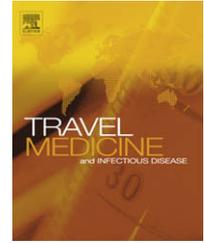




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## INVITED SUBMISSION

# A practical approach to common skin problems in returning travellers

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Received 27 February 2009; accepted 9 March 2009

Available online 11 April 2009

### KEYWORDS

Dermatoses;  
Travellers;  
Skin;  
Tropical disease;  
Infection

**Summary** Skin diseases are the third most common cause of morbidity in returning travellers and may affect 8% of travellers during travel. Classic tropical diseases account for one quarter and the remainder are cosmopolitan diseases. The majority are of infectious origin, and of these bacterial infections are the most common and lead to the most hospitalisations. The ten most frequently encountered diagnoses comprise four classical tropical infections (cutaneous larva migrans, myiasis, tungiasis and cutaneous leishmaniasis) and six nontropical diseases (bacterial skin infections, arthropod bites, allergic reactions, scabies, animal bites and superficial fungal infections). Other notable skin problems include swimmer's itch, dengue fever presenting with a rash and rickettsial infections presenting with a rash or eschar. Delayed diagnosis, especially of tropical diseases, is common and may be reduced by improved knowledge and a systematic approach to skin problems. This involves a thorough travel specific, traveller specific and skin problem based history, combined with targeted examination and investigations. A frequency weighted differential diagnosis of the most common skin lesions is presented. An increased emphasis on preventative advice in relation to skin disease is encouraged during pre-travel consultations.

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## Introduction

Dermatoses are a common problem affecting travellers, with some evidence to suggest they are becoming more

common.<sup>1</sup> They may cause significant distress and morbidity, with up to 10% resulting in hospitalisation.<sup>2</sup> Unfortunately misdiagnosis or delay to diagnosis is a frequent feature and this may contribute to morbidity. Travel medicine practitioners need to be aware of the common dermatological diseases of travel so they can both recognise and appropriately manage them and advise prospective travellers how to prevent them effectively.

This article will review the literature on the epidemiology of skin problems in travellers and present a brief description of the ten most common disorders. It will then

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provide a suggested clinical approach to the traveller who returns with a skin problem. This includes a frequency weighted differential diagnosis of the major types of skin lesions encountered, incorporating trip specific, traveller specific and lesion specific factors. An extensive discussion of diagnostic investigations and treatment is beyond the scope of this article and is covered elsewhere in the literature. Note that the spectrum of dermatoses seen in immigrants differs from that seen in travellers and this article focuses on dermatoses seen in travellers.

## Epidemiology

Epidemiological data aids our understanding of which dermatoses are most frequently encountered and how they are likely to present. However potential limitations of the studies to date must be taken into account. Firstly, most large scale studies are not able to provide the true incidence of various dermatoses in travellers to various destinations and therefore the risk of a traveller contracting them.<sup>3</sup> This is because they tend to be case series (of skin complaints in travellers) in which the denominator of the number of overall travellers to each destination is not known. Secondly, as travelling populations may be diverse we must be cautious when extrapolating the findings of a study in one discrete population, for example French travellers, to other populations of travellers. Thirdly, not all travellers seek medical advice for their skin problem so results based on those who do present may underestimate the full extent of dermatoses experienced by travellers in general. Finally, those presenting to tropical disease units are often referred there and thus findings in these populations may not be representative of travellers self-presenting in primary care and vice versa. Nonetheless these case series are an extremely valuable way to examine the diseases and travel characteristics of those who do present to a healthcare professional after travel.

Although their exact frequency amongst travellers is not well established, dermatoses are now believed to be one of the leading medical problems experienced by travellers. One of the best estimates of overall frequency comes from a prospective study of 784 Americans who travelled during the period 1989–1991.<sup>4</sup> Of this cohort 8% reported skin problems whilst abroad and a further 3% (of which half were a continuation of a problem developed during travel) upon return. Dermatoses were the third most common problem after diarrhoea and respiratory tract symptoms and comprised 12.5% of the illnesses experienced. In a study of ill returned travellers presenting to a Parisian tropical disease unit in 2002 and 2003 skin problems were the most common disease type diagnosed and made up nearly one quarter of the diagnoses.<sup>5</sup> Two landmark large scale international studies performed by the GeoSentinel Surveillance Network involved 17,353 and 25,500 ill returned traveller encounters respectively at thirty and thirty-one globally dispersed travel or tropical medicine clinics between 1996 and 2006.<sup>3,6</sup> Skin conditions made up 17–18% of diagnoses and were again ranked third, after fever and diarrhoeal illnesses. The only published study to date of travellers presenting in primary care (of 97 patients in France between 2005 and 2006) also

showed skin diseases to be the third most common problem at 11%, after gastrointestinal complaints and respiratory tract infections.<sup>7</sup>

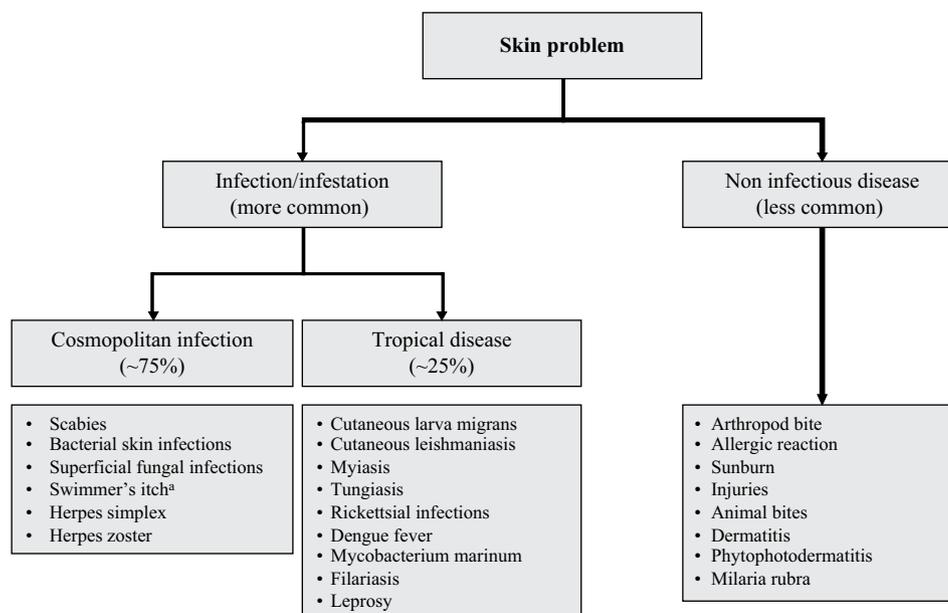
## Types of skin disorders

Most dermatoses have their clinical onset during travel (61% in a prospective study of 269 French travellers presenting between 1991 and 1993),<sup>2</sup> with the remainder tending to occur a median of one week after return.<sup>1</sup>

Skin conditions in travellers can be divided into two main categories. These are noninfectious (including arthropod bites, allergies, endogenous dermatological conditions) and infection or infestation (Fig. 1). The latter can be further subdivided into classic tropical type (travel related, exotic type, for example cutaneous larva migrans and myiasis) and nontropical cosmopolitan type (for example pyoderma and scabies). Some skin disorders, infectious and noninfectious, seen typically in a nontravel context may be exacerbated by travel to the tropics. Examples include eczema and staphylococcal, streptococcal and fungal infections which thrive in hot humid environments.<sup>8,9</sup>

Various studies have attempted to address the relative frequencies of these groups of skin conditions in travellers. Results differ, possibly reflecting the populations studied, the particular destinations travelled to and whether the problems appeared and were diagnosed during or after travel. However, in general infectious diseases account for the majority.<sup>1</sup> Classic tropical infections make up varying proportions depending on the study, ranging from 24% in most the recently published study<sup>3</sup> to 53% in the early 1990s.<sup>2</sup> The latter figure may be an overestimation because it reflected referrals to a tropical disease hospital and the patients had travelled specifically to tropical countries, whereas the former also includes travel to nontropical countries and visits to travel medicine clinics. Skin problems occurring during travel tend toward more cosmopolitan diagnoses than those diagnosed after travel which show a higher preponderance of tropical diseases.<sup>10</sup> This may be a reflection of the longer incubation period of some tropical diseases versus cosmopolitan ones.<sup>10</sup> It has been postulated that the proportion of tropical dermatoses seen in returning travellers may have declined since the early 1990s, while the total proportion of skin diseases is rising although the reasons are unclear.<sup>11</sup> Nonetheless as they still comprise about one quarter of all diagnoses a working knowledge of tropical medicine is essential.

The GeoSentinel Network analysis of dermatoses does not directly divide the causes into these specific categories, but infection makes up 70% of the ten most frequently diagnosed diseases and as stated, tropical infections make up 24% of the total.<sup>3</sup> In a French study of travellers returning from the tropics between 2002 and 2003 similarly the proportion with infections was not directly measured, but excluding the miscellaneous category it comprised about 65% of the sample, with tropical diseases comprising 33.9%.<sup>10</sup> An earlier French study of travellers presenting to the same tropical diseases unit from 1991 to 1993 gives an infection rate of 73% (excluding miscellaneous and undetermined diagnoses) with tropical diseases comprising 53%.<sup>2</sup> Of the infectious diseases, whether tropical or cosmopolitan, the majority tend to be bacterial,<sup>1,11</sup> and these most frequently account for hospitalisation.<sup>2</sup>



<sup>a</sup> From non human schistosomes

**Figure 1** Categorisation of skin problems in returning travellers with common examples.

Another useful approach to sub grouping types of dermatoses has been introduced by GeoSentinel Network and aims to quantify the exposures or aetiologies responsible for the conditions.<sup>3</sup> In this approach arthropod-related diseases are the most common at 30.9%, followed by unknown 14.6%, pyodermas 12.8%, soil related 10.5%, animal related 9.3%, allergic 5.5%, human to human 4.9%, fungal 4.4%, endogenous 2.7%, trauma 1.4%, water-borne infections 1.3%, drug related 0.9%, temperature related 0.4% and food-borne 0.1%.

### Geographical patterns

Overall those presenting with dermatoses are more likely to have travelled in Southeast Asia and the Americas than those presenting with other illnesses.<sup>3</sup> Various studies, particularly those from the GeoSentinel Network have identified some important geographical patterns.<sup>3</sup> Travel to the Caribbean is associated with cutaneous larva migrans while travel to Latin America is associated with cutaneous leishmaniasis (especially the Amazon basin in Bolivia),<sup>12</sup> myiasis (especially Belize and the Amazon Basin in Bolivia)<sup>3,13</sup> and tungiasis (especially Brazil and Colombia).<sup>14</sup> Tungiasis is also commonly associated with travel to sub-Saharan Africa.<sup>14</sup> Southern African trips are linked too with rickettsial infections.<sup>3</sup> In fact the estimated incidence of African tick bite fever in travellers to African safaris is 4–5.3%.<sup>15</sup>

Travel to Southeast Asia is associated with dengue fever<sup>6</sup> and dog bites, the latter particularly in China, Vietnam and Thailand.<sup>3</sup> Studies of pilgrims attending the Hajj have shown dermatitis, pyoderma and intertrigo to be common skin diagnoses.<sup>16,17</sup> Bacterial skin infections, although found worldwide are more commonly associated with travel to sub-Saharan Africa, south central and Southeast Asia.<sup>6</sup>

Not unexpectedly those studies where the population had travelled to tropical countries showed a higher rate of

tropical diseases than the GeoSentinel Network study of dermatoses that included all destinations.<sup>3</sup> Thus a returned traveller from a tropical country is more likely to have a tropical disease than a traveller from a nontropical country; however travel to a tropical country does not automatically infer that a skin problem will be a tropical disease.

