

## Chapter

# 157

## *Importance of Travel Medicine in Today's Global Village*

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### **INTRODUCTION**

Travel medicine is an interdisciplinary specialty that has developed rapidly in response to the needs of the traveling population. Specialists in travel medicine consider diverse aspects of travel related health, including fitness to travel and the health risks of traveling in itself, as well as the implications of exposure to a variety of diseases.

In 2004, 763 million people crossed international borders, reflecting an increase of 73% over the course of 15 years<sup>1</sup>. International travel is steadily increasing; nearly 55% of travelers are vacationing, 15% are conducting business, but a growing numbers are visiting friends and relatives<sup>1</sup>. Moreover, thousands of uncounted travelers cross borders to flee prosecution or to seek better opportunities. Travelers may be exposed to a variety of pathogens and risks, and 20-70% people report some health problems while traveling<sup>2</sup>. Overall during international travel, 1 to 5% of travelers seek medical attention, 0.01 to 0.1% require emergency medical evacuation, and 1 in 1,00,000 dies<sup>2</sup>. With the coming age of travel medicine, it is now appropriate that a standard be developed.

### **RISK ASSESSMENT**

To assess the traveler's risk of illness or injury, the health care provider must consider both the traveler's medical condition and the details of the planned journey, including the exact itinerary, the length of stay in each area, the type of travel (urban vs. rural, business vs. backpacking), the level of accommodation (hotels, hostels, homes, or camping), and the activities (freshwater exposure, contact with animals, or sexual activity)<sup>3</sup>. Special efforts should be made to identify travelers who are at high risk, including those traveling

off the usual tourist routes, backpackers, long-term travelers, and foreign-borne persons returning to visit family and friends since such travelers are more likely than others to acquire a number of illnesses<sup>3</sup>.

### **PRE-TRAVEL ADVICE**

This can be obtained from medical practitioners interested in travel medicine, embassies of the countries to be visited, travel agencies, organizations; specialists travel clinics, and Internet. Members of immigrant communities in Western countries, especially from Indian subcontinent and West Africa, are vulnerable to endemic diseases, including malaria and typhoid, when they return on holiday to their country of origin.<sup>2</sup> Details of immunizations, allergies, blood group, and regular medications should be carried by the travelers. Adequate insurance is essential. The geographical area to be visited, the age and health of the traveler and the risks of journey are taken into account. In remote areas or those with inadequate health facilities, the travel insurance policy must cover repatriation.

### **GENERAL ADVICE ABOUT HEALTH**

The basic 'first aid kit' should include: a topical anti-septic solution; bandages; plasters; proprietary drugs for pain relief, diarrhea, dyspepsia, allergy, and itch; sunscreen preparations; water purification tablets; and insect repellents<sup>4</sup>.

For motion sickness, antiemetic drugs such as cyclizine are effective but long-term transdermal patches containing scopolamine are preferable<sup>4</sup>. Long haul air flights lead to jet lag: sleep disturbance, fatigue, a feeling of light headedness, and poor concentration. A short acting benzodiazepine, taken for the first couple of nights after flying, helps to establish a regular sleep

pattern<sup>4</sup>. People with diabetes may need advice on adjusting their insulin regimen or diet for changes in time zones<sup>4</sup>.

At high altitudes, snow blindness and severe sunburn can occur under clear skies even at very low ambient temperatures. Those going to high altitudes should acclimatize slowly and build up their level of physical activity gradually. Acetazolamide in an adult dose of 250 mg twice a day, starting 12 hours before the ascent, is effective prophylaxis for mild mountain sickness<sup>3</sup>. But gradual ascent following acclimatization is preferable and, if severe symptoms develop, there is no substitute for rapid descent. In the tropics, heat, dehydration, and salt depletion may cause problems. Several days of relative inactivity are needed initially.

Strict food and water hygiene are important in countries with relatively poor sanitation. "Boil it, pill it, or forget it" is a useful adage. Water purification tablets and many types of portable water filters are available.

In many developing countries, blood-borne pathogens, such as hepatitis B and C viruses, human immunodeficiency virus (HIV), human T-cell leukemia/lymphoma virus type 1 (HTLV-1), and, in some areas, malaria, trypanosomiasis, and other infections are prevalent<sup>2</sup>. Screening of donated blood may not be rigorous and needles are commonly reused, sometimes without adequate sterilization. As a result, travelers have been advised to take 'AIDS Kits'. It is, at least, worth taking a few 21-gauge needles and 10 ml syringe in case blood must be taken for a laboratory test or an injectable drug is needed.

