TRAVEL VACCINATIONS

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TRAVEL VACCINATION

GENERAL RECOMMENDATIONS

The visit by a client to the Travel Immunisation Clinic should be seen as an opportunity to bring an incompletely vaccinated person up to date on his or her routine vaccinations.

The National Immunisation Schedule is regularly updated as recommended by the Advisory Committee on Immunisation Policy. The latest schedule appears in Table 1.

Table 1

<table>
<thead>
<tr>
<th>AGE</th>
<th>VACCINE</th>
</tr>
</thead>
<tbody>
<tr>
<td>From 6 weeks</td>
<td>DTaP-Hib-IPV</td>
</tr>
<tr>
<td>3 months</td>
<td>DTaP-Hib-IPV</td>
</tr>
<tr>
<td>4 months</td>
<td>DTaP-Hib-IPV</td>
</tr>
<tr>
<td>12 months</td>
<td>Hep B</td>
</tr>
<tr>
<td>13 months</td>
<td>Hep B + MMR</td>
</tr>
<tr>
<td>18 months</td>
<td>Hep B+ DTaP-Hib-IPV</td>
</tr>
<tr>
<td>3-4 years</td>
<td>MMR</td>
</tr>
<tr>
<td>12 years</td>
<td>BCG</td>
</tr>
<tr>
<td>16 years</td>
<td>dT-IPV</td>
</tr>
</tbody>
</table>

SPACING OF VACCINES

Simultaneous Administration

All commonly used vaccines can safely and effectively be given simultaneously (on the same day) at separate sites without impairing antibