UNIT NO. 1

TRAVEL MEDICINE – GENERAL PREVENTIVE MEASURES

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ABSTRACT

Attention to details of prevention is necessary to be free of travel related illnesses. More than 20 to 50 percent of individuals report some health problems while travelling. Illnesses and clinical conditions that may be adversely affected by air travel require medical clearance. The non-infective travel related problems that could be prevented or reduced are motion sickness, jet-lag, air transit associated barotraumas, and venothrombosis. Travel related infections that need to be prevented are intestinal infections and travel diarrhea, respiratory infections, insect borne illnesses, sexually transmitted infections, and others. Food and water precautions cover hygiene of food and drinks, avoidance of food borne infections, and dangers of water activities to be avoided. Prevention of mosquito-borne infections include prevention of bites by mosquitoes and specific measures where appropriate against malaria, yellow fever, and Japanese B encephalitis. Early treatment of the returning traveler with symptoms is important and the symptoms that should alert the primary care physician to ask for recent travel out of the country are : fever, diarrhoea, dermatological conditions, and animal bites.

INTRODUCTION

Attention to details of prevention is necessary to be free of travel related illnesses. Early consultation in the returned traveler with symptoms is also important. In this study unit, the following are discussed:

- Epidemiology of travel related health problems
- General preventive measures
- Food and water precautions
- Prevention of mosquito-borne infections
- Early consultation of the returned traveler with symptoms – fever, diarrhea, skin conditions, and animal bites.

EPIDEMIOLOGY OF TRAVEL RELATED HEALTH PROBLEMS

More than 20 to 50 percent of individuals report some health problems while travelling. Although infectious diseases cause considerable morbidity among travelers, they account for only 1 to 4 percent deaths that occur during international travel.

Cardiovascular disease is the most frequent cause of death among all travelers; age-specific fatality rates are however similar to those of non-travelers.

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Trauma, especially that associated with motor vehicle accidents, accounts for 21 to 26 percent of travel associated fatalities, rates that are several times higher than those of non-travelers.

In order to assess the travelers' risks during a journey, primary care physicians must consider both the physical status of the traveler and details of the journey, namely, (1) the exact itinerary, (2) the length of stay in each area, (3) the type of travel (air, sea, land - back packing or type of vehicle), (4) purpose of travel (leisure, business, seeking medical treatment abroad or adventure), (5) the level of accommodation (hotels, hostels, homes, camping), and (6) expected activities such fresh water exposure, or animal contact.

GENERAL PREVENTIVE MEASURES

Travelers to foreign countries are often exposed to pathogens that are absent or uncommon in their countries of residence. Health problems in travelers are therefore common and prevention of possible ill-health in primary care patients intending to travel, should be of concern to primary care physicians. Advice to travelers include recommendations regarding appropriate immunisation, prevention of malaria and other insect borne diseases, and measures to maintain good general health.

1. Medical clearance

Illnesses and clinical conditions that may be adversely affected by air travel require medical clearance. These are:

Cardiovascular diseases. These include: congestive heart failure, myocardial Ischaemia, pulmonary hypertension, and severe hypertension. Recent myocardial Infarction patients will only be accepted for air travel 3 weeks after onset, provided the prognosis is uncomplicated and the patient is fully mobilised, allowed and able to walk and climb stairs.

Respiratory Diseases. These include: chronic bronchitis, emphysema, bronchiectasis, cor pulmonale, and pneumothorax. Pneumonia and open pulmonary tuberculosis are contra indicated for air travel.

Blood disorders. Severe anaemia with a haemoglobin 7.5 gm/dl is the lowest acceptable value for air travel.

Gastro-Intestinal Diseases. For recent gastro-intestinal surgery, minimum post-operative period of 10 days before flying is required. Recent gastric or duodenal haemorrhage is a contraindication for air travel.

Neurological Diseases. Recent Cerebro-vascular accidents (stroke), thrombotic or haemorrhagic renders the traveler unfit. Uncontrolled epilepsy is also unacceptable.

Ear, sinuses and jaws. The following can make it difficult to travel: common cold, flu, sinus and middle ear infections.

Recent facio-maxillary surgery and middle ear surgery are contra indicated for air travel.

Psychiatric conditions. Mentally ill travelers, especially the psychotics need medical escorts (doctors) for air travel.

Infectious (contagious) Illnesses. Chicken pox, Measles, Rubella will render the patient unfit to travel.

2. Non-infective travel related problems

Common non-infective illnesses associated with travel are:

- Motion sickness
- Jet-Lag
- Air transit associated barotrauma
- Venothrombosis associated with prolonged sitting during prolonged travel. (Economy class syndrome).

Motion sickness. Except in the case of severe turbulence, in the majority of travelers by air, motion sickness is rare. For those who suffer from motion sickness, effective preventive measures are listed in Table 1. Antihistamines or scopolamine patches should be taken before the journey starts. Because they may cause drowsiness, they should not be used by drivers or machine operators. They can also result in confusion, falls in older people and need to be used with caution.

Table 1. Prevention of motion sickness

Sit in the front of a coach or the middle of a plane or ship
Focus on the distant horizon
Keep children occupied with games
Avoid fizzy drinks and rich or fatty foods
Use antihistamines or patches

Source: Pugh C & Fante PD. Aust Fam Physician 1994:23:9:1689 (adapted)

Jet lag. Jet lag is the term used for the symptoms caused by the disruption of the body's internal clock and the approximate 24-hour (circadian) rhythms it controls. Disruption occurs when crossing multiple time zones (more than three) i.e. when flying east to west or west to east. Sleep disturbance does not occur with sea, rail, or car travel because travelers have time to adjust to time zone changes.

