

Infectious diseases of potential risk for travellers

Depending on the travel destination, travellers may be exposed to a number of infectious diseases; exposure depends on the presence of infectious agents in the area to be visited. The risk of becoming infected will vary according to the purpose of the trip and the itinerary within the area, the standards of accommodation, hygiene and sanitation, as well as the behaviour of the traveller. In some instances, disease can be prevented by vaccination, but there are some infectious diseases, including some of the most important and most dangerous, for which no vaccines exist.

General precautions can greatly reduce the risk of exposure to infectious agents and should always be taken for visits to any destination where there is a significant risk of exposure. These precautions should be taken regardless of whether any vaccinations or medication have been administered.

Modes of transmission and general precautions

The modes of transmission for different infectious diseases and the corresponding general precautions are outlined in the following paragraphs.

Foodborne and waterborne diseases

Food- and waterborne diseases are transmitted by consumption of contaminated food and drink. The risk of infection is reduced by taking hygienic precautions with all food, drink and drinking-water consumed when travelling and by avoiding direct contact with polluted recreational waters (see Chapter 3). Examples of diseases acquired by food and water consumption are traveller's diarrhoea, hepatitis A, typhoid fever and cholera.

Vector-borne diseases

A number of particularly serious infections are transmitted by insects and other vectors such as mosquitoes and ticks. The risk of infection can be reduced by taking precautions to avoid insect bites and contact with other vectors in places where infection is likely to be present (see Chapter 3). Examples of vector-borne diseases are malaria, yellow fever, dengue, Japanese encephalitis, chikungunya and tick-borne encephalitis.

Zoonoses (diseases transmitted by animals)

Zoonoses include many infections that can be transmitted to humans through animal bites or contact with animals, contaminated body fluids or faeces, or by consumption of foods of animal origin, particularly meat and milk products. The risk of infection can be reduced by avoiding close contact with any animals—including wild, captive and domestic animals—in places where infection is likely to be present. Particular care should be taken to prevent children from approaching or touching animals. Examples of zoonoses are rabies, tularemia, brucellosis, leptospirosis and certain viral haemorrhagic fevers.

Sexually transmitted diseases

Sexually transmitted diseases are passed from person to person through unsafe sexual practices. The risk of infection can be reduced by avoiding casual and unprotected sexual intercourse, and by use of condoms. Examples of sexually transmitted diseases are hepatitis B, HIV/AIDS and syphilis.

Bloodborne diseases

Bloodborne diseases are transmitted by direct contact with infected blood or other body fluids. The risk of infection can be reduced by avoiding direct contact with blood and body fluids, by avoiding the use of potentially contaminated needles and syringes for injection or any other medical or cosmetic procedure that penetrates the skin (including acupuncture, piercing and tattooing), and by avoiding transfusion of unsafe blood (see Chapter 8). Examples of bloodborne diseases are hepatitis B and C, HIV/AIDS and malaria.

Airborne diseases

Airborne transmission occurs when droplet nuclei (evaporated droplets) < 5 micron in size are disseminated in the air. These droplet nuclei can remain suspended in the air for some time. Droplet nuclei are the residuals of droplets and then suspended in the air, they dry and produce particles ranging in size from 1–5 microns. Diseases spread by this mode include open/active pulmonary tuberculosis (TB), measles, chicken pox, pulmonary plague and haemorrhagic fever with pneumonia. Droplet transmission occurs when there is adequate contact between the mucous membranes of the nose and mouth or conjunctivae of a susceptible person and large particle droplets (> 5 microns). Droplets are usually generated by the infected person during coughing, sneezing, talking or when health care workers undertake procedures such as tracheal suctioning. Diseases transmitted by this route include pneumonias, pertussis, diphtheria, SARS, mumps and meningitis.

Diseases transmitted from soil

Soil-transmitted diseases include those caused by dormant forms (spores) of infectious agents, which can cause infection by contact with broken skin (minor cuts, scratches, etc.). The risk of infection can be reduced by protecting the skin from direct contact with soil in places where soil-transmitted infections are likely to be present. Examples of bacterial diseases transmitted from soil are anthrax and tetanus. Certain intestinal parasitic infections, such as ascariasis and trichuriasis, are transmitted via soil and infection may result from consumption of soil-contaminated vegetables. Fungal infections may be acquired by inhalation of contaminated soil.

Specific infectious diseases involving potential health risks for travellers

The main infectious diseases to which travellers may be exposed, and precautions for each, are detailed on the following pages. Information on malaria, one of the most important infectious disease threats for travellers, is provided in Chapter 7. The infectious diseases described in this chapter have been selected on the basis of the following criteria:

- diseases that have a sufficiently high global or regional prevalence to constitute a significant risk for travellers;
- diseases that are severe and life-threatening, even though the risk of exposure may be low for most travellers;
- diseases for which the perceived risk may be much greater than the real risk, and which may therefore cause anxiety to travellers;
- diseases that involve a public health risk due to transmission of infection to others by the infected traveller.

Information about available vaccines and indications for their use by travellers is provided in Chapter 6. Advice concerning the diseases for which vaccination is routinely administered in childhood, i.e. diphtheria, measles, mumps and rubella, pertussis, poliomyelitis and tetanus, and the use of the corresponding vaccines later in life and for travel, is also given in Chapter 6. These diseases are not included in this chapter.

The most common infectious illness to affect travellers, namely travellers' diarrhoea, is covered in Chapter 3. Because travellers' diarrhoea can be caused by many different foodborne and waterborne infectious agents, for which treatment and precautions are essentially the same, the illness is not included with the specific infectious diseases.

Some of the diseases included in this chapter, such as brucellosis, HIV/AIDS, leishmaniasis and tuberculosis, have prolonged and variable incubation periods. Clinical manifestations of these diseases may appear long after the return from travel, so that the link with the travel destination where the infection was acquired may not be readily apparent.

AVIAN INFLUENZA

Cause	Avian influenza A(H5N1) virus, and sometimes other non-human influenza subtypes (H7, H9).
Transmission	Human infections with avian influenza A(H5N1) virus occur through bird-to-human, possibly environment-to-human, and very rarely limited, non-sustained human-to-human transmission. Direct contact with infected poultry, or surfaces and objects contaminated by their droppings, is the main route of spread to humans. Exposure risk is considered highest during slaughter, de-feathering, butchering, and preparation of poultry for cooking. There is no evidence that properly cooked poultry or poultry products can be a source of infection.
Nature of disease	Patients usually present initially with symptoms of fever and influenza-like illness (malaise, myalgia, cough, sore throat). Diarrhoea and other gastrointestinal symptoms may occur. The disease progresses within days and almost all patients develop clinically apparent pneumonia with radiographic infiltrates of varying patterns. Sputum production is variable and sometimes bloody. Multi-organ failure, sepsis-like syndromes, and uncommonly encephalopathy, occur. The fatality rate among hospitalized patients with confirmed H5N1 infection has been high (about 60%), most commonly as a result of respiratory failure caused by progressive pneumonia and acute respiratory distress syndrome.
Geographical distribution	Extensive outbreaks in poultry have occurred in parts of Asia, the Middle East, Europe and Africa since 2003, but only sporadic human infections have occurred to date. Continued exposure of humans to avian H5N1 viruses increases the likelihood that the virus will acquire the necessary characteristics for efficient and sustained human-to-human transmission through either gradual genetic mutation or reassortment with a human influenza A virus. Between November 2003 and October 2007, > 300 human cases of laboratory-confirmed H5N1 infection were reported to WHO from 12 countries in South-East and central Asia, Europe, Africa and the Middle East.
Risk for travellers	H5N1 avian influenza is primarily a disease in birds. The virus does not easily cross the species barrier to infect humans. To date, no traveller has been infected. The risk of infection is increased by prolonged, close and heavy exposure to the virus.
Prophylaxis	No human H5 vaccine is commercially available at present. Neuraminidase inhibitors (oseltamivir, zanamivir) are inhibitory for the virus and demonstrate proven efficacy in vitro and in animal studies for prophylaxis and treatment of H5N1 infection. They are therefore recommended for post-exposure prophylaxis in certain exposed persons (http://www.who.int/csr/disease/avian_influenza/guidelines/pharmamanagement/en/index.html). At present WHO does not recommend pre-exposure prophylaxis for travellers but advice may change depending on new findings.
Precautions	Travellers should avoid contact with high-risk environments in affected countries such as live animal markets and poultry farms, any free-ranging or caged poultry, or surfaces that might be contaminated by poultry droppings. Travellers in affected countries should avoid contact with dead migratory birds or wild birds showing signs of disease. Travellers should avoid consumption of undercooked eggs, poultry or poultry products. Hand hygiene with frequent washing or use of alcohol rubs is recommended. If exposure to persons with suspected H5N1

illness or severe, unexplained respiratory illness occurs, travellers should urgently consult health professionals. Travellers should contact their local health providers or national health authorities for supplementary information.

