

## Review

### Developing countries: health round-trip

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#### Abstract

International travel can pose various risks to health, depending both on the health needs of the traveller and on the type of travel to be undertaken. Travellers intending to visit a destination in a developing country should consult a travel medicine clinic or medical practitioner before the journey. General precautions can greatly reduce the risk of exposure to infectious agents. Vaccination is a highly effective method of preventing certain infectious diseases.

The aim of this study is to know the risks involved and the best way to prevent them.

**Key words:** international travel; developing countries; travel health risks; vaccines; infectious diseases; preventive measures.

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#### Travel-related risks

According to statistics from the World Tourism Organization, international tourist arrivals worldwide in 2010 for business, leisure and other purposes amounted to 940 million.

International travel can pose various risks to health, depending both on the health needs of the traveller and on the type of travel to be undertaken. Travellers may encounter sudden and significant changes in altitude, humidity, temperature and exposure to a variety of infectious diseases, which can result in illness. In addition, serious health risks may arise in areas where accommodation is of poor quality, hygiene and sanitation are inadequate, medical services are not well developed and clean water is unavailable.

All individuals planning travel should seek advice on the potential hazards of their chosen destinations and understand how best to protect their health and minimize the risk of acquiring disease. Forward planning, appropriate preventive measures and careful precautions can protect their health and minimize the risks of accidents and acquiring disease [1].

#### Medical consultation before travel

Travellers intending to visit a destination in a developing country should consult a travel medicine clinic or medical practitioner before the journey

(<http://www.ecdc.europa.eu>). This consultation should take place at least 4–8 weeks before the journey, preferably earlier if long-term travel or overseas work is envisaged. The consultation will include information about the most important health risks (including traffic accidents), determine the need for any vaccinations and/or antimalarial medication and identify any other medical items that the traveller may require [2]. A basic medical kit will be prescribed, supplemented as appropriate, to meet individual needs. All travellers should be strongly advised to seek comprehensive travel insurance.

Medical advisors base their recommendations, including those for vaccinations and other medication, on a risk assessment for the individual traveller, which takes into account the likelihood of acquiring a disease and how serious this might be for the person concerned. Key elements of this risk assessment are: the pre-travel health status of the traveller, destination(s), duration and purpose of travel, the mode of transport, standards of accommodation and food hygiene, and risk behaviour while travelling [3,4].

#### Medical kit and toilet items

A medical kit should be carried to all destinations where there may be significant health risks, particularly those in developing countries and/or

where the local availability of specific medications is uncertain. This kit will include basic medicines to treat common ailments, first-aid articles, and any other special medical items, such as syringes and needles (to minimize exposure to blood-borne viruses), that may be required and can in some cases be used by the individual traveller. (Table 1)

Certain categories of prescription medicine or special medical items should be carried together with a medical attestation on letterhead, signed by a physician, certifying that the traveller requires the medication or the items for a specific medical condition. Some countries require that this attestation be signed not only by a physician but also by the national health administration.

Health risks associated with travel are greater for certain groups of travellers, including infants and young children, pregnant women, the elderly, the disabled, the immune-compromised and those who have pre-existing health problems.

### **Insurance for travellers**

Travellers are strongly advised to travel with comprehensive travel insurance as a matter of routine and to declare any underlying health conditions to their travel insurer.

This health insurance should include coverage for changes to the itinerary, emergency evacuation for health reasons, hospitalization, medical care in case of illness or accident and repatriation of the body in case of death. Travellers should discuss with the parties concerned any issues or claims as they happen and not upon return from the trip [5].

### **Diseases and vaccines**

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 currently 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, regardless of whether any

vaccinations or medication have been administered [6].

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

- Food-borne and water-borne diseases
- Vector-borne diseases
- Zoonoses (diseases transmitted by animals)
- Sexually transmitted diseases
- Blood-borne diseases
- Airborne diseases
- Diseases transmitted via soil

The most common infectious illness, affecting travellers is travellers' diarrhoea. This can be caused by many different food-borne and water-borne infectious agents, for which treatment and precautions are essentially the same.