### Duration of travel

In the GeoSentinel Network study of dermatoses in returned travellers longer travel (greater than eight weeks duration) was associated with leishmaniasis, fungal infections and scabies.<sup>3</sup> Longer time abroad has also been associated with seroconversion to dengue fever,<sup>18</sup> tungiasis<sup>19</sup> and potential rabies exposure.

### Reason for travel

For all major skin diagnoses, where recorded, the primary stated reason for travel is tourism.<sup>3</sup> Travel for the purpose of visiting friends or relatives (VFR) appears to be associated with skin abscesses, infected insect bites, dog bites and cellulitis.<sup>3</sup> Research and education are associated with cutaneous leishmaniasis, while missionary or voluntary work is associated with scabies and fungal infection.<sup>3</sup> Safaris and game hunting in southern Africa are linked with rickettsial infections.<sup>3</sup> Business travel, like tourism has a number of associations.<sup>3</sup>

### Demographics

The GeoSentinel Network study has identified some interesting demographic patterns.<sup>3</sup> Returned travelling children and teenagers are more likely to present with cutaneous larva migrans and dog bites than older people. This is likely to be a reflection of their behaviours; children are more likely to walk barefoot on beaches and play with animals. Those over the age of sixty-five years are more likely to

develop rickettsial infections and cellulitis. The former observation may be due to the fact many in this age group will be retired with sufficient funds and time to visit African safari parks where rickettsial diseases are most commonly acquired.<sup>3</sup> The increased risk of cellulitis may reflect the presence of underlying predisposing medical problems such as diabetes and congestive heart disease which have a higher incidence in this age group.

In this same study females were more likely than males to have an allergic skin reaction or insect bites, whilst leishmaniasis was a more likely diagnosis in males. The latter may reflect the type of travel males do; known risk factors are work in the military which is a male dominated occupation and jungle exposure which may accompany other male dominated domains such as geology and adventure travel.<sup>12,20,21</sup>

Some studies have shown a female preponderance for myiasis from the New World and a male preponderance for myiasis from the Old World.<sup>3,13</sup> However the largest study to date of dermatoses in returned travellers did not reflect this, finding an equal sex ratio for both types.<sup>3</sup>

### Most common diagnoses

Looking at four of the most important studies of dermatoses in returned travellers in the literature it can be seen that a wide variety of problems are noted at sometimes inconsistent frequencies between the studies. These studies comprise the two aforementioned GeoSentinel Network analyses<sup>3,6</sup> and the two large case series from a French tropical medicine unit from the periods 1991–1993 and 2002–2003.<sup>2,10</sup> Reasons for these inconsistencies may include the different populations studied (including different types of destinations) and periods when studied (the earliest study period is 1991–1993 and the most recent is 1997–2006). However examining the results of these studies we can draw some conclusions as to the dermatoses that are generally most likely to present and derive what are likely to be the top ten diagnoses (Table 1). In deriving this most weight overall has been given to the frequencies found by GeoSentinel analysis of dermatological conditions of the ill returned traveller published in 2008<sup>3</sup> by virtue of it being the most recent and largest study. The first five

diagnoses listed in the table are those that are all consistently within the top eleven most frequently encountered in each study. The second five diagnoses appear frequently listed amongst the top fourteen diagnoses in the majority or all of the studies.

Note that of these top ten, only four are classical “tropical” infections or infestations (cutaneous larva migrans, myiasis, cutaneous leishmaniasis and tungiasis). The majority are potentially cosmopolitan and nontravel related dermatoses. Other significantly occurring diagnoses seen across the studies include swimmer’s itch (a 2.8% incidence in returned travellers with dermatoses),<sup>6</sup> rickettsial infections (Fig. 2), and rash with fever or dengue fever (Fig. 3). Rickettsial infections and dengue fever deserve special mention as the incidence in travellers of both is increasing.<sup>15,18,22</sup> More fine print diagnoses include filariasis, dermatitis, leprosy, herpes simplex and zoster, phytophotodermatitis, seabather’s eruption and *Mycobacterium marinum*. Notably absent are many of the classical tropical infections that are common in endemic populations and immigrants and may occasionally be seen in long-term travellers or expatriates. These include infection with multiple varieties of protozoan and helminthic parasites (such as onchocerciasis, cysticercosis, trypanosomiasis, cutaneous amoebiasis), bacteria (such as cutaneous tuberculosis, Buruli ulcer, yaws, syphilis, anthrax, diphtheria, plague, tularaemia, melioidosis), fungi (such as paracoccidioidomycosis and sporotrichosis) and viruses (such as viral haemorrhagic diseases). These will not be discussed in depth in this article as they are reviewed extensively in elsewhere in the literature.

## Cutaneous larva migrans

### Aetiology

Cutaneous larva migrans is caused by subcutaneous migration of nonhuman nematodes including hookworms (usually dog or cat *Ancylostoma* larvae, most commonly *Ancylostoma braziliense* and *caninum*) and *Gnathostoma* species.<sup>11</sup> The nematode penetrates intact skin and as the human is an accidental host the nematode is confined to the dermis where it migrates and eventually dies. The symptoms are due to a local allergic reaction. Note that some human nematodes such as *Strongyloides stercoralis* can cause a creeping eruption but this is not strictly considered to be cutaneous larva migrans.<sup>11</sup>

### Common source

Sand or sandy soil in tropical countries.

### Frequency

Cutaneous larva migrans is one of the most common dermatoses in returned travellers (the most common in several studies)<sup>2,3</sup> and considered to be the most common skin problem of tropical origin in travellers.<sup>1</sup> Rates range from 5% up to 25% of returned travellers with dermatoses.<sup>2,3,6,10</sup> An airport survey of exiting travellers to Brazil revealed an incidence of 0.8%.<sup>19</sup>

**Table 1** Top ten most common diagnoses in returned travellers with skin problems.

1. Cutaneous larva migrans
2. Soft tissue bacterial infection<sup>a</sup>
3. Arthropod bite<sup>b</sup>
4. Allergic reaction or urticaria
5. Myiasis
6. Superficial fungal infection
7. Injuries including animal bites
8. Scabies
9. Cutaneous leishmaniasis
10. Tungiasis

<sup>a</sup> Includes pyoderma, skin abscess, and cellulitis.

<sup>b</sup> Includes pruritis from, secondary dermatitis, and bacterial superinfection.

## Distribution

The causative organisms are found in the tropical and subtropical beach regions of Southeast Asia, Africa, South America, Southern USA and the Caribbean.<sup>11,23</sup> Cutaneous larva migrans is most commonly seen in returning travellers from the Caribbean region.<sup>3</sup> Most common countries visited include Barbados, Jamaica, Malaysia, Brazil and Thailand.<sup>3,23</sup>

## Risk factors

Behavioural risks include walking barefoot and sitting or lying on the beach or on sandy soil in endemic areas. Demographically it is associated with younger age groups (children and teenagers), although this may be more a reflection of behaviours than age per se.<sup>3</sup>

## Incubation/latency

Brief (hours to days) and rarely beyond one month.<sup>1,24</sup> The itch may start within hours and migration after four days.<sup>24</sup> In over half of travellers the lesions may appear after return.<sup>25</sup>

## Typical presentation

Pruritis, at times severe, is characteristic, occurring in virtually all.<sup>24</sup> The foot is most frequently affected, followed by the buttocks and thighs.<sup>25</sup> "Creeping eruption" is a serpiginous or linear elevated reddened cutaneous track that migrates a few millimetres to centimetres per day (Fig. 4). The track is approximately 3 mm wide and up to 20 mm long.<sup>11</sup> There may be associated vesiculation and oedema and sometimes there may be a follicular variant.<sup>11,23</sup> The average number of lesions is one to three.<sup>23</sup> Secondary bacterial infection sometimes occurs (in 8%) and occasional systemic spread has been reported with pulmonary involvement.<sup>23</sup>

## Diagnosis

Diagnosis is clinical, based on the appearance of the lesion and a compatible history. Biopsy of the lesion is not recommended. Cutaneous larva migrans is typically misdiagnosed in up to 58%.<sup>23</sup> Eosinophilia may be observed in 20–40%.<sup>8</sup>

## Treatment

The treatment of choice has now been established as either oral ivermectin 200 µg/kg as a stat dose, repeated once or twice if necessary (cure rates 94–100% in most series), or oral albendazole 400 mg as a single dose or 400–800 mg per day for three days.<sup>11,24</sup> A single dose of ivermectin is significantly more effective than a single dose of albendazole.<sup>24</sup> While thiabendazole is efficacious its side effects are poorly tolerated therefore it is not recommended.<sup>1</sup> Cryotherapy or surgery tend to be ineffective because the parasite is actually a couple of centimetres ahead of the track.<sup>24</sup> Topical thiabendazole or albendazole are alternatives in young children who cannot take oral treatment.<sup>25</sup>

## Prognosis

Spontaneous resolution occurs after several weeks (usually two to eight weeks).<sup>1</sup> Following oral ivermectin the median time to resolution of itch and of lesions was three and seven days respectively in one prospective study of 64 French travellers.<sup>24</sup>

## Prevention

Cutaneous larva migrans is prevented by wearing shoes and sitting on a towel or chair at the beach. Wet sand is preferable to dry sand as the parasites are more likely to have been swept away from these areas.<sup>23</sup>

## Myiasis

### Aetiology

Myiasis is the infestation of vertebrate tissue by a fly maggot of the order *Diptera*. The tissue may be living or necrotic.<sup>26</sup> Typically in Africa it is caused by *Cordylobia anthropophaga* and in Latin America by *Dermatobia hominis*.<sup>13</sup>

### Common source

In Latin America the human botfly lays its eggs on mosquitoes, flies or ticks which then deposit them when they bite a warm blooded animal.<sup>26</sup> The main host is livestock and humans are incidental hosts.<sup>13</sup> In Africa the tumbu fly lays its eggs directly on linen and clothing hung outside which are then transferred to skin when they come in contact with it.