Jet lag may lead to indigestion and disturbance of bowel function, general malaise, daytime sleepiness, difficulty in sleeping at night, and reduced physical and mental performance. Its effects are often combined with tiredness due to the journey itself. Jet lag symptoms gradually wear off as the body adapts to the new time zone. Jet lag cannot be prevented but there are some ways to reduce its effects (Table 2) (WHO, 2005).

Air transit associated barotrauma. Changes in cabin pressure during take-off and descent can cause minor discomfort in the ears and sinuses. Swallowing frequently or yawning during takeoff and descent helps to equalize pressure. These actions are normally sufficient to relieve the minor ear and sinus discomfort. With allergies, sinusitis, and colds, the Eustachian tubes become inflamed and obstructed by mucus, thereby preventing air pressure from equalizing normally. People with such problems may experience great discomfort and benefit from taking decongestants before flying or by blowing hard against a closed mouth and pinched nostrils (Valsalva manoeuvre) to equalize air pressure. People with severe nasal and sinus congestion, whatever the cause, should consider postponing air travel. Children are particularly susceptible to the pain of unequal air pressure. They should chew gum, suck hard candy, or be given something to drink during takeoff and descent to encourage swallowing. Babies can be breastfed or given a bottle or pacifier. In general, infants may fly safely after the age of 7 days.

Table 2. General measures to reduce the effects of jet lag

- Be as well rested as possible before departure, and rest during the flight. Short naps can be helpful.
- Eat light meals and limit consumption of alcohol. Alcohol should be avoided if possible: whilst it can accelerate sleep onset, it reduces sleep quality, making sleep less recuperative. The after effects of alcohol (hangover) can exacerbate the effects of jet lag and travel fatigue.
- Caffeine should be limited to normal amounts and avoided within a few hours of an anticipated period of sleep.
- Try to create the right conditions when preparing for sleep. When taking a nap during the day, eyeshades and earplugs may help.
- At the destination, try to get as much sleep in every 24 hours as normal. A minimum block of 4 hours sleep during the local night – known as "anchor sleep" – is thought to be necessary to allow the body's internal clock to adapt to the new time zone. If possible, make up the total sleep time by taking naps at times when feeling sleepy during the day.
- The cycle of light and dark is one of the most important factors in setting the body's internal clock. Exposure to daylight at the destination will usually help adaptation.
- Melatonin is available in some countries and can be used to help resynchronize the body's internal clock. The timing and effective dosage of melatonin have not been fully evaluated and its side effects, particularly if used long term, are unknown. For these reasons, melatonin cannot be recommended.

Source: WHO, 2005

Economy class syndrome. Venothrombosis can occur when people sit for long periods during air, rail, bus, or car travel. The risk of developing DVT when travelling is very small unless one or more other risk factors are present. These include:

- Previous DVT or pulmonary embolism
- History of DVT or pulmonary embolism in a close family member
- Use of oestrogen therapy–oral contraceptives ("the Pill") or hormone replacement therapy (HRT)
- Pregnancy
- Recent surgery or trauma, particularly to the abdomen, pelvic region or legs
- Cancer.

The risk of a passenger who does not have any of the risk factors above developing DVT as a consequence of flying is small and the benefits of most precautionary measures in such passengers are unproven and some might even result in harm. Some common-sense advice for such passengers is given in Table 3 (WHO, 2005).

Table 3. Common-sense advice to prevent venothrombosis

- Moving around the cabin during long flights will help to reduce any period of prolonged immobility. A walk around in the cabin, e.g. go to the bathroom, once every 2–3 hours can be practised.
- Many airlines also provide helpful advice on exercises that can be carried out in the seat during flight.
- It is thought that exercise of the calf muscles can stimulate the circulation, reduce discomfort, fatigue and stiffness, and it may reduce the risk of developing DVT.
- Hand luggage should not be placed where it restricts movement of the legs and feet.
- Clothing should be loose and comfortable.
- Wearing properly fitted graduated compression stockings may be helpful. These compress the calf muscles and improve the flow of blood in the deep veins. They may also help prevent the swollen ankles that are quite common on long flights. However, they need to be the correct size to be effective.
- In view of the clear risk of significant side effects and absence of clear evidence of benefit, passengers are advised not to use aspirin just for the prevention of travel-related DVT.

WHO, 2005

3. Travel Related Infections

Infections that may be picked up during travel are many. They include:

- Intestinal Infections and travelers diarrhoea
- Respiratory infections
- Insect borne illnesses: malaria, dengue fever, yellow fever, Japanese B Encephalitis, Tick-borne diseases like lyme disease (lyme borreliosis), Rocky mountain spotted fever (Rickettsia rickettsia), African tick typhus (Rickettsia africae)
- Sexually transmitted infections
- Others: Severe Acute Respiratory Syndrome (SARS), Avian influenza (bird flu), schistosomiasis, and leptospirosis.

Preventive measures follow general principles depending on the nature of infective agents: food and water precautions for those infections propagated by oral-faecal spread; immunization for the vaccine preventable infections; and specific measures for insect borne infections like malaria and dengue fever.