ANTHRAX

Cause	<i>Bacillus anthracis</i> bacteria.
Transmission	Cutaneous infection, the most frequent clinical form of anthrax, occurs through contact with contaminated products from infected animals (mainly cattle, goats, sheep), such as leather or woollen goods, or through contact with soil containing anthrax spores.
Nature of the disease	A disease of herbivorous animals that occasionally causes acute infection in humans, usually involving the skin, as a result of contact with contaminated tissues or products from infected animals, or with anthrax spores in soil. Untreated infections may spread to regional lymph nodes and to the bloodstream, and may be fatal.
Geographical distribution	Sporadic cases occur in animals worldwide; there are occasional outbreaks in central Asia and Africa.
Risk for travellers	Very low for most travellers.
Prophylaxis	None. (A vaccine is available for people at high risk because of occupational exposure to <i>B. anthracis</i> ; it is not commercially available in most countries.)
Precautions	Avoid direct contact with soil and with products of animal origin, such as souvenirs made from animal skins.

BRUCELLOSIS

Cause	Several species of <i>Brucella</i> bacteria.
Transmission	Brucellosis is primarily a disease of animals. Infection occurs from cattle (<i>Brucella abortus</i>), dogs (<i>B. canis</i>), pigs (<i>B. suis</i>), or sheep and goats (<i>B. melitensis</i>), usually by direct contact with infected animals or by consumption of unpasteurized (raw) milk or cheese.
Nature of the disease	A generalized infection with insidious onset, causing continuous or intermittent fever and malaise, which may last for months if not treated adequately. Relapse is common after treatment.
Geographical distribution	Worldwide, in animals. It is most common in developing countries and the Mediterranean region.
Risk for travellers	Low for most travellers. Those visiting rural and agricultural areas may be at greater risk. There is also a risk in places where unpasteurized milk products are sold near tourist centres.
Prophylaxis	None.
Precautions	Avoid consumption of unpasteurized milk and milk products and direct contact with animals, particularly cattle, goats and sheep.

CHIKUNGUNYA

Cause	Chikungunya virus – an Alphavirus (family Togaviridae).
Transmission	Chikungunya is transmitted by mosquitoes, including several <i>Aedes</i> species which bite during daylight hours. Two important vectors are <i>Aedes aegypti</i> and <i>Aedes albopictus</i> , both of which also transmit dengue virus. There is no direct person-to-person transmission. The virus has been isolated from monkeys in Africa.
Nature of the disease	Chikungunya is an acute febrile illness with sudden onset of fever and joint pains, particularly affecting the hands, wrists, ankles and feet. There may be severe chills, leukopenia and often a rash. Generalized myalgia is also common. The name “chikungunya” derives from a Kimakonde word meaning “that which bends up”. Most patients recover after a few days but in some cases the joint pains may persist for weeks, months or even longer. Chikungunya may also be asymptomatic.
Geographical distribution	Chikungunya occurs in sub-Saharan Africa, South-East Asia and tropical areas of the Indian subcontinent, as well as islands in the south-western Indian Ocean. The period 2005–2007 witnessed an unprecedented spread of outbreaks that affected at least 12 countries and territories (see map), including a localized outbreak in north-eastern Italy.
Risk for travellers	There is a risk for travellers in areas where chikungunya is endemic and in areas affected by epidemics.
Prophylaxis	None.
Precautions	Travellers should take precautions to avoid mosquito bites both during the day and night (see Chapter 3).

CHOLERA

Cause	<i>Vibrio cholerae</i> bacteria, serogroups O1 and O139.
Transmission	Infection occurs through ingestion of food or water contaminated directly or indirectly by faeces or vomitus of infected persons. Cholera affects only humans; there is no insect vector or animal reservoir host.
Nature of the disease	An acute enteric disease varying in severity. Most infections are asymptomatic (i.e. do not cause any illness). In mild cases, diarrhoea occurs without other symptoms. In severe cases, there is sudden onset of profuse watery diarrhoea with nausea and vomiting and rapid development of dehydration. In severe untreated cases, death may occur within a few hours due to dehydration leading to circulatory collapse.
Geographical distribution	Cholera occurs mainly in poor countries with inadequate sanitation and lack of clean drinking-water and in war-torn countries where the infrastructure may have broken down. Many developing countries are affected, particularly those in Africa and Asia, and to a lesser extent those in central and South America (see map).
Risk for travellers	Very low for most travellers, even in countries where cholera epidemics occur. Humanitarian relief workers in disaster areas and refugee camps are at risk.

Prophylaxis	Cholera vaccines for use by travellers and those in occupational risk groups are available in some countries (see Chapter 6).
Precautions	As for other diarrhoeal diseases. All precautions should be taken to avoid consumption of potentially contaminated food, drink and drinking-water. Oral rehydration salts should be carried to combat dehydration in case of severe diarrhoea (see Chapter 3).

DENGUE

Cause	The dengue virus – a flavivirus of which there are four serotypes.
Transmission	Dengue is mostly transmitted by the <i>Aedes aegypti</i> mosquito, which bites during daylight hours. There is no direct person-to-person transmission. Monkeys act as a reservoir host in South-East Asia and West Africa.
Nature of the disease	<p>Dengue occurs in three main clinical forms:</p> <ul style="list-style-type: none"> ■ Dengue fever is an acute febrile illness with sudden onset of fever, followed by development of generalized symptoms and sometimes a macular skin rash. It is known as “breakbone fever” because of severe muscle, joint and bone pains. Pain behind the eyes (retro-orbital pain) may be present. The fever may be biphasic (i.e. two separate episodes or waves of fever). Most patients recover after a few days. ■ Dengue haemorrhagic fever has an acute onset of fever followed by other symptoms resulting from thrombocytopenia, increased vascular permeability and haemorrhagic manifestations. ■ Dengue shock syndrome supervenes in a small proportion of cases. Severe hypotension develops, requiring urgent medical treatment to correct hypovolaemia. Without appropriate treatment, 40–50% of cases are fatal; with timely therapy, the mortality rate is 1% or less.
Geographical distribution	Dengue is widespread in tropical and subtropical regions of central and South America and South and South-East Asia and also occurs in Africa (see map). The risk is lower at altitudes above 1000 metres.
Risk for travellers	There is a significant risk for travellers in areas where dengue is endemic and in areas affected by epidemics of dengue.
Prophylaxis	None.
Precautions	Travellers should take precautions to avoid mosquito bites both during the day and evening in areas where dengue occurs.

FILARIASIS

Cause	The parasitic diseases covered by the term filariasis are caused by nematodes (roundworms) of the family Filarioidea. Diseases in this group include lymphatic filariasis (elephantiasis) and onchocerciasis (river blindness).
Transmission	Lymphatic filariasis is transmitted through the bite of infected mosquitoes, which introduce larval forms of the nematode during a blood meal. Onchocerciasis is transmitted through the bite of infected blackflies.

Nature of the disease	<p>■ Lymphatic filariasis is a chronic parasitic disease in which adult filaria inhabit the lymphatic vessels, discharging microfilaria into the blood stream. Typical manifestations in symptomatic cases include filarial fever, lymphadenitis and retrograde lymphangitis followed by chronic manifestations such as lymphoedema, hydrocele, chyluria and in rare instances renal damage.</p> <p>■ Onchocerciasis is a chronic parasitic disease occurring mainly in sub-Saharan western Africa in which adult worms are found in fibrous nodules under the skin. They discharge microfilaria, which migrate through the skin causing dermatitis, and reach the eye causing damage that results in blindness.</p>
Geographical distribution	Lymphatic filariasis occurs throughout sub-Saharan Africa and in much of South-East Asia, in the Pacific islands and in smaller foci in south America. Onchocerciasis occurs mainly in western and central Africa, also in central and South America.
Risk for travellers	Generally low, unless travel involves extensive exposure to the vectors in endemic areas.
Prophylaxis	None.
Precautions	Avoid exposure to the bites of mosquitoes and/or blackflies in endemic areas.