### Distribution

Myiasis is most commonly seen in travellers returning from Belize, Bolivia and Costa Rica.<sup>3</sup> The Amazon Basin of Bolivia (the Madidi National Park at the confluence of the Tuichi and Beni rivers) is considered a hotspot.<sup>13</sup> The botfly (*D. hominis*) is distributed along streams and coastal forested or jungle areas in South and Central America. *C. anthropophaga* is endemic in sub-Saharan Africa.<sup>27</sup>

### Frequency

Myiasis accounts for 7–9.3%<sup>2,10</sup> of dermatoses in returning travellers from the tropics and 2.7–3.5%<sup>3,6</sup> of worldwide returning travellers. A study of Israeli travellers conservatively estimated the attack rate as 1 in 190 travellers to Bolivia<sup>13</sup> while an airport survey of exiting travellers to Brazil revealed an incidence of 3.2%.<sup>19</sup>

### Risk factors

Some studies have shown a possible association between female gender and *D. hominis* myiasis and male gender and *C. anthropophaga* myiasis,<sup>13</sup> but this has not been replicated in the more recent and larger GeoSentinel Network series.<sup>3</sup> In the New World exposing skin to mosquitoes is a risk factor, while in Africa the risk relates to using clothes



**Figure 2** Eschar of tick typhus on the posterior chest wall of a traveller to a game park in South Africa. Reproduced with the kind permission of the McGill University Centre for Tropical Diseases published at <http://www.medicine.mcgill.ca/tropmed/cantropmed/Default.htm>.

or bed linen that have been dried outdoors without ironing. Military personnel working in tropical jungle regions is reported to be at higher risk<sup>26</sup> and young adults tend to be most commonly afflicted.<sup>13</sup>

### Incubation/latency

For New World myiasis the incubation period is fifteen to forty-five days and the duration is six to twelve weeks.<sup>1</sup> For



**Figure 3** Macular rash due to dengue fever. Note the characteristic pattern of "white islands on a red sea". Reproduced with the kind permission of The Gorgas Course in Clinical Tropical Medicine from Gorgas Cases of the Week [www.gorgas.org](http://www.gorgas.org).



**Figure 4** Cutaneous larva migrans in a woman who returned from Barbados. Reproduced with the kind permission of the McGill University Centre for Tropical Diseases published at <http://www.medicine.mcgill.ca/tropmed/cantropmed/Default.htm>.

Old World myiasis the incubation period is seven to ten days and duration nine days.<sup>1</sup>

### Typical presentation

Both types of myiasis present as a painful swelling resembling a boil (Fig. 5) and are associated with a sensation of movement within the lesion. An opening may develop over the lesion from which the larval breathing tubes may protrude.<sup>27</sup> New World lesions tend to be found on exposed skin, such as the head and extremities.<sup>26,27</sup> For New World myiasis the typical number of lesions is one to three while for Old World myiasis multiple lesions are typical and they



**Figure 5** Myiasis due to *D. hominis*, acquired in Peru. A central breathing punctum is demonstrated. Reproduced with the kind permission of The Gorgas Course in Clinical Tropical Medicine from Gorgas Cases of the Week [www.gorgas.org](http://www.gorgas.org).



**Figure 6** Tungiasis on the foot of a woman who had spent several weeks in West Africa. The object in the insert is an extruded egg examined under a microscope. Reproduced with the kind permission of the McGill University Centre for Tropical Diseases published at <http://www.medicine.mcgill.ca/tropmed/cantropmed/Default.htm>.

are located on areas covered by clothing, particularly the trunk, buttocks and thighs.<sup>27</sup>

### Diagnosis

Diagnosis is by identifying the larva<sup>25</sup> and may be delayed if the physician is unfamiliar with myiasis. In a study of Israeli travellers the mean time to diagnosis was six weeks from exposure.<sup>13</sup>

### Treatment

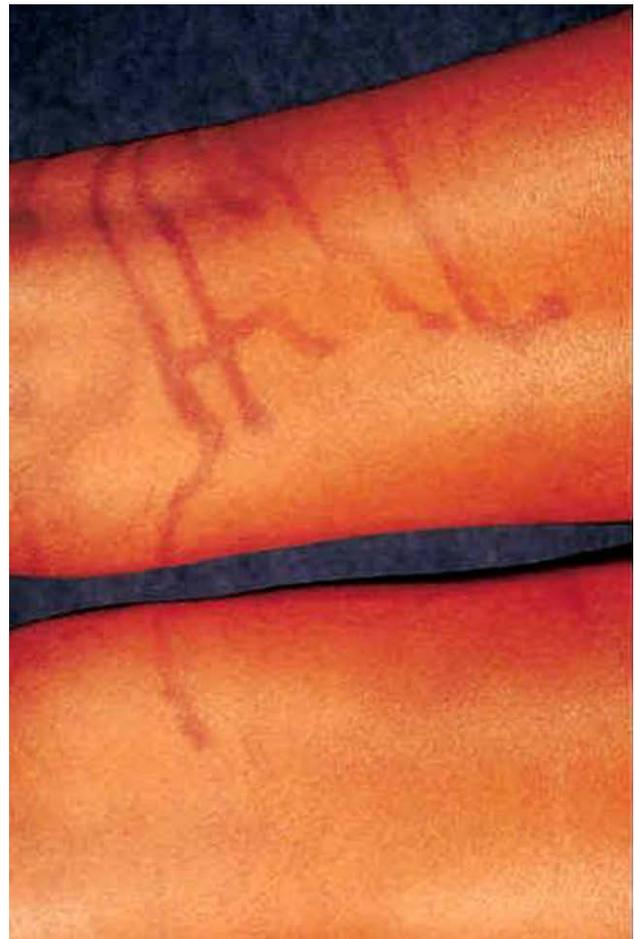
According to a number of reports occlusion of the tumbu fly larvae and first stage *D. hominis* larvae with various materials including petroleum and pork fat can lead to asphyxiation of



**Figure 7** Ulcer due to cutaneous leishmaniasis caused by *Leishmania braziliensis*. Reproduced with the kind permission of The Gorgas Course in Clinical Tropical Medicine from Gorgas Cases of the Week [www.gorgas.org](http://www.gorgas.org).



**Figure 8** Scabies. Reproduced with the kind permission of New Zealand Dermatological Society Incorporated from [www.dermnetnz.org](http://www.dermnetnz.org).



**Figure 9** Phytophotodermatitis on the legs of a girl who had holidayed in Mexico. She had been lying on the beach and lime juice from wedges in her drink had dripped on her legs. Reproduced with the kind permission of the McGill University Centre for Tropical Diseases published at <http://www.medicine.mcgill.ca/tropmed/cantropmed/Default.htm>.

the larva prompting it to protrude far enough out to facilitate its removal with forceps.<sup>27</sup> Alternatively squeezing the lateral aspects lesion may have a similar result.<sup>27</sup> However in the case of mature New World myiasis backward-projecting spines mean careful surgical extraction is more successful.<sup>27,28</sup> Care should be taken to remove the larvae intact to avoid an allergic or foreign body reaction to retained parts.<sup>1</sup> Standard surgical extraction is through a cruciate incision however an excisional biopsy has been recommended by some authors as a means of better avoiding incomplete removal of the larva.<sup>29</sup> Ivermectin has also been shown to be effective.<sup>25</sup> Secondary bacterial infection is uncommon because of bacteriostatic substances produced in the gut of the larva, but should be treated if present.<sup>28</sup> Ensure tetanus vaccination is up to date.

### Prognosis

Myiasis is self-limiting and usually benign unless the larva burrows into specialised tissue.

### Prevention

For New World myiasis use of mosquito repellents, mosquito nets and protective clothing is recommended. For Old World myiasis iron all clothes and linen that have been outside to kill larvae before use.

## Tungiasis

### Aetiology

Tungiasis is an infestation of the skin by *Tunga penetrans*, the sand flea, also known as the jigger flea.<sup>9,14</sup> The pregnant female penetrates the skin and then expels her eggs there during a two–three-week period.

### Common source

Sandy soils, rainforests and banana plantations.<sup>14</sup>

### Frequency

Tungiasis constitutes 4–6.3% of dermatoses in those returning from the tropics.<sup>2,10</sup> High prevalences are seen (up to 50%) in locals in endemic areas.<sup>14</sup>

### Distribution

The flea is found in tropical regions, particularly in urban slums, poor coastal villages and rural inland communities in the American Continent from Northern Argentina to Mexico, the Caribbean, sub-Saharan Africa and Asia up to west coast of India.<sup>14,25</sup>

### Risk factors

The principle behavioural risk factor is walking with bare feet or with open shoes on sandy soil in endemic regions.

Tungiasis has been associated with longer duration of travel (more than one month) and was more common in males in a review of returned travellers.<sup>14,19</sup>

### Incubation/latency

One to two weeks (range two days to three weeks) after the flea penetrates the skin.<sup>9,14</sup> In travellers half of the lesions are diagnosed during travel and half after travel.<sup>14</sup>

### Typical presentation

Tungiasis typically affects the feet especially the heels, between the toes or around the toe nails.<sup>14</sup> Studies of travellers show that a single lesion only is most common.<sup>14</sup> The characteristic lesion is a papule with central black crater which develops into an inflammatory nodule of 5–8 mm diameter (Fig. 6).<sup>30</sup> This is painful, itchy and associated with a foreign body sensation.<sup>14</sup> Travellers usually do not notice the initial penetration of the flea however. Symptoms most commonly appear during stage 3 (mature stage) of the natural history of tungiasis, which is between two and three weeks after penetration. In this stage visible extrusion of eggs and faeces may occur. Later the flea dies and involutes and the lesion is covered by a black crust.<sup>14</sup>

### Diagnosis

Diagnosis is clinical, based on the characteristic appearance and a compatible exposure history. Dermoscopy may be helpful.<sup>11</sup>

### Treatment

The treatment of choice is surgical extraction of the flea taking care to remove it whole, followed by topical antibiotics.<sup>14</sup> Treat any associated bacterial infection and ensure tetanus vaccination is up to date.

### Prognosis

The infestation is self-limiting, but bacterial superinfection may occur.<sup>14</sup>

### Prevention

Tungiasis is prevented by the use of repellents and wearing closed shoes, in combination with flea control in endemic areas. Early removal is recommended to prevent complications.

## Cutaneous leishmaniasis

### Aetiology

Cutaneous leishmaniasis is caused by an intracellular protozoan parasite *Leishmania*. Old World cutaneous leishmaniasis is mainly caused by *Leishmania major*, *Leishmania tropica* and *Leishmania aethiopsica*. New World leishmaniasis is caused by *L. viannia* and *L. mexicana*

subgenera, with four subspecies in the former and three subspecies in the latter.<sup>12</sup> The organism most commonly responsible for mucocutaneous leishmaniasis is *Leishmania (viannia) braziliensis*.<sup>12</sup>

### Common source

*Leishmania* infection is transmitted by the bite of the female sandfly, *Lutzomyia* in the New World and *Phlebotamus* in the Old World.

### Distribution

The vector is found in rural rainforests in New World and rural arid areas in the Old World. In the New World hot spots are Manu National Park in Peru, Madidi National Park in Bolivia, Costa Rica and Brazil.<sup>3,31,32</sup> In the Old World it is found in the Middle East, the Mediterranean coast and North Africa, particularly Algeria, Iran, Iraq, Afghanistan and Saudi Arabia.<sup>31</sup> In travellers it is most common following trips to Latin America, followed by Africa, Asia and least frequently Southern Europe.<sup>12</sup> Note that 90% of cutaneous leishmaniasis is seen in just five countries: Afghanistan, Iran, Saudi Arabia, Brazil and Peru, while 90% of mucocutaneous disease occurs in Brazil, Bolivia and Peru.<sup>33</sup>

### Frequency

A significant increase in the frequency of cutaneous leishmaniasis in travellers is being observed with a doubling of cases in Holland and a tripling in the UK over the past ten years.<sup>12</sup> It is one of ten most frequently occurring skin problems in travellers returning from tropics and comprises 3% of dermatoses in returned travellers.<sup>2,3,32</sup> The estimated incidence was 0.28% in Israeli travellers to Amazon Basin in Bolivia.<sup>12</sup>

### Risk factors

Cutaneous leishmaniasis has been associated with trips for tourism or research and education, and trips of a duration greater than two months.<sup>3</sup> Demographic risk factors include male gender (male to female ratio is approximately two to one) and young adults.<sup>3</sup> Military trips to the Middle East are an identified risk factor.