Vaccination is a highly effective method of preventing certain infectious diseases. Vaccines are generally very safe, and serious adverse reactions are uncommon. Routine immunization programmes protect most of the world's children from a number of infectious diseases that previously claimed millions of lives each year. For travellers, vaccination offers the possibility of avoiding a number of infectious diseases that may be encountered abroad. However, satisfactory vaccines have not yet been developed against several of the most life-threatening infections, including tuberculosis, malaria and HIV/AIDS.

### **Choice of vaccines for travel**

Vaccines for travellers include: (1) basic vaccines used in most national routine programmes, particularly but not only in children; (2) vaccines that are recommended before travelling to particular countries or areas; (3) vaccines required by the International Health Regulations. (Table 2)

Several of the vaccines that are routinely administered in childhood require one or more booster doses to maintain an effective level of immunity. Adults often neglect the need for booster vaccinations, particularly if the risk of infection is low. Some adults, particularly the elderly, may never have been vaccinated. It is important to realise that diseases such as diphtheria and poliomyelitis, which are eliminated in most industrialized countries, may be present in countries frequently visited by travellers.

**Table 1.** Contents of basic medical kit.

| <b>Basic Medical Kit</b>                   |  |
|--|--|
| <b>First-aid items</b>                     | <b>Additional items according to destination and individual needs</b>  |
| Adhesive tape                              | Medication for pre-existing medical conditions.  |
| Antiseptic wound cleanser or alkaline soap | Antidiarrhoeal medication (to include an antisecretory agent, an antimotility drug, oral rehydration salts, with appropriate written instructions regarding their use)     |
| Bandages                                   | Antibiotics targeting the most frequent infections in travellers (e.g. travellers' diarrhoea, and infections of skin and soft-tissue, respiratory tract and urinary tract) |
| Scissors                                   | Antibacterial ointment   |
| Safety pins                                | Antifungal powder  |
| Emollient (lubricant) eye drops            | Antimalarial medication  |
| Insect repellent                           | Mosquito net and insecticide to treat fabrics (clothes, nets, curtains)  |
| Insect bite treatment                      | Adequate supplies of condoms and oral contraceptives   |
| Antihistamine tablets                      | Medication for pre-existing medical conditions   |
| Nasal decongestant                         | Sterile syringes and needles   |
| Oral rehydration salts                     | Water disinfectant   |
| Oral rehydration salts                     | Spare eyeglasses and/or spare contact lenses (and solution)  |
| Simple analgesic (e.g. paracetamol)        | Other items to meet foreseeable needs, according to the destination and duration of the visit.   |
| Sterile dressing                           |  |
| Clinical thermometer                       |  |
| Sunscreen                                  |  |
| Earplugs                                   |  |
| Tweezers                                   |  |
| Adhesive strips to close small wounds.     |  |

**Table 2.** Vaccines for travellers.

| <b>Category</b>                     | <b>Vaccines</b>  |
|-------------------------------------|--|
| <b>Routine vaccination</b>          | Diphtheria   |
|                                     | Hepatitis B  |
|                                     | Haemophilus influenzae type b  |
|                                     | Human papillomavirus <sup>a</sup>  |
|                                     | Seasonal influenza <sup>b</sup>  |
|                                     | Measles  |
|                                     | Mumps  |
|                                     | Pertussis  |
|                                     | Rubella  |
|                                     | Pneumococcal disease   |
|                                     | Poliomyelitis (Polio)  |
|                                     | Rotavirus <sup>a</sup>   |
|                                     | Tuberculosis (TB) <sup>c</sup>   |
|                                     | Tetanus  |
| Varicella <sup>a</sup>              |  |
| <b>Selective use for travellers</b> | Cholera  |
|                                     | Hepatitis A <sup>e</sup>   |
|                                     | Japanese encephalitis <sup>e</sup>                                       |
|                                     | Meningococcal disease <sup>e</sup>                                       |
|                                     | Rabies   |
|                                     | Tick-borne encephalitis <sup>e</sup>                                     |
| <b>Required vaccination</b>         | Typhoid fever  |
|                                     | Yellow fever <sup>e</sup>  |
|                                     | Yellow fever   |
|                                     | Meningococcal disease and polio (required by Saudi Arabia for pilgrims.) |