GIARDIASIS

Cause	The protozoan parasite <i>Giardia intestinalis</i> , also known as <i>G. lamblia</i> and <i>G. duodenalis</i> .
Transmission	Infection usually occurs through ingestion of <i>G. intestinalis</i> cysts in water (including both unfiltered drinking-water and recreational waters) contaminated by the faeces of infected humans or animals.
Nature of the disease	Many infections are asymptomatic. When symptoms occur, they are mainly intestinal, characterized by chronic diarrhoea (watery initially, then loose greasy stools), abdominal cramps, bloating, fatigue and weight loss.
Geographical distribution	Worldwide.
Risk for travellers	Significant risk for travellers in contact with recreational waters used by wildlife or with unfiltered water in swimming pools, or contaminated municipal water supplies.
Prophylaxis	None.
Precautions	Avoid ingesting any potentially contaminated (i.e. unfiltered) drinking-water or recreational water.

HAEMOPHILUS MENINGITIS

Cause	<i>Haemophilus influenzae</i> type b (Hib) bacteria.
Transmission	Direct contact with infected persons (usually children).
Nature of the disease	Hib causes meningitis in infants and young children; it may also cause epiglottitis, osteomyelitis, pneumonia, sepsis and septic arthritis.

Geographical distribution	Worldwide. Hib disease is most common in countries where vaccination against Hib is not practised. It has almost disappeared in countries where routine childhood vaccination is carried out.
Risk for travellers	A risk for unvaccinated children visiting countries where Hib vaccination is not practised and where infection is therefore likely to be more common.
Prophylaxis	Vaccination of children (see Chapter 6).
Precautions	None.

HAEMORRHAGIC FEVERS

Haemorrhagic fevers are viral infections; important examples are Crimean–Congo haemorrhagic fever (CCHF), dengue, Ebola and Marburg haemorrhagic fevers, Lassa fever, Rift Valley fever (RVF) and yellow fever.

Dengue and yellow fever are described separately.

Cause	Viruses belonging to several families. Most haemorrhagic fevers, including dengue and yellow fever, are caused by flaviviruses; Ebola and Marburg are caused by filoviruses, CCHF by a bunyavirus, Lassa fever by an arenavirus, and RVF by a phlebovirus.
Transmission	Most viruses that cause haemorrhagic fevers are transmitted by mosquitoes. However, no insect vector has so far been identified for Ebola or Marburg viruses. Although humans have on occasion acquired infection from contact with tissues of diseased non-human primates and other mammals, most human infections have resulted from direct contact with the body fluids or secretions of infected patients. Humans who become infected with CCHF usually become infected from a tick bite, but can also acquire the virus from direct contact with blood or other infected issues from livestock. Lassa fever virus is carried by rodents and transmitted by excreta, either as aerosols or by direct contact. RVF can be acquired either by mosquito bite or by direct contact with blood or tissues of infected animals (mainly sheep), including consumption of unpasteurized milk. Some viral haemorrhagic fevers were amplified in hospitals by nosocomial transmission by unsafe procedures, use of contaminated medical devices (including needles and syringes) and unprotected exposures to contaminated body fluids.
Nature of the diseases	The haemorrhagic fevers are severe acute viral infections, usually with sudden onset of fever, malaise, headache and myalgia followed by pharyngitis, vomiting, diarrhoea, skin rash and haemorrhagic manifestations. The outcome is fatal in a high proportion of cases (over 50%).
Geographical distribution	Diseases in this group occur widely in tropical and subtropical regions. Ebola and Marburg haemorrhagic fevers and Lassa fever occur in parts of sub-Saharan Africa. CCHF occurs in the steppe regions of central Asia and in central Europe, as well as in tropical and southern Africa. RVF occurs in Africa and has recently spread to Saudi Arabia. Other viral haemorrhagic fevers occur in central and South America.
Risk for travellers	Very low for most travellers. However, travellers visiting rural or forest areas may be exposed to infection.
Prophylaxis	None (except for yellow fever).

Precautions	Avoid exposure to mosquitoes and ticks and contact with rodents or bats. Avoid unpasteurized milk.
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HANTAVIRUS DISEASES

Hantavirus diseases are viral infections; important examples are haemorrhagic fever with renal syndrome (HFRS) and hantavirus pulmonary syndrome (HPS).

Cause	Hantaviruses, which belong to the family of bunyaviruses.
Transmission	Hantaviruses are carried by various species of rodents; specific viruses have particular rodent hosts. Infection occurs through direct contact with the faeces, saliva or urine of infected rodents or by inhalation of the virus in rodent excreta.
Nature of the diseases	Acute viral diseases in which the vascular endothelium is damaged, leading to increased vascular permeability, hypotension, haemorrhagic manifestations and shock. Impaired renal function with oliguria is characteristic of HFRS. Respiratory failure caused by acute non-cardiogenic pulmonary oedema occurs in HPS. The outcome is fatal in up to 15% of HFRS cases and up to 50% of HPS cases.
Geographical distribution	Worldwide, in rodents.
Risk for travellers	Very low for most travellers. However, travellers may be at risk in any environment where rodents are present in large numbers and contact may occur.
Prophylaxis	None.
Precautions	Avoid exposure to rodents and their excreta. Adventure travellers, back-packers, campers and travellers with occupational exposure to rodents in areas endemic for hantaviruses should take precautions to exclude rodents from tents or other accommodation and to protect all food from contamination by rodents.

HEPATITIS A

Cause	Hepatitis A virus, a member of the picornavirus family.
Transmission	The virus is acquired directly from infected persons by the faecal–oral route or by close contact, or by consumption of contaminated food or drinking-water. There is no insect vector or animal reservoir (although some non-human primates are sometimes infected).
Nature of the disease	An acute viral hepatitis with abrupt onset of fever, malaise, nausea and abdominal discomfort, followed by the development of jaundice a few days later. Infection in very young children is usually mild or asymptomatic; older children are at risk of symptomatic disease. The disease is more severe in adults, with illness lasting several weeks and recovery taking several months; case-fatality is greater than 2% for those over 40 years of age and 4% for those over 60.
Geographical distribution	Worldwide, but most common where sanitary conditions are poor and the safety of drinking-water is not well controlled (see map).

Risk for travellers	Non-immune travellers to developing countries are at significant risk of infection. The risk is particularly high for travellers exposed to poor conditions of hygiene, sanitation and drinking-water control.
Prophylaxis	Vaccination (see Chapter 6).
Precautions	Travellers who are non-immune to hepatitis A (i.e. have never had the disease and have not been vaccinated) should take particular care to avoid potentially contaminated food and water.

HEPATITIS B

Cause	Hepatitis B virus (HBV), belonging to the Hepadnaviridae.
Transmission	Infection is transmitted from person to person by contact with infected body fluids. Sexual contact is an important mode of transmission, but infection is also transmitted by transfusion of contaminated blood or blood products, or by use of contaminated needles or syringes for injections. There is also a potential risk of transmission through other skin-penetrating procedures including acupuncture, piercing and tattooing. Perinatal transmission may occur from mother to baby. There is no insect vector or animal reservoir.
Nature of the disease	Many HBV infections are asymptomatic or cause mild symptoms, which are often unrecognized in adults. When clinical hepatitis results from infection, it has a gradual onset, with anorexia, abdominal discomfort, nausea, vomiting, arthralgia and rash, followed by the development of jaundice in some cases. In adults, about 1% of cases are fatal. Chronic HBV infection persists in a proportion of adults, some of whom later develop cirrhosis and/or liver cancer.
Geographical distribution	Worldwide, but with differing levels of endemicity. In north America, Australia, northern and western Europe and New Zealand, prevalence of chronic HBV infection is relatively low (less than 2% of the general population) (see map).
Risk for travellers	Negligible for those vaccinated against hepatitis B. Unvaccinated travellers are at risk if they have unprotected sex or use contaminated needles or syringes for injection, acupuncture, piercing or tattooing. An accident or medical emergency requiring blood transfusion may result in infection if the blood has not been screened for HBV. Travellers engaged in humanitarian relief activities may be exposed to infected blood or other body fluids in health care settings.
Prophylaxis	Vaccination (see Chapter 6).
Precautions	Adopt safe sexual practices and avoid the use of any potentially contaminated instruments for injection or other skin-piercing activity.