FOOD AND WATER PRECAUTIONS

1. Food and drinks

About two-thirds of all international travelers suffer from diarrhea abroad. It is therefore pertinent for the patient to learn how to take food and water precautions. Travelers should avoid drinking tap water or untreated water. If water purity is unknown or uncertain, bottled carbonated or non-carbonated mineral water, sodas or canned fruit juices is advisable. Coffee and tea are generally safe. Beer, wine and alcohol served without ice cubes are safe. Water swallowed while showering or by using tap water for brushing teeth can lead to gastrointestinal infection. Unpasteurised milk and milk products are to be avoided entirely. The traveler should be advised to avoid salads, uncooked vegetables and milk including its by-products such as cheese and yoghurt.

2. Food borne infections

Traveler's Diarrhoea. Traveler's diarrhoea is by far the most common health problem faced by International travelers. The common organisms causing traveler's diarrhoea are Enterotoxigenic Escherichia Cols (ETEC) being most common, Shigella (causing dysentery) and Salmonella typhi (causing typhoid). Fever, vomiting and bloody stools occur in 10% to 20% of episodes.

Typhoid Fever. Typhoid Fever is an infection that is mostly acquired from developing countries abroad. It is caused by two bacterial species – Salmonella typhi and Salmonella paratyphi which cause three main clinical symptoms – gastroenteritis, septicaemia and enteric fever. Typhoid is usually transmitted via the faecal-oral route, and the source is usually an asymptomatic carrier, or a recently infected individual who has not yet cleared the organism.

Heating water to 57 degree Centigrade, iodination and chlorination are effective ways of killing typhoid bacilli. Salmonella typhi thrives on cold meats and shellfish; therefore these foods should be avoided. All travelers to endemic areas should be immunized against typhoid.

Dysentery. Dysentery is an acute bacterial or parasite disease involving the large and small intestines. The mode of transmission is by direct or indirect faecal-oral route. The disease is characterized by bloody mucoid diarrhoea accompanied by fever, nausea, vomiting and abdominal cramps. It may be caused by Shigella or Entamocba Histolytica.

Cholera. Past outbreaks and cholera epidemics in and before 1991 were caused by Vibrio Cholera 01 (el Tor biotype). A new epidemic strain, Vibrio Cholera 0139 or the Bengal strain was identified in India and Bangladesh in late 1992. Transmission of cholera is by ingestion of high risk food such as raw or under cooked seafood and via faecal contaminated food and water.

Hepatitis A. Hepatitis A is the most common vaccine preventable infection of travelers and developing countries have the highest incidence. The illness is accompanied by symptoms of fever, aches and pains, loss of appetite, jaundice and dark urine. Adults have more pronounced symptoms than children.

3. Dangers of water activities

Swimming in unknown waters can be hazardous especially those swimming along estuaries need to be aware of the possibility of strong undercurrents, stinging jellyfish, and other dangerous creatures. Fresh water areas in parts of Africa, South America and Asia may carry the risk of schistomomiasis. In schistosomiasis endemic areas, wearing shoes or sandals when walking along the edge of a lake or slow moving river prevents infection.

PREVENTION OF MOSQUITO-BORNE INFECTIONS

Malaria, Yellow fever, Japanese B Encephalitis and Dengue fever are the most serious mosquito-borne diseases. Prevention hinges on avoidance of mosquito bites.

1. Malaria

Malaria is an important health risk to travelers to the tropical and subtropical regions of the world. Travellers and their advisers should note the four principles of malaria protection (WHO,2005):

- Be Aware of the risk, the incubation period, and the main symptoms.
- Avoid being Bitten by mosquitoes, especially between dusk and dawn.
- Take antimalarial drugs (Chemoprophylaxis) when appropriate, to prevent infection from developing into clinical disease.
- Immediately seek Diagnosis and treatment if a fever develops one week or more after entering an area where there is a malaria risk, and up to 3 months after departure from a risk area.

Preventing bites. Measures should be taken to reduce or prevent mosquito bites:

- Avoid the female Anopheles mosquito, which is active form dusk till dawn.
- Use long sleeved light coloured clothing.
- Use mosquito repellents containing >30% DEET (NN chethylmethyl toluamide).
- Sleep under mosquito nets.
- Use insect sprays containing pyrethrum in living and sleeping areas.
- Lighting a mosquito coil which gives off pyrethrum or pyrethroids for 6-8 hours is still effective.

Chemoprophylaxis. Table 4 shows the drugs used in prophylaxis against malaria.

2. Yellow fever occurs in the jungles of Northern South America and West Africa between latitude 15 degree North or 10 degree South. The vector for the virus is the Aedes mosquito with the Aedes aegypti causing urban yellow fever. Yellow fever is unknown in Asia despite the presence of the Aedes mosquitoes capable of transmitting the virus. After an incubation period of between 3 to 6 days, fever, headache, muscle pains and abdominal pains develops. After a brief recovery period, shock, bleeding and signs of kidney and liver failure with jaundice develops. The diagnosis is confirmed by measuring antibody levels in the blood by viral cultures. Treatment is mainly supportive.

3. Japanese B Encephalitis is the most common cause of epidemic encephalitis worldwide. It occurs chiefly in Japan, South East Asia and India. Japanese B Encephalitis is transmitted by Culex mosquito. Persons at risk are those living for prolonged periods (more than a month) in rice and pig farming areas where Japanese Encephalitis is endemic. During the initial stages of the illness, the patient experiences headache, fever and malaise lasting 2-3 days. This is followed by vomiting confusion, seizures and coma. Treatment is largely supportive.