<sup>a</sup>So far, introduced into the routine immunization programme of a limited number of countries; <sup>b</sup>Routine vaccination for certain age groups and for individuals potentially exposed to certain risk factors; <sup>c</sup>No longer routine in most industrialized countries; <sup>d</sup>For diseases in this category a summary of vaccine recommendations and other precautions is provided; <sup>e</sup>These vaccines are also included in the routine immunization programme in several high-risk countries.

**Table 3.** Diseases and vaccines.

| Diseases                         | Hepatitis B  | Tetanus  | Poliomyelitis   |
|----------------------------------|--|--|---|
| <b>Cause</b>                     | Hepatitis B virus ( <i>Hepadnaviridae</i> family)  | The bacterium <i>Clostridium tetani</i> ( <i>C. tetani</i> )   | Poliovirus types 1, 2 and 3 (three closely related enteroviruses).  |
| <b>Transmission</b>              | Infection is transmitted from person to person by contact with infected body fluids (Sexual contact, transfusion of contaminated blood or blood products). Perinatal transmission. There is no insect vector or animal reservoir.  | Tetanus is acquired through exposure to the spores of <i>C. tetani</i> which are present in soil worldwide. The disease is not communicable.   | Predominantly by the faecal–oral route.   |
| <b>Geographical distribution</b> | HBV is found worldwide, but with differing levels of endemicity.   | Wounds can become infected with the spores of <i>C. tetani</i> anywhere in the world.  | Endemic in Afghanistan, Nigeria and Pakistan – and has reestablished transmission in three countries which were previously polio-free (Angola, Chad and the Democratic Republic of the Congo). Several other countries had ongoing outbreaks due to importations of poliovirus. |
| <b>Risk for travellers</b>       | Principal risky activities include unprotected sexual intercourse with an infected person; health care interventions (medical, dental, laboratory or other) that entail direct exposure to human blood or body fluids; receipt of a transfusion of blood that has not been tested for HBV; and exposure to needles (e.g. acupuncture, piercing, tattooing or injecting drug use) that have not been appropriately sterilized. In addition, transmission from HBV-positive to HBV-susceptible individuals may occur through direct contact between open skin lesions following a penetrating bite or scratch. | Every traveller should be fully vaccinated against tetanus. Almost any form of injury, from a simple laceration to a motor-vehicle accident, can expose the individual to the spores.  |   |
| <b>General precautions</b>       | Protected sexual intercourse. Avoid exposure to human blood or body fluids.  |  |   |
| <b>Vaccines</b>                  | Hepatitis B vaccine should be considered for all non-immune individuals travelling to countries or areas with moderate to high risk of infection. It can be administered to infants from birth.  | All travellers should be up to date with the vaccine before departure. The type of tetanus prophylaxis that is required following injury depends on the nature of the lesion and the history of previous immunizations. However, no booster is needed if the last dose of the primary series, or of subsequent booster injections was given less than 5 years ago for dirty wounds or less than 10 years ago for clean wounds. | All travellers to and from poliovirus-infected areas should be adequately vaccinated. Required by Saudi Arabia for pilgrims   |