HEPATITIS C

Cause	Hepatitis C virus (HCV), which is a flavivirus.
Transmission	The virus is acquired through person-to-person transmission by parenteral routes. Before screening for HCV became available, infection was mainly transmitted by transfusion of contaminated blood or blood products. Nowadays transmission frequently occurs through use of contaminated needles,

	syringes and other instruments used for injections and other skin-piercing procedures. Sexual transmission of hepatitis C occurs rarely. There is no insect vector or animal reservoir for HCV.
Nature of the disease	Most HCV infections are asymptomatic. In cases where infection leads to clinical hepatitis, the onset of symptoms is usually gradual, with anorexia, abdominal discomfort, nausea and vomiting, followed by the development of jaundice in some cases (less commonly than in hepatitis B). Most clinically affected patients will develop a long-lasting chronic infection, which may lead to cirrhosis and/or liver cancer.
Geographical distribution	Worldwide, with regional differences in levels of prevalence (see map).
Risk for travellers	Travellers are at risk if they practise unsafe behaviour involving the use of contaminated needles or syringes for injection, acupuncture, piercing or tattooing. An accident or medical emergency requiring blood transfusion may result in infection if the blood has not been screened for HCV. Travellers engaged in humanitarian relief activities may be exposed to infected blood or other body fluids in health care settings.
Prophylaxis	None.
Precautions	Adopt safe sexual practices and avoid the use of any potentially contaminated instruments for injection or other skin-piercing activity.

HEPATITIS E

Cause	Hepatitis E virus, which has not yet been definitively classified (formerly classified as a member of the Caliciviridae).
Transmission	Hepatitis E is a waterborne disease usually acquired from contaminated drinking-water. Direct faecal–oral transmission from person to person is also possible. There is no insect vector. It is suspected, but not proved, that hepatitis E may have a domestic animal reservoir host, such as pigs.
Nature of the disease	The clinical features and course of the disease are generally similar to those of hepatitis A. As with hepatitis A, there is no chronic phase. Young adults are most commonly affected. In pregnant women there is an important difference between hepatitis E and hepatitis A: during the third trimester of pregnancy, hepatitis E takes a much more severe form with a case-fatality rate reaching 20%.
Geographical distribution	Worldwide. Most cases, both sporadic and epidemic, occur in countries with poor standards of hygiene and sanitation.
Risk for travellers	Travellers to developing countries may be at risk when exposed to poor conditions of sanitation and drinking-water control.
Prophylaxis	None.
Precautions	Travellers should follow the general conditions for avoiding potentially contaminated food and drinking-water (see Chapter 3).

HIV/AIDS AND OTHER SEXUALLY TRANSMITTED INFECTIONS

The most important sexually transmitted diseases and infectious agents are:

HIV/AIDS	human immunodeficiency virus
hepatitis B	hepatitis B virus
syphilis	<i>Treponema pallidum</i>
gonorrhoea	<i>Neisseria gonorrhoeae</i>
chlamydial infections	<i>Chlamydia trachomatis</i>
trichomoniasis	<i>Trichomonas vaginalis</i>
chancroid	<i>Haemophilus ducreyi</i>
genital herpes	herpes simplex virus (human (alpha) herpesvirus 2)
genital warts	human papillomavirus

Travel restrictions

Some countries have adopted entry and visa restrictions for people with HIV/AIDS. Travellers who are infected with HIV should consult their personal physician for a detailed assessment and advice before travel. WHO has taken the position that there is no public health justification for entry restrictions that discriminate solely on the basis of a person's HIV status.

Transmission	Infection occurs during unprotected sexual intercourse. Hepatitis B, HIV and syphilis may also be transmitted in contaminated blood and blood products, by contaminated syringes and needles used for injection, and potentially by unsterilized instruments used for acupuncture, piercing and tattooing.
Nature of the diseases	<p>Most of the clinical manifestations are included in the following syndromes: genital ulcer, pelvic inflammatory disease, urethral discharge and vaginal discharge. However, many infections are asymptomatic.</p> <p>Sexually transmitted infections are a major cause of acute illness, infertility, long-term disability and death, with severe medical and psychological consequences for millions of men, women and children.</p> <p>Apart from being serious diseases in their own right, sexually transmitted infections increase the risk of HIV infection. The presence of an untreated disease (ulcerative or non-ulcerative) can increase by a factor of up to 10 the risk of becoming infected with HIV and transmitting the infection. On the other hand, early diagnosis and improved management of other sexually transmitted infections can reduce the incidence of HIV infection by up to 40%. Prevention and treatment of all sexually transmitted infections are therefore important for the prevention of HIV infection.</p>
Geographical distribution	Worldwide (see map). The regional differences in the prevalence of HIV infection are shown on the map. Sexually transmitted infections have been known since ancient times; they remain a major public health problem, which was compounded by the appearance of HIV/AIDS around 1980. An estimated 340 million episodes of curable sexually transmitted infections (chlamydial infections, gonorrhoea, syphilis, trichomoniasis) occur throughout the world every year. Viral infections, which are more difficult to treat, are also very common in many populations. Genital herpes is becoming a major cause of genital ulcer, and subtypes of the human papillomavirus are associated with cervical cancer.
Risk for travellers	For some travellers there may be an increased risk of infection. Lack of information about risk and preventive measures and the fact that travel and tourism enhance the probability of having sex with casual partners increase

	<p>the risk of exposure to sexually transmitted infections. In some developed countries, a large proportion of sexually transmitted infections now occur as a result of unprotected sexual intercourse during international travel.</p> <p>In addition to transmission through sexual intercourse (both heterosexual and homosexual – anal, vaginal or oral), some of these infections can be passed on from an infected mother to her unborn or newborn baby. Hepatitis B, HIV and syphilis are also transmitted through transfusion of contaminated blood or blood products and the use of contaminated needles.</p> <p>There is no risk of acquiring any sexually transmitted infection from casual day-to-day contact at home, at work or socially. People run no risk of infection when sharing any means of communal transport (e.g. aircraft, boat, bus, car, train) with infected individuals. There is no evidence that HIV or other sexually transmitted infections can be acquired from insect bites.</p>
Prophylaxis	Vaccination against hepatitis B (see Chapter 6). Preventive vaccines against oncogenic types of human papillomavirus are now available in some countries. For post-exposure prophylaxis see Chapter 8.
Precautions	<p>Male or female condoms, when used properly and consistently, have proved to be effective in preventing the transmission of HIV and other sexually transmitted infections, and for reducing the risk of unwanted pregnancy. Latex rubber condoms are relatively inexpensive, are highly reliable and have virtually no side-effects. The transmission of HIV and other infections during sexual intercourse can be effectively prevented when high-quality condoms are used correctly and consistently. Studies on serodiscordant couples (only one of whom is HIV-positive) have shown that, with regular sexual intercourse over a period of two years, partners who consistently use condoms have a near-zero risk of HIV infection. A man should always use a condom during sexual intercourse, each time, from start to finish, and a woman should make sure that her partner uses one. A woman can also protect herself from sexually transmitted infections by using a female condom – essentially, a vaginal pouch – which is now commercially available in some countries.</p> <p>It is essential to avoid injecting drugs for non-medical purposes, and particularly to avoid any type of needle-sharing to reduce the risk of acquiring hepatitis, HIV, syphilis and other infections from contaminated needles and blood.</p> <p>Medical injections using unsterilized equipment are also a possible source of infection. If an injection is essential, the traveller should try to ensure that the needles and syringes come from a sterile package or have been sterilized properly by steam or boiling water for 20 minutes.</p> <p>Patients under medical care who require frequent injections, e.g. diabetics, should carry sufficient sterile needles and syringes for the duration of their trip and a doctor's authorization for their use.</p> <p>Unsterile dental and surgical instruments, needles used in acupuncture and tattooing, ear-piercing devices, and other skin-piercing instruments can likewise transmit infection and should be avoided.</p>

