Parasites in travellers: a brief guide

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Australians travelling both locally and overseas are regularly exposed to a wide range of human parasites. Thus, it is important to be familiar with these parasites, their modes of transmission and resultant diseases.

The generally accepted definition of a parasite is an organism that lives on or in another, usually larger, host organism in a way that harms or is of no advantage to the host. Parasites cause a wide variety of diseases (see Tables 1 and 2), yet they have limited modes of transmission. Blood transmission is relatively rare; the more common modes are via skin, mucous membrane or ingestion. Parasites do not always induce an inflammatory response and may live in their host for prolonged periods of time, often many months and sometimes years, without causing local or systemic symptoms or signs. This factor, together with a lack of awareness of these diseases by both patient and doctor, may lead to delayed diagnosis or misdiagnosis, with potentially severe and sometimes fatal consequences.

In view of the immense range of clinical presentations seen with parasitic diseases, a symptomatic approach to this topic is precluded in this short update. Instead, this article provides a potpourri of some of the more common protozoan and helminth (worm) infections to consider in travellers.

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Malaria

Malaria is a protozoan infection transmitted by the bite of infected female *Anopheles* mosquitoes. It is well recognised as one of the world's most common infectious diseases, with over 300 million cases and one million deaths reported annually and being endemic in about 100 countries.[1]

The *Plasmodium* parasite has two cycles, one occurring in mosquitoes, the other in humans. The human cycle is divided into two parts: erythrocytic and hepatic (or exoerythrocytic). The release of parasites into the blood at the different stages is generally associated with fever and other typical symptoms. Four species of *Plasmodium* cause malaria; that caused by *Plasmodium falciparum* can progress quickly, and is the main cause of mortality.

It is wise to retain the maxim 'suspect malaria in any traveller with fever occurring from seven days after leaving an endemic area' even if the traveller has used the correct antimalarial prophylaxis. Despite the presumed widespread knowledge about prevention, doctors in Australia still continue to treat many hundreds of returned travellers annually for this disease, with notifications for 2005 significantly higher than average.[2]

Diagnosis rests on microscopy of thick and thin blood smears, with ELISA and PCR techniques increasingly being of help.

Table 1. Examples of common parasites

Parasite	Infection
Protozoa	
Entamoeba histolytica	Amoebiasis (amoebic dysentery)
Blastocystis hominis (considered a commensal if no symptoms)	Diarrhoea
Cryptosporidium spp.	Diarrhoea
Cyclospora spp.	Diarrhoea
Giardia lamblia	Giardiasis
Leishmania spp.	Leishmaniasis
Plasmodium spp.	Malaria
Toxoplasma gondii	Toxoplasmosis
Trypanosoma spp.	Trypanosomiasis
Helminths	
Cestodes (tapeworms)	(see Table 2)
Nematodes (roundworms)	(see Table 2)
Trematodes (flukes)	(see Table 2)
Ectoparasites	
Fleas	Pulicosis, tungiasis
Botfly, tumbu fly	Myiasis
Pediculosis humanus corporis and *capitis* (lice)	Pediculosis
Ticks and mites – e.g. *Sarcoptes scabiei*	Tick and mite borne diseases – e.g. fever, paralysis, scabies

Preventative advice, including prophylaxis and treatment, is readily available from numerous sources.[1,3,4] Given the increasing complexity of providing advice on malaria prophylaxis, most authorities now recommend that for more complex situations, or if unsure, general practitioners should refer intending travellers to a travel clinic or medical practitioner well versed in travel health.

Cutaneous, mucocutaneous and visceral leishmaniases

Cutaneous, mucocutaneous and visceral leishmaniases are estimated to occur in over 1.5 million people annually, and occur in about 90 countries, including parts of the Middle East, northern Africa, Central America, southern Europe and Asia.[5] They are not notifiable diseases in Australia. Infection in travellers is not common but nonetheless real. Risk of infection is greater in those travelling to rural areas, and infection is more likely to occur between dusk and dawn. Travellers to endemic areas who are at higher risk include adventure travellers, missionaries, ornithologists and soldiers.[5,6]

The protozoan parasites causing leishmaniases (*Leishmania* spp.) are transmitted by the bite of sandflies (Figure 1) and invade macrophage cells, the location of which determines the different clinical syndromes:

- in the cutaneous form ('oriental sore'), patients present with erythema around a sandfly bite, usually on the face or arms, or with a chronic nodule with or without ulceration – this form can be extremely difficult to treat
- the mucocutaneous form usually develops after an initial cutaneous infection, and usually begins in the nose or palate
- patients with the visceral form ('kala-azar') present with fever, hepatosplenomegaly, anaemia and/or weight loss; this form has a mortality of up to 90%. It should be excluded in people of any age with suspected leukaemia or lymphoma who have visited the Mediterranean area within the previous two years.

