difficult to enforce, without causing offence, when receiving hospitality. Especially hazardous are salads (even peeled tomatoes), which may have been fertilised with human faeces, raw egg products such as mayonnaise, undercooked chicken (pink at the bone) or eggs, milk or cheeses (which also carry the risk of brucellosis, listeriosis and campylobacter infection), rare or frankly raw meat (relished in France, the Middle East and Ethiopia) and ice cream. Deep fried food is safer than grilled food and "barbecued" usually means raw in the middle.

**TABLE 14.2 PREVENTION OF TRAVELLERS' DIARRHOEA**

**Food and water hygiene**

1. "Cook it, peel it or forget it!"
2. Drink only water that is boiled/filtered/chemically sterilised/bottled.
3. Beware of ice cubes.
4. Avoid unpasteurised milk and milk products – cheese, ice cream, etc. – and raw eggs.
5. Avoid shellfish and crustaceans, even if boiled.
6. Consider prophylactic antibiotics, e.g. ciprofloxacin.

As a result of the wide range of possible causes, prevention with even a broad-spectrum antibiotic ("kills all known germs") such as ciprofloxacin (and other fluoroquinolone drugs) will be only partially effective. Early treatment with ciprofloxacin (500 mg) after passing the first loose stool has proved effective. Other drugs such as doxycycline or co-trimoxazole are less effective.

**Travellers' diarrhoea: treatment**

Repeated and copious diarrhoea and vomiting rapidly dehydrate the victim. Patients should be encouraged to rest and to keep drinking clear fluids (frequent small sips to reduce the risk of vomiting). In severe cases, oral rehydration salts should be added. These contain glucose to promote absorption of minerals. Very severe cases will require intravenous fluids. It is best to avoid solid food, which may stimulate

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vomiting and further colicky pain and diarrhoea (“gastrocolic reflex”). Ideally, the victim should rest quietly in bed but, if travel or exertion is unavoidable, diarrhoeal symptoms can be damped down with codeine phosphate (Imodium or Lomotil). It may be possible to swallow and retain anti-vomiting drugs such as Stemetil or metoclopramide. Otherwise, these can be given by suppository (through the anus into the rectum).

**TABLE 14.3 TREATMENT OF TRAVELLERS’ DIARRHOEA**

1. Rest; take small sips of clear fluids frequently.
2. Oral rehydration salts.
3. Avoid solid food.
- (4. Palliate diarrhoea and vomiting).
5. Take antibiotic (ciprofloxacin) immediately.
6. If symptoms continue for more than 48 hours, are very severe or there is blood in the stools, SEEK MEDICAL ADVICE.

The vast majority of attacks of traveller’s diarrhoea will resolve spontaneously after 12–48 hours of conservative treatment. More prolonged and very severe symptoms require medical advice or a trial of ciprofloxacin (500 mg once a day for 3 days) or, if the symptoms suggest giardiasis (see above), a dose of tinidazole (Fasigyn) 2 g (repeated 1 and 2 weeks later) or metronidazole (Flagyl) 250 mg three times a day for 5 days (avoid alcohol!).

### Malaria

One of the world’s major killing diseases, malaria is also the most common cause of life-threatening illness in travellers. Each year, about 2000 people arrive back in the UK with malaria, three-quarters of them with life-threatening *Plasmodium falciparum* malaria, 7–16 of whom will die of the disease (Figure 14.4). The other three kinds of human malaria, *P. vivax*, *P. malariae* and *P. ovale*, cause an unpleasant feverish illness but very rarely kill. Malaria is transmitted by night-biting anopheline mosquitoes throughout most parts of the tropics except in islands east of Vanuatu in the Pacific and the Caribbean islands (except for Haiti/Dominican Republic).

#### Symptoms of malaria

All four kinds of malaria cause high fever with shivering and shaking, severe headache, pains in the neck, back and muscles, prostration, nausea and diarrhoea. Sometimes the episodes of fever, lasting a few hours, are interspersed with 24- to 48-hour intervals of feeling almost well. *Plasmodium falciparum* malaria can cause

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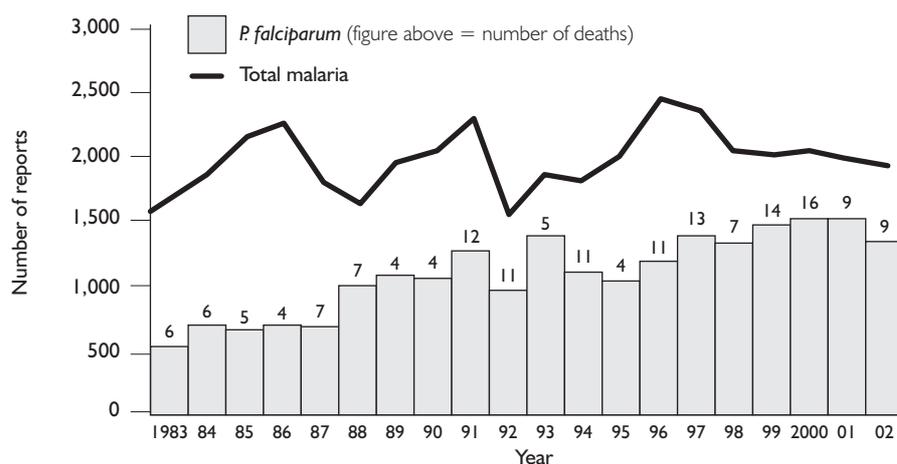


Figure 14.4 Number of imported malaria cases to the United Kingdom reported to the Health Protection Agency Malaria Reference Laboratory 1983–2002; and number of fatalities each year from *P. falciparum* infections

unconsciousness and fits (cerebral malaria), jaundice, bleeding, black urine (black-water fever), severe anaemia and other dangerous effects. Symptoms of malaria start no sooner than 7 days after the infective mosquito bite and usually up to a few months, but sometimes longer, after the traveller has returned home.