EARLY TREATMENT OF THE TRAVELER WITH SYMPTOMS

The presence of the following symptoms should prompt the primary care physician to check out if the patient has recently traveled out of the country.

1. Fever

The initial evaluation of fever should focus on infections that are life-threatening, treatable, or transmissible. Careful assessment of the travel history, likely incubation period, exposure history, associated signs and symptoms, duration of fever, immunization status, use or non-use of antimalarial chemoprophylaxis, and degree of compliance with a chemoprophylactic regimen, if used, helps to establish diagnosis. Determining an appropriate incubation period can be particularly helpful in ruling out possible causes of fever (Table 5A, 5B, and 5C). For example, if fever begins more than 21 days after a traveler's return, then dengue, rickettsial infections, and viral hemorrhagic fevers such as yellow fever and Lassa fever are unlikely, regardless of the traveler's exposure history.

As indicated by the exposure history, time course of illness, and associated signs and symptoms, initial investigations for febrile travelers may include prompt evaluation of peripheral blood for malaria, complete and differential blood counts; liver function tests; urinalysis; culture of blood, stool and urine; chest radiography; and specific serologic assays such as those for arboviruses (e.g. dengue fever), rickettsiae, schistosomes, leptospira, and human immunodeficiency virus (HIV).

Fever in the returning traveler can be grouped into several groups:

Undifferentiated fevers

- Malaria

  Malaria is the most important cause of fever among persons who have recently traveled. There are four species of malaria parasite that can cause malaria in humans — Plasmodium vivax, Plasmodium falciparum, Plasmodium ovale, and Plasmodium malariae

  Malaria caused by Plasmodium falciparum can be rapidly fatal and must be immediately ruled out in all febrile persons who have recently returned from an area where malaria is endemic. Resistance of Plasmodium falciparum to anti-malarial drugs is widespread and increasing. Although currently recommended anti-malarial drugs are efficacious, they do not guarantee protection against malaria, and malaria remains an important diagnostic consideration in febrile travelers, regardless of any previous use of anti-malarial agents.

  A history of fever is typically present, fevers occurring at regular intervals of 48-72 hours are virtually pathognomonic of Plasmodium vivax, Plasmodium ovale and Plasmodium malariae infections.

Table 4. Drugs used in the prophylaxis of malaria

Drug	Usage & duration of therapy	Adult dose	Pediatric dose	Comments (See Adverse Reactions and Contraindications below)
Atovaquone/ Proguanil combination tablet (Malarone™)	Primary prophylaxis* in areas with chloroquine-resistant or mefloquine-resistant *Plasmodium falciparum* Start 1 day before departure and continue for 7 days after return Not recommended for children <11 kg, pregnant women, and women breastfeeding infants weighing <11 kg.	Adult tablets contain 250 mg atovaquone and 100 mg proguanil hydrochloride 1 adult tablet orally, daily	Pediatric tablets contain 62.5 mg atovaquone and 25 mg proguanil hydrochloride. 11-20 kg: 1 tablet 21-30 kg: 2 tablets 31-40 kg: 3 tablets > 40 kg: 1 **adult tablet daily **Adult tablets contain 250mg atovaquone and 100mg proguanil hydrochloride.	◦ Contraindicated in persons with severe renal impairment (creatinine clearance < 30mL/min). ◦ Atovaquone/proguanil should be taken with food or a milky drink. ◦ Plasma concentrations of atovaquone are reduced when it is co-administered with rifapicin, rifabutin, metoclorpramide or tetracycline.
Chloroquine phosphate (Aralen™ and generic)	Primary prophylaxis* only in areas with chloroquine-sensitive *P. falciparum* Start 1 week before departure and continue for 4 weeks after return. If daily doses: start 1 day before departure (when taken as combination with proguanil) Safe for use in pregnancy, breast feeding, and children	300 mg base (500 mg salt) orally, once/week	5 mg/kg base (8.3 mg/kg salt) orally, once/week, up to maximum adult dose of 300mg base	◦ May exacerbate psoriasis ◦ Concurrent use of chloroquine can reduce the antibody response to intradermally admininstered human diploid-cell rabies vaccine.
Hydroxychloro-quine sulfate (Plaquenil™)	An alternative to chloroquine for primary prophylaxis* only in areas with chloroquine- sensitive *P. falciparum* Safe for use in pregnancy, breast feeding, but tablet size not suitable for persons under 50 kg body weight.	310 mg base (400 mg salt) orally, once/week	5 mg/kg base (6.5 mg/kg salt) orally, once/week, up to maximum adult dose of 310 mg base.	◦ See chloroquine comment.
Proguanil	Use only in combination with chloroquine. Start 1 day before departure and continue for 4 weeks after return. Safe for use in pregnancy, breast feeding, and children.	2 tablets of 100 mg daily	3 mg/kg daily	◦ Proguanil can interfere with live typhoid vaccine. ◦ Contraindicated in liver and kidney dysfunction.
Doxycycline (Many brand names and generic)	Primary prophylaxis* in areas with chloroquine-resistant or mefloquine-resistant *P. falciparum* Start 1 day before departure and continue for 4 weeks after return. Contraindicated in pregnancy, breast feeding, and children under 8 years of age.	100 mg orally, daily	8 years of age or older: 2 mg/kg up to adult dose of 100mg/day	◦ Doxycycline makes the skin more susceptible to sunburn. People with sensitive skin should use a highly protective (UVA) sunscreen and avoid prolonged direct sunlight, or switch to another drug. ◦ Doxycycline should be taken with plenty of water to prevent oesophageal irritation. ◦ Doxycycline may increase the risk of vaginal Candida infections.
Mefloquine (Lariam™ and generic)	Primary prophylaxis* in areas with chloroquine-resistant *P. falciparum* Start at least 1 week (preferably 2-3 weeks) before departure and continue for 4 weeks after return. Not recommended in first trimester because of lack of data, safe in breast feeding, in children not recommended under 5 kg because of lack of data.	228 mg base (250 mg salt) orally, once/week	**5-10 kg: 1/8 tablet orally, once/week **10-20 kg: ¼ tablet once/week 20-30 kg: ½ tablet, once/week 30-45 kg: ¾ tablet once/week > 45 kg: 1 tablet, once/week **The recommended dose of mefloquine is 5mg/kg body weight once weekly.	◦ Contraindicated in persons allergic to mefloquine and in persons with active depression or a previous history of depression, generalized anxiety disorder, psychosis, schizophrenia, other major psychiatric disorders, or seizures. ◦ Not recommended for persons with cardiac conduction abnormalities. ◦ Not recommended for people performing activities requiring fine coordination and spatial discrimination e.g., pilots, machine operators. ◦ Do not give mefloquine within 12 hours of quinine treatment. ◦ Ampicillin, tetracycline and metocloproamide can increase mefloquine blood levels. ◦ Vaccination with live bacterial vaccines (e.g., oral live typhoid vaccine, cholera vaccine) should be completed at least 3 days before the first prophylactic dose of mefloquine.