**Table 4.** Diseases and vaccines.

| Diseases                         | Cholera  | Hepatitis A  | Typhoid fever   |
|----------------------------------|--|--|---|
| <b>Cause</b>                     | <i>Vibrio cholerae</i> (serogroups O1 and O139).   | Hepatitis A virus ( <i>Picornaviridae</i> family).   | The typhoid bacillus <i>Salmonella typhi</i> , which infects humans only.   |
| <b>Transmission</b>              | Infection occurs through ingestion of food or water contaminated directly or indirectly by faeces or vomitus of infected individuals. Cholera affects only humans; there is no insect vector or animal reservoir host.   | The virus is acquired through close contact with infected individuals or through faecally contaminated food or drinking-water. There is no insect vector or animal reservoir.  | The typhoid bacillus is transmitted by consumption of contaminated food or water.   |
| <b>Geographical distribution</b> | Cholera occurs mainly in low-income countries with inadequate sanitation and lack of clean drinking-water and in war-torn areas where the infrastructure may have broken down. Many developing countries are affected, particularly in Africa and Asia and, to a lesser extent, in central and South America | Worldwide, but most common in areas where sanitary conditions are poor   | There is a higher risk of typhoid fever in countries or areas with low standards of hygiene and water supply facilities.  |
| <b>Risk for travellers</b>       | The risk for most travellers is very low, even in countries where cholera epidemics occur, provided that simple precautions are taken. However, humanitarian relief workers in disaster areas and refugee camps may be at risk.  | Non-immune travellers to developing countries are at significant risk of infection, in particular in settings with poor food and drinking water control and poor sanitation. People born and raised in developing countries, and those born before 1945 in industrialized countries, have usually been HAV-infected in childhood and are likely to be immune                                       | The risk for travellers is generally low, except in parts of northern and western Africa, in southern Asia, in parts of Indonesia and in Peru. Elsewhere, travellers are usually at risk only when exposed to low standards of hygiene.                                     |
| <b>General precautions</b>       | As for other diarrheal diseases, precautions should be taken to avoid consumption of potentially contaminated food, drinks and water. Oral rehydration salts (ORS) should be carried to combat dehydration and electrolyte depletion in case of severe diarrhea.   | Avoid or boil potentially contaminated food and water. Short-term protection through injection of human immune globulin is gradually being replaced worldwide by hepatitis A vaccination.  | For general precautions against exposure to foodborne and waterborne infections   |
| <b>Vaccines</b>                  | Cholera vaccination is not required as a condition of entry to any country. Travellers at high risk (e.g. emergency/ relief workers)   | <b>Recommended for:</b> Hepatitis A vaccination should be considered for individuals aged $\geq 1$ year who are travelling to countries or areas with moderate to high risk of infection. Those at high risk of acquiring severe disease such as immunosuppressed patients and patients with chronic liver disease should be strongly encouraged to be vaccinated regardless of where they travel. | Typhoid fever vaccination may be offered to those travelling to destinations where the risk of typhoid fever is high, especially individuals staying in endemic areas for >1 month and/or in locations where antibiotic resistant strains of <i>S. typhi</i> are prevalent. |