### Incubation/latency

The incubation period is variable and may range from a few days to a few months, but on average is nine weeks.<sup>1,34</sup> Cutaneous leishmaniasis more commonly appears after return than during travel.<sup>20</sup>

### Typical presentation

Initially a papule develops at the site of the sandfly bite. Classically it progresses to a nodule then ulcerates. The ulcer is painless with a raised well-defined border and a crusted or granulomatous base (Fig. 7). There may be associated lymphadenopathy.<sup>12</sup> The lesion occurs on

exposed skin (lower legs and face commonly).<sup>31</sup> Up to half of affected travellers have more than one lesion and the average number of lesions is between one and three (usually fewer than ten).<sup>1,31</sup> Travellers may present with a papule, nodule, ulcer or occasionally with a sporotrichoid pattern. Oro or nasopharyngeal mucosal involvement occurs rarely in travellers and only after infection with New World species particularly *L. (v) braziliensis*. Usually antibiotics have been prescribed with no response.<sup>1</sup>

### Diagnosis

A skin biopsy is taken from the edge of the ulcer (or other lesion) and can be used for an impression smear, histopathology, culture and PCR. Dermal scrapings or lesion aspirates may also be used. PCR is now considered the investigation of choice as other methods are less sensitive.<sup>12</sup>

### Treatment

While many lesions will spontaneously heal all those acquired in the New World should be treated because of the risk of progression to mucocutaneous leishmaniasis. Treatment reduces the chance of this progression and also accelerates the healing process and reduces scarring.<sup>20</sup> Many compounds have been trialed with varying degrees of success but pentavalent antimony remains the mainstay of treatment. Amphotericin B is indicated for the mucocutaneous variant.

### Prognosis

Skin lesions tend to heal spontaneously over time; however infection with *L. (v) braziliensis* carries a 3% risk of later progression to mucocutaneous disease.

### Prevention

Cutaneous leishmaniasis can be prevented by avoidance of sandfly bites through the use of protective clothing, bed nets and repellents.

### Injuries including dog bite

I will focus here on cutaneous injuries from mammals resulting in potential rabies exposure.

### Aetiology

Rabies, a lyssavirus which causes a fatal encephalomyelitis.

### Common source

Mammalian saliva, most commonly from dogs, bats and cats.

### Frequency

The reported frequency of bites is not insignificant. Various estimates of risk include up to a 2% risk of a bite from a potentially rabid animal for travellers to the developing

world or a 0.2–0.4% risk of exposure per month of travel.<sup>35–37</sup> Animal bites have been recorded as accounting for 4.3–4.7% of all dermatological diagnoses in travellers.<sup>3,6</sup>

### Distribution

Rabies is found in more than one hundred countries (mainly developing) and all continents except for Antarctica. Hot spots for returned travellers with dog bites are China, Vietnam and Thailand which are all considered high risk regions as the majority of deaths in indigenous populations from rabies occur in Asia.<sup>3</sup>

### Risk factors

Those at most risk are animal handlers, veterinarians, cavers, children (four times increased relative risk), long-term travellers and travellers with extensive outdoor exposure, for example biking, hiking, camping, VFR travellers.<sup>3,38</sup>

### Incubation/latency

The recognition of potential exposure to rabies may be delayed in children whose parents are not immediately aware of a bite or scratch, or in adults with inadequate knowledge of rabies. These travellers may present at variable intervals post-exposure. The incubation period of rabies ranges from several weeks to months (occasionally years).

### Typical presentation

A traveller will present with a wound secondary to a scratch or bite and may or may not have knowledge or concerns about rabies. Correct post-exposure management often has not been initiated in the country of exposure due to poor availability of vaccine or rabies immunoglobulin and lack of medical expertise.<sup>39</sup>

### Diagnosis

Diagnosis of a wound with potential rabies risk is clinical and depends on a history of exposure by a mammal in a rabies endemic region. The animal is considered to potentially be harbouring rabies unless it is known to be properly vaccinated or can be killed and tested for rabies (usually impractical). Higher risk wounds are those that penetrate the dermis or mucosa and are in regions with a high density of nerve endings such as the hand.

### Treatment

As established rabies treatment is essentially palliative, management of rabies focuses on its prevention through a combination of pre- and post-exposure prophylaxis.

### Prognosis

Correctly given post-exposure prophylaxis is considered virtually 100% effective at preventing rabies. Established rabies however is virtually 100% fatal.

### Prevention

Behavioural prevention involves avoidance of contact with animals in rabies endemic regions. Pre-exposure prophylaxis consists of a primary three dose course of modern cell culture rabies vaccines administered at day 0, 7, and 21 or 28. Post-exposure prophylaxis in the case of a traveller who has had correct pre-exposure vaccination entails booster vaccinations at days 0 and 3. For those who have not been pre-vaccinated rabies immunoglobulin is infiltrated into the wound if a World Health Organization Category 3 exposure has occurred and a five-dose course of vaccine is given at days 0, 3, 7, 14 and 28. Vigorous cleaning of the wound and application of alcohol or iodine is recommended to flush out or kill virus present in the wound.

### Arthropod bites

#### Aetiology

Bites or stings from arthropods result in a local skin lesion due to allergic reaction or toxin release. Arthropods are a diverse group of animals belonging to the Phylum *Arthropoda* and are characterised by jointed limbs and cuticles. They include insects, arachnids, crustaceans, mites, ticks and centipedes and others.

#### Common source

Different arthropods may be associated with different sources. For example the *Aedes aegypti* mosquito is associated with water in used tyres and the rickettsia carrying tick (*Amblyomma*) is associated with livestock.

#### Distribution

The distribution is variable depending on the arthropod. In general it is worldwide, although some arthropods are restricted to certain geographic areas, for example mosquitoes are generally restricted to tropical regions and altitudes below 2500 m.

#### Frequency

Arthropod bites are very common. They account for 10% of dermatoses in returned travellers from tropics and 15–18.7% of dermatoses in worldwide returned travellers.<sup>2,3</sup>

#### Risk factors

Risk factors include pregnancy and female gender and not using repellents, protective clothing or mosquito nets.<sup>3</sup>

#### Incubation/latency

Allergic reactions may occur in minutes to hours after the exposure, whereas secondary bacterial infection may present days later.

## Typical presentation

The most common presentation is pruritic papules, as seen commonly after sandfly, flea and mosquito bites. Flea bites commonly occur in linear clusters of three. Sometimes vesicular lesions may occur. Some arthropods bites cause an eschar or ulcer, for example ticks and spiders. A foreign body reaction may occur if parts of the arthropod are retained and bacterial superinfection can occur, especially following scratching. Some arthropods may be vectors for particular infections which the traveller may present with such as dengue fever and rickettsial infection which have various systemic features associated with them.

## Diagnosis

The diagnosis is clinical. It may be supported by serological tests of the infection that the arthropod is a suspected vector for, for example rickettsial infections.

## Treatment

Treatment is symptomatic with antihistamines and steroids as required for pruritis, analgesics as required for painful lesions and antimicrobials for bacterial superinfection. Specific treatments for any associated disease that the arthropod was a vector for may be indicated, such as doxycycline for rickettsial infections.

## Prognosis

Pruritis is generally self-limiting. Complications include scarring and secondary bacterial infection which can lead to post-streptococcal glomerulonephritis. Some arthropods such as the brown recluse spider may cause more extensive tissue damage.

## Prevention

Preventative measures include staying indoors, wearing protective clothing, permethrin, repellent use, mosquito nets, knock down sprays and air conditioning.

## Bacterial skin or soft tissue infection

### Aetiology

Such infections are usually caused by *Staphylococcus aureus* (including methicillin-resistant *S. aureus* and Panton–Valentine leukocidin toxin associated *S. aureus*) and *Streptococcus pyogenes*. Climatic factors such as heat and humidity may make infection with these organisms more common under tropical conditions.<sup>32</sup>

There is evidence that travellers are at increased risk of PVL-associated *S. aureus* infections which are correlated with more severe tissue destruction.<sup>11,32</sup> Hypothesized reasons for PVL-associated infections in travellers include use of doxycycline which may select for it and conditions of reduced hygiene.<sup>11</sup>

## Common source

These organisms may colonise the skin and nasal mucosa of a large proportion of the population and cause infection via a breach in the skin. This may result from an arthropod bite, dermatitis or trauma. Infection is secondary to an insect bite or sting in a significant proportion of cases (28.6% in one study and 63% in another).<sup>2,10</sup>

## Frequency

The true incidence of bacterial skin infections in travellers is unknown.<sup>32</sup> They account for 16% of dermatoses in returned travellers (including pyodermas and infected insect bites) and are the most common cause of dermatoses in the Geo-Sentinel Network analysis.<sup>3</sup> Skin abscesses accounted for 9.7% of dermatoses (fourth most common cause) in returned travellers in another study, in which infected insect bites also accounted for a significant but unreported percentage.<sup>6</sup> Bacterial infections made up between 17.8% and 21% of dermatoses in two studies of returned travellers from the tropics and were the first or second most common cause of dermatoses in these studies.<sup>2,10</sup> They were also a leading cause of dermatoses during travel in several studies, for example in Nepal and Burkina Faso.<sup>40,41</sup>

Pyodermas were the second most common type of skin lesion in a study of Hajj pilgrims.<sup>16</sup> Ecthyma is the most common cause of skin ulcers in returned travellers.<sup>42</sup>

## Distribution

Bacterial skin infections are more common in those returning from sub-Saharan Africa or Southeast Asia.<sup>6</sup> Hot spots identified by the GeoSentinel Network include Madagascar, Kenya, Philippines, Sri Lanka, South Africa and Thailand.<sup>3</sup>

## Risk factors

Risk factors include arthropod bite, dermatitis, skin trauma and underlying immunocompromise such as diabetes. Older age is associated with cellulitis in returned travellers.<sup>3</sup>

## Incubation/latency

These infections appearing whilst still travelling in a significant proportion (71% in one study) and a few days after returning in the most of the rest.<sup>2</sup>

## Typical presentation

The spectrum of skin lesions includes erysipelas, furunculosis, skin abscess, folliculitis, cellulitis, impetigo and ecthyma.<sup>16</sup>

## Diagnosis

Diagnosis is usually clinical. Swabs of open lesions can be taken for culture and sensitivity to guide antimicrobial use and are useful for the diagnosis of MRSA or Panton–Valentine leukocidin strains of *S. aureus*.

## Treatment

Treatment is with standard beta lactam antibiotics, orally or occasionally intravenously if indicated, along with incision and drainage in the case of abscesses. Empirical antibiotics should cover beta lactamase producing strains of *S. aureus* and *S. pyogenes*. If a swab result is available then this should be used to guide antimicrobial use. Consider MRSA if there is a poor response to standard antibiotics. Clindamycin or vancomycin is used for MRSA.