#### Diagnosis and treatment of malaria

The diagnosis is made by examining a specially stained blood smear under the microscope or using dipsticks (rapid antigen test). The treatment of malaria has been complicated by the development of resistance to many of the established antimalarial drugs. Chloroquine (Nivaquine) is still effective for the three milder types of malaria, but can be relied upon to cure *P. falciparum* malaria only in Central America and Haiti/Dominican Republic. Elsewhere, treatment is with atovaquone–proguanil (Malarone), artemether–lumefantrine (Riamet) or quinine. If an expedition member develops acute fever in a malarious area, but is too far away from medical support to allow laboratory diagnosis of malaria, a full course of any one of these three drugs can be taken as a therapeutic trial (standby treatment). People who are vomiting and cannot keep their tablets down should be treated by intravenous infusion (quinine), intravenous injection (artesunate), intramuscular injection (quinine/artemether/artesunate) or rectal suppository (artesunate/artemisinin). A patient with *P. falciparum* malaria can deteriorate rapidly and so suspected cases should be evacuated to the nearest hospital.

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Figure 14.5 *Malaria is endemic in almost all parts of the tropical world as far north as southern Turkey, as far south as north-eastern South Africa, as far west as Mexico and as far east as Vanuatu in the western Pacific*

**Prevention of malaria** (see Bradley and Bannister, 2001)

It is important to find out if the precise area of the expedition is malarious so that proper precautions can be taken. Night-time exposure (camping, animal collecting) carries a high risk of infection, while pregnant women and people who have lost their spleen or are especially susceptible should, if possible, not enter malarious areas. To reduce the risk of mosquito bites, wear sensible clothing after dark (light-coloured, long sleeves and long trousers), and apply repellents (containing "DEET") to exposed areas. In the sleeping quarters, mosquitoes should be killed by knock-down insecticides and excluded by insecticide (permethrin)-impregnated mosquito nets. Taking drugs to prevent malaria (chemoprophylaxis) is never completely effective. Advice should be taken about which drug is effective in a particular area. In drug-resistant areas, such as Africa, the Amazon Basin and South-east Asia, mefloquine (Lariam),

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doxycycline (Vibramycin) or atovaquone–proguanil will be needed. The risk of unpleasant side effects from mefloquine has been exaggerated by the media, but between 0.1 and 1 per cent of people, especially women, may become depressed, dizzy, nauseated and unsteady, and may suffer from nightmares as a reaction to this drug. It is wise to start mefloquine 4 weeks before leaving on the expedition, to allow a switch to another drug in the small minority of people who will develop side effects. Antimalarial drugs should be continued for a full 4 weeks after leaving the malarious area, except in the case of Malarone, which is continued for only 7 days. No prophylactic drug will work unless it is taken regularly, as prescribed, and continued for this period. Feverish illnesses that develop after return from the expedition should be taken seriously! It is important to see a doctor and to mention the risk of malaria.

People who suffer from epilepsy or psychiatric illnesses should not take mefloquine and those with epilepsy or psoriasis should avoid chloroquine. Chloroquine can cause severe itching in dark-skinned individuals.

**TABLE 14.4 MALARIA PREVENTION**

1. Avoid being bitten: sleep under a treated mosquito net; use insecticides, repellents, sensible clothing and behave sensibly.
2. Take preventive drugs: mefloquine (Lariam) or other drugs, depending on the particular geographical area.
3. Carry a course of standby treatment.
4. SEE A DOCTOR AND MENTION MALARIA – if you develop a feverish illness within a few months of returning!

### Dengue

This mosquito-borne virus infection is very widespread in tropical countries and continues to extend its range throughout the tropics, including large conurbations (Figure 14.6). Adults experiencing their first attack will develop fever and severe pains in the head, back, muscles and joints (“dengue” means break bone fever). The only treatment is rest, painkillers and antipyretics. Use paracetamol or codeine phosphate but avoid aspirin and non-steroidal anti-inflammatory drugs such as ibuprofen (Nurofen). After a few days the fever seems to be getting better but there may then be a relapse with the appearance of a red rash and sometimes bleeding. However, in residents of tropical areas, particularly children, a second attack of dengue, with a different type of dengue virus, can cause fatal shock and bleeding. Increasing numbers of travellers are catching dengue in Indonesia, other parts of Asia, the Caribbean and Latin America. There is no vaccine (Almond et al., 2002) and the only way to prevent infection is to avoid mosquito bites. Unfortunately, the stripy-legged,

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Figure 14.6 *Dengue fever* ("break bone" fever)

dengue-transmitting *Aedes* mosquitoes do not confine their biting to night time.

**Schistosomiasis (bilharzia)**

This infection with a flatworm (flake) is acquired through contact with freshwater from lakes and sluggish rivers, usually by bathing or washing with water taken from

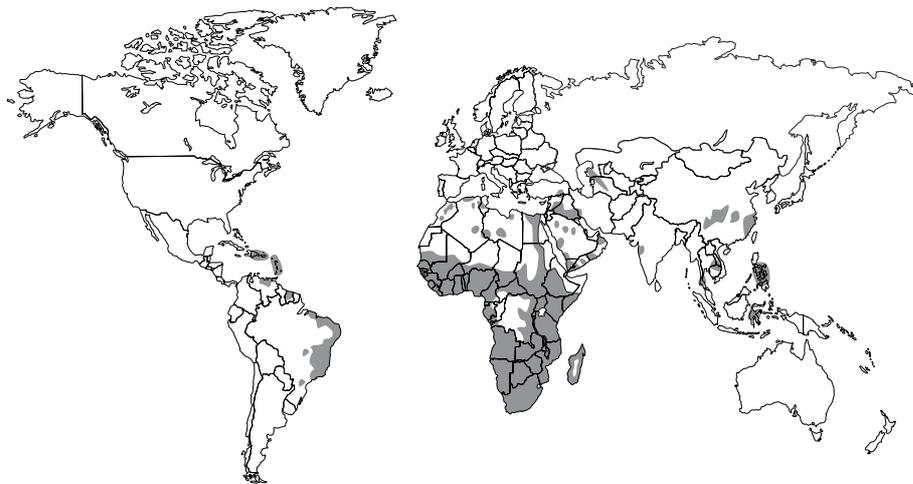
Figure 14.7 *Bilharzia* (*schistosomiasis*)



