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Febrile illnesses account for about 40% of hospital admissions for tropical illness in UK referral units. The initial assessment of travelers is aimed primarily at early detection and treatment of malaria (see MEDICINE 33:8, 39), which can be rapidly fatal. Malaria is the most common diagnosis, followed by nonspecific, self-limiting infections, and respiratory and gastrointestinal infections.1–5

Travel history
Start with the question: “Have you ever been overseas?” Every possibly relevant trip should be recorded in detail.

Where? – the precise area of travel should be identified, not just the continent or country.

Why? – the reason for travel and the patient’s activities there may suggest or exclude specific diseases.

When? – precise dates of departure and return are required. Viral haemorrhagic fevers can be excluded when more than 21 days have elapsed since the traveller left an endemic area in Africa. Malaria does not develop until at least 8 days after arrival in an endemic area, and most cases of falciparum malaria present within 2 months of exposure. Malaria developing more than 9 months after leaving the Indian subcontinent is almost always caused by Plasmodium vivax, symptoms of which may develop up to 2 years after exposure.

What? – a risk assessment of behaviour and activities while overseas should include a detailed sexual history. Swimming in fresh water carries a risk of schistosomiasis (Africa) or leptospirosis (particularly Asia, and Central and South America). A history of tsetse fly bite (usually vividly remembered) in a game park in Africa, or of tick bites (often unnoticed) is helpful.

Who? – details of pre-travel immunization and malaria prophylaxis should be recorded, and adherence to antimalarial regimens and antimosquito measures should be assessed, though full compliance does not exclude malaria. Pre-travel health is also important, particularly in patients who are immunocompromised.

Nick Beeching is Senior Lecturer in Infectious Diseases in the Clinical Research Group of the Liverpool School of Tropical Medicine, and Clinical Lead in the Tropical and Infectious Disease Unit at Royal Liverpool University Hospital. Conflicts of interest: none declared.
Examination

**Fever** – the presence of fever should be confirmed; it is usually futile to pursue detailed diagnosis of a minor febrile illness that has already resolved. Patterns of fever are seldom as useful as textbooks suggest. Falciparum malaria usually causes continuous rather than periodic fever, though up to 10% of patients with malaria may be afebrile at presentation. The general condition of the patient should be assessed, looking for localizing signs and for complications of severe malaria, including confusion or drowsiness, shock and jaundice.

**Insect bites** commonly become infected with streptococci or staphylococci. Careful examination is needed to find the eschar (scab) of tick bites (Figure 1), which may be hidden in the hairline or under constricting garments (e.g. bra straps, underwear elastic).

**Diarrhoea** may be a presenting feature of falciparum malaria, pneumonia, atypical respiratory infections including severe acute respiratory syndrome, or enteric infection.

**Jaundice** suggests malaria, hepatitis or leptospirosis.

**Hepatosplenomegaly** is found in many infections. Less than 50% of patients with malaria have a palpable spleen, so this sign has little negative predictive value.

**Lymphadenopathy** should always raise suspicion of HIV seroconversion illness, but is also seen in dengue, brucellosis, rickettsial infections and the ‘glandular fever’ group of infections.

Investigations

**Blood tests** – investigations should include full blood count, differential WBC count, renal function, liver function tests and at least two sets of blood cultures. It is always worth storing an acute serum or plasma sample on admission for paired serological tests or for polymerase chain reaction-based diagnosis later.

Blood films for malaria are essential. Most laboratories are accustomed to interpreting thin blood films, which are most useful for diagnosing the type of malaria and determining the degree of parasitaemia. However, thin films are less sensitive than thick films, which are preferred where local expertise allows. Chemo prophylaxis makes blood films more difficult to interpret because the parasitaemia is more scanty.

**Advice on imported infections**

*In the UK, expert advice is available from the Schools of Tropical Medicine*

- **Liverpool**
  - Tel: 0151 700 2000 for physician on call
  - Web: www.liv.ac.uk/lstm/lstm.html
- **London**
  - Tel: 0207 387 9300, bleep 5845
  - Web: www.thehtd.org

*Information on emerging infections is available from*

- **ProMED** www.promedmail.org
- **US Centers for Disease Control** www.cdc.gov/
- **WHO** www.who.int

1 Eschar and maculopapular rash of African tick typhus contracted after the patient visited a game park. Fever and lymphadenopathy preceded the rash by 5 days.

2 Ultrasound scan showing amoebic liver abscess in a merchant seaman with fever, neutrophilia and dullness at the right lung base. Liver abscess may mimic pneumonia.

Dipsticks for plasmodium-species-specific lactate dehydrogenase can detect *P. falciparum* and *P. vivax* with almost the same sensitivity as a thick film examined by an expert. In a district general hospital setting, out of hours, these tests should supplement thin film examination. If the first film is negative and malaria is possible, films should be repeated after 12 hours, and possibly repeated again 24 hours later.

Thrombocytopenia is present in more than 75% of patients with malaria, but is also caused by dengue and other infections. Malaria or leptospirosis is more likely in those with both raised serum bilirubin and thrombocytopenia, and the combination of splenomegaly and thrombocytopenia is strongly suggestive of malaria. Neutrophilia suggests bacterial sepsis, including meningococcal disease, or amoebic liver abscess (serology is positive in the latter). Eosinophilia suggests nematodes or cestodes, typically acute schistosomiasis (serology and parasitology are often negative at this stage) or filariasis.