## Prognosis

Recovery is generally good with appropriate antimicrobials. However bacterial skin infection is the most common reason for hospitalisation of returned travellers with dermatoses.<sup>2</sup>

## Prevention

Bacterial skin infection is prevented by the use of repellents, nets and protective clothing to avoid arthropod bites, along with avoidance of injuries causing breaches to the skin. Topical antibiotic treatment of early lesions may prevent progression.<sup>3</sup> Good personal hygiene should be encouraged. Travellers should consider carrying oral antibiotics for self-treatment and seek prompt help if they develop systemic symptoms or experience a poor response to these.<sup>10</sup>

## Allergic reaction

### Aetiology

The aetiology of allergic reactions is exposure to any of a very broad number of allergens.

### Common sources

These may include bites and stings, animals, drugs, foods and plants.

### Distribution

Worldwide.

### Frequency

Allergic reactions are common, accounting for between 5.5% and 11.3% of dermatoses in returned worldwide travellers.<sup>3,6</sup> Drug related rash accounted for 0.9% of dermatoses in returned travellers in the GeoSentinel Network analysis.<sup>3</sup> A study of travellers to Africa published in 2003 showed the incidence of moderate to severe adverse skin reactions to antimalarials was 8% for chloroquine–proguanil, 3% for doxycycline, 2% for malarone 2% and 1% for mefloquine.<sup>43</sup>

### Risk factors

Risk factors include underlying atopy, contact with a known allergen and female gender.<sup>3</sup>

## Incubation/latency

Following exposure, the onset of symptoms ranges from seconds to minutes in immediate type one hypersensitivity, to days in delayed onset hypersensitivity reactions.

## Typical presentation

Allergic reactions are characterised by a pruritic urticarial rash, sometimes accompanied by systemic symptoms such as faintness, vomiting, rhinorrhoea, wheeze and cardiovascular collapse.

## Diagnosis

The diagnosis is usually clinical. Skin testing, measurement of antibodies, antigen challenge and serum tryptase can help support the diagnosis.

## Treatment

Removal or avoidance of the antigen is essential where possible. Topical antihistamines and topical steroids are indicated for mild rashes and oral or parenteral antihistamines and steroids for more severe reactions. Adrenaline is used for anaphylaxis. Travellers with known anaphylaxis should carry an Epi-pen and wear a medic alert bracelet.

## Prognosis

Localised allergic reactions are usually self-limiting over days to weeks. Anaphylaxis can be fatal if not treated promptly.

## Prevention

Allergic reactions can be minimised by avoidance of known allergens and of insect bites by use of repellents and protective clothing and mosquito nets.

## Scabies

### Aetiology

*Sarcoptes scabiei*, an ectoparasitic arthropod that burrows into the skin.

### Common source

Scabies is transmitted by skin-to-skin contact and possibly by clothing or bed sheets in cases of heavy infestation.<sup>44</sup>

### Distribution

Scabies is endemic in tropical and subtropical regions, but also occurs sporadically in industrialized countries.<sup>44</sup> Countries most frequently visited identified in the

**Table 2** Differential diagnosis of ulcers in returning travellers.

Frequency <sup>a</sup>	Diagnosis	Travel and traveller factors <sup>b</sup>	Skin problem characteristics <sup>c</sup>
<i>Most common</i>	Pyoderma	Worldwide, especially tropics, SE Asia, sub-Saharan Africa; tourism, VFR <sup>d</sup> ; breach to skin integrity	<i>Painful</i> . Shallow ulcers with crust; lower limbs
<i>Common</i>	Cutaneous leishmaniasis <sup>e</sup>	Latin America > <sup>f</sup> Africa > Asia > Southern Europe, rural, jungle; longer trips, military, research; preponderance in young males; sandfly bite	<i>Painless</i> . Well defined rolled up edges; initial papule, then nodule then ulcerates; exposed skin
	Rickettsial infection <sup>g</sup>	ATBF <sup>h</sup> : Southern African safari, game ticks. Mediterranean fever: Africa, Asia, Middle East, Europe, dog ticks. Scrub typhus: Asia, north Australia, scrub vegetation, rat mites	<i>Painless</i> . Inoculation eschar, 1 or more; exposed skin; systemic features; possible generalised rash: maculopapular, vesicular or petechial
<i>Less common</i>	Herpes simplex	Worldwide; mucosal contact, sun, stress	<i>Painful</i> . Initial vesicle breaks down into ulcer in orolabial region
	Loxosceles spider bite	Americas, domestic setting urban or rural; bites more common night or morning and summer	<i>Painful</i> . Necrotic arachnidism, "red, white and blue" sign, sometimes viscerocutaneous loxoscelism; exposed skin
	Atypical mycobacterium	<i>M. marinum</i> : worldwide; skin injury in aquatic environment. <i>M. ulcerans</i> (Buruli ulcer): tropics, especially Africa, swamps and rivers	Buruli ulcer: <i>painless</i> , undermined edges, extensive; limbs. <i>M. marinum</i> : <i>painful</i> , nodule that ulcerates, extremities
<i>Rare</i>	Anthrax, cutaneous amoebiasis, diphtheria, leprosy, subcutaneous mycoses, tropical ulcer, yaws	Mostly seen in immigrants or long-term travellers to developing and tropical regions; variable presentations	

<sup>a</sup> Relative frequency that *this* diagnosis is seen in *this* type of skin lesion in a returning traveller.  
<sup>b</sup> Includes typical geographical destination, type and duration of travel, exposures and activities, type of traveller, traveller demographic features, relevant medical history or medications.  
<sup>c</sup> Typical clinical features of the skin lesion, including nature, distribution, associated pain or pruritis and associated systemic features.  
<sup>d</sup> Visiting friends or relatives.  
<sup>e</sup> See Fig. 6.  
<sup>f</sup> More than.  
<sup>g</sup> See Fig. 2.  
<sup>h</sup> African tick bite fever.

GeoSentinel Network study were Guyana, Costa Rica and Brazil.<sup>3</sup>

### Frequency

Scabies is the most common cause of diffuse pruritis in those returning from tropics.<sup>6,10</sup> It accounts for 1.5–10% of dermatoses in returned travellers.<sup>2,3,10</sup>

### Risk factors

Scabies is associated with travel in overcrowded impoverished regions and sexual or skin-to-skin contact. Although globally scabies is traditionally more common in young children this has not been reflected in studies of returning travellers.<sup>3</sup> Outbreaks are known to occur in institutions. Immunosuppressed travellers are at risk of crusted or Norwegian scabies.

### Incubation/latency

It usually takes four to six weeks for itch to develop.<sup>45</sup> Scabies is transmissible before it becomes symptomatic.

### Typical presentation

Scabies is characterised by generalised pruritis that is typically worse nocturnally. The classic sign is the mite burrow, which is a 5-mm serpiginous grey lesion. The characteristic distribution of burrows is the finger webs, flexor aspects of wrists, extensor aspects of elbows, periumbilical region, ankles, axillae, breasts in females and genitalia in males. The face and scalp are usually spared in temperature zones, but may be involved in travellers who have visited the tropics. The burrows are often not detectable, but small papules are generally evident and may occur anywhere on the body (Fig. 8).<sup>44</sup>

**Table 3** Differential diagnosis of pruritic lesions in returning travellers.

Frequency <sup>a</sup>	Diagnosis	Travel and traveller factors <sup>b</sup>	Skin problem characteristics <sup>c</sup>
<i>Most common</i>	Arthropod bite	Worldwide; slight female preponderance; lack of repellents, protective clothing, nets	<i>Localised pruritis</i> . Red papules, vesicles or urticaria; bites in clusters (often 3s) or lines
	Cutaneous larva migrans <sup>d</sup>	Tropics, especially Caribbean; beach holidays; walking barefoot or sitting on sandy soil; preponderance in children and teenagers	<i>Localised pruritis</i> . Migratory serpiginous tract; feet > <sup>e</sup> buttocks > trunk
	Allergic reaction	Worldwide; female preponderance; underlying atopy; exposure to medications, foods, animals, plants, arthropods	<i>Diffuse pruritis</i> . Urticarial; sometimes systemic features
	Fungal skin infection	Worldwide, especially the tropics; exposure to animals, sweat, heat, moisture, communal bathrooms	<i>Localised pruritis</i> . Erythematous plaques or scales, annular lesions, pigment change; body folds
	Scabies <sup>f</sup>	Worldwide, especially tropics; poor crowded conditions; backpackers, aid workers; skin to skin contact, sexual contact	<i>Diffuse pruritis</i> (worse at night); burrows in web spaces, wrists, elbows, axillae, genitalia; generalised papular rash
	Dermatitis	Worldwide, especially in tropics; Hajj pilgrims; pre-existing dermatitis, underlying atopy, contact with irritant	<i>Localised pruritis</i> . Erythema, vesiculation, oozing, scales, crusts; variable distribution
<i>Common</i>	Swimmer's itch (cercarial dermatitis)	Worldwide for nonhuman schistosomes; Africa, Middle East, Asia, South America for human ones; immersion in fresh water	<i>Localised pruritis</i> . Red papules, sometimes vesicular or urticarial; exposed skin
	Seabather's eruption	Tropical and subtropical coastal destinations, especially USA, Caribbean, Latin America, Papua New Guinea, Singapore and Philippines; swimming and surfing trips; summer	<i>Localised pruritis</i> . Macules, papules, urticaria or vesicles; skin covered by bathing costume
<i>Less common</i>	Phytophotodermatitis <sup>g</sup>	Worldwide; beach holidays; skin exposure to furocoumarin containing compound e.g. citrus juice, then sun	<i>Localised pruritis</i> (mild). Painful burning erythema then vesicles, then painless, hyperpigmented streaky lesions; do not migrate
	Varicella	Worldwide; typically childhood disease; contact with infected person	<i>Diffuse pruritis</i> . Papules then vesicles, then crusts; associated systemic features; adults more severe
	Ciguatera poisoning	Worldwide, especially Pacific, Caribbean, Indian Ocean; ingestion of fish carrying ciguatoxin (barracuda, mackerel, snapper, tuna)	<i>Diffuse pruritis</i> . Associated gastrointestinal and neurological symptoms (e.g. hot/cold temperature reversal); symptoms worsen following alcohol
<i>Rare</i>	Invasive phase of parasitic diseases	Mostly seen in immigrants or long-term travellers to developing and tropical regions; may be eosinophilia	

<sup>a</sup> Relative frequency that *this* diagnosis is seen in *this* type of skin lesion in a returning traveller.

<sup>b</sup> Includes typical geographical destination, type and duration of travel, exposures and activities, type of traveller, traveller demographic features, relevant medical history or medications.

<sup>c</sup> Typical clinical features of the skin lesion, including nature, distribution, associated pain or pruritis and associated systemic features.

<sup>d</sup> Cutaneous larva migrans.

<sup>e</sup> More than.

<sup>f</sup> See Fig. 8.

<sup>g</sup> See Fig. 9.