Figure 14.8 *River blindness (onchocerciasis)*

these sources. The water is contaminated by humans or baboons that have defaecated or urinated into it. The intermediate snail hosts that live in the reeds are then infected. Snails release tiny larvae into the water, which burrow through the skin of bathers, causing “swimmer’s itch”, experienced soon after contact with infected water. However, most cases of “swimmer’s itch” are caused by kinds of bird and animal schistosomiasis that do not go on to cause infection in humans. Some people infected with schistosomiasis develop an acute fever with rash a few weeks after infection. Later symptoms include passage of cloudy or frankly bloodstained urine or bloody diarrhoea. Bilharzia is one of the most common travellers’ diseases dealt with in travel clinics in western countries. Expedition members usually get worried when they get back from their trip and remember bathing in infected lakes or they hear that another member of their expedition has been diagnosed as having schistosomiasis. Diagnosis is confirmed by finding eggs in the stool, urine or lining of the rectum (diagnosed by “rectal snip”) or by a blood test. Treatment is simple, safe and effective with one or two doses of praziquantel (Biltricide). Prevention is by avoiding skin contact with freshwater sources in the endemic countries of Africa, the Caribbean, South America, Middle East and South-east Asia (Figure 14.7). Local advice may be misleading. Lake Malawi, officially declared free of bilharzia for many years, has been the source of many imported cases of bilharzia.

### **River blindness (onchocerciasis)**

This infection of skin, lymph nodes and eyes occurs in parts of Central and South

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America, Africa and Yemen (Figure 14.8). It is caused by a filarial roundworm transmitted between humans by viciously biting little black flies which breed in fast-flowing streams, rivers and waterfalls. Skin changes (itching, roughness, thickening, decreased or increased pigmentation, and loss of elasticity) and eye damage are caused by tiny larvae (microfilariae) produced by the adult worms which live in lumps (nodules) beneath the skin, especially around the waist and hip joints. Diagnosis is by microscopic examination of a skin snip and by blood tests. If there are nodules on the head or visual or eye symptoms, slit-lamp examination of the eye by an ophthalmologist is essential. Treatment with ivermectin is effective but may cause a flare-up of symptoms and so must be supervised in hospital. The only partial protection against infective black fly bites is the wearing of light-coloured clothing (long sleeves and long trousers) and the application of DEET-containing repellents to exposed areas of skin.

### Sleeping sickness (African trypanosomiasis)

There is a resurgence of sleeping sickness in Angola, Central African Republic, western Uganda and other countries of equatorial Africa. There have been some recent cases in the game parks of northern Tanzania (Serengeti) (Figure 14.9). Voracious, blood-sucking tsetse flies, slightly larger than house flies, transmit the causative trypanosomes (protozoan parasites) between humans and, in eastern Africa, between humans and game animal reservoirs (e.g. antelopes and bucks). A boil (chancre) may develop at the site of an infective bite, followed by fevers, headache, enlargement of lymph nodes in the base of the neck and, eventually, when the brain is invaded by the parasites, development of the characteristic sleepiness that



Figure 14.9 *Sleeping sickness (African trypanosomiasis)*

gives the disease its popular name. Trypanosomes may be found in the blood, fluid from lymph nodes or the cerebrospinal fluid bathing the brain. Treatment is difficult and dangerous using toxic drugs. Prevention is by avoiding endemic areas and tsetse fly bites.

### **Typhus**

The various kinds of typhus bacteria are transmitted by mites, ticks, fleas or lice in different parts of the world. African tick fever (typhus) is particularly common in travellers to game parks in Central and Southern Africa (e.g. Kruger). About 7 days after finding an attached tick, severe fevers, headaches, nausea and muscle pain develop and, at the site of the infective bite, a boil comes up which eventually develops a blackish scab (eschar); there is a generalised, reddish rash. Other kinds of typhus may be similar, with abrupt fever, generalised rash, a local eschar and other severe systemic flu-like symptoms. Prompt treatment with a tetracycline such as doxycycline can produce dramatic relief of the symptoms.

### **Worms**

Infections with roundworms (nematodes), flukes or flat worms (trematodes) and tapeworms (cestodes) are enormously prevalent among the inhabitants of many parts of the tropics. Infection with hookworms and *Strongyloides* results from walking barefooted in areas contaminated with human faeces. The infective larvae can penetrate the skin of the feet. Most of the other worm infections are acquired by ingesting eggs that have been deposited in faeces or by eating the intermediate hosts of the parasites such as fish containing larval forms. These infections can result in a variety of symptoms: anaemia and weight loss in the case of many of the worms that infect the gut; jaundice and enlargement of the liver in the case of liver flukes; coughing up blood-stained sputum in the case of lung flukes; and development of itching rashes and transient cough or asthma in the case of nematodes, the larvae of which migrate in the skin or lungs. The person infected with *Ascaris* may pass a worm (about the size of an earthworm) in their stools or, in the case of tapeworm infection, some wriggling segments of the worm. Depending on the kind of worm infection, diagnosis can be achieved by finding characteristic eggs or larvae in the stools or sputum, or by locating adult worms by x-ray or ultrasound imaging techniques. Effective drugs include praziquantel for flukes, thiabendazole, mebendazole or albendazole for nematodes, and niclosamide for gut tapeworms.