Primaquine	Used for terminal prophylaxis *** to decrease risk of relapses of *P. vivax* and *P. ovale*. Contraindicated during pregnancy and breast feeding unless the infant being breast-fed has a documented normal G6PD level, safe for children who are not G6PD deficient.	30 mg base (52.6 mg salt) orally, once/day for 14 days after departure from the malarious area. Note: The recommended dose of primaquine for terminal prophylaxis has been increased from 15 mg to 30 mg for adults.	0.6 mg/kg base (1.0 mg/kg salt) up to adult dose orally, once/day for 14 days after departure from the malarious area. Note: The recommended dose of primaquine for terminal prophylaxis ** has been increased from 0.3 mg/kg to 0.6 mg/kg for children.	◦ Indicated for persons who have had prolonged exposure to *P. vivax* and *P. ovale* or both. ◦ Contraindicated in persons with G6PD deficiency.

Other symptoms at presentation include headache, cough, and gastro-intestinal problems and may mimic the constellation of symptoms in other conditions, so malaria should be considered in all febrile travelers regardless of their clinical presentation.

- *Dengue Fever*
  Dengue fever is present in South East Asia, The Pacific area, Africa and the Caribbean. Dengue viruses are transmitted by the day-biting Aedes aegypti mosquitoes, which breed both indoors and outdoors.

  There are four dengue viruses, which do not provide cross protective immunity. Dengue viruses cause two disease syndromes:
  - Classic dengue fever
  - Dengue haemorrhagic fever – dengue shock syndrome (DHF-DSS)

  Dengue fever presents with sudden onset of high fever, headache, backache, joint and muscle pains. Generalised rash appears 3-5 days after the onset of fever. The severe and life-threatening dengue haemorrhagic fever – dengue shock syndrome (DHF-DSS) is thought to be a second infection in persons with some remaining immunity following a first attack. Treatment is largely supportive.

- *Rickettsia*
  The triad of fever, headache, and myalgia in a person who has recently traveled should also prompt consideration of rickettsial infections. Detection of a painless eschar at the inoculation site is an important diagnostic clue. Persons who have been camping, hiking, or traveling on safari in grassy or scrubby areas are at highest risk for infection. Regional lymphadenopathy, rash, leukopenia, and thrombocytopenia may be present, although rash is frequently absent in African tick typhus. The diagnosis of a rickettsial infection is generally made clinically, prompting treatment (usually with a tetracycline antibiotic) while serologic confirmation of the diagnosis is pending.

- *Acute leptospirosis*
  Acute leptospirosis may also manifest as fever, myalgia, headache, and rash. Conjunctival suffusion is a characteristic diagnostic sign but may occur in only 28 to 44 percent of cases. Growth in adventure sports and ecotourism is placing an increasing number of travelers at risk for leptospirosis, and a history of exposure to fresh water (rafting or kayaking or wading through flooded streets) in a person with symptoms suggests this diagnosis.

- *Typhoid fever*
  Typhoid fever may present with fever and headache in a person with otherwise unremarkable findings on physical examination. Vaccines against typhoid fever are only partially protective, and breakthrough infections may occur.

Fever associated with Haemorrhage

- Several treatable infections, including meningococcaemia, malaria, leptospirosis and rickettsial infections can cause fever associated with haemorrhage.
- Many viral infections (in addition to dengue and yellow fever) can also cause fever associated with haemorrhage as for example, the Lassa fever and Ebola fever. Such infections are fortunately, rarely acquired by travelers.

Fever associated with involvement of the Central Nervous System

- Included here are malaria, tuberculosis, typhoid fever, rickettsial infections, poliomyelitis, rabies and viral encephalitis (including Japanese Encephalitis, West Nile encephalitis and tick-bone encephalitis).
- Meningococcal meningitis has been associated with the annual Haji Pilgrimage to Mecca.