Travelers seem to become unusually disinhibited to engage in promiscuous unprotected sexual activity, especially if they are taking alcohol or other recreational drugs<sup>5</sup>. Since sexually transmitted diseases, including HIV, are highly prevalent in many holiday resorts, good quality condoms, often not available while traveling, should be carried and used<sup>4</sup>.

Patients with chronic illnesses, such as diabetes or asthma, should take plenty of their current medications as these may not be available abroad.

## IMMUNIZATIONS

Table 1 summarizes information of immunization for travelers<sup>3,6</sup>.

**Routine immunizations** Travelers to the developing world should have adequate immunity against measles, mumps, rubella, tetanus, diphtheria, pertussis, varicella, polio and Hemophilus influenzae type B infection<sup>6</sup>. If indicated pneumococcal vaccine should be adminis-

tered. Influenza vaccine and chemotherapeutic agents should be considered for those at high risk for severe influenza. Long-term travelers and those at risk of exposure to blood or body fluids should be immunized against hepatitis B<sup>2,6</sup>.

**Required immunizations** Immunization against yellow fever is required by certain countries for entry, according to World Health Organization (WHO) regulations. Vaccination becomes valid for the purpose of entry 10 days after primary inoculation, and it must be administered at an approved WHO yellow fever vaccinating center<sup>3</sup>. Saudi Arabia requires meningococcal immunization of all pilgrims, and a number of countries may require vaccination against cholera<sup>6</sup>.

**Recommended immunizations according to risk of infection** Hepatitis A is the most frequent vaccine-preventable, travel-related illness<sup>4</sup>. The hepatitis A vaccine is indicated for most nonimmune travelers to the developing world. Two doses provide long-term immunity. Intramuscular immunoglobulin may be used to provide short-term protection in persons requiring immediate immunity or those too young to receive the vaccine<sup>6</sup>. A combination vaccine of hepatitis A and B is now available.

Vaccination against typhoid should be targeted to travelers at the highest risk; those traveling to South Asia, North and West Africa, or the more impoverished areas of Latin America; long-term travelers, backpackers, and travelers staying with family or friends in developing nations<sup>6</sup>. Vaccination is also recommended for immunocompromised persons and those with severe atherosclerotic disease, prostheses, or cholelithiasis, since they are likely to have a prolonged disease<sup>3</sup>.

Vaccination against rabies before travel should be considered for long-term travelers to the developing world, those who will have unavoidable direct contact with animals, and those unable to report possible exposure<sup>6</sup>. Travelers to the 'meningitis belt' of sub-Saharan Africa should consider receiving the quadrivalent meningococcal vaccine<sup>6</sup>. Vaccination against Japanese encephalitis should be targeted to those planning visits to areas of rural Asia. The risk of tuberculosis in routine traveler is low. Tuberculin testing should be performed before or after prolonged or high-risk travel. The efficacy of bacilli Calmette-Guerin vaccine continues to be debated<sup>4</sup>.

## TRAVEL-RELATED ILLNESSES

### Traveler's Diarrhea

Diarrhea is the most common illness of travelers. Ten to 60% of travelers to developing nations have diarrhea;