### **Creeping eruption (cutaneous larva migrans)**

People who walk barefooted or lie in the sand in coastal regions of Central/South America, Africa and South Asia may be infected by larvae of animal hookworms. Having penetrated the skin, these parasites are unable to develop further because they are in the wrong host. They therefore crawl around aimlessly under the skin,

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provoking intensely itchy, sore and reddish serpiginous tracks which may become secondarily infected by scratching. These lesions can creep several millimetres to a few centimetres each day. Treatment is by daily applications of an ointment made by grinding up a 0.5 g tablet of thiabendazole and mixing with 5 g petroleum jelly.

### **HIV/AIDS and other sexually transmitted infections**

Seroprevalence of HIV has exceeded 30 per cent in some African countries, and other sexually transmitted infections, including gonorrhoea, syphilis, chancroid, herpes, venereal warts and hepatitis B, are highly prevalent in many less developed countries, especially in prostitutes, bar girls, "beach boys" and other "professional sex workers". As foreign travel seems often to be associated with a relaxation of usual sexual inhibitions and prohibitions, expedition members should be warned explicitly about the risks of unprotected sex. Although condoms are widely available as part of HIV-prevention programmes, expedition members should carry and use their own supplies of good quality condoms. Immediate medical advice should be sought if there is a purulent discharge from the penis or vagina and if ulcers develop in the genital area or at any other possible site of genital contact.

### **Potential dangers of blood transfusion**

In countries where screening of blood donated for blood transfusion is not possible or is unreliable, there is a risk of a variety of infections of which HIV, hepatitis viruses, HTLV-1 (the cause of tropical spastic paraparesis), malaria and Chagas' disease are the most important. To reduce this risk, some expeditions carry bags of intravenous fluids that can be used as a temporary substitute for blood in the treatment of bleeding and shock. Other equipment included in "AIDS-prevention kits", which might prevent a blood-borne infection, are disposable hypodermic needles (for countries where injection needles are still reused), syringes in case a blood specimen is needed for laboratory tests, and intravenous cannulae and giving sets for the administration of intravenous fluids.

### **Viral hepatitis**

This is a common acute infection in which there is fever with shivering, headache and other pains, weakness, loss of appetite, nausea, vomiting and pain, and tenderness over the liver in the right upper part of the abdomen. As jaundice becomes noticeable in the eyes and skin, the urine becomes very dark and the stools become very pale.

Infection with hepatitis A is through contaminated water or food and is prevalent in less developed countries. Symptoms start between 3 and 5 weeks after infection. It is easily and effectively prevented by immunisation. Hepatitis B and hepatitis C are highly contagious. They are spread by blood contamination of needles, by blood transfusion and by sexual intercourse. Both infections can be chronic, resulting in

progressive liver damage, cirrhosis and eventually the development of liver cancer. Effective vaccines are available for hepatitis B but not yet for hepatitis C. Other methods of prevention include avoiding unprotected sex, avoiding any skin penetration by potentially infected needles or other sharp instruments (including body piercing, acupuncture, tattooing and of course the sharing of needles by intravenous drug abusers), avoiding even conventional medical procedures if the practitioner is unable to ensure hepatitis-free conditions, and avoiding contamination by the blood of an infected person – even the sharing of a toothbrush.

## COMMON NON-TROPICAL INFECTIONS

### Sore throats and respiratory tract infections

Acute sore throat may be part of a generalised viral respiratory infection such as influenza, or caused by bacteria, most commonly streptococci, or from infectious mononucleosis (glandular fever). It may be accompanied by fever and painful, enlarged glands in the neck. Complications include tonsillitis (the tonsils on one or both sides are enlarged, red and covered with flecks of pus), local abscess formation in the throat, such as a quinsy, which may threaten to obstruct the upper airway, sinusitis (profuse, purulent nasal catarrh that may suddenly stop flowing, pain in the face, tenderness over the cheeks or forehead) and middle-ear infection (otitis media; earache, purulent discharge from one ear). There is no reliable way of distinguishing the different causes of a sore throat just by examination. However, if the lymph glands elsewhere are enlarged (e.g. in both armpits and both groins), glandular fever should be suspected and the patient should, on no account, be treated with ampicillin/amoxicillin because this can cause a severe rash. Provided that the patient is not known to be allergic to penicillin, the simplest treatment is to give a 7-day course of penicillin V (phenoxymethylpenicillin) or cloxacillin. Penicillin-allergic people can be given erythromycin. Gargling with water in which an aspirin has been dissolved or sucking anaesthetic lozenges may improve the symptoms.

Chest infections (bronchitis, pneumonia) cause fever, cough, bringing up greenish-yellow sputum (phlegm) and sometimes breathlessness and a sharp, localised chest pain (pleurisy), worse on breathing in or coughing. A stethoscope is useful for detecting signs in the infected lung. Treatment is with antibiotics such as amoxicillin or erythromycin or a cephalosporin or clarithromycin.

### Painful red eyes (conjunctivitis)

If one or both eyes become red and painful with a purulent discharge so that the lids stick together at night, an infection of the outer membranes of the eye (conjunctivitis) and/or a local infection of one of the eyelash follicles (stye) is likely. A topical

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eye ointment such as chloramphenicol or tetracycline should be applied regularly. The eye can be irrigated with sterile (boiled) tepid water.

A piece of grit may become lodged above the cartilaginous tarsal plate of the upper eyelid, causing days of soreness and misery. It may be removed only by everting the tarsal plate, a very useful skill that can earn many grateful patients.

### **Pimples, boils and other bacterial skin infections**

These are very common, especially at the sites of injury, on the feet where sites of friction or abrasion have become infected, or at the sites of insect bites. Lesions should be kept as clean as possible and covered with light, non-adherent dressings. A topical antiseptic should be applied, such as povidone-iodine. If the pustule, boil or carbuncle has developed a yellowish head, or if the local area is tensely swollen and fluctuant, an attempt should be made to drain the pus by lancing with a sterile needle or scalpel blade. This can cause immediate relief. A course of antibiotics may be needed, especially if the local lymph glands are tender and enlarged and there is fever.