INFLUENZA

Cause	Influenza viruses of types A, B and C; type A occurs in two principal subtypes (H1N1 and H3N2). Type A viruses cause most of the widespread influenza epi-
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	<p>demics; type B viruses generally cause regional or sporadic outbreaks, and type C cause mild disease in the form of common colds and bronchitis in children.</p> <p>Influenza viruses evolve rapidly, changing their antigenic characteristics, so that vaccines need to be modified each year to be effective against currently circulating influenza strains.</p> <p>Other subtypes of influenza A viruses occur in animals and all 16 HA and 9 NA subtypes are found in birds (mainly in water fowl); inter-species transmission (1918 pandemic) and viral reassortment (1957, 1968 pandemics) may give rise to new subtypes able to infect humans.</p>
Transmission	Respiratory transmission occurs mainly by droplets disseminated by unprotected coughs and sneezes. Short-distance airborne transmission of influenza viruses may occur, particularly in crowded enclosed spaces. Hand contamination and direct inoculation of virus is another potential route of spread.
Nature of the disease	An acute respiratory infection of varying severity, ranging from asymptomatic infection to fatal disease. Classic influenza symptoms include fever with rapid onset, sore throat, cough and chills, often accompanied by headache, coryza, myalgia and prostration. Influenza may be complicated by viral or more often bacterial pneumonia. Illness tends to be most severe in the elderly and in infants and young children, and in immunocompromised hosts. Death resulting from seasonal influenza occurs mainly in the elderly and in individuals with pre-existing chronic diseases.
Geographical distribution	Worldwide. In temperate regions, influenza is a seasonal disease occurring typically in winter months: it affects the northern hemisphere from November to April and the southern hemisphere from April to September. In tropical areas there is no clear seasonal pattern, and influenza may occur at any time of the year. Activity may occur year-round in the tropics.
Risk for travellers	Travellers, like local residents, are at risk in any country during the influenza season. In addition, groups of travellers that include persons from areas affected by seasonal influenza (e.g. cruise ships) may experience out-of-season outbreaks. Travellers visiting countries in the opposite hemisphere during the influenza season are at special risk, particular if they do not have some degree of immunity through regular vaccination. The elderly, people with pre-existing chronic diseases and young children are most susceptible to complications.
Prophylaxis	<p>Vaccination before the start of the influenza season. However, vaccine for visitors to the opposite hemisphere may not be obtainable before arrival at the travel destination (see Chapter 6).</p> <p>For travellers in the highest risk groups for severe influenza who have not been or cannot be vaccinated, the prophylactic use of antiviral drugs such as zanamivir or oseltamivir is indicated in countries where they are available. Amantadine and rimantadine may also be considered when the circulating strains are known to be susceptible. However, the latter drugs are not active against influenza B, and high frequencies of resistance in H3N2 and less often H1N1 viruses make them unreliable for prevention currently.</p>
Precautions	Whenever possible, avoid crowded enclosed spaces and close contact with people suffering from acute respiratory infections. Hand-washing after direct

contact with ill persons or their environment may reduce the risk of illness. Ill persons should be encouraged to practise cough etiquette (maintain distance, cover coughs and sneezes with disposable tissues or clothing, wash hands).

JAPANESE ENCEPHALITIS

Cause	Japanese encephalitis (JE) virus, which is a flavivirus.
Transmission	The virus is transmitted by various mosquitoes of the genus <i>Culex</i> . It infects pigs and various wild birds as well as humans. Mosquitoes become infective after feeding on viraemic pigs or birds.
Nature of the disease	Most infections are asymptomatic. In symptomatic cases, severity varies; mild infections are characterized by febrile headache or aseptic meningitis. Severe cases have a rapid onset and progression with headache, high fever and meningeal signs. Permanent neurological sequelae are common among survivors. Approximately 50% of severe clinical cases have a fatal outcome.
Geographical distribution	JE occurs in a number of countries in Asia (see map) and occasionally in northern Queensland, Australia.
Risk for travellers	Low for most travellers. Visitors to rural and agricultural areas in endemic countries may be at risk, particularly during epidemics of JE.
Prophylaxis	Vaccination, if justified by likelihood of exposure (see Chapter 6).
Precautions	Avoid mosquito bites (see Chapter 3).

LEGIONELLOSIS

Cause	Various species of <i>Legionella</i> bacteria, frequently <i>Legionella pneumophila</i> , serogroup I.
Transmission	Infection results from inhalation of contaminated water sprays or mists. The bacteria live in water and colonize hot-water systems at temperatures of 20–50 °C (optimal 35–46 °C). They contaminate air-conditioning cooling towers, hot-water systems, humidifiers, whirlpool spas and other water-containing devices. There is no direct person-to-person transmission.
Nature of the disease	Legionellosis occurs in two distinct clinical forms: <ul style="list-style-type: none"> ■ Legionnaires' disease is an acute bacterial pneumonia with rapid onset of anorexia, malaise, myalgia, headache and rapidly rising fever, progressing to pneumonia, which may lead to respiratory failure and death. ■ Pontiac fever is an influenza-like illness with spontaneous recovery after 2–5 days. <p>Susceptibility to legionellosis increases with age, especially among smokers and people with pre-existing chronic lung disease or other immunocompromising conditions.</p>
Geographical distribution	Worldwide.

Risk for travellers	Generally low. Outbreaks occasionally occur through dissemination of infection by contaminated water or air-conditioning systems in hotels and other facilities used by visitors.
Prophylaxis	None. Prevention of infection depends on regular cleaning and disinfection of possible sources.
Precautions	None.

LEISHMANIASIS (INCLUDING ESPUNDIA OR ORIENTAL SORE, AND KALA-AZAR)

Cause	Several species of the protozoan parasite <i>Leishmania</i> .
Transmission	Infection is transmitted by the bite of female phlebotomine sandflies. Dogs, rodents and other mammals are reservoir hosts for leishmaniasis. Sandflies acquire the parasites by biting infected humans or animals. Transmission from person to person by injected blood or contaminated syringes and needles is also possible.
Nature of the disease	Leishmaniasis occurs in two main forms: <ul style="list-style-type: none"> ■ Cutaneous and mucosal leishmaniasis (espundia) causes skin sores and chronic ulcers of the mucosae. Cutaneous leishmaniasis is a chronic, progressive, disabling and often mutilating disease. ■ Visceral leishmaniasis (kala-azar) affects the bone marrow, liver, spleen, lymph nodes and other internal organs. It is usually fatal if untreated.
Geographical distribution	Many countries in tropical and subtropical regions, including Africa, parts of central and South America, Asia, southern Europe and the eastern Mediterranean. Over 90% of all cases of visceral leishmaniasis occur in Bangladesh, Brazil, India, Nepal and Sudan. More than 90% of all cases of cutaneous leishmaniasis occur in Afghanistan, Algeria, Brazil, the Islamic Republic of Iran, Saudi Arabia and the Syrian Arab Republic.
Risk for travellers	Visitors to rural and forested areas in endemic countries are at risk.
Prophylaxis	None.
Precautions	Avoid sandfly bites, particularly after sunset, by using repellents and insecticide-impregnated bednets. The bite leaves a non-swollen red ring, which can alert the traveller to its origin.

LEPTOSPIROSIS (INCLUDING WEIL DISEASE)

Cause	Various spirochaetes of the genus <i>Leptospira</i> .
Transmission	Infection occurs through contact between the skin (particularly skin abrasions) or mucous membranes and water, wet soil or vegetation contaminated by the urine of infected animals, notably rats. Occasionally infection may result from direct contact with urine or tissues of infected animals, or from consumption of food contaminated by the urine of infected rats.
Nature of the disease	Leptospirosis infections take many different clinical forms, usually with sudden onset of fever, headache, myalgia, chills, conjunctival suffusion and skin

	rash. The disease may progress to meningitis, haemolytic anaemia, jaundice, haemorrhagic manifestations and other complications, including hepatorenal failure.
Geographical distribution	Worldwide. Most common in tropical countries.
Risk for travellers	Low for most travellers. There is an occupational risk for farmers engaged in paddy rice and sugar cane production. Visitors to rural areas and in contact with water in canals, lakes and rivers may be exposed to infection. There is increased risk after recent floods. The risk may be greater for those who practise canoeing, kayaking or other activities in water. Outbreaks associated with eco-sports activities have occurred.
Prophylaxis	Doxycycline may be used for prophylaxis if exposure is likely. Vaccine against local strains is available for workers where the disease is an occupational hazard, but it is not commercially available in most countries.
Precautions	Avoid swimming or wading in potentially contaminated waters including canals, ponds, rivers, streams and swamps. Avoid all direct or indirect contact with rodents.

LISTERIOSIS

Cause	The bacterium <i>Listeria monocytogenes</i> .
Transmission	Listeriosis affects a variety of animals. Foodborne infection in humans occurs through the consumption of contaminated foods, particularly unpasteurized milk, soft cheeses, vegetables and prepared meat products such as pâté. Listeriosis multiplies readily in refrigerated foods that have been contaminated, unlike most foodborne pathogens. Transmission can also occur from mother to fetus or from mother to child during birth.
Nature of the disease	Listeriosis causes meningoencephalitis and/or septicaemia in adults and newborn infants. In pregnant women, it causes fever and abortion. Newborn infants, pregnant women, the elderly and immunocompromised individuals are particularly susceptible to listeriosis. In others, the disease may be limited to a mild acute febrile episode. In pregnant women, transmission of infection to the fetus may lead to stillbirth, septicaemia at birth or neonatal meningitis.
Geographical distribution	Worldwide, with sporadic incidence.
Risk for travellers	Generally low. Risk is increased by consumption of unpasteurized milk and milk products and prepared meat products.
Prophylaxis	None.
Precautions	Avoid consumption of unpasteurized milk and milk products. Pregnant women and immunocompromised individuals should take stringent precautions to avoid infection by listeriosis and other foodborne pathogens (see Chapter 3).