Fever associated with Respiratory findings

- Respiratory symptoms in a febrile traveler should suggest the presence of common respiratory pathogens like strep. pneumoniae, influenza virus (including SARS, bird-flu), mycoplasma, Legionella and pneumonia.
- Legionellosis has been acquired by travelers in spa cruise ships and in hotels.
- International travelers are also at increased risk for tuberculosis.
- Cough may also occur in malaria, typhoid fever, scrub typhus and dengue.

Fever associated with Sexual or Blood Exposures

- Many sexually transmitted diseases can cause febrile illnesses without genital findings like HIV, Syphilis, cytomegalovirus, Epstein-Barr virus and Hepatitis B virus infections.
- Exposures to blood bourne agents of infection many also occur in persons who undergo tattooing or body piercing procedures, receive injections or transfusions, undergo surgery or shave with communal razors while traveling.

Table 5A. Common or Important Infectious Disseases That May Cause Fever in Travelers: Incubation less than 14 days

Disease	Distribution	Mode of transmission	Incubation period
Undifferentiated fever			
◦ Malaria (plasmodium species)	Most tropical and subtropical areas; some temperate areas	Bite of infective mosquito	6 days to years
◦ Dengue (dengue virus serotypes 1, 2, 3, and 4)	Tropics and subtropics, including urban areas	Bite of infective mosquito	4-8 days (3-14 days)
◦ Scrub typhus (*Orientia tsutsugamushi*)	Widespread in Asia; also found in Australia	Bite of infective mite	10 days (6-21 days)
◦ Leptospirosis (*Leptospira interrogans serotypes*)	Widespread; most common in tropical areas	Percutaneous or permucosal contact with animal urine or contaminated water or soil; ingestion	7-12 days (2-26 days)
◦ Campylobacteriosis, salmonellosis, shigellosis	Widespread; most common in developing	Ingestion of contaminated countries	2–6 days (1-20 days) food or water
◦ Typhoid fever (*Salmonella enterica serotype typhi*)	Developing countries, especially Indian subcontinent	Ingestion of contaminated food or water	7-18 days (3-60 days)
◦ Acute human immunodeficiency virus infection	Worldwide	Permucosal or percutaneous exposure to infective fluids or blood	Acute illness, 10-28 days (10 days-6 wks)
◦ East African trypanosomiasis (*Trypanosoma brucei rhodesiense*)	Sub-Saharan East Africa, with focal distribution	Bite of infective tsetse fly	Acute illness, 5-16 days (3-21 days); chronic illness, mths to years
Fever with haemorrhage			
◦ Meningococcemia, Leptospirosis, and other bacterial infections; malaria			
◦ Viral hemorrhagic fever	Worldwide; causative agent varies	Usually bite of infective mosquito or tick; direct or airborne contact with infective fluid or excrement	3-14 days (2 days to 2 mths)
Fever with involvement of the central nervous system			
◦ Meningococcal meningitis, many viral and bacterial forms of meningitis and encephalitis; malaria, typhoid, and typhus			
◦ Rabies	Especially common in parts of Africa, Asia, and Latin America	Bite of an animal (usually a dog); exposure to the saliva	1-2 mths (9 days to yrs)
◦ Arboviral encephalitis	Worldwide; causative agent varies	Usually, bite of an infective mosquito or tick	3-14 days (1-20 days)
◦ Angiostrongyliasis, eosinophilic meningitis (*An giostrongylus cantonensis*)	Widely scattered; most common in East Asia and Southeast Asia; recent outbreak among travelers to Jamaica	Ingestion of food or water contaminated with snail or slug slime; ingestion of infective larvae in slugs, snails, or freshwater fish	2 wks (5 days to 4-6 wks)
◦ Poliomyelitis	Primarily Africa and parts of Asia; recent outbreaks due to vaccine-derived poliovirus in the Philippines, the Dominican Republic, and Haiti	Ingestion of food or water contaminated with feces	7-14 days (3-35 days)
◦ East African trypanosomiasis	See East African trypanosomiasis, above		
Fever with respiratory findings			
◦ Influenza	Widespread; seasonal and nonseasonal outbreaks on cruise ships and among travelers	Direct or airborne transmission from another person	1-3 days
◦ Legionellosis (*Legionella pneumophila*)	Widespread; outbreaks on cruise ships and in hotels	Inhalation; aspiration	5-6 days (2-10 days)
◦ Acute histoplasmosis (*Histoplasma capsulatum*)	Primarily the Americas (including caves, mines, and construction sites); recent outbreak among travelers to Mexico	Inhalation of airborne conidia	Acute illness, 7-14 days (3-21 days)
◦ Acute coccidioidomycosis (*Coccidioides immitis*)	The Americas	Inhalation of airborne arthroconidia	Acute illness, 10-14 days (7-28 days)
◦ Q fever (*Coxiella burnetii*)	Worldwide, with foci of endemic disease	Inhalation of infective aerosol from animal source	14-21 days (2-29 days)

Table 5B. Common or Important Infectious Disseases That May Cause Fever in travelers: Incubation 14 days to 6 weeks