### **Urinary tract infections**

The symptoms are frequent, urgent, painful urination with local burning. If the infection is severe there may be generalised symptoms such as fever with shivering, nausea and vomiting, and pain and tenderness in the lower back (loins) on one or both sides. The urine may look cloudy, dark or frankly bloodstained and may have a fishy or other strong unpleasant odour. Treatment is with antibiotics such as trimethoprim, amoxicillin or ciprofloxacin. It is important to drink a lot of fluid.

Vaginal discharge with local itching is commonly caused by thrush (*Candida*, a yeast) especially in women taking antibiotics (such as doxycycline for malaria prophylaxis). Treatment is with clotrimazole (Canesten) cream or pessaries.

### **Athlete's foot, dhobi's itch and other fungal infections**

These are very common problems on expeditions. Athlete's foot is prevented by meticulous attention to foot hygiene, washing with antiseptic soap between the toes regularly and thoroughly drying the feet, which should be kept as well aerated and dry as possible by wearing open sandals without socks. Antifungal powder such as miconazole (Daktarin) can be used. Dhobi's itch is a reddish, irritating rash that may develop blisters and weep. It occurs in moist, occluded areas such as the groin under the scrotum, in the armpits or under the breasts. Washing with antiseptic soap, thorough drying, application of antifungal powder (miconazole) or creams (clotrimazole, econazole or ketoconazole), and maximal aeration are the best treatments. Patches of fungal infection may develop on any part of the body, especially in humid climates. They are often circular or annular with an irregular, scaly, reddish border. A trial of antifungal cream is the best treatment.

## ENVIRONMENTAL DISEASES

### High-altitude sickness

Rapid ascent from sea level to 11,000 feet (3500 metres) causes acute mountain sickness (AMS), a reaction to hypoxia, in more than 50 per cent of people, while rapid ascent to 16,000 feet (5000 metres) causes AMS in most people. The symptoms, which develop within 36 hours, include headache, lassitude, fatigue, loss of appetite, drowsiness, weakness, dizziness, palpitations, breathlessness, nausea and vomiting. Sleeping is interrupted by irregular (Cheyne–Stokes) breathing. AMS can be prevented by slow acclimatisation. The symptoms are reduced by taking Diamox (acetazolamide) 250 mg 12 hours before ascent and then 250 mg twice a day for 5 days. The most common side effect of acetazolamide is tingling in the fingers and toes. Sedative drugs and the contraceptive pill should be stopped because there may be an increased risk of venous thrombosis. Heavy, physical exercise should be avoided during the 2–5 days after arrival at altitude.

Two severe life-threatening forms of high-altitude sickness are recognised: high-altitude pulmonary oedema (HAPO), which causes breathlessness, coughing up frothy sputum, blueness (cyanosis) and drowsiness, and high-altitude cerebral oedema (HACO) in which there is headache, confusion, drowsiness, double vision and unsteadiness. Treatment of HAPO is with oxygen and rapid descent to lower altitude or the use of a portable hyperbaric chamber. If this is not possible, nifedipine (Adalat) and acetazolamide can be used. An experimental method of preventing HAPO is to inhale salmeterol (Sartori et al., 2002). For treatment of HACO, oxygen, rapid descent or use of a portable hyperbaric chamber is also essential, together with dexamethasone, furosemide or acetazolamide.

### Motion sickness

This can be prevented by taking hyoscine hydrobromide by mouth (e.g. Kwells), which is effective in 30 minutes and lasts for 4 hours, or by a skin patch (Scopoderm) which takes up to 8 hours to act but lasts for 72 hours.

### Jet lag

Air travel, east or west, across two or more time zones, commonly causes daytime tiredness, disorientation, memory loss, a feeling of unreality, loss of appetite and other gastrointestinal symptoms resulting from disruption of the diurnal rhythm. Excessive alcohol consumption during the flight adds “hangover” to these already unpleasant symptoms. Jet lag can be minimised by sleeping during the flight and, at the appropriate time, after arrival. A short-acting sleeping pill such as zopiclone, zaleplon or temazepam can help. The use of melatonin remains controversial but it may speed recovery from jet lag if taken on arrival, just before going to sleep and, in advance of travel, on waking (westbound travel) or at 2 pm (eastbound travel).

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Exposure to light can also help: on waking (eastbound travel) or at the end of the day (westbound).

### **Heat illnesses and sunburn**

When the body's heat-losing mechanisms fail, the body temperature rises with sometimes disastrous results. This is most commonly the result of exposure to environmental heat and high humidity (such as during a heatwave), especially in people undertaking prolonged physical exercise, wearing inappropriately heavy clothing. Heatstroke is a severe form of heat illness in which the increase in body temperature affects the brain, causing confusion, loss of consciousness or fits. This can also be caused by drugs such as Ecstasy. Heat illness should be suspected if a member of the expedition becomes unexpectedly weak, lethargic and tired, complaining of muscle cramps, with mental changes, headache and any impairment of consciousness. The patient should be quickly removed to shade or a cooler place, their clothes should be removed and they should be vigorously cooled by being sponged all over with water and fanned. This is a medical emergency and so medical help should be summoned immediately.

Exposure to the sun, even when it feels cold as at high altitude, can cause acute effects such as sunburn and prickly heat, whereas long-term exposure can cause skin cancers. Sunburn is prevented by wearing a broad-brimmed hat and adequate clothing and by applying sunscreens protecting against UVB and UVA to all exposed areas of skin.