**Table 1:** Immunization schedule for travelers

<i>Illness</i>	<i>Vaccine</i>	<i>Age</i>	<i>Dosage Schedule</i>	<i>Booster</i>
Yellow fever	Live attenuated 17D	> 9 months	1 dose	10 yr
Hepatitis A	Hepatitis A vaccine	≥ 2 yr	2 doses at 0 and 6-18 months, depending on vaccine	≥ 10 yr
	Immune globulin	All ages	1 dose	3 m if 0.02 ml/kg, 6 m if 0.06 ml/Kg
Hepatitis B	Recombinant HBsAg	All ages	3 doses, usually at 0,1,6 months	Not routine
Typhoid	Parenteral vaccine	≥ 6 months	2 doses ≥ 4 wk apart	3 yr
	Oral live attenuated Ty 21a vaccine	≥ 6 yr	4 oral doses given every other day	5 yr
	Parenteral capsular polysaccharide Vi	≥ 2 yr	1 dose	2 yr
Cholera	Parenteral vaccine	≥ 6 months	2 doses ≥ 1-4 wk apart	6 months
	Oral killed whole cell recombinant B subunit vaccine	≥ 2 yr	> 6 yr of age: 2 doses;	2 yr > 6 months
	Oral live attenuated		2-6 yrs: 3 doses, all separated by 7-42 days	6 months
Rabies	CVD-103 HgR vaccine	≥ 2 yr	1 dose	
	Cell-culture derived vaccine	All ages	Preexposure, 3 doses at 0, 7, and 21 or 28 days	≥ 6-36 months depending on risk category or results of serologic tests
	Human diploid cell vaccine			
	Rabies vaccine adsorbed			
Meningococcal disease	Purified chick embryo cell culture vaccine			of serologic tests
	Meningococcal quadrivalent vaccine	≥ 2 yr	1 dose	≥ 3-5 yr
Japanese encephalitis	Inactivated mouse-brain-derived vaccine	≥ 1 yr	3 doses at 0,7, and 14 or 30 days	≥ 3 yr
Tuberculosis	Bacille Calmette-Guerin vaccine	All ages	1 dose	No
Lyme disease	<i>Borrelia burgdorferi</i> OspA vaccine	15-70 yr	3 doses at 0, 1, and 12 months	Not established, may be yearly
Tick-borne encephalitis	Inactivated whole virus vaccine	Varies	3 doses, usually at 0, 1-3 months and 9-12 months varies according to vaccine	≥ 3 yr

at least 20% are bedridden for part of their trip, and 40% change their itinerary<sup>7</sup>. A causative agent can be identified in approximately 50 to 70%<sup>7</sup>. Causes are listed in Table 2. Travelers should be instructed about ways to avoid illness transmitted through food and water and about the importance of fluid replacement should diarrhea occur<sup>8</sup>. Most travelers should carry an antimotility agent and an antibiotic for self treatment of diarrhea<sup>7</sup>. Although fluoroquinolones are generally used for diarrhea, fluoroquinolone resistance is increasing, especially for *C jejuni*, and the use of fluoroquinolone antibiotics in children and pregnant women is not approved. Azithromycin may be a reasonable alternative<sup>7</sup>.

### Respiratory Infections

Patients with underlying cardiopulmonary conditions may have severe illness. Immunocompromised

persons and those with marginal cardiopulmonary reserve may benefit from carrying an appropriate antibiotic for self-treatment<sup>3</sup>. In indicated, influenza and pneumococcal vaccines should be administered<sup>6</sup>.

### Arthropod-borne Illnesses

Malaria and dengue are the two most common arthropod-borne diseases of travelers. Most dengue infections in travelers are mild and self-limited, and dengue often goes undiagnosed<sup>9</sup>. The mosquitoes that transmit dengue are urban inhabitants, whereas the night-biting mosquitoes that transmit malaria are usually rural. Persons should limit their exposure to arthropods. A number of insect repellants are available; products containing DEET (*N,N*-diethyl-*m*-toluamide) are the most effective and are extremely safe<sup>10</sup>. Travelers should apply products containing DEET to their exposed

**Table 2:** Causes of traveler's diarrhea

a.	Bacteria:
	Enterotoxigenic <i>Escherichia coli</i> (ETEC)-50%
	<i>Campylobacter jejuni</i>
	<i>Salmonella</i> spp.
	<i>Shigella</i> spp.
	<i>Aeromonas</i> , <i>Plesiomonus</i>
	<i>Vibrio parahemolyticus</i>
b.	Viruses:
	Rotavirus
	Norwalk virus
c.	Protozoa:
	<i>Cryptosporidium parvum</i>
	<i>Cyclospora cayetanensis</i>
	<i>Entamoeba histolytica</i>
d.	Helminths:
	<i>Schistosoma mansoni</i>
	<i>Strongyloides stercoralis</i>
e.	Other causes:
	<i>Plasmodium falciparum</i>
	<i>Salmonella typhi</i>
	Irritable bowel syndrome
	Inflammatory bowel disease
	Tropical sprue
	Drug side effects
	<i>Clostridium difficile</i> toxins
	Fish/shellfish toxins

skin and, if indicated, apply products containing permethrin to their clothing and mosquito nets<sup>10</sup>.