LYME BORRELIOSIS (LYME DISEASE)

Cause	The spirochaete <i>Borrelia burgdorferi</i> , of which there are several different serotypes.
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Transmission	Infection occurs through the bite of infected ticks, both adults and nymphs, of the genus <i>Ixodes</i> . Most human infections result from bites by nymphs. Many species of mammals can be infected, and deer act as an important reservoir.
Nature of the disease	The disease usually has its onset in summer. Early skin lesions have an expanding ring form, often with a central clear zone. Fever, chills, myalgia and headache are common. Meningeal involvement may follow. Central nervous system and other complications may occur weeks or months after the onset of illness. Arthritis may develop up to 2 years after onset.
Geographical distribution	There are endemic foci of Lyme borreliosis in forested areas of Asia, north-western, central and eastern Europe, and the USA.
Risk for travellers	Generally low. Visitors to rural areas in endemic regions, particularly campers and hikers, are at risk.
Prophylaxis	None.
Precautions	Avoid tick-infested areas and exposure to ticks (see Chapter 3). If a bite occurs, remove the tick as soon as possible.

MALARIA

See Chapter 7 and map.

MENINGOCOCCAL DISEASE

Cause	The bacterium <i>Neisseria meningitidis</i> , of which 12 serogroups are known. Most cases of meningococcal disease are caused by serogroups A, B and C; less commonly, infection is caused by serogroups Y (emerging in the United States) and W-135 (particularly in Burkina Faso). Some small-scale outbreaks caused by serogroup X have been reported in Niger and Uganda. Epidemics in Africa are usually caused by <i>N. meningitidis</i> type A.
Transmission	Transmission occurs by direct person-to-person contact, including aerosol transmission and respiratory droplets from the nose and pharynx of infected persons, patients or asymptomatic carriers. There is no animal reservoir or insect vector.
Nature of the disease	Most infections do not cause clinical disease. Many infected people become asymptomatic carriers of the bacteria and serve as a reservoir and source of infection for others. In general, susceptibility to meningococcal disease decreases with age, although there is a small increase in risk in adolescents and young adults. Meningococcal meningitis has a sudden onset of intense headache, fever, nausea, vomiting, photophobia and stiff neck, plus various neurological signs. The disease is fatal in 5–10% of cases even with prompt antimicrobial treatment in good health care facilities; among individuals who survive, up to 20% have permanent neurological sequelae. Meningococcal septicaemia, in which there is rapid dissemination of bacteria in the bloodstream, is a less common form of meningococcal disease, characterized by circulatory collapse, haemorrhagic skin rash and high fatality rate.

Geographical distribution	Sporadic cases are found worldwide. In temperate zones, most cases occur in the winter months. Localized outbreaks occur in enclosed crowded spaces (e.g. dormitories, military barracks). In sub-Saharan Africa, in a zone stretching across the continent from Senegal to Ethiopia (the African "meningitis belt"), large outbreaks and epidemics take place during the dry season (November–June). Meningococcal serogroups A, B and C are responsible for the vast majority of cases worldwide. Serogroup A is the cause of most major epidemics. In most parts of the world, serogroups X, Y and W135 are relatively uncommon causes of meningococcal infection. However, recent reports of endemic occurrence of group Y meningococcal disease in the United States, and outbreaks caused by serogroup W-135 strains in Saudi Arabia and sub-Saharan Africa, particularly Burkina Faso, suggest that these serogroups may be gaining in importance.
Risk for travellers	Generally low. However, the risk is considerable if travellers are in crowded conditions or take part in large population movements such as pilgrimages in the Sahel meningitis belt. Localized outbreaks occasionally occur among travellers (usually young adults) in camps or dormitories. See also Chapter 6 for specific risks for travellers.
Prophylaxis	Vaccination is available for <i>N. meningitidis</i> types A, C, Y and W135 (see Chapter 6). Protection by vaccines is group-specific, and appropriate vaccines need to be administered to protect against the most prevalent serogroup at the destination country of the traveller.
Precautions	Avoid overcrowding in confined spaces. Following close contact with a person suffering from meningococcal disease, medical advice should be sought regarding chemoprophylaxis.

PLAGUE

Cause	The plague bacillus, <i>Yersinia pestis</i> .
Transmission	Plague is a zoonotic disease affecting rodents and transmitted by fleas from rodents to other animals and to humans. Direct person-to-person transmission does not occur except in the case of pneumonic plague, when respiratory droplets may transfer the infection from the patient to others in close contact.
Nature of the disease	<p>Plague occurs in three main clinical forms:</p> <ul style="list-style-type: none"> ■ Bubonic plague is the form that usually results from the bite of infected fleas. Lymphadenitis develops in the drainage lymph nodes, with the regional lymph nodes most commonly affected. Swelling, pain and suppuration of the lymph nodes produces the characteristic plague buboes. ■ Septicaemic plague may develop from bubonic plague or occur in the absence of lymphadenitis. Dissemination of the infection in the bloodstream results in meningitis, endotoxic shock and disseminated intravascular coagulation. ■ Pneumonic plague may result from secondary infection of the lungs following dissemination of plague bacilli from other body sites. It produces severe pneumonia. Direct infection of others may result from transfer of infection by respiratory droplets, causing primary pulmonary plague in the recipients.

	Without prompt and effective treatment, 50–60% of cases of bubonic plague are fatal, while untreated septicaemic and pneumonic plague are invariably fatal.
Geographical distribution	There are natural foci of plague infection in rodents in many parts of the world. Wild rodent plague is present in central, eastern and southern Africa, South America, the western part of North America and in large areas of Asia. In some areas, contact between wild and domestic rats is common, resulting in sporadic cases of human plague and occasional outbreaks.
Risk for travellers	Generally low. However, travellers in rural areas of plague-endemic regions may be at risk, particularly if camping or hunting or if contact with rodents takes place.
Prophylaxis	A vaccine effective against bubonic plague is available exclusively for persons with a high occupational exposure to plague; it is not commercially available in most countries.
Precautions	Avoid any contact with live or dead rodents.

RABIES

Cause	The rabies virus, a rhabdovirus of the genus <i>Lyssavirus</i> .
Transmission	Rabies is a zoonotic disease affecting a wide range of domestic and wild mammals, including bats. Infection of humans usually occurs through the bite of an infected animal as the virus is present in the saliva. Any other contact with a rabies-susceptible species such as a penetrating scratch with bleeding and licking of broken skin and mucosa in an area where rabies is present should be treated with caution. In developing countries, transmission is usually through dog bites. Person-to-person transmission has not been laboratory-confirmed.
Nature of the disease	An acute viral encephalomyelitis, which is almost invariably fatal. The initial signs include a sense of apprehension, headache, fever, malaise and sensory changes around the site of the animal bite. Excitability, hallucinations and aerophobia are common, followed in some cases by fear of water (hydrophobia) due to spasms of the swallowing muscles, progressing to delirium, convulsions and death a few days after onset. A less common form, paralytic rabies, is characterized by loss of sensation, weakness, pain and paralysis.
Geographical distribution	Rabies is present in mammals in many countries worldwide (see map). Most of the estimated 55 000 rabies deaths per year in Africa and Asia alone occur in developing countries and follow a dog bite. More information is available on www.who.int/rabies/rabnet/en .
Risk for travellers	In rabies-endemic areas, travellers may be at risk if there is exposure to a rabies-susceptible animal species (domestic, particularly dogs and cats, or wild, including bats). Travellers with extensive outdoor exposure and certain occupational activities are at higher risk even if the duration of the trip is short. Spelunkers (cavers) should not handle bats. Children are considered at higher risk because they may play with animals and often do not report bites or scratches.
Prophylaxis	Vaccination for travellers with a foreseeable significant risk of exposure to rabies or travelling to a hyperendemic area where modern rabies vaccine may not be available (see Chapter 6).