### **Hypothermia, cold injuries and frostbite**

The dangers of cold must be considered and prevented in expeditions to a variety of environments. Hypothermia can develop insidiously and the dangers of inadequate shelter, inadequate clothing, wind, being wet or immersed in water, undernourished and forced to be immobile must all be recognised. Low ambient temperatures may be predictable on geographical grounds, at altitude and at certain seasons, but unseasonal cold snaps and the night-time fall in temperature in many desert regions may catch expeditions unawares. Exposed areas of the face and the extremities, hands and feet, are especially vulnerable to frost-nip and frostbite. Thawing or rewarming of frostbitten parts should not be attempted until the victim has reached a warmer environment where medical care is available.

### **Allergic and atopic diseases**

Expedition members who suffer from chronic allergic/atopic diseases, such as asthma, hay fever and eczema, should take adequate supplies of their usual medications. Those who have suffered anaphylactic attacks from nuts, shellfish and other foods, and from stings by wasps, hornets, bees, ants, etc., should carry self-injectable adrenaline (e.g. EpiPen or Anapen) and make sure that they and other expedition members know how to use this equipment effectively. Contact reactions to plants,

animals, insect bites, etc. are common and should be treated with topical crotamiton (Eurax) and corticosteroid ointments (e.g. betamethasone [Betnovate]) and antihistamine tablets (e.g. chlorpheniramine [Piriton] or promethazine [Phenergan]).

### **Attacks by animals**

Wild animals, such as the big cats, bears, wolves, hyenas, elephants, hippopotamuses, rhinoceroses, camels, buffaloes and wild pigs, have all been known to attack and kill humans. Domestic cattle and dogs can also be dangerous. Large wild animals must be respected and avoided unless you are travelling in a vehicle. Attacks by the big cats are especially likely between dusk and dawn. In the water, hippos, sharks and crocodiles can kill. Take local advice about the resident dangers before walking, swimming or camping. Teeth, claws, tusks and horns can produce devastating injuries, blood loss and fractures, with a high risk of contamination from a range of germs including tetanus and rabies. First aid involves control of bleeding, closing gaping wounds with dressings and evacuating the casualty to medical care. Broad-spectrum antibiotics should be given.

### **Rabies**

In most parts of the world (see Figure 14.2), there is a risk of transmission of rabies or rabies-related viruses by bites of wild mammals or domestic dogs and cats. Pre-exposure immunisation is recommended (see above). All bites (including human bites) should be thoroughly cleaned (scrubbed with soap under a running tap), irrigated with clean water and then treated with a strong antiseptic such as alcohol or povidone-iodine. If there is a risk of rabies, a course of post-exposure immunisation should be started immediately and rabies immune globulin infiltrated around the wound. Those who have been immunised against rabies in the past require only two booster injections of vaccine.

### **Venomous bites and stings**

Snake bites are best avoided by wearing proper boots, socks and long trousers, especially in undergrowth and sand, using a light after dark and avoiding high-risk activities such as attempting to handle snakes or snake-shaped animals and putting hands into holes or vegetation. The important first-aid treatment of a snake bite is to keep the bitten limb absolutely still with a splint or sling and to move the patient to medical care on a stretcher as soon as possible. Firm bandaging of the entire bitten limb with a long, crêpe or elasticated bandage may delay absorption of neurotoxic venoms (e.g. mambas, coral snakes, kraits) until the patient reaches a hospital. Most traditional first-aid methods (tight tourniquets, incisions, suction, electric shocks, snake stones, etc.) are dangerous and useless. The decision whether or not to give antivenom, the only antidote against snake venom, should be made by a medically trained person. Fish stings can be treated by immersing the stung

## EXPEDITION HANDBOOK

part in uncomfortably hot but not scalding water. Jellyfish stings are treated with vinegar (box jellyfish in Australia) or baking soda (Atlantic jellyfish). Scorpions can be revealed with an ultraviolet lamp. Their very painful stings are treated with local anaesthetic. Leeches are very common in the rain forest and in freshwater. DEET applied to the skin, socks, boots and trousers is a partially effective deterrent.

**FURTHER INFORMATION****RGS-IBG Expedition Medical Cell**

Helping to improve health and safety is a key part of the RGS-IBG Expedition Advisory Centre's work.

Members of the RGS-IBG Expedition Medical Cell ([www.rgs.org/medicalcell](http://www.rgs.org/medicalcell)), chaired by David Warrell, advise the RGS-IBG on all medical matters relating to fieldwork in remote and challenging environments, to ensure the associated risks of participating in such activities are kept to a minimum.

An ongoing Survey of Expedition Health and Safety has been carried out by the Expedition Advisory Centre since 1995 to help improve the effectiveness of the work of the Medical Cell. All expeditions are encouraged to contribute to the survey.

Medical advice for expedition planners is given in the edition of *Expedition Medicine* edited by David Warrell and Sarah Anderson (Profile Books, London, 2002). The Medical Cell also develops and maintains information sheets/guidelines on specific topics. Information is available on *First Aid Training, Children at Altitude, Guidelines for Acclimatisation on Mount Kilimanjaro* and *Heat-related Illness*.

Regular seminars and workshops on matters of expedition health and safety include: a weekend Wilderness Medical Training course, and courses leading to the Certificate in Offsite Safety Management.

The Expedition Advisory Centre also helps expeditions recruit medical personnel for expeditions through its Register of Personnel available for expeditions, and publicises opportunities for medical professionals to participate in expeditions and fieldwork overseas through its *Bulletin of Expedition Vacancies*.

**Useful addresses and websites**

BCB Limited, Morland Road, Cardiff CF24 2YL. Tel: +44 292 046 4464, fax: +44 292 048 1100, email:

[bcb@bcbltd.uk](mailto:bcb@bcbltd.uk), website: [www.bcb.ltd.uk](http://www.bcb.ltd.uk)

First aid kits and emergency medical supplies.

Blood Care Foundation, PO Box 588, Horsham RH12 5WJ. Tel: +44 1403 262652, fax: +44 1403 262657,

email: [bcf@compuserve.com](mailto:bcf@compuserve.com), website: [www.bloodcare.org.uk](http://www.bloodcare.org.uk)

Emergency blood supplies.