**Table 4** Differential diagnosis of papules in returning travellers.

Frequency <sup>a</sup>	Diagnosis	Travel and traveller factors <sup>b</sup>	Skin problem characteristics <sup>c</sup>
<i>Most common</i>	Arthropod bites	Worldwide; slight female preponderance; lack of repellents, protective clothing, nets	Pruritic red papules, vesicles or urticaria; bites in clusters (often 3s) or lines
	Pyoderma	Worldwide, especially tropics, SE Asia, sub-Saharan Africa; tourism, VFR <sup>d</sup> , diabetic; breach to skin integrity	Painful, erythematous; often lower limbs
<i>Common</i>	Scabies <sup>e</sup>	Worldwide, especially tropics; poor crowded conditions; backpackers, aid workers; skin to skin contact, sexual contact	Diffuse pruritis, worse at night; burrows in web spaces, wrists, elbows, axillae, genitalia; generalised papular rash
	Fungal skin infections	Worldwide, especially the tropics; exposure to animals, sweat, heat, moisture, communal bathrooms	Localised pruritis; may also be plaques or scales, annular lesions, pigment change; body folds
	Allergic reactions	Worldwide; female preponderance; underlying atopy; exposure to medications, foods, animals, plants, arthropods	May be pruritis and urticaria; sometimes systemic features
	Myiasis <sup>f</sup>	Latin America (botfly) and sub-Saharan Africa (tumbu fly); mosquito bites in New World; drying linen outside in Old World	Painful; boil like; central port with spicules may be seen; crawling sensation; ooze; exposed regions for botfly; covered regions for tumbu fly
	Tungiasis <sup>g</sup>	Latin America, Caribbean, Africa, Asia up to west coast of India; longer trips; male preponderance	Papule with central black dot which develops into a nodule; feet
	Dermatitis	Worldwide, especially in tropics; Hajj pilgrims; pre-existing dermatitis, underlying atopy, contact with irritant	May be pruritic with erythema, vesiculation, oozing, scales, crusts; variable distribution
	Malaria rubra	Tropics; unacclimatised travellers; sweat	Small pruritic papules on an erythematous base; sparing of hair follicles; covered areas
	Swimmer's itch	Worldwide for nonhuman schistosomes; Africa, Middle East, Asia, South America for human ones; immersion in fresh water	Localised pruritis; red papules, sometimes vesicular or urticarial; exposed skin
<i>Rare</i>	Gnathostomiasis, onchocerciasis, sporotrichosis	Mostly seen in immigrants or long-term travellers to developing and tropical regions	

<sup>a</sup> Relative frequency that *this* diagnosis is seen in *this* type of skin lesion in a returning traveller.

<sup>b</sup> Includes typical geographical destination, type and duration of travel, exposures and activities, type of traveller, traveller demographic features, relevant medical history or medications.

<sup>c</sup> Typical clinical features of the skin lesion, including nature, distribution, associated pain or pruritis and associated systemic features.

<sup>d</sup> Visiting friends or relatives.

<sup>e</sup> See Fig. 8.

<sup>f</sup> See Fig. 5.

<sup>g</sup> See Fig. 6.

These are due to an allergic reaction to mite saliva and faeces. The more severe crusted scabies can occur in immunocompromised individuals and presents as a less pruritic generalised scaly rash.

## Diagnosis

Diagnosis can be problematic as microscopy of skin scrapings has a sensitivity of only about 50% and the mite burrows are often difficult to see.<sup>44</sup> A presumptive diagnosis can be based on diffuse itching and lesions in typical

locations, especially if there is a history of contact with another scabies case.

## Treatment

A recent Cochrane review showed topical permethrin to be the most effective treatment.<sup>46</sup> Oral ivermectin is also to effective and a good option for those who cannot tolerate topical treatment. To prevent secondary spread and reinfestation all sexual and household contacts should also be treated and clothes

**Table 5** Differential diagnosis of nodules and subcutaneous swellings in returning travellers.

Frequency <sup>a</sup>	Diagnosis	Travel and traveller factors <sup>b</sup>	Skin problem characteristics <sup>c</sup>
<i>Most common</i>	Boils/furuncles	Worldwide, especially tropics, SE Asia, sub-Saharan Africa; tourism, VFR <sup>d</sup> , diabetic; breach to skin integrity	<i>Painful nonmigratory</i> swelling. Red, warm; may exude pus; hair bearing areas e.g. buttock, neck, axillae; may be fever and systemic symptoms
<i>Common</i>	Myiasis <sup>e</sup>	Latin America (botfly) and sub-Saharan Africa (tumbu fly); mosquito bites in New World; drying linen outside in Old World	<i>Painful nonmigratory</i> swelling. Boil like; central port with spicules may be seen; crawling sensation; ooze; exposed regions for botfly; covered regions for tumbu fly
	Tungiasis <sup>f</sup>	Latin America, Caribbean, Africa, Asia up to west coast of India, longer trips; male preponderance	<i>Painful nonmigratory</i> swelling. Papule with central black dot which develops into a nodule; feet
<i>Less common</i>	<i>Mycobacterium marinum</i>	Worldwide; skin injury in aquatic environment	<i>Painful nonmigratory</i> nodule that ulcerates; extremities
<i>Rare</i>	Loa loa, gnathostomiasis	Rural West Africa (loa loa), Asia, Latin America (gnathostomiasis)	<i>Painless migratory</i> swellings
	Cysticercosis, onchocerciasis	Tropics (cysticercosis); rural Africa, Latin America (onchocerciasis)	<i>Painless nonmigratory</i> swellings

<sup>a</sup> Relative frequency that *this* diagnosis is seen in *this* type of skin lesion in a returning traveller.

<sup>b</sup> Includes typical geographical destination, type and duration of travel, exposures and activities, type of traveller, traveller demographic features, relevant medical history or medications.

<sup>c</sup> Typical clinical features of the skin lesion, including nature, distribution, associated pain or pruritis and associated systemic features.

<sup>d</sup> Visiting friends or relatives.

<sup>e</sup> See Fig. 5.

<sup>f</sup> See Fig. 6.

and bed linen laundered. Treat any associated bacterial superinfection.

### Prognosis

Treatment kills the mites, but itch may continue for several weeks due to persisting mite products at the skin surface. Secondary bacterial infection may occur.

### Prevention

Primary prevention is by avoiding skin-to-skin contact with those infested and general hygiene measures.

## Superficial fungal skin infection

### Aetiology

Dermaphytosis is caused by fungi of three main genera: *Trichophyton*, *Microsporum*, and *Epidermophyton*.<sup>47</sup> These may cause tinea corporis, tinea cruris, tinea axillae, tinea pedis and tinea capitis. Other organisms that can cause superficial skin infection include *Candida* (intertrigo) and *Malassezia furfur* (pityriasis versicolor).<sup>47</sup>

### Common source

Humans, animals or soil.<sup>47</sup>

### Distribution

Worldwide, but more common in the tropics.

### Frequency

In a study of Hajj pilgrims fungal infections made up 4.3% of dermatoses.<sup>16</sup> In studies of returned travellers they comprise 1.9–6% of dermatoses.<sup>2,3,6,10</sup>

The most common forms, especially in those travelling to the tropics are probably tinea corporis and tinea capitis in children (ringworm), tinea pedis, intertrigo and pityriasis versicolor.<sup>1,47</sup> Pityriasis versicolor is the most common cause of hyperpigmented and hypopigmented lesions in returning travellers.<sup>30</sup> As travellers may not always present for medical care as a result of fungal infections the true frequency may be higher than is reported. Note that subcutaneous and systemic fungal infections are rare in travellers (for example mycetomas, sporotrichosis and paracoccidioidomycosis).

### Risk factors

Major risk factors are heat and moisture. Excessive sweating and friction especially in skin folds promote fungal growth.<sup>1</sup> Other risk factors are contact with animals, contact with other infected people, communal baths, sports or activities that cause skin tears. In the GeoSentinel

**Table 6** Differential diagnosis of vesicles and bullae in returning travellers.

Frequency <sup>a</sup>	Diagnosis	Travel and traveller factors <sup>b</sup>	Skin problem characteristics <sup>c</sup>
<i>Most common</i>	Sunburn	Tropical; sunny destinations; beach holidays, Caucasians, exposed skin, lack sunscreen use	<i>Painful, nonmigratory.</i> Red with blisters; may exfoliate
	Arthropod bites	Worldwide; slight female preponderance; lack of repellents, protective clothing, nets	<i>Nonmigratory.</i> Localised pruritis with red papules, wheals or vesicles; bites in clusters (often 3s) or lines
	Dermatitis	Worldwide, especially in tropics; Hajj pilgrims; pre-existing dermatitis, underlying atopy; contact with irritant	<i>Nonmigratory.</i> May be pruritic with erythema, vesiculation, oozing, scales, crusts; variable distribution; often at site of irritant contact
	Cutaneous larva migrans <sup>e</sup>	Tropics, especially Caribbean; beach holidays; walking barefoot or sitting on sandy soil; preponderance in children and teenagers	<i>Migratory</i> serpiginous tract; localised pruritis; feet > <sup>d</sup> buttocks > trunk
	Bullous impetigo	Worldwide, especially tropics; poor personal hygiene; contact with infected person	<i>Nonmigratory.</i> Rapid onset blisters, enlarge then rupture. Generally no pain or itch
<i>Less common</i>	Herpes simplex	Worldwide; mucosal contact, sun, stress	<i>Painful, nonmigratory.</i> Initial vesicle breaks down into ulcer; orolabial region
	Herpes zoster	Worldwide; immunosuppressed; elderly	<i>Painful, nonmigratory.</i> Prodromal pain, parasthesiae then vesicles on erythematous base; unilateral dermatomal
	Phytophotodermatitis <sup>f</sup>	Worldwide; beach holidays; skin exposure to furocoumarin containing compound e.g. citrus juice, then sun	<i>Nonmigratory. Painful</i> burning erythema, then vesicles, then <i>painless</i> hyperpigmentation. Mild pruritis. Streaky lesions on skin exposed to furocoumarins and sun
	Blister beetle dermatitis	Wide distribution, especially South America; rural; cantharidin or pederin toxin released when beetle crushed on skin	<i>Painful, nonmigratory.</i> Vesicular dermatitis in a linear array; exposed skin

<sup>a</sup> Relative frequency that *this* diagnosis is seen in *this* type of skin lesion in a returning traveller.  
<sup>b</sup> Includes typical geographical destination, type and duration of travel, exposures and activities, type of traveller, traveller demographic features, relevant medical history or medications.  
<sup>c</sup> Typical clinical features of the skin lesion, including nature, distribution, associated pain or pruritis and associated systemic features.  
<sup>d</sup> More than.  
<sup>e</sup> See Fig. 4.  
<sup>f</sup> See Fig. 9.

Network study there was a significant association with travel for tourism and missionary or volunteer work.<sup>3</sup>

### Incubation/latency

Approximately two weeks.

### Typical presentation

The presentation depends of the type of fungal infection. A cardinal feature is pruritis. Hair loss may occur in the affected region and erythematous plaques and scales are often seen. Annular lesions are common in tinea corporis. Moist areas such as body folds are commonly affected. Pityriasis versicolor usually affects the upper body (arms,

trunk and neck) and is characterised by skin patches of varying colour that are well demarcated and usually round or oval.<sup>1</sup> The patches are usually flat and may be scaly.<sup>1</sup> Hyper- or hypopigmentation is common.<sup>30</sup> Nail and hair infections may also be seen.

### Diagnosis

Diagnosis is clinical or by skin scrapings for microscopy and fungal culture.

### Treatment

Treatment is with a topical or oral (if more extensive infection) antifungal agent, for example terbinafine.