Precautions	<p>Avoid contact with wild animals and stray domestic animals, particularly dogs and cats, in rabies-endemic areas. If bitten by an animal that is potentially infected with rabies, or after other suspect contact as defined above, immediately clean the wound thoroughly with disinfectant or with soap or detergent and water. Medical assistance should be sought immediately and post-exposure prophylaxis initiated if indicated (see Chapter 6).</p> <p>The vaccination status of the animal involved should not be a criterion for withholding post-exposure prophylaxis unless the vaccination has been thoroughly documented and vaccine of known potency has been used. In the case of domestic animals, the suspect animal should be kept under observation for a period of 10 days. After 10 days, if the animal under observation is healthy, post-exposure prophylaxis may be stopped.</p>
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SARS (SEVERE ACUTE RESPIRATORY SYNDROME)

Cause	SARS coronavirus (SARS-CoV) – virus identified in 2003. SARS-CoV is thought to be an animal virus from an as-yet uncertain–animal reservoir, perhaps bats, that spread to other animals (civets) and first infected humans in the Guangdong province of southern China in 2002.
Transmission	<p>An epidemic of SARS affected 26 countries and resulted in over 8000 cases in 2003. Since then, a small number of cases have occurred as a result of laboratory accidents or, possibly, through animal-to-human transmission (Guangdong, China).</p> <p>Transmission of SARS-CoV is primarily from person-to-person. It occurs mainly during the second week of illness, which corresponds to the peak of virus excretion in respiratory secretions and stool, and when cases with severe disease start to deteriorate clinically.</p>
Nature of the disease	<p>Symptoms are flu-like and include fever, malaise, muscle aches and pains (myalgia), headache, diarrhoea, and shivering (rigors). No individual symptom or cluster of symptoms has proved to be specific for a diagnosis of SARS. Although fever is the most frequently reported symptom, it is sometimes absent on initial measurement, especially in elderly and immunosuppressed patients.</p> <p>Cough (initially dry), shortness of breath, and diarrhoea present in the first and/or second week of illness. Severe cases often develop rapidly, progressing to respiratory distress and requiring intensive care.</p>
Geographical distribution	<p>The distribution is based on the 2002–2003 epidemic. The disease appeared in November 2002 in the Guangdong province of southern China. This area is considered as a potential zone of re-emergence of SARS-CoV.</p> <p>Other countries/areas in which chains of human-to-human transmission occurred after early importation of cases were Hong Kong Special Administrative Region of China and Taiwan (Province of China), Toronto in Canada, Singapore, and Hanoi in Viet Nam. In other countries, imported cases did not lead to local outbreaks.</p>
Risk for travellers	Currently, no areas of the world are reporting transmission of SARS. Since the end of the global epidemic in July 2003, SARS has reappeared four times – three times from laboratory accidents (Singapore; Taiwan, Province of China), and once in southern China where the source of infection remains undetermined although there is circumstantial evidence of animal-to-human transmission.

	Should SARS re-emerge in epidemic form, WHO will provide guidance on the risk of travel to affected areas. Travellers should stay informed about current travel recommendations. However, even during the height of the 2003 epidemic, the overall risk of SARS-CoV transmission to travellers was low.
Prophylaxis	None. Experimental vaccines are under development.
Precautions	Follow any travel recommendations and health advice issued by WHO.

SCHISTOSOMIASIS (BILHARZIASIS)

Cause	Several species of parasitic blood flukes (trematodes), of which the most important are <i>Schistosoma mansoni</i> , <i>S. japonicum</i> and <i>S. haematobium</i> .
Transmission	Infection occurs in fresh water containing larval forms (cercariae) of schistosomes, which develop in snails. The free-swimming larvae penetrate the skin of individuals swimming or wading in water. Snails become infected as a result of excretion of eggs in human urine or faeces.
Nature of the disease	Chronic conditions in which adult flukes live for many years in the veins (mesenteric or vesical) of the host where they produce eggs, which cause damage to the organs in which they are deposited. The symptoms depend on the main target organs affected by the different species, with <i>S. mansoni</i> and <i>S. japonicum</i> causing hepatic and intestinal signs and <i>S. haematobium</i> causing urinary dysfunction. The larvae of some schistosomes of birds and other animals may penetrate human skin and cause a self-limiting dermatitis, "swimmers itch". These larvae are unable to develop in humans.
Geographical distribution	<i>S. mansoni</i> occurs in many countries of sub-Saharan Africa, in the Arabian peninsula, and in Brazil, Suriname and Venezuela. <i>S. japonicum</i> is found in China, in parts of Indonesia, and in the Philippines (but no longer in Japan). <i>S. haematobium</i> is present in sub-Saharan Africa and in eastern Mediterranean areas. <i>S. mekongi</i> is found along the Mekong River in northern Cambodia and in the south of the Lao People's Democratic Republic.
Risk for travellers	In endemic areas, travellers are at risk while swimming or wading in fresh water.
Prophylaxis	None.
Precautions	Avoid direct contact (swimming or wading) with potentially contaminated fresh water in endemic areas. In case of accidental exposure, dry the skin vigorously to reduce penetration by cercariae. Avoid drinking, washing, or washing clothing in water that may contain cercariae. Water can be treated to remove or inactivate cercariae by paper filtering or use of iodine or chlorine.

TICK-BORNE ENCEPHALITIS (SPRING-SUMMER ENCEPHALITIS)

Cause	The tick-borne encephalitis (TBE) virus is a flavivirus. Three subtypes of the causative agent are known. The most common subtypes are the European subtype, the Far Eastern subtype (Russian Spring Summer encephalitis) and the Siberian subtype. Other closely related viruses cause similar diseases.
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Transmission	Infection is transmitted by the bite of infected ticks or by ingestion of unpasteurized milk. There is no direct person-to-person transmission. Some related viruses, also tick-borne, infect animals such as birds, deer (louping-ill), rodents and sheep.
Nature of the disease	Infection may induce an influenza-like illness, with a second phase of fever occurring in 10% of cases. Encephalitis develops during the second phase and may result in paralysis, permanent sequelae or death. Severity of illness increases with age. The Far Eastern subtype causes more severe symptoms and sequelae than the European subtype.
Geographical distribution	The European subtype is present in large parts of central and eastern Europe, particularly Austria, southern Germany or northern Switzerland, the Baltic states (Estonia, Latvia, Lithuania), the Czech Republic, Hungary and Poland; the Far Eastern subtype is found from north eastern Europe to China and Japan, and the Siberian subtype from northern Europe to Siberia. The disease is seasonal; most cases occur during April to November. The risk is highest in forested areas up to an altitude of about 1400 m.
Risk for travellers	In endemic areas during the summer months, travellers are at risk when hiking or camping in rural or forested areas.
Prophylaxis	A vaccine against TBE is available (see Chapter 6).
Precautions	Avoid bites by ticks by wearing long trousers and closed footwear when hiking or camping in endemic areas. If a bite occurs, the tick should be removed as soon as possible.

TRYPANOSOMIASIS

1. African trypanosomiasis (sleeping sickness)

Cause	Protozoan parasites <i>Trypanosoma brucei gambiense</i> and <i>T. b. rhodesiense</i> .
Transmission	Infection occurs through the bite of infected tsetse flies. Humans are the main reservoir host for <i>T. b. gambiense</i> . Domestic cattle and wild animals, including antelopes, are the main animal reservoir of <i>T. b. rhodesiense</i> .
Nature of the disease	<i>T. b. gambiense</i> causes a chronic illness with onset of symptoms after a prolonged incubation period of weeks or months. <i>T. b. rhodesiense</i> causes a more acute illness, with onset a few days or weeks after the infected bite; often, there is a striking inoculation chancre. Initial clinical signs include severe headache, insomnia, enlarged lymph nodes, anaemia and rash. In the late stage of the disease, there is progressive loss of weight and involvement of the central nervous system. Without treatment, the disease is invariably fatal.
Geographical distribution	<i>T. b. gambiense</i> is present in foci in the tropical countries of western and central Africa. <i>T. b. rhodesiense</i> occurs in eastern Africa, extending south as far as Botswana.
Risk for travellers	Travellers are at risk in endemic regions if they visit rural areas for hunting, fishing, safari trips, sailing or other activities in endemic areas.

Prophylaxis	None.
Precautions	Travellers should be aware of the risk in endemic areas and as far as possible avoid any contact with tsetse flies. However, bites are difficult to avoid because tsetse flies can bite through clothing. Travellers should be warned that tsetse flies bite during the day and are not repelled by available insect-repellent products. The bite is painful, which helps to identify its origin, and travellers should seek medical attention promptly if symptoms develop subsequently.

2. American trypanosomiasis (Chagas disease)

Cause	Protozoan parasite <i>Trypanosoma cruzi</i> .
Transmission	Infection is transmitted by blood-sucking triatomine bugs ("kissing bugs"). Oral transmission by ingestion of unprocessed freshly squeezed sugar cane in areas where the vector is present has also been reported. During feeding, infected bugs excrete trypanosomes, which can then contaminate the conjunctiva, mucous membranes, abrasions and skin wounds including the bite wound. Transmission also occurs by blood transfusion when blood has been obtained from an infected donor. Congenital infection is possible, due to parasites crossing the placenta during pregnancy. <i>T. cruzi</i> infects many species of wild and domestic animals as well as humans.
Nature of the disease	In adults, <i>T. cruzi</i> causes a chronic illness with progressive myocardial damage leading to cardiac arrhythmias and cardiac dilatation, and gastrointestinal involvement leading to mega-oesophagus and megacolon. <i>T. cruzi</i> causes acute illness in children, which is followed by chronic manifestations later in life.
Geographical distribution	American trypanosomiasis occurs in Mexico and in central and South America (as far south as central Argentina and Chile). The vector is found mainly in rural areas where it lives in the walls of poorly-constructed housing.
Risk for travellers	In endemic areas, travellers are at risk when trekking, camping or using poor-quality housing.
Precautions	Avoid exposure to blood-sucking bugs. Residual insecticides can be used to treat housing. Exposure can be reduced by the use of bednets in houses and camps.