A growing number of travelers are at risk of contracting malaria; the risk being highest in sub-Saharan Africa and Oceania, intermediate in South Asia, and lowest in the Americas and Southeast Asia<sup>11</sup>. The risk varies according to the time of travel (high- or low-transmission season) and the altitude (transmission is rare above 2000 meter)<sup>3</sup>. Table 3 shows useful chemoprophylactic drugs for malaria<sup>11,12</sup>. The drug of choice is chloroquine in areas where chloroquine resistance has not been described<sup>11</sup>. Mefloquine is the current drug of choice for most persons at high risk for malaria who are traveling in areas where there is chloroquine resistance<sup>12</sup>. A systematic review has failed to find any significant difference in the rates of adverse events including neuropsychiatric symptoms or drug discontinuation between subjects taking mefloquine and those taking other antimalarial drugs<sup>12</sup>.

Doxycycline and primaquine are also effective and well tolerated agents. A fixed dose combination of

atovaquone and proguanil is highly effective. However, halofantrine, artemisinin derivatives, and azithromycin should not be used for the prevention of malaria, because of poor absorption, toxicity, unfavorable pharmacokinetics, and low efficacy<sup>11</sup>. Malaria during pregnancy may have severe consequences. Doxycycline and primaquine are contraindicated in pregnancy<sup>13</sup>. The use of chloroquine is safe in all trimesters. Mefloquine may be also be considered. Chloroquine plus proguanil is safe, but less effective than mefloquine.

Travelers to malarious areas should be informed that no measure guarantees complete protection. Thus irrespective of whether prophylaxis was used or not, travelers should seek medical attention immediately if fever develops<sup>14</sup>.

### Sexually Transmitted Diseases

At least 5% of short-term travelers engage in casual sex while abroad, and condoms are used in half or fewer of these encounters<sup>5</sup>. Long-term workers in foreign countries appear to be at even greater risk. Travelers should know the benefits of safe sexual practices, and hepatitis B vaccine should be administered if it is indicated<sup>2,4</sup>.

## ILLNESS IN SPECIAL GROUPS

### Immunocompromised Travelers

Except for asplenic patients, immunocompromised travelers- including those who have received radiotherapy for lymphomas- should not be given live vaccines such as yellow fever, oral polio, and oral typhoid<sup>15</sup>. Killed or synthetic vaccines are safe. Patients with mild to moderate immunosuppression, including those with early HIV infection, will probably make a reasonable response to immunization. Influenza, pneumococcal, and Hemophilus influenzae type b (Hib) conjugate vaccines are recommended, as the risk of respiratory infection and bacteremia is increased<sup>15</sup>. Gammaglobulin is the preferred prophylaxis against hepatitis A in these patients. Asplenic individuals should be on prophylactic antibiotics, such as amoxicillin, particularly if traveling, and should be dissuaded from traveling to areas with high rates of malaria transmission<sup>15</sup>. Immunocompromised patients should carry a letter from their physician outlining their condition and medication.

### Pregnant Travelers

Commercial airlines will not normally carry a woman who is 36 weeks or more pregnant and the insurance to cover the cost of delivery should be