**Table 7** Differential diagnosis of pigment change in returning travellers.

Frequency <sup>a</sup>	Diagnosis	Travel and traveller factors <sup>b</sup>	Skin problem characteristics <sup>c</sup>
<i>Most common</i>	Pityriasis versicolor	Worldwide, especially tropics; hot and humid climates; sweat	Usually asymptomatic well defined flaky brown, white or pink patches; trunk, neck, arms
<i>Common</i>	Post-inflammatory	Worldwide; following skin trauma or infection	Hyperpigmentation at site of trauma or infection
	Phytophotodermatitis <sup>d</sup>	Worldwide; beach holidays; skin exposure to furocoumarin containing compound, e.g. citrus juice, then sun	Painful burning erythema, then vesicles, then hyperpigmentation; mild puritis; streaky lesions on skin exposed to furocoumarins and sun
<i>Rare</i>	Other fungal skin infections e.g. tinea nigra	Tropical regions; skin trauma and contact with soil	Hyperpigmentation of palms or soles
	Leprosy	Mostly seen in immigrants or long-term travellers to developing and tropical regions. Africa, Indian subcontinent, Latin America	Hypo or hyperpigmentation; decreased sensation and sweating; peripheral nerve thickening
	Pinta	Latin America, rural; skin contact	Papule, then plaque, then pigmented; lower limbs
	Vitiligo	Worldwide; young adults	Hypopigmented patches; head, hands, feet

<sup>a</sup> Relative frequency that *this* diagnosis is seen in *this* type of skin lesion in a returning traveller.

<sup>b</sup> Includes typical geographical destination, type and duration of travel, exposures and activities, type of traveller, traveller demographic features, relevant medical history or medications.

<sup>c</sup> Typical clinical features of the skin lesion, including nature, distribution, associated pain or pruritis and associated systemic features.

<sup>d</sup> See Fig. 9.

## Prognosis

Prognosis is good with appropriate antifungal treatment.

## Prevention

Preventative measures include maintenance of good hygiene, minimization of sweating and avoiding communal showers and baths.

## Suggested clinical approach

In the returned traveller presenting with a skin problem, as with any patient presenting for a post-travel consultation, a thorough history combined with a targeted examination and investigations is essential. To help narrow down the diagnosis the history should cover three broad areas: travel specific factors, traveller specific factors and details of the skin problem. The travel and traveller history will help to establish risk factors for various dermatoses, while the history and examination of the skin lesion(s) will provide further clues towards the diagnosis. Investigations may not always be necessary as many skin problems may be diagnosed on purely clinical grounds.

## Travel specific history includes

- Detailed itinerary of countries and regions visited
- Travel purpose, for example business, VFR, missionary, military
- Type of travel, for example urban or rural, and accommodation, for example air conditioned hotel
- Duration of travel
- Ill contacts, for example scabies
- Outbreaks occurring in regions visited or amongst groups travelling with, for example African tick bite fever, leptospirosis, scabies
- Preventative measures employed, for example shoes worn, repellents used
- Exposures and activities:
  - Dirt/dust (soil borne infections such as helminthes, bacteria, fungi)<sup>8</sup>
  - Water (cercarial dermatitis, leptospirosis, seabather's eruption, marine stings)<sup>8</sup>
  - Food consumption (ciguatera poisoning, parasites such as gnathostomiasis)
  - Close human to human contact (scabies, impetigo, sexually transmitted infections, HIV)<sup>8</sup>
  - Animal contact (bites, zoonoses)
  - Arthropod bite (papular urticaria, bacterial superinfection, dengue fever, rickettsial infection, cutaneous leishmaniasis, myiasis)
  - Walking barefoot (cutaneous larva migrans, tungiasis)
  - Safari game parks (rickettsial infections)
  - Jungle (cutaneous leishmaniasis)
  - Citrus juice (phytophotodermatitis)
  - Walking in long grass (rickettsial infections)
  - Trauma to the skin (bacterial or fungal infections).

**Table 8** Differential diagnosis of linear lesions in returning travellers.

Frequency <sup>a</sup>	Diagnosis	Travel and traveller factors <sup>b</sup>	Skin problem characteristics <sup>c</sup>
<i>Most common</i>	Cutaneous larva migrans <sup>d</sup> (nonhuman nematodes)	Tropics, especially Caribbean; beach holidays; walking barefoot or sitting on sandy soil; preponderance in children and teenagers	<i>Migratory</i> . Narrow serpiginous tract that moves a few cm per day; feet > <sup>e</sup> buttocks > trunk
<i>Less common</i>	Phytophotodermatitis <sup>f</sup>	Worldwide; beach holidays; skin exposure to furocoumarin containing compound, e.g. citrus juice, then sun	<i>Nonmigratory</i> . Painful burning erythema, then vesicles, then hyperpigmentation; mild puritis; streaky lesions on skin exposed to furocoumarins and sun
	Jelly fish sting	Tropics, subtropics; swimming in ocean	<i>Nonmigratory</i> . Painful, pruritic, linear lesions; may be systemic features
	Blister beetle dermatitis	Wide distribution, especially South America; rural; cantharidin or pederin toxin released when beetle crushed on skin	<i>Nonmigratory</i> . Painful vesicular dermatitis in a linear array; exposed skin
<i>Rare</i>	Human helminth causes of creeping eruption e.g. fascioliasis, <i>Strongyloides stercoralis</i> (larva currens)	Tropics and subtropics; developing regions; various exposures including walking barefoot; ingesting undercooked foods	<i>Migratory</i> . Larva currens occurs on buttocks as broad pruritic serpiginous tract that moves several cm per hour

<sup>a</sup> Relative frequency that *this* diagnosis is seen in *this* type of skin lesion in a returning traveller.

<sup>b</sup> Includes typical geographical destination, type and duration of travel, exposures and activities, type of traveller, traveller demographic features, relevant medical history or medications.

<sup>c</sup> Typical clinical features of the skin lesion, including nature, distribution, associated pain or pruritis and associated systemic features.

<sup>d</sup> See Fig. 4.

<sup>e</sup> More than.

<sup>f</sup> See Fig. 9.

### Traveller specific history includes

- Demographics
- Previous vaccinations, particularly noting tetanus, varicella, measles and rubella immune status
- Medications and allergies
- Past and present medical history, particularly pre-existing dermatological conditions, immunosuppressive disorders, chronic conditions.

### Skin problem specific history includes

- Date of onset
- Description of lesion: appearance, pain, itch, progression/regression
- Number and distribution of lesions
- Associated systemic features such as fever, headache, myalgias
- Effect of any treatments already tried

### The examination includes

- Temperature
- General systems examination, including lymph nodes
- Identification of nature and distribution of skin lesions.

Presenting skin lesions can be simplified into eight different categories (with occasional overlap) to aid diagnosis. These include:

1. Ulcers
2. Pruritic lesions
3. Papules
4. Nodules or subcutaneous swellings
5. Vesicles or bullae
6. Pigment change
7. Linear lesions
8. Rash with fever

I have combined the most important elements of the history and examination for each type of skin lesion into a tabular form, with the inclusion of an estimated relative frequency of each diagnosis (Tables 2–9).

Overall papules and pruritis are probably the most common types of lesion. For most types of lesion there are usually one or two key distinguishing clinical features. For ulcers it is the presence or absence of pain and the features of the border (undermined for Buruli ulcer, rolled up for cutaneous leishmaniasis). For pruritis it is whether the itch is localised or generalised. Generalised pruritis is associated with scabies, allergic reactions, varicella and ciguatera poisoning while localised itch has numerous causes

**Table 9** Differential diagnosis rash with fever in returning travellers.

Frequency <sup>a</sup>	Diagnosis	Travel and traveller factors <sup>b</sup>	Skin problem characteristics <sup>c</sup>
<i>Most common</i>	Dengue fever <sup>d</sup>	Tropics and subtropics, especially SE Asia; longer trips; young and middle aged travellers	Rash in 50%: early flushing, later maculopapular ("white islands in red sea"), petechiae if thrombocytopenia; associated headache, joint aches, myalgias
<i>Common</i>	Rickettsial infections <sup>e</sup>	ATBF <sup>f</sup> : Southern African safari; game ticks. Mediterranean fever: Africa, Asia, Middle East, Europe; dog ticks. Scrub typhus: Asia, northern Australia; scrub vegetation; rat mites	Generalised rash: maculopapular, vesicular or petechial; possible inoculation eschar, 1 or more on exposed skin; headache and myalgias
	Childhood virus, e.g. Measles, rubella, varicella	Worldwide; nonimmune	Measles: coryza, cough, conjunctivitis, Koplik spots, generalised maculopapular rash. Rubella: arthralgia, lymphadenopathy, transient maculopapular rash. Varicella: pruritis, vesicles
	Other viral exanthems e.g. primary HIV, CMV, EBV <sup>g</sup>	Worldwide, HIV especially in sub-Saharan Africa; sexual exposure (HIV); contact with ill person (EBV, CMV)	Transient maculopapular rash; sore throat, malaise, lymphadenopathy
<i>Less common</i>	Chikungunya	Asia, Indian Ocean, Africa	Similar to dengue but persistent arthralgia
	Tropical bacterial infections e.g. typhoid fever, leptospirosis, brucellosis	Tropics and subtropics; ingestion of contaminated food or water (typhoid); skin exposure to contaminated water (leptospirosis); ingestion of unpasteurised dairy products (brucellosis)	Typhoid: Rose spots. Leptospirosis: erythema nodosum, maculopapular or petechial. Brucellosis: erythema nodosum
<i>Rare</i>	Drug reaction	History of taking drugs	Various cutaneous manifestations and systemic features
	Meningococcaemia Viral haemorrhagic fevers	Central Africa; Hajj pilgrims; unimmunised Variable regions, usually rural tropics and subtropics, especially Africa; contact with animal reservoir, arthropod vector or sick person	Petechiae, purpura, meningitis or sepsis Petechiae, purpura, coagulopathy, bleeding; systemically unwell

<sup>a</sup> Relative frequency that *this* diagnosis is seen in *this* type of skin lesion in a returning traveller.

<sup>b</sup> Includes typical geographical destination, type and duration of travel, exposures and activities, type of traveller, traveller demographic features, relevant medical history or medications.

<sup>c</sup> Typical clinical features of the skin lesion, including nature, distribution, associated pain or pruritis and associated systemic features.

<sup>d</sup> See Fig. 3.

<sup>e</sup> See Fig. 2.

<sup>f</sup> African tick bite fever.

<sup>g</sup> Human immunodeficiency virus, cytomegalovirus, Epstein–Barr virus.

as listed. For both subcutaneous swellings and vesicular lesions the presence or absence of pain and whether the lesion is fixed or migrates are crucial differentiators. Migration is again an essential factor in diagnosing linear lesions.

### Investigations

If the diagnosis is not apparent clinically or requires laboratory confirmation then specific investigations may be undertaken. These may include a complete blood

count (eosinophilia may be present in parasitic infection), paired serology (for dengue, schistosomiasis or rickettsial diseases), bacterial or viral swabs and skin scrapings or biopsies for microscopy, histopathology, culture or PCR.

### Treatment

Once the diagnosis is established or suspected, treat as appropriate remembering to also treat any contacts if necessary (for example in scabies).