Diagnosis is confirmed by microscopy of smears, biopsy and serology. Prevention rests on standard insect bite avoidance measures, including the use of DEET-containing skin repellents and permethrin-impregnated nets and clothing. Treatment is with antimonial drugs, usually sodium stibogluconate or liposomal amphotericin (AmBisome) under special access arrangements.

African and American trypanosomiases

African and American trypanosomiases are two clinically different diseases caused by protozoan parasites belonging to the *Trypanosoma* genus. The parasites are transmitted by the tsetse fly in Africa (where it is known as African sleeping sickness) and the reduviid bug in Central America (the acute form is known as Chagas' disease). Although both diseases are rare in travellers, they do occur, and the latter was responsible for a death of an Australian traveller in 2004 (personal communication).

Symptoms are nonspecific, including fever, skin lesions, rash, oedema and lymphadenopathy, and can progress to meningoencephalitis.[7] Risk of infection is highest in rural areas, with the reduviid

Table 2. Examples of helminth infections

Helminth	Infection
Nematodes (roundworms)	
Ascaris lumbricoides	Ascariasis
Dracunculus medinensis (guinea worm)	Dracunculiasis
Enterobius vermicularis (threadworm)	Enterobiasis
Filariidae	
– *Wuchereria bancrofti*	Bancroftian filariasis, elephantiasis
– *Brugia malayi*	Malayan filariasis
– *Loa loa*	Loa loa (loiasis)
– *Onchocercar volvulus*	Onchocerciasis (river blindness)
Ancylostoma duodenale, Necator americanus (human hookworms)	Ground itch (papular dermatitis), anaemia
Ancylostoma braziliense, Ancylostoma caninum (animal hookworms)	Cutaneous larva migrans, anaemia
Strongyloides stercoralis (threadworm)	Strongyloidiasis
Toxocara canis	Toxocariasis (visceral larva migrans)
Trichinella spiralis	Trichinosis
Cestodes (tapeworms)	
Echinococcus alveolaris	Alveolar echinococcosis
Echinococcus granulosus (dog tapeworm)	Cystic echinococcosis (hydatid disease)
Diphylobothrium latum (fish tapeworm)	Diphyllobothiasis
Hymenolepis nana (dwarf tapeworm)	Hymenolepiasis
Taenia saginata (beef tapeworm)	Taeniasis
Taenia solium (pork tapeworm)	Taeniasis (cysticercosis)
Trematodes (flukes)	
Schistosoma mansoni, S. japonicum, S. haematobium	Schistosomiasis (bilharzia, snail fever)
Fasciola hepatica (liver fluke)	Fascioliasis

bug living in thatched dwellings and tsetse fly-infested areas generally well known to the locals.

Diagnosis is made by microscopy, and treatment can be toxic. Prevention is limited to avoiding infested areas, wearing protective clothing and remaining inside screened vehicles when travelling in known high risk areas.

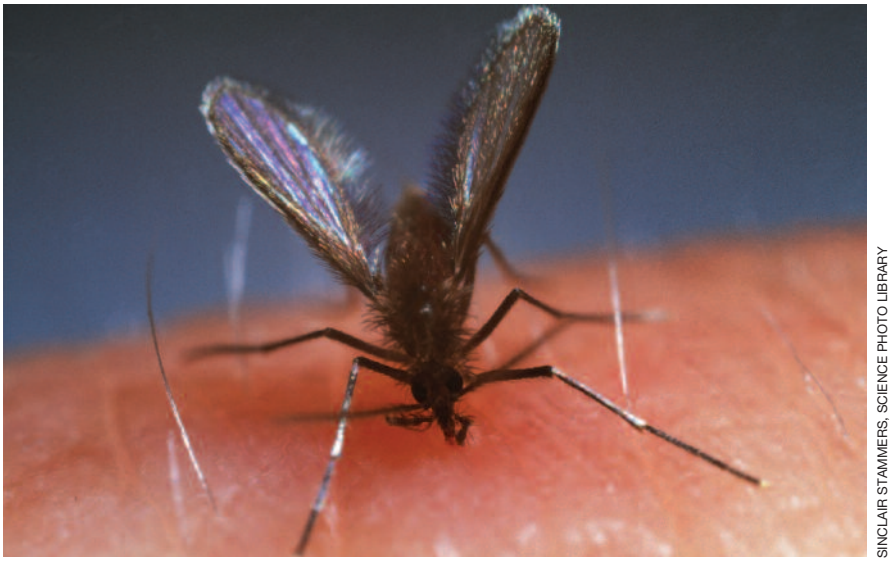

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Figure 1. Sandflies transmit the protozoan parasites causing leishmaniasis.