**Table 3:** Prophylaxis and self-treatment for malaria and acute traveler's diarrhea

<i>Illness</i>	<i>Medication</i>	<i>Adult dose</i>	<i>Pediatric dose</i>
Malaria prophylaxis	Areas of chloroquine sensitivity Chloroquine phosphate	300 mg base (500 mg salt) once per week beginning 1 to 2 wk before entering malarious area and continuing until 4 wk after leaving	5 mg/kg once per week
	Areas of chloroquine resistance Mefloquine Or	228 mg base (250 mg salt) once per wk beginning 1 to 2 wk before entering malarious area and continuing until 4 wk after leaving	Weight <15 kg: 5 mg salt/kg, 15-19 kg: tablet, 300 kg: tab, 4351 kg: tab, >45kg: 1 tab, once wk; 2 mg/kg daily
	Doxycycline	100 mg once per day beginning 1 to 2 days before entering malarious area and continuing until 4 wk after leaving	
	Alternatives Atovaquone/proguanil	One 250 mg/100 mg tablet per day beginning 1 to 2 days before entering malarious area and continuing until 7 days after leaving	Weight 11-20 kg: 62.5/25 mg, 21-30 kg: 125/30, 31-40 kg: 187.5/75, >40 kg: 250/100 mg, all doses daily 0.5 mg/kg daily
	Primaquine	30 mg base once per day beginning 1 to 2 days before entering malarious area and continuing until 7 days after leaving	
	Chloroquine phosphate Plus Proguanil	As above 200 mg once per day beginning 1 to 2 days before entering malarious area and continuing until 4 wk after leaving	As above Age <2 yr: 50 mg, 2-6 yrs: 100 mg, 7-10 yrs: 150 mg, >10 yrs: 200 mg, all doses daily
	Areas of mefloquine resistance Doxycycline	As above	As above
	Acute travelers diarrhea Self treatment		
Mild to mod. non-dysenteric	Loperamide with or without	4 mg, then 2 mg after each loose stool, to a maximum mg 16 mg/day	Do not use in children <2 yr of age
Severe or dysenteric	Antimicrobial agent Antimicrobial agent	Single dose ciprofloxacin (750 mg), levofloxacin (500 mg), ofloxacin 400 mg Ciprofloxacin 500 mg twice daily/ levofloxacin 500 mg once daily/ norfloxacin 400 mg twice daily/ofloxacin 300 mg twice daily, all for 3 days or azithromycin 500 mg on day 1, then 250 mg daily for 4 additional days or azithromycin 1000 mg once	Do not routinely give fluoroquinolone antibiotics Seek medical attention

considered. The risk benefit assessment of immunizations and chemoprophylaxis is of particular importance for the pregnant woman and the fetus. Live vaccines should be avoided, inactivated polio vaccine may be given parenterally, and tetanus immunization is safe<sup>15</sup>. Heat-killed typhoid vaccine is best avoided as it might cause a febrile reaction, stimulating premature labor<sup>15</sup>. However the modern polysaccharide capsular A vaccine is safe. Pneumococcal, meningococcal and hepatitis B vaccines are safe in pregnancy as is immunoglobulin<sup>6</sup>.

For malaria, chloroquine and proguanil are safe chemoprophylactic drugs, and quinine, in normal therapeutic doses, is safe for treatment<sup>11</sup>. Pregnant women should take special care with food and drink when abroad, as dehydration may threaten the fetus. There are concerns about goiter when pregnant women use iodine to purify water – maximum recommended daily intake is 175 µg<sup>3</sup>. Loperamide as antidiarrheal agent is safe, but antimicrobials such as tetracyclines and quinolones should be avoided<sup>7</sup>.

**Extremes of Age**

Young children should have completed their routine immunizations before traveling<sup>16</sup>. Malaria chemoprophylaxis is recommended for all ages<sup>11</sup>. Yellow fever vaccine should only be given to children older than 9 months<sup>6</sup>. Most other vaccines including rabies are safe. Families planning to live in developing countries should be offered BCG vaccination for their children<sup>16</sup>.

The elderly should have the same immunizations as younger adults and should take antimalarial drugs<sup>17</sup>. They are more prone to respiratory infections. Jet lag and changes in time zones may be very disturbing. Older people are more likely to have an underlying medical condition requiring medication.

**Explorers and Expeditions**

Expeditions are likely to involve exposure to greater environmental extremes and hazards than ordinary travel. Prevention and treatment of medical problems must be planned well in advance. All expeditions should have a designated medical officer and all the members should receive first-aid training<sup>14</sup>. The basics are clearing the airway, controlling bleeding, treating shock, relieving pain, and moving the injured person without causing further damage<sup>17</sup>. The medical facilities nearest to the site of expedition must be identified and contacted in advance. An emergency plan must be drawn up for the first-aid treatment and evacuation of severely ill or injured expedition members. Medical insurance must be generous and comprehensive including repatriation of the injured<sup>3</sup>.

**Refugees and Migrants**

Migrants often have a higher rate than other travelers of conditions such as tuberculosis, hepatitis B and C, malaria, schistosomiasis, and sexually transmitted infections<sup>17</sup>. They also have a higher rate of non-infectious conditions such as diabetes, cardiovascular disease, malignant diseases, asthma, respiratory diseases linked to smoking, occupational diseases and injuries, as well as psychological disorders<sup>17</sup>. Stress-related health problems are exacerbated by changes in lifestyle, food habits, culture, and religious life<sup>17</sup>. As the number of refugees and migrants grows, medical providers and travel medicine physicians need to understand and respond to the wide range of health problems they have<sup>14</sup>.