Disease	Distribution	Mode of transmission	Incubation period
Malaria		See malaria, Table 5A	
Typhoid fever		See typhoid fever, Table 5A	
Hepatitis A	Widespread; most common in developing countries	Ingestion of contaminated food or water	28-30 days (15-50 days)
Hepatitis E	Widespread; outbreaks in Asia, Africa, and Latin America	Ingestion of contaminated food or water	26–42 days (2–9 wks)
Acute schistosomiasis (Katayama fever)	Parts of Africa, Asia, and Latin America	Penetration of intact skin by cercariae in fresh water	Katayama fever, 4–8 wks
Amebic liver abscess (*Entamoeba histolytica*)	Widespread; most common in developing countries	Ingestion of cysts, usually in food or water contaminated with feces	Weeks to months
Leptospirosis		See leptospirosis, Table 5A	
Acute human immuno deficiency virus infection		See acute human immunodeficiency virus, Table 5A	
East African trypanosomiasis		See East African trypanosomiasis, Table 5A	
Viral hemorrhagic fever**		See viral hemorrhagic fever, Table 5A	
Q fever		See Q fever, Table 5A	

Source: E. T. Ryan, M. T. Wilson, K. C. Kain. Illness after International Travel. N. England, J Med, Vol 347, No. 7, Aug. 15, 2002, 505-516)

Table 5C. Common or Important Infectious Diseases That May Cause Fever in travelers: Incubation More than 6 weeks

Disease	Distribution	Mode of transmission	Incubation period
Malaria		See malaria, Table 5A	
Tuberculosis	Worldwide; very common in parts of Africa, Asia, Latin America, Eastern Europe, and Russia	Inhalation	Primary, weeks; reactivation, years
Hepatitis B	Worldwide; chronic infection common in parts of Asia, Africa, and Latin America	Percutaneous and permucosal exposure to infective fluids or blood; sexual and perinatal transmission	60-90 days (45-180 days; rarely, 9 mths)
Visceral leishmaniasis (*Leishmania donovani, L. chagasi*, others)	Many parts of Africa, Asia, South America, and the Mediterranean basin, especially rural areas	Bite of infective sand fly	2-6 mths (10 days to years)
Lymphatic filariasis (*Wuchereria bancrofti* and other filariae)	Widespread in tropical areas	Bite of an infective mosquito or other arthropod	3-6 mths or longer
Schistosomiasis		See acute schistosomiasis, Table 5A	
Amebic liver abscess		See amebic liver abscess, Table 5A	
Chronic mycosis	Worldwide; causative agent varies	Inhalation of infectious conidia, soil, or dust	1 wk to years
Hepatitis E		See hepatitis E, Table 5A	
Rabies		See rabies,Table 5A	
African trypanosomiasis (*T. brucei rhodesiense*, *T. brucei gambiense*)	Sub-Saharan Africa, with focal distribution	Bite of infective tsetse fly	Chronic illness, mths to years

Source: E. T. Ryan, M. T. Wilson, K. C. Kain. Illness after International Travel. N. England, J Med, Vol 347, No. 7, Aug. 15, 2002, 505-516)

Fever associated with Eosinophilia

- Although fever in association with peripheral eosinophilia may be due to haematologic conditions or acute allergic reactions, the presence of both fever and eosinophilia in a traveler should prompt consideration of an infectious cause like helminthic infections from hookworm, ascasis, strongylordes, schistosomiasis, toxocanasis, lymphatic filariasis, and acute trichinosis.

2. Diarrhoea

Most episodes of travelers' diarrhoea resolve during or shortly after travel, often in response to antimicrobial and antimotility agents. Causative bacterial or viral agents may be identified in 50 to 75 percent of travelers with diarrhea that lasts less than two weeks. As the duration of diarrhea increases, the likelihood of diagnosing a specific infectious cause decreases, although the likelihood of diagnosing a parasitic infection increases. Giardia lamblia, crytosporidium parvum, Entamoeba histolytica, and cryptospora cayetanensis are the most frequently identified parasites (Table 6).