British Association for Immediate Care (BASICS), BASICS Headquarters, Turret House, Turret Lane,

Ipswich IP4 1DL. Tel: +44 870 165 4999, fax: +44 870 165 4949, email: [admin@basics.org.uk](mailto:admin@basics.org.uk), website:

[www.basics.org.uk](http://www.basics.org.uk)

British Dental Association, 64 Wimpole Street, London W1M 8AL. Tel: +44 20 7935 0875, website:

[www.bda-dentistry.org.uk](http://www.bda-dentistry.org.uk)

British Medical Association, BMA House, Tavistock Square, London WC1H 9JP. Tel: +44 20 7387 4499,

fax: +44 20 7383 6400, email: [info.web@bma.org.uk](mailto:info.web@bma.org.uk), website: [www.bma.org.uk](http://www.bma.org.uk)

Centre for Tropical Medicine, University of Oxford, Nuffield Department of Clinical Medicine, John

Radcliffe Hospital, Oxford OX3 9DU, Founding Director (Emeritus): Professor David Warrell. Tel: +44

1865 220968, fax: +44 1865 220984, email: [david.warrell@ndm.ox.ac.uk](mailto:david.warrell@ndm.ox.ac.uk)

Department of Health (Medicines Division), Market Towers, 1 Nine Elms Lane, London SW1 5NQ. Tel

(weekdays 09.00–17.00): +44 20 7273 0000, (other times): +44 20 7210 3000, fax: +44 20 7273 0353

For UK drug export certificates: email: [info@mca.gsi.gov.uk](mailto:info@mca.gsi.gov.uk), website: [www.mca.gov.uk](http://www.mca.gov.uk)

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Diving Diseases Research Centre, The Hyperbaric Medical Centre, Tamar Science Park, Research Way, Plymouth PL6 8BU. Emergency tel: +44 1752 209999, fax: +44 1752 209115, email: enquiries@ddrc.org, website: www.ddrc.org

East Africa Flying Doctors Society (AMREF), 11 Old Queen Street, London SW1H 9JA. Tel: +44 20 7233 0066, fax: +44 20 7233 0099

The Fleet Street Travel Clinic, Dr Richard Dawood, 29 Fleet Street, London EC4Y 1AA. Tel: +44 20 7353 5678, fax: +44 20 7353 5500, email: Info@fleetstreetclinic.com, website: www.fleetstreetclinic.com

Health Literature Line, The Library, Department of Health, Shipton House, London SE1 6LH. Tel: +44 800 555777, fax: +44 1623 724524, website: www.equip.nhs.uk

Phone for individual copies of material produced by the Department of Health. If more copies are required, fax or write

Hospital for Tropical Diseases, Mortimer Market, Capper Street, Tottenham Court Road, London WC1E 6AU. Tel: +44 20 7387 9300/4411, healthline: +44 9061 337733, fax: +44 20 7388 7645, website: www.thehtd.org

InterHealth, 157 Waterloo Road, London SE1 8US. Tel: +44 20 7902 9000, email: Info@interhealth.org.uk, website: www.interhealth.org.uk

Long-term advice and treatment for aid workers and expatriates.

International Health Exchange, 134 Lower Marsh, London SE1 7AE. Tel: +44 20 7620 3333, fax: +44 20 7620 2277, email: info@ihe.org.uk, website: www.ihe.org.uk

Maintains a register of health professionals wanting to work in less developed countries, and runs training courses on primary health care and refugee community health

John Bell and Croyden, 50–54 Wigmore Street, London W1V 2AU. Tel: +44 20 7935 5555, fax: +44 20 7935 9605, website: www.johnbellcroyden.co.uk

Pharmacy and medical supplier.

Lifesystems Limited, 4 Mercury House, Calleva Park, Aldermaston RG7 8PN. Tel: +44 118 981 1433, fax: +44 118 981 1406, email: mail@lifesystems.co.uk, website: www.lifesystems.co.uk

First aid and emergency dental kits.

Liverpool School of Tropical Medicine, Pembroke Place, Liverpool L3 5QA. Tel: +44 151 708 9393, fax: +44 151 708 8733, website: www.liv.ac.uk/lstm/lstm.html

London School of Hygiene and Tropical Medicine, Keppel Street, London WC1E 7HT. Tel: +44 20 7636 8636, fax: +44 20 7436 5389, website: www.lshtm.ac.uk

London School of Tropical Medicine Malaria Reference Laboratory. Tel: +44 20 7636 3924; +44 9065 508 908 (24-hour), website: www.lshtm.ac.uk/centres/malaria

Medical Advisory Service for Travellers Abroad (MASTA) Travel Clinics. Tel: +44 1276 685040, email: enquiries@masta.org, website: www.masta.org

MedicAlert Foundation International, 1 Bridge Wharf, 156 Caledonian Road, London N1 9UU. Tel: +44 20 7833 3034, fax: +44 20 7278 0647, email: info@medicalert.org.uk, website: www.medicalert.org.uk

National Poisons Centre. Tel: +44 870 600 6266 (for clinically complex cases), website: www.doh.gov.uk/npis.htm

Nomad Traveller's Store and Medical Centre, 3–4 Wellington Terrace, Turnpike Lane, London N8 0PX. Tel: +44 20 8889 7014, fax: +44 20 8889 9529, email: sales@nomadtravel.co.uk, website: www.nomadtravel.co.uk

Travel pharmacy. Medical kits made to order at a low cost.

Royal College of Nursing, 20 Cavendish Square, London W1G 0RN. Tel: +44 845 772 6100, website: www.rcn.org.uk

Royal Society for the Prevention of Accidents, Edgbaston Park, 353 Bristol Road, Edgbaston, Birmingham B5 7ST. Tel: +44 121 248 2000, fax: +44 121 248 2001, email: help@rospa.co.uk, website: www.rospa.co.uk

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SP Services (UK), Unit D4, Hortonpark Estate, Hortonwood 7, Telford TF1 7GX. Tel: +44 1952 288999, fax: +44 1952 606112, website: [www.999supplies.com](http://www.999supplies.com)  
Emergency medical and rescue supplies.