Lymphatic filariases

Lymphatic filariases are a range of diseases that follow infection with parasitic nematodes (roundworms) belonging to the Filariidae family (see Table 2). The filariae (adult worms) cause anatomical obstruction such as in lymphatic vessels, while the microfilariae (or larvae) circulate in the peripheral blood and are transmitted by the bite of a mosquito or fly.

The range of clinical presentations includes skin rashes, fever, pulmonary infiltrates, lymphoedema and, in the extreme form, elephantiasis. Eosinophilia, which does not usually occur in protozoan infections, is an indicator of helminth infection. Diagnosis of lymphatic filariasis is by microscopy of blood and infected tissue, and PCR assays are gradually becoming available.[8]

Lymphatic filariasis occurs throughout developing tropical countries, including South East Asia and Africa (Figure 2), and results in a massive world burden, with over 120 million people carrying the disease. People travelling long term to endemic areas who have prolonged exposure to mosquitoes are at higher risk of infection.

Prevention is achieved via the use of insect bite avoidance measures. Although

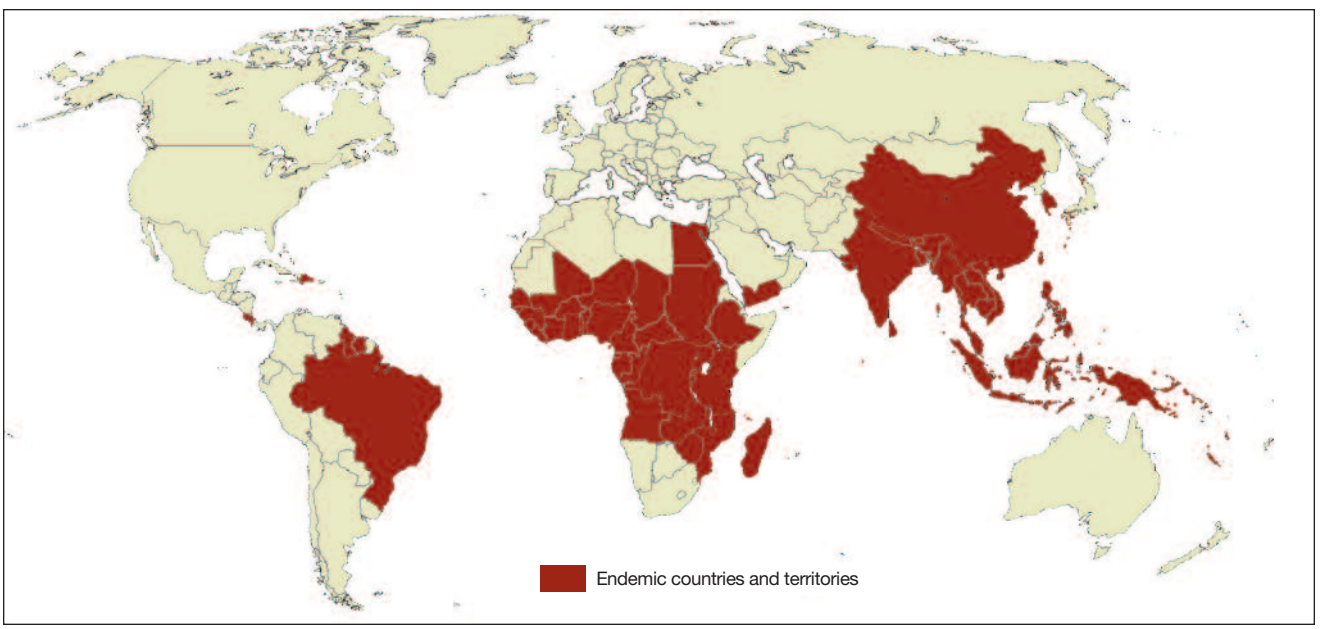

Figure 2. Lymphatic filariasis endemic countries and territories in 2003.