TUBERCULOSIS

Cause	<i>Mycobacterium tuberculosis</i> , the tubercle bacillus. Humans can also become infected by bovine tuberculosis, caused by <i>M. bovis</i> .
Transmission	Infection is usually by direct airborne transmission from person to person.
Nature of the disease	Exposure to <i>M. tuberculosis</i> may lead to infection, but most infections do not lead to disease. The risk of developing disease following infection is generally 5–10% during the lifetime, but may be increased by various factors, notably immunosuppression (e.g. advanced HIV infection). Multidrug resistance refers to strains of <i>M. tuberculosis</i> that are resistant to at least isoniazid and rifampicin (MDR-TB). The resistant strains do not

	differ from other strains in infectiousness, likelihood of causing disease, or general clinical effects; however, if they do cause disease, treatment is more difficult and the risk of death will be higher. Extensively drug-resistant TB (XDR-TB) is TB that is resistant to at least isoniazid and rifampin, to any fluoroquinolone and to at least one of the injectable second-line anti-TB drugs capreomycin, kanamycin and amikacin.
Geographical distribution	Worldwide. The risk of infection differs between countries, as shown on the map of estimated TB incidence.
Risk for travellers	Low for most travellers. Long-term travellers (over 3 months) to a country with a higher incidence of tuberculosis than their own may have a risk of infection comparable to that for local residents. As well as the duration of the visit, living conditions are important in determining the risk of infection: high-risk settings include health facilities, shelters for the homeless, and prisons.
Prophylaxis	BCG vaccine is of limited use for travellers but may be advised for infants and young children in some situations (see Chapter 6).
Precautions	Travellers should avoid close contact with known tuberculosis patients. For travellers from low-incidence countries who may be exposed to infection in relatively high-incidence countries (e.g. health professionals, humanitarian relief workers, missionaries), a baseline tuberculin skin test is advisable in order to compare with retesting after return. If the skin reaction to tuberculin suggests recent infection, the traveller should receive, or be referred for, treatment for latent infection. Patients under treatment for tuberculosis should not travel until the treating physician has documented, by laboratory examination of sputum, that the patient is not infectious and therefore of no risk to others. The importance of completing the prescribed course of treatment should be stressed.

TYPHOID FEVER

Cause	<i>Salmonella typhi</i> , the typhoid bacillus, which infects only humans. Similar paratyphoid and enteric fevers are caused by other species of <i>Salmonella</i> , which infect domestic animals as well as humans.
Transmission	Infection is transmitted by consumption of contaminated food or water. Occasionally direct faecal–oral transmission may occur. Shellfish taken from sewage-polluted beds are an important source of infection. Infection occurs through eating fruit and vegetables fertilized by night soil and eaten raw, and milk and milk products that have been contaminated by those in contact with them. Flies may transfer infection to foods, resulting in contamination that may be sufficient to cause human infection. Pollution of water sources may produce epidemics of typhoid fever, when large numbers of people use the same source of drinking-water.
Nature of the disease	A systemic disease of varying severity. Severe cases are characterized by gradual onset of fever, headache, malaise, anorexia and insomnia. Constipation is more common than diarrhoea in adults and older children. Without treatment, the disease progresses with sustained fever, bradycardia, hepatosplenomegaly, abdominal symptoms and, in some cases, pneumonia. In white-skinned patients, pink spots (papules), which fade on pressure, appear on the skin of

	the trunk in up to 50% of cases. In the third week, untreated cases develop additional gastrointestinal and other complications, which may prove fatal. Around 2–5% of those who contract typhoid fever become chronic carriers, as bacteria persist in the biliary tract after symptoms have resolved.
Geographical distribution	Worldwide. The disease occurs most commonly in association with poor standards of hygiene in food preparation and handling and where sanitary disposal of sewage is lacking.
Risk for travellers	Generally low risk for travellers, except in parts of northern and western Africa, in southern Asia, parts of Indonesia and in Peru. Elsewhere, travellers are usually at risk only when exposed to low standards of hygiene with respect to food handling, control of drinking-water quality, and sewage disposal.
Prophylaxis	Vaccination (see Chapter 6).
Precautions	Observe all precautions against exposure to foodborne and waterborne infections (see Chapter 3).

TYPHUS FEVER (EPIDEMIC LOUSE-BORNE TYPHUS)

Cause	<i>Rickettsia prowazekii</i> .
Transmission	The disease is transmitted by the human body louse, which becomes infected by feeding on the blood of patients with acute typhus fever. Infected lice excrete rickettsia onto the skin while feeding on a second host, who becomes infected by rubbing louse faecal matter or crushed lice into the bite wound. There is no animal reservoir.
Nature of the disease	The onset is variable but often sudden, with headache, chills, high fever, prostration, coughing and severe muscular pain. After 5–6 days, a macular skin eruption (dark spots) develops first on the upper trunk and spreads to the rest of the body but usually not to the face, palms of the hands or soles of the feet. The case-fatality rate is up to 40% in the absence of specific treatment. Louse-borne typhus fever is the only rickettsial disease that can cause explosive epidemics.
Geographical distribution	Typhus fever occurs in colder (i.e. mountainous) regions of central and eastern Africa, central and South America, and Asia. In recent years, most outbreaks have taken place in Burundi, Ethiopia and Rwanda. Typhus fever occurs in conditions of overcrowding and poor hygiene, such as prisons and refugee camps.
Risk for travellers	Very low for most travellers. Humanitarian relief workers may be exposed in refugee camps and other settings characterized by crowding and poor hygiene.
Prophylaxis	None.
Precautions	Cleanliness is important in preventing infestation by body lice. Insecticidal powders are available for body-lice control and treatment of clothing for those at high risk of exposure.

YELLOW FEVER

Cause	The yellow fever virus, an arbovirus of the <i>Flavivirus</i> genus.
Transmission	<p>Yellow fever in urban and some rural areas is transmitted by the bite of infective <i>Aedes aegypti</i> mosquitoes and by other mosquitoes in the forests of South America. The mosquitoes bite during daylight hours. Transmission occurs at altitudes up to 2500 metres. Yellow fever virus infects humans and monkeys.</p> <p>In jungle and forest areas, monkeys are the main reservoir of infection, with transmission from monkey to monkey carried out by mosquitoes. The infective mosquitoes may bite humans who enter the forest area, usually causing sporadic cases or small outbreaks.</p> <p>In urban areas, monkeys are not involved and infection is transmitted among humans by mosquitoes. Introduction of infection into densely populated urban areas can lead to large epidemics of yellow fever.</p> <p>In Africa, an intermediate pattern of transmission is common in humid savannah regions. Mosquitoes infect both monkeys and humans, causing localized outbreaks.</p>
Nature of the disease	Although some infections are asymptomatic, most lead to an acute illness characterized by two phases. Initially, there is fever, muscular pain, headache, chills, anorexia, nausea and/or vomiting, often with bradycardia. About 15% of patients progress to a second phase after a few days, with resurgence of fever, development of jaundice, abdominal pain, vomiting and haemorrhagic manifestations; half of these patients die 10–14 days after onset of illness.
Geographical distribution	The yellow fever virus is endemic in some tropical areas of Africa and central and South America (see map). The number of epidemics has increased since the early 1980s. Other countries are considered to be at risk of introduction of yellow fever due to the presence of the vector and suitable primate hosts (including Asia, where yellow fever has never been reported).
Risk for travellers	Travellers are at risk in all areas where yellow fever is endemic. The risk is greatest for visitors who enter forest and jungle areas.
Prophylaxis	Vaccination (see Chapter 6). In some countries, yellow fever vaccination is mandatory for visitors (see Country list).
Precautions	Avoid mosquito bites during the day and evening (see Chapter 3).

Further reading

Disease outbreak news: <http://www.who.int/csr/don/en>

Heymann D, ed. *Control of communicable diseases manual*, 18th ed. Washington, DC, American Public Health Association, 2005.

Weekly epidemiological record: <http://www.who.int/wer/>

WHO information on infectious diseases: <http://www.who.int/csr/disease/en>