Table 6. Causes and duration of diarrhea in travelers

Causes, Duration, and Organism	Comments
Acute (duration less than 2 wks)	
Viral – *Caliciviruses* (Norwalk and Norwalk-like viruses), rotaviruses, enteroviruses	Often not specifically diagnosed; may account for 5 to 10% of cases of acute traveler's diarrhea
Bacterial – Enterotoxigenic or enteroaggregative *Escherichia coli*, *Campylobacter jejun* plesiomonas, *Clostridium difficile*, salmonella, shigella, vibrio, aeromonas	Most commonly identified cause of acute traveler's diarrhea; account for 50 to 75% of acute traveler's diarrhea
Parasitic – *Giardia lamblia*, *Cryptosporidium parvum*†, *Entamoeba histolytica*, *Cyclospora cayetanensis*, *Isospora belli*†, *E. polecki*, - *Balantidium coli*, *Trichinella spiralis*	Account for <1 to 5% of cases of acute traveler's diarrhea
Chronic or persistent (duration from 2 to 4 wks)	
Bacterial – Enteroaggregative or enteropathogenic *E. coli*, *C. jejuni*, shigella, salmonella, *Yersinia enterocolitica*, aeromonas, plesiomonas, *C. difficile*, *Mycobacterium tuberculosis*, *M. avium* complex, *Tropheryma whippelii* (cause of Whipple's disease)	Rare cause of chronic traveler's diarrhea; enteroaggregative *E. coli*, enteropathogenic *E. coli*, and *T. whippelii* not identified on routine stool culture; diarrhea caused by *T. whippelii* may be associated with arthritis, rash, and cardiac or neurologic involvement
Fungal – *Paracoccidioides brasiliensis*, *Histoplasma capsulatum*	Rarely associated with chronic traveler's diarrhea; respiratory symptoms may predominate
Parasitic – Microsporidial – *Enterocytozoon bieneusi*, *Encephalitozoon intestinalis*	Cause chronic diarrhea almost exclusively in immuno-compromised persons
Protozoal – *G. lamblia*	Account for 30% of cases of chronic traveler's diarrhea. Most commonly identified parasitic cause of traveler's diarrhea; relapsing infections may be associated with hypogamma-globulinemia
Protozoal – *E. histolytica*	Bloody diarrhea with fever; presence of fecal leukocytes may be variable
Protozoal – *C. parvum*†	Watery, nonbloody diarrhea
Protozoal – *C. cayetanensis*	May initially manifest as watery diarrhea, vomiting, and fever with residual severe fatigue and anorexia; seasonal variation in incidence
Protozoal – *I. belli*	May be associated with eosinophilia in immuno-competent hosts
Protozoal – *Dientamoeba fragilis*	Pathogenicity controversial; may be associated with enterobiasis (pinworm infection)
Helminthic – *Trichuris trichiura*, *Strongyloides stercoralis*, schistosoma, *Capillaria philippinensis*, *Fasciolopsis buski*, *Metagonimus yokogawai*, echinostoma	Rarely associated with chronic traveler's diarrhea; usually in persons with heavy parasite burdens
Small-bowel overgrowth syndrome	May follow resolved infection; usually diagnosed presumptive ly; responds to antimicrobial agents such as metronidazole or a fluoroquinolone antibiotic
Tropical sprue	Small-bowel biopsy shows villous blunting and crypt hyperplasia; responds to tetracycline and folate
Disaccharidase deficiency	Enzyme deficiency may persist after an inciting infection clears; usually diagnosed presumptively; responds to dietary modification; may be permanent
Irritable bowel syndrome	May follow traveler's diarrhea
Non-travel-related: inflammatory bowel disease, cancer, laxa tive use, endocrinopathy, dysmotility, idiopathic disease	Onset may be temporally, but not causally, related to travel

Source: E. T. Ryan, M. T. Wilson, K. C. Kain. Illness after International Travel. N. England, J Med, Vol 347, No. 7, Aug. 15, 2002, 505-516)

3. Dermatological Conditions

Dermatological conditions are common among persons who have recently traveled. The location of lesions, their pattern (maculopapular, nodular, ulcerative, or linear), and the presence or absence of associated symptoms (such as pain, pruritus, and fever) are useful in establishing the diagnosis.

- Bites from insects (e.g. bed bugs and fleas) cause pruritic, papular lesions that generally occur in clusters or in a linear distribution.
- Scabies (due to sarcoptes scabiei) is common in the developing world, and adventurous backpacks and sexually active travelers are those most commonly infected.
- Eschars may be seen in scrub typhus, and African tick typhus (often from safari in South Africa), An eschar, the site where a rickettsia-transmitting arthropod has fed is usually small (less than 1cm in diameter) is asymptomatic and is often overlooked.
- The serpanginous lesion of cutaneous larva migrans is the most frequent serpanginous lesion seen among travelers. It results from the migration of animal hookworms in superficial tissues. It is usually acquired after direct contact of the skin with soil or sand contaminated with dog or cat faeces.

4. Animal bites and risk of rabies

Few countries are rabies free. Risk of rabies is highest in those countries in which dog rabies is highly endemic and includes many countries in Africa, Central and South America, parts of Mexico, India, Nepal, and other Asian countries. Rabies is a potentially fatal viral infection transmitted in the saliva of animals, usually through a bite.

It is important to stress to the traveler that any dog or animal (bats, foxes, coyotes) bite is a potential source of rabies. Rabies should be considered in any case of rapidly progressive encephalitis, even in individuals who do not have a history of an animal bite. Therapy is preventive in nature and should be administered as either preexposure or, more commonly, postexposure prophylaxis. Travelers who plan to visit countries where postexposure rabies vaccine is not available or difficult to access should have preexposure vaccination. Advise travelers to also cover any open wounds on their limbs since even a dog lick can infect a wound with the rabies virus.

For dog and other animal bites, prompt first aid measures including washing the wound with soap and water for at least five minutes, followed by seeking urgent medical attention for further management of the wound with injection tetanus vaccine and postexposure rabies vaccination. It is important to inform the traveler that preexposure rabies vaccination does not eliminate the need for additional therapy after rabies exposure.

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TAKE HOME MESSAGES

- **More than 20 to 50 percent of individuals report some health problems while travelling.**
- **Illnesses and clinical conditions that may be adversely affected by air travel require medical clearance.**
- **The non-infective travel related problems that may be reduced or prevented are motion sickness, jet-lag, air transit associated barotraumas, and venothrombosis.**
- **Travel related infections that need to be prevented are intestinal infections and travel diarrhea, respiratory infections, insect borne illnesses, sexually transmitted infections, and others, like avian influenza, Schistosomiasis or leptospirosis.**
- **Food and water precautions cover hygiene of food and drinks, avoidance of food borne infections, and dangers of water activities to be avoided.**
- **Prevention of mosquito-borne infections covers measures to prevent mosquito bites and specific measures where appropriate against malaria, yellow fever, and Japanese B encephalitis.**
- **Early treatment of the returning traveler with symptoms is important and the symptoms that should alert the primary care physician to ask for a history of recent travel out of the country are: fever, diarrhoea, dermatological conditions, and animal bites.**