REPRODUCED WITH PERMISSION FROM WHO. LYMPHATIC FILARIASIS ELIMINATION PROGRAMME. PUBLIC HEALTH MAPPING GROUP, COMMUNICABLE DISEASES, WHO, MAY 2003. WWW.WHO.INT/GLOBALATLAS/INTERACTIVEMAP/RMM/MAPS/WORLD_ENDEMICITY.JPG?ID=MAP306

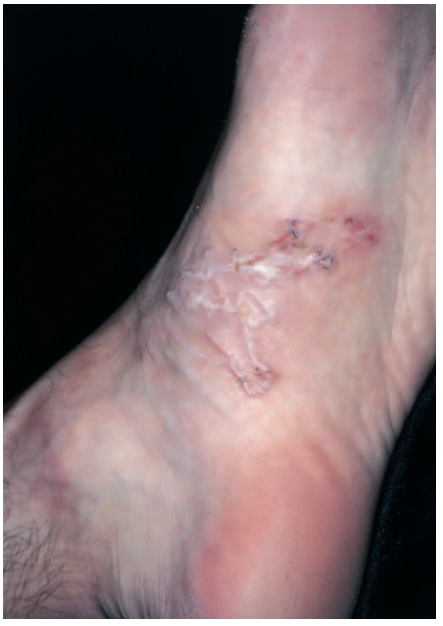

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Figure 3. Cutaneous larva migrans on the sole of a returned traveller.

treatment is not always satisfactory, it is available with diethylcarbamazine, ivermectin (Stromectol) and specific lymphoedema care.

Intestinal and urinary schistosomiases

Intestinal and urinary schistosomiases ('snail fever', 'bilharzia') are caused by trematodes (flukes) that penetrate the skin after contact with fresh water infested with cercariae (a stage of the parasite). The worms migrate to veins in the intestine and/or bladder and lay eggs, and may eventually cause damage to the liver, kidney and bladder. Symptoms may include fever, general lethargy, abdominal pains and blood in the urine or faeces; however, most travellers are asymptomatic.

Endemic areas include Asia, South America and, especially, throughout the greater African continent, with travellers being at particular risk at the popular Lake Malawi, Lake Kariba and Lake Victoria. An Australian study showed an infection rate of 8.5% in travellers visiting areas of risk in Africa for less than six weeks, and on the basis that this was the 'tip of the iceberg', the recommendation is to screen all travellers to areas of risk with a history of fresh water exposure.[9]

Diagnosis is by microscopy of stool and midday terminal urine or serology. Treatment of infected travellers and their partners with praziquantel (Biltricide) and six-monthly follow up is recommended. Prevention rests on avoidance or limiting exposure to fresh water in endemic areas.

Hookworm and Strongyloides infection

Hookworm and *Strongyloides* are both nematodes that penetrate skin, migrate through pulmonary vessels and subsequently enter the gut where they can cause severe anaemia.

Migration of human hookworms through the skin may cause ground itch (papular dermatitis) at the site of penetration. Animal hookworms cause cutaneous larva migrans (Figure 3), with a typical serpiginous rash and sometimes the visible movement of larvae at several millimetres per day. *Strongyloides stercoralis* causes larva currens, with movement at several centimetres per hour.

Skin entry of both hookworm and *Strongyloides* can occur as a result of sitting or lying on contaminated sand above the water line at tropical seaside resort areas such as in Bali and Thailand.

Diagnosis is by detection of larvae or eggs in the faeces, and serology is available for *Strongyloides*. Hookworm infestation is treated with mebendazole (Chemists' Own De Worm Tablets, Combantrin-1 with Mebendazole, DeWorm Chewable Tablets, Rid-Worm, Vermox) or with albendazole (Eskazole, Zentel), which has recently become readily available. First line treatment for strongyloidiasis is with ivermectin.

Other parasitic infections

Many other parasitic infections result from ingestion of the pathogenic organism, and have been discussed previously.[10,11]

Amoebiasis and giardiasis are two of the more important conditions that need to be excluded in travellers presenting with relevant gastrointestinal symptoms; both infections are readily curable.

Tapeworm infections are often asymptomatic, with patients becoming aware of infection only when they see worm parts in faeces.

Ectoparasites, in addition to causing local disease, also act as vectors for a range of viral, protozoan, bacterial and helminth diseases, including plague, typhus, and arboviral disease (see Table 2).

Conclusion

Since no vaccinations exist for the prevention of any parasitic disease, and as chemoprophylaxis for selected conditions is quite restricted, travellers need to be given preventative advice specific to the endemic areas that they are to visit. Risk of infection is higher with extended periods of stay, travel to highly endemic areas, rural accommodation and ingestion of contaminated food. Those at higher risk include adventure travellers, backpackers, expatriates, construction workers, missionaries, scientists, volunteer workers and army personnel. Prevention rests on avoidance of skin contact with potentially contaminated fresh water, sand and soil; avoidance of biting insects and arthropods; and avoidance of potentially contaminated foods.

To help pathologists identify specific organisms, medical practitioners requesting pathology for returning travellers should clearly identify the countries visited, list relevant symptoms and signs and, where possible, state the potential disease requiring detection or exclusion. MT

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Further reading

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DECLARATION OF INTEREST. Dr Cohen is Medical Director, Travel Clinics Australia.