Antibiotic sensitivities should be reported. Pneumococci from many parts of the tropics are penicillin resistant, and *Salmonella typhi* and *S. paratyphi* isolates from Asia are usually multi-drug resistant.
## Selected ‘tropical’ fevers in travellers

| Fevers | Epidemiology | Clinical features | Investigations |
|--------|--------------|-------------------|----------------|
| **Malaria** | Tropics, bite of anopheline mosquito | Undifferentiated fever, later stupor, anaemia, shock, renal failure (*Plasmodium falciparum*); regular rigors (*P. vivax* or *P. ovale*) | Thrombocytopenia, hypoglycaemia, blood films (thick and thin), antigen tests |
| **Dengue virus types 1–4** | Tropics, bite of *Aedes* (Steomyia) mosquito, sometimes epidemic, incubation 5–6 days | Fever for about 5 days, severe headache, retro-orbital pain, myalgia, lymphadenopathy, blanching skin rash on third day, rarely haemorrhages and shock | Leucopenia, polymerase chain reaction analysis (early), serology (after first week of illness) |
| **Lassa fever** | Rural West or Central Africa or hospital workers exposed to rodent urine or blood of patients, incubation 6–21 days (maximum) | Persistent fever with severe malaise, pharyngeal exudate, swollen face, stupor and hypotension | Leucopenia, virus isolation, polymerase chain reaction analysis or serology |
| **Tick typhus** | Mediterranean, southern and East Africa, bite of hard tick | Black eschar (scab) at site of tick bite, generalized maculopapular erythematous rash from fourth day, headache, cough | Leucopenia, serology |
| **Typhoid fever** | Worldwide | Headache, persistent fever, abdominal discomfort, splenomegaly, rose spots (rare) | Leucopenia, blood culture |
| **Amoebic liver abscess** | Worldwide, but mainly tropics | Persistent fever, right upper abdominal pain and tenderness, signs at right lung base | Neutrophil leucocytosis, ultrasonography of liver, serology |
| **African trypanosomiasis** | Visitors to African game parks, tsetse fly | Chancre at bite site, tachycardia, lymphadenopathy, splenomegaly, transient oedema, variable rashes | Hypoglycaemia, thrombocytopenia, thick blood films, serology, consider CSF examination only after obtaining expert advice |
| **Visceral leishmaniasis** | Mediterranean, Middle East, India, East Africa and South America, sandflies | Persistent fever and wasting in relatively well individuals, progressive splenomegaly, anaemia and lymphadenopathy, infants affected in Mediterranean countries, pyrexia of unknown origin and skin rash in HIV-positive patients | Leucopenia, bone marrow, microscopy, polymerase chain reaction analysis, culture (NNN medium); skin biopsy or buffy coat examination in HIV-positive patients |
| **Acute schistosomiasis** | Bathing in infected fresh water in Africa, Asia, Middle East, South America | Persistent fever, urticaria, diarrhoea, liver and splenic enlargement, cough | Eosinophilia at presentation, ova in stool, urine or semen (later only), serology (later) |

**Imaging** – chest radiography is useful in patients with respiratory symptoms, bearing in mind *Legionella* infection, tuberculosis (TB) and atypical chest infections. Ultrasonography of the liver is required in patients who may have amoebic liver abscess (Figure 2).

**Management**

Unless the patient clearly has a minor upper respiratory infection, hospital admission for investigation may be necessary for 24–48 hours. Falciparum malaria must be excluded, and is the
diagnosis in 65–75% of patients hospitalized after visiting Sub-Saharan Africa, compared with 15–25% of those returning from Asia, who are more likely to have dengue fever.\textsuperscript{2,5} A combination of geographical and exposure history, presenting syndrome and simple laboratory tests should lead to a sensible working diagnosis (Figure 3). More detailed, evidence-based diagnostic algorithms have recently become available and could be adapted for local use.\textsuperscript{6} If malaria cannot be excluded in a patient who is severely ill, empirical treatment for sepsis should include quinine. Management of malaria is discussed in MEDICINE 33:8, 39.

Further investigations and management should be determined by the most likely diagnosis. Early therapy is often appropriate before investigations confirm a clear diagnosis; this usually comprises doxycycline for leptospirosis or tick typhus, or a fluoroquinolone when there is a strong suspicion of enteric fever (with or without a third-generation cephalosporin or azithromycin). When viral haemorrhagic fever or multi-drug-resistant TB is suspected, public health authorities must be involved immediately and the patient should be managed in appropriate isolation facilities. Rare exotic infections should be discussed with an expert in tropical diseases at the earliest opportunity.

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**FURTHER READING**

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(Review covering paediatric issues.)
Ryan E T, Wilson M E, Kain K C. Illness after international travel. N Engl J Med 2002; 347: 505–16.
(Comprehensive tables and references for all imported diseases; a good starting point.)
www.nathnac.org
(National Travel Health Network and Centre; risks of travel worldwide and preventive measures to reduce risk.)
www.promedmail.org/
(ProMED; an excellent website, with archives, highlighting current infections worldwide.)