**ILLNESS IN RETURNED TRAVELERS**

Details are needed about the countries visited, activities while traveling, immunizations, and

**Table 4:** Common problems in returned travelers

<b>a. Fever</b>	
<i>Tropical (short incubation; &lt;3 weeks)</i>	<i>Tropical (long incubation; &gt;3 weeks)</i>
African trypanosomiasis	Amoebic abscess
Brucellosis	Brucellosis
Dengue	Coccidioidomycosis
Hemorrhagic fevers (Lassa)	Filariasis
Hepatitis A	Hepatitis A, B, or C
Malaria	HIV (incubation)
Relapsing fevers	Leishmaniasis
Tick/Scrub typhus	Malaria
Typhoid	Schistosomiasis
Leptospirosis	Tuberculosis/ typhoid
<i>Other infections</i>	
Endocarditis	<i>Non-infective causes of fever</i>
Pneumonia	Connective tissue diseases
Prostatitis	Drug reaction
Sexually transmitted diseases	Factitious
Sinusitis	Malignancy
Urinary tract infections	
<b>b. Rash</b>	
<i>Infective</i>	<i>Non-infective</i>
Cutaneous larva migrans, myiasis	Contact allergy
Cutaneous leishmaniasis	Drug reaction
Dengue	Erythema multiforme
Dermatophytes	Insect bites
Lyme disease	Sun burn
Meningococcus	
Mycobacteria	
Scabies/Pediculosis	
Sexually transmitted diseases	
Tick/Scrub typhus	
Tinea versicolor	
Typhoid/Paratyphoid	
<b>c. Eosinophilia</b>	
Angiostrongylus	Pulmonary eosinophilia
Ascaris	Schistosomiasis
Echinococcus spp.	Strongyloides
Filaria (onchocerciasis)	Trichinosis
Gnathostoma	Trichuris
Hookworm and other gut nematodes	Visceral larva migrans

antimalarials taken. Common problems are fever, rash, diarrhea, and eosinophilia<sup>18</sup>.

In travelers with acute diarrhea, a dietary history, assessment of hydration state, stool microscopy and culture, abdominal films, and sigmoidoscopy may be needed. There are many possible causes<sup>19</sup>. Patients with chronic diarrhea may be infected with *Giardia spp.*, *Cryptosporidium spp.*, *Entamoeba histolytica*, *Shigella* and *Salmonella*<sup>19</sup>. Investigations should include a search for *Clostridium difficile*, and its toxin, especially if the patient took antimicrobial while abroad. A minority of patients may develop a postinfective enteropathy, often due to secondary lactose intolerance<sup>3</sup>. Rarely, bacterial overgrowth or tropical sprue develops. Common causes of fever, rash and eosinophilia in returned travelers are shown in the Table 4.

## CONCLUSION

Travel medicine has attracted a diverse group of health care providers, and not only clinicians with an interest in tropical medicine, but also internists, emergency medicine specialists, occupational medicine professionals, and nurses from all disciplines. The need for expertise remains great for several reasons. First is the incredible growth of travel in a continually shrinking world. The second reason has been an AIDS pandemic that affects large parts of the world where HIV has a complex interaction with an environment of multiple tropical pathogens. Lastly the current generation of patients has a far different perception of the world: it is a world contracted by Internet and by rapid transit times between continents.

As more and more informed physicians increasingly consider the travel history while caring for ill travelers, international travel will become a healthier experience.

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### Useful web sites:

- [www.cdc.gov/travel](http://www.cdc.gov/travel)
- [www.hc-sc.gc.ca](http://www.hc-sc.gc.ca)
- [www.who.int/ith](http://www.who.int/ith)
- [www.fas.org/promed](http://www.fas.org/promed)
- [www.astmh.org](http://www.astmh.org)
- [www.csih.org](http://www.csih.org)
- [www.istm.org](http://www.istm.org)
- [www.isid.org](http://www.isid.org)
- [www.premedmail.org](http://www.premedmail.org)
- [www.doh.gov.uk/traveladvice/index.htm](http://www.doh.gov.uk/traveladvice/index.htm)