**Table 5.** Diseases and vaccines.

| Diseases                         | Japanese encephalitis   | Rabies  | Tick-borne encephalitis  |
|----------------------------------|---|---|--|
| <b>Cause</b>                     | Japanese encephalitis virus belonging to the mostly vector-borne <i>Flaviviridae</i> family.  | Lyssavirus of the family <i>Rhabdoviridae</i> .   | Tick-borne encephalitis virus (TBEV) of the family <i>Flaviviridae</i> . Three subtypes of the causative agent are known: the European (Western), the Far Eastern (spring-and-summer encephalitis) and the Siberian.   |
| <b>Transmission</b>              | Pigs and various wild birds represent the natural reservoir of this virus, which is transmitted to new animal hosts and occasionally humans by mosquitoes of the genus <i>Culex</i> .   | Rabies is a zoonotic disease affecting a wide range of domestic and wild mammals, including bats. The virus is present primarily in the saliva and infection of humans usually occurs through the bite of an infected animal, usually a dog, which may not show signs of rabies. Transmission may occasionally occur also through other contact with a rabid animal, for example following a penetrating scratch with bleeding, or through licking of broken skin and mucosa. | TBEV is transmitted by the bite of infected ticks or occasionally by ingestion of unpasteurized milk. There is no direct person-to-person transmission.  |
| <b>Geographical distribution</b> | In almost all Asian countries. Transmission occurs principally in rural agricultural locations. Transmission is mainly related to the rainy season in southeast Asia, but may take place all year-round, particularly in tropical climate zones.  | Rabies is present in mammals in most parts of the world. Most of the estimated 55 000 human rabies deaths per year occur in Africa and Asia   | Baltic States, Slovenia and the Russian Federation and North-Western Federal Area of the Russian Federation. Other countries that have reported cases include Albania, Austria, Belarus, Bosnia, Bulgaria, China, Croatia, Denmark, Finland, Germany, Greece, Hungary, Italy, Mongolia, Norway, Poland, the Republic of Korea, Romania, Serbia, Slovakia, Slovenia, Sweden, Switzerland, Turkey and Ukraine. |
| <b>Risk for travelers</b>        | The risk for Japanese encephalitis is very low for most travellers to Asia, particularly for short-term visitors to urban areas. However, the risk varies according to season, destination, duration of travel and activities.  | Contact with free-roaming animals, especially dogs and cats, and with wild (e.g. bats) free-ranging or captive animals.   | Travellers to endemic areas may be at risk during April to November. The risk is highest when hiking or camping in forested areas up to an altitude of about 1500 m.   |
| <b>General precautions</b>       | Prevention is by avoidance of mosquito bites and by vaccination.  | Travellers should avoid contact with free-roaming animals, especially dogs and cats, and with wild, free-ranging or captive animals. For travellers who participate in caving or spelunking, casual exposure to cave air is not a concern, but cavers should be warned not to handle bats.  | By wearing appropriate clothing (long trousers and closed footwear) when hiking or camping in countries or areas at risk. The body should be inspected daily and attached ticks removed as soon as possible. Avoid the consumption of unpasteurized dairy products.  |
| <b>Vaccines</b>                  | Vaccination is recommended for travellers with extensive outdoor exposure (camping, hiking, working, etc.) during the transmission season, particularly in endemic countries or areas where flooding irrigation is practised. Whereas in areas at risk, Japanese encephalitis is primarily a disease of children, it can occur in travellers of any age | Vaccination against rabies is used in two distinct situations: To protect those who are at risk of exposure to rabies, i.e. pre-exposure vaccination; and To prevent the development of clinical rabies after exposure has occurred, usually following the bite of an animal suspected of having rabies, i.e. post-exposure prophylaxis. In most countries of the world, suspect contact with bats should be followed by post-exposure prophylaxis.                           | <b>Recommended for:</b> High-risk individuals only   |

**Table 6.** Diseases and vaccines.

| <b>Diseases</b>                  | <b>Meningococcal disease</b>   | <b>Yellow Fever</b>  |
|----------------------------------|--|--|
| <b>Cause</b>                     | <i>Neisseria meningitides</i> serogroups A, B, C, Y, X, W-135.   | Yellow fever virus and arbovirus of the <i>Flavivirus</i> genus.   |
| <b>Transmission</b>              | Transmission occurs by direct person-to-person contact and through respiratory droplets from patients or asymptomatic meningococcal carriers. Humans are the only reservoir.   | Yellow fever occurs in urban and rural areas of Africa and central South America. In jungle and forest areas, monkeys are the main reservoir of infection, which is spread by mosquitoes from monkey to monkey and occasionally, to humans. In urban settings mosquitoes transmit the virus from human-to-human.   |
| <b>Geographical distribution</b> | Sporadic cases are found worldwide. In temperate zones, most cases occur in the winter months. In the “meningitis belt” of sub-Saharan Africa, a zone stretching across the continent from Senegal to Ethiopia, large outbreaks and epidemics take place during the dry season (November to June). | In tropical areas of Africa and Central and South America (see maps). YFV transmission can occur at altitudes up to 2300 metres (in Africa, possibly higher).  |
| <b>Risk for travelers</b>        | The risk of meningococcal disease in travellers is generally low. Travellers to the sub-Saharan meningitis belt may be exposed to outbreaks, (serogroup A and W135). Pilgrims visiting Mecca for the Hajj or Umrah are at particular risk.   | Apart from areas of high yellow fever endemicity, YFV transmission may take place also in low-endemic areas if the traveller’s itinerary implies heavy exposure to mosquitoes, for example during prolonged travel in rural areas.   |
| <b>General precautions</b>       | Avoid overcrowding in confined spaces. Following close contact with an individual suffering from meningococcal disease, medical advice should be sought regarding possible chemoprophylaxis and vaccination.   | Avoid mosquito bites (e.g. mosquito net and insecticide to treat fabrics); the highest risk for YFV transmission is during the day and early evening.  |
| <b>Vaccines</b>                  | A, C, Y, W-135 vaccine. Saudi Arabia demands proof of recent meningococcal vaccination (tetravalent vaccine) as a visa requirement for pilgrims and guest workers. Recommended in the “meningitis belt” of sub-Saharan Africa, a zone stretching across the continent from Senegal to Ethiopia.    | Type of vaccine: Live, attenuated Recommended for: All travellers to countries and areas with risk of yellow fever transmission and when required by countries. Special precautions: Not recommended for infants aged 6-8 months, except during epidemics when the risk of YF virus transmission may be very high. |