TALC (Teaching-aids At Low Cost), PO Box 49, St Albans AL1 5TX. Tel: +44 1727 853869, fax: +44 1727 846852, website: [www.talcuk.org](http://www.talcuk.org)

Trailfinders Travel Clinics, (London). Tel: +44 20 7938 3999, (Glasgow) +44 141 429 0913

UIAA Mountain Medicine Data Centre. Website: [www.thebmc.co.uk/world/mm/mmo.htm](http://www.thebmc.co.uk/world/mm/mmo.htm)

Wilderness Medical Training (WMT), The Coach House, Thorny Bank, Skelsmergh, Kendal LA8 9AW.  
Tel./fax: +44 1539 823183, email: [enquiries@wildernessmedicaltraining.co.uk](mailto:enquiries@wildernessmedicaltraining.co.uk), website: [www.wildernessmedicaltraining.co.uk](http://www.wildernessmedicaltraining.co.uk)

World Health Organization, WHO, Avenue Appia 20, 1211 Geneva 27, Switzerland. Tel: +41 22 791 21 11, fax: +41 22 791 31 11, website: [www.who.int](http://www.who.int)  
Publishers of the WHO Weekly Epidemiological Record, Global Epidemiological Surveillance and Health Situation Assessment, International Travel and Health

### Useful web addresses

British Travel Health Association: [www.btha.org/site/index.php](http://www.btha.org/site/index.php)  
Centers for Disease Control (CDC), USA: [www.cdc.gov](http://www.cdc.gov)  
Department of Health: Advice for Travellers: [www.doh.gov.uk/traveladvice](http://www.doh.gov.uk/traveladvice)  
E-Med: [www.e-med.co.uk](http://www.e-med.co.uk)  
Fit for travel: [www.fitfortravel.scot.nhs.uk](http://www.fitfortravel.scot.nhs.uk)  
International Society for Infectious Diseases: [www.promedmail.org](http://www.promedmail.org)  
For disease alerts.  
International Travel Health Association: [www.istm.org](http://www.istm.org)  
Public Health Laboratory Service: [www.phls.org.uk](http://www.phls.org.uk)  
Excellent malaria guidelines.  
Travel Health Online: [www.tripprep.com](http://www.tripprep.com)  
Travel Screening Services: [www.travelscreening.co.uk](http://www.travelscreening.co.uk)  
The Travellers' Health website: [www.travellershealth.info](http://www.travellershealth.info)  
Has news and links to over 200 travel health-related sites.

### Further reading

Almond, J., Clemens, J., Engers, H. et al. (2002) Accelerating the development and introduction of a dengue vaccine for poor children. *Vaccine* **20**: 3043–6.

Anderson, S.R. and Johnson, C.J.H. (2000). Expedition health and safety: a risk assessment. *Journal of the Royal Society of Medicine* **93**: 557–62.

Auerbach, P.S. (ed.) (1995) *Wilderness Medicine. Management of wilderness and environmental emergencies*, 3rd edn. St Louis, MO: Mosby,

Backer, H.D., Bowman, W.D., Paton, B.C., Steele, P. and Thygeson, A. (1998) *Wilderness First Aid. Emergency care for remote locations*. Boston, MA: Jones & Bartlett Publishers.

Bouchama, A. and Knochel, J.P. (2002) Medical progress: heatstroke. *New England Journal of Medicine* **346**: 1978–88.

Bradley, D.J. and Bannister, B. (2001) Guidelines for malaria prevention in travellers from the United Kingdom for 2001. *Communicable Diseases and Public Health* **4**: 84–101.

British Medical Journal (2002) Road traffic accidents. *British Medical Journal* **324**, 11 May: 1107–10, 1119–54.

Dawood, R. (2002) *Travellers' Health*, 4th edn. Oxford: Oxford University Press.

Forgey, W.W. (2000) *Wilderness Medicine Beyond First Aid*, 5th edn. Guilford, CT: Globe Pequot Press.

## EXPEDITION MEDICINE

- Gibbons, R.V. and Vaughn, D.W. (2002) Dengue: an escalating problem. *British Medical Journal* **324**: 1563–6.
- Hatt, J. (1993) *The Tropical Traveller*, 3rd edn. London: Penguin Books.
- Molesworth, A.M., Thomson, M.C., Connor, S.J. et al. (2002) Where is the meningitis belt? Defining an area at risk of epidemic meningitis in Africa. *Transactions of the Royal Society for Tropical Medicine and Hygiene* **96**: 242–9.
- Monath, T.P. and Cetron, M.S. (2002) Prevention of Yellow Fever in persons travelling to the tropics. *Clinical Infectious Diseases* **34**: 1369–78.
- Sartori, C., Allemann, C. and Duplain, H. (2002) Salmeterol for the prevention of high-altitude pulmonary edema. *New England Journal of Medicine* **346**: 1631–6.
- Shlim, D.R. and Solomon, T. (2002) Japanese encephalitis vaccine for travellers: exploring the limits of risk. *Clinical Infectious Diseases* **35**: 183–8.
- Steedman, D.J. (1994) *Environmental Medical Emergencies*. Oxford: Oxford University Press.
- Stich, A., Abel, P.M. and Krishna, S. (2002) Human African trypanosomiasis. *British Medical Journal* **325**: 203–6.
- Warrell, D. and Anderson, S. (eds) (2002) *Expedition Medicine*, 2nd edn. London: Profile Books. Available from [www.rgs.org/eacpubs](http://www.rgs.org/eacpubs)
- Werner, D. (1993) *Where There is No Doctor*. London: Macmillan Education Ltd.