## Future prevention

Advise the prospective traveller on how to best avoid skin problems. This includes:

- Avoid direct exposure to sand, soil, animals
- Arthropod bite avoidance, for example with DEET containing repellents, protective clothing, air conditioning
- Maintain personal hygiene
- Carry a first aid kit with a skin antiseptic, topical and oral antibiotics for self-treatment of skin infections and antihistamines for allergy.

## Conclusion

Skin diseases are a common affliction of travellers, with an estimated incidence of 8%. They are the third most common health problem experienced by returning travellers, accounting for 17–18% of such problems. They are most commonly of bacterial infectious origin. Tropical diseases make up about one quarter of the infections or infestations and the remainder are cosmopolitan. The ten most commonly encountered diagnoses are comprised of four classical tropical infections (cutaneous larva migrans, myiasis, tungiasis and cutaneous leishmaniasis) and six nontropical diseases (bacterial skin infections, arthropod bites, allergic reactions, scabies, animal bites and superficial fungal infections). Other increasingly commonly seen skin diseases include swimmer's itch, dengue fever presenting with a rash and rickettsial infections presenting with a rash or eschar.

Knowledge of the relative frequencies with which various diagnoses present provides a useful aid to diagnosis. This combined with targeted history taking and examination, focusing on destinations, exposures, nature of the lesions and associated features should improve clinical diagnostic accuracy. This can prevent unnecessary investigations and the delay in diagnosis that frequently accompanies a number of tropical skin problems such as cutaneous larva migrans and myiasis.

Travellers attending for a pre-trip consultation should be made aware of the risks of skin problems and given advice on prevention. Repellents, protective clothing, antiseptics and antihistamines should be carried. Consideration should also be given to carrying antibiotics for self-treatment of skin and soft tissue infections.

Further large scale prospective studies of travellers are needed to determine the overall incidence of dermatoses in travellers, as well as the relative destination specific incidences of various types of dermatoses. A further research question is whether providing pre-travel advice has any appreciable impact on the incidence of skin problems. While the overall proportion of dermatoses due to a tropical disease appears to have fallen, the incidence of cutaneous leishmaniasis, dengue fever and African tick bite fever in returning travellers has grown in the past decade. Thus it is vital for travel medicine professionals to keep abreast of changes in disease epidemiology and maintain a sound working knowledge of tropical medicine. As the distribution of vectors and diseases evolve and international travel from temperate to tropical regions continues

to grow it will be of great interest to the travel medicine community to chart trends in traveller dermatoses.

## Conflict of interest

The authors have no competing interests to declare.

## Acknowledgements

Thank you to Dr Steven Toovey for the invitation to submit this article and to Dr Paul Winton for technical support.

## References

1. Caumes E. Skin diseases. In: Keystone J, Kozarsky P, Freedman D, Nothdurft H, Connor B, editors. *Travel medicine*. Spain: Mosby; 2004. p. 491–502.
2. Caumes E, Carriere J, Guermontprez G, Bricaire F, Danis M, Gentilini M. Dermatoses associated with travel to tropical countries: a prospective study of the diagnosis and management of 269 patients presenting to a tropical disease unit. *Clinical Infectious Diseases* 1995;20(3):542–8.
3. Lederman E, Weld L, Elyazar I, vonSonnenburg F, Loutan L, Schwartz E, et al. Dermatological conditions of the ill returned traveler: an analysis from the GeoSentinel Surveillance Network. *International Journal of Infectious Diseases* 2007;12:593–602.
4. Hill D. Health problems in a large cohort of Americans traveling to developing countries. *Journal of Travel Medicine* 2000;7(5): 259–66.
5. Ansart S, Perez L, Vergely O, Davis M, Bricaire F, Caumes E. Illnesses in travelers returning from the tropics: a prospective study of 622 patients. *Journal of Travel Medicine* 2005;12(6):312–8.
6. Freedman D, Weld L, Kozarsky P, Fisk T, Robins R, vonSonnenburg F, et al. Spectrum of disease and relation to place of exposure among ill returned travelers. *New England Journal of Medicine* 2006;354:119–30.
7. Caumes E, Legros F, Duhot D, Cohen JM, Arnould P, Mosnier A. Health problems in returning travelers consulting general practitioners. *Journal of Travel Medicine* 2008;15(6):457–9.
8. Joyce M. Skin diseases of travelers. *Primary Care Clinical Office Practice* 2002;29:971–81.
9. Lucchina L, Wilson M, Drake L. Dermatology and the recently returned traveler: infectious diseases with dermatological manifestations. *International Journal of Dermatology* 1997; 36:167–81.
10. Ansart S, Perez L, Jaureguiberry S, Davis M, Bricaire F, Caumes E. Spectrum of dermatoses in 165 travelers returning from the tropics with skin diseases. *American Journal of Tropical Medicine and Hygiene* 2007;76(1):184–6.
11. Monsel G, Caumes E. Recent developments in dermatological syndromes in returning travelers. *Current Opinion in Infectious Diseases* 2008;21(5):495–9.
12. Schwartz E, Hatz C, Blum J. New world cutaneous leishmaniasis in travelers. *The Lancet Infectious Diseases* 2006;6(6):342–9.
13. Schwartz E, Gur H. *Dermatobia hominis* myiasis: an emerging disease among travelers to the Amazon Basin of Bolivia. *Journal of Travel Medicine* 2002;9(2):97–9.
14. Franck S, Feldmeier H, Heuklebach J. Tungiasis: more than an exotic nuisance. *Travel Medicine and Infectious Disease* 2003; 1:159–66.
15. Jensenius M, Fournier P, Vene S, Hoel T, Hasle G, Henriksen AZ, et al. African tick bite fever in travelers to rural sub-Equatorial Africa. *Clinical Infectious Diseases* 2003;36:1411–7.

16. Fatani M, Al-Afif K, Hussain H. Pattern of skin diseases among pilgrims during Hajj season in Makkah, Saudi Arabia. *International Journal of Dermatology* 2000;39(7):493–6.
17. Samdani A. Spectrum of skin disorders presenting to King Abdul Aziz Hospital during Hajj season-2000. *Journal of Ayub Medical College* 2004;16(3):10–3.
18. Jelinek T. Dengue fever in international travelers. *Clinical Infectious Diseases* 2000;31:144–7.
19. Heukleback J, Gomide M, Araujo F, Pinto N, Santana R, Brito J, et al. Cutaneous larva migrans and tungiasis in international travelers exiting Brazil: an airport survey. *Journal of Travel Medicine* 2007;14(6):374–80.
20. Herwaldt B, Stokes S, Juranek D. American cutaneous leishmaniasis in U.S. travelers. *Annals of Internal Medicine* 1993;118(10):779–84.
21. Scarisbrick J, Chiodini P, Watson J, Moody A, Armstrong A, Lockwood D, et al. Clinical features and diagnosis of 42 travellers with cutaneous leishmaniasis. *Travel Medicine and Infectious Disease* 2006;4(1):12–21.
22. Schwartz E, Weld L, Wilder-Smith A, vonSonnenburg F, Keystone J, Kain K, et al. Seasonality, annual trends, and characteristics of dengue among ill returned travelers, 1997–2006. *Emerging Infectious Diseases* 2008;14(7):1081–8.
23. Hochedez P, Caumes E. Hookwork-related cutaneous larva migrans. *Journal of Travel Medicine* 2007;14(5):326–33.
24. Bouchaud O, Houze S, Sciemann R, Durand R, Ralaimazava P, Ruggeri C, et al. Cutaneous larva migrans in travelers: a prospective study, with assessment of therapy with ivermectin. *Clinical Infectious Diseases* 2000;31:493–8.
25. Hochedez P, Caumes E. Common skin problems in travelers. *Journal of Travel Medicine* 2008;15(4):252–62.
26. Haruki K, Hayashi T, Kobayashi M, Katagiri T, Sakurai Y, Kitajima T. Myiasis with *Dermatobia hominis* in a traveler returning from Costa Rica: review of 33 cases imported from South America to Japan. *Journal of Travel Medicine* 2005;12(5):285–8.
27. Siraj D, Luczkovich J. Nodular skin lesion in a returning traveler. *Journal of Travel Medicine* 2005;12(4):229–31.
28. Brent A, Hay D, Conlon C. Souvenirs to make your skin crawl. *The Lancet Infectious Diseases* 2008;8:524.
29. Sampson BC, McGuire J, Eriksson E. Botfly myiasis: case report and brief review. *Plastic Surgery* 2001;46(2):150–2.
30. Kain K. Skin lesions in returned travelers. *Medical Clinics of North America* 1999;83(4):1077–102.
31. House H, Ehlers J. Travel-related infections. *Emergency Clinics of North America* 2008;26:499–516.
32. Zeegelara J, Faber W. Imported tropical infectious ulcers in travelers. *American Journal of Clinical Dermatology* 2008;9(4):219–32.
33. Cutaneous leishmaniasis. In: Gill G, Beeching N, editors. *Tropical Medicine*. 5 ed. Oxford: Blackwell Science; 2004. p. 80–3.
34. Amichai B, Finkelstein E, Grunwald M, Halevy S. Think cutaneous leishmaniasis. *Australian Family Physician* 1993;22(7):1213–7.
35. Spira A. Preparing the traveller. *The Lancet* 2003;361(9366):1368–81.
36. Steffen R, Banos A, deBernadis C. Vaccination priorities. *International Journal of Antimicrobial Agents* 2003;21:175–80.
37. Awada A, Kojan S. Neurological diseases and travel. *International Journal of Antimicrobial Agents* 2003;21(2):189.
38. LeGuerrier P, Pilon P, Deshaies D, Allard R. Pre-exposure rabies prophylaxis or the international travellers: a decision analysis. *Vaccine* 1996;14(2):167–76.
39. Shaw M, O'Brien B, Leggat P. Rabies postexposure management of travelers presenting to travel health clinics in Auckland and Hamilton, New Zealand. *Journal of Travel Medicine* 2009;16(1):13–7.
40. Hochedez P, Vinsentini P, Ansart S, Caumes E. Changes in the pattern of health disorders diagnosed among two cohorts of French travelers to Nepal, 17 years apart. *Journal of Travel Medicine* 2004;11:1–6.
41. Caumes E, Bris VL, Couzigou C, Menard A, Janier M, Flahault A. Dermatoses associated with travel to Burkina Faso and diagnosed by means of teledermatology. *British Journal of Dermatology* 2004;150(2):312–6.
42. Ryan E, Wilson M, Kain K. Illness after international travel. *New England Journal of Medicine* 2002;347(7):505–16.
43. Schlagenhauf P, Tschopp A, Johnson R, Nothdurft HD, Beck B, Schwartz E, et al. Tolerability of malaria chemoprophylaxis in non-immune travellers to sub-Saharan Africa: a multicentre, randomised, double blind, four arm study. *British Medical Journal* 2003;327:1078–82.
44. Walton S, Currie B. Problems in diagnosing scabies, a global disease in human populations. *Clinical Microbiology Reviews* 2007;20(2):268–79.
45. Page T, Eiff M, Judkins D. When should you treat scabies empirically? *The Journal of Family Practice* 2007;56(7):570–2.
46. Strong M, Johnstone P. Interventions for treating scabies. *The Cochrane Database of Systemic Reviews*; 2008::4.
47. Hay R. Skin disease. *British Medical Bulletin* 1993;49(2):440–53.