Pre-travel precautions should include booster doses of routine vaccines if the regular schedule has not been followed, or a full course of primary immunization for people who have never been vaccinated. Adequate vaccinations should also be ensured for inhabitants of endemic areas travelling to non-endemic locations in order to prevent introduction/reintroduction of diseases such as polio, yellow fever, measles and rubella. WHO information on vaccine preventable diseases can be found at: <http://www.who.int/immunization/>.

Other vaccines will be advised on the basis of a travel risk assessment for the individual traveller. In deciding which vaccines would be appropriate, the following factors are to be considered for each vaccine:

- Risk of exposure to the disease
- Age, health status, vaccination history
- Reactions to previous vaccine doses, allergies
- Risk of infecting others
- Cost.

Nowadays, only yellow fever vaccination is, in certain situations, required by the International Health Regulations. Yellow fever vaccination is carried out for two different reasons: (1) to protect the individual in areas where there is a risk of yellow fever infection; and (2) to protect vulnerable countries from importation of the yellow fever virus. Travellers should therefore be vaccinated if they visit a country where there is a risk of exposure to yellow fever. In some non-endemic countries the yellow fever vaccination is a prerequisite for entry, for those who have recently passed through yellow fever-endemic areas.

Vaccination against meningococcal disease (quadrivalent vaccine) is required by Saudi Arabia for pilgrims visiting Mecca and Medina for the Hajj or Umrah as well as for seasonal workers. Some polio-free countries may also require travellers from countries or areas reporting wild polio viruses to be immunized against polio in order to obtain an entry visa, e.g. Saudi Arabia [7]. Travellers should be provided with a written record of all vaccines administered (patient-retained record), preferably using the international vaccination certificate (which is required in the case of yellow fever vaccination). The certificate can be ordered from WHO (Tables 3-6).

### Medical examination after travel

Travellers should be advised to have a medical examination upon their return, according to The International Society of Travel Medicine (<http://www.istm.org>) or the American Society of Tropical Medicine and Hygiene (<http://www.astmh.org>), if they:

- Return with a fever from a country where malaria is, or may be, present so that malaria can be disregarded as a cause of illness.
- suffer from a chronic disease, such as cardiovascular disease, diabetes mellitus, or chronic respiratory disease or have been taking anticoagulants;
- experience illness in the weeks following their return home, particularly if fever, persistent diarrhoea, vomiting, jaundice, urinary disorders, skin disease or genital infection occurs;
- they received treatment for malaria while travelling;
- may have been exposed to a serious infectious disease while travelling;
- Have spent more than 3 months in a developing country.

Travellers should provide medical personnel with information on recent travel, including destination, purpose and duration of visit. Frequent travellers should give details of all journeys that have taken place in the preceding weeks and months including pre-travel vaccinations received and malaria chemoprophylaxis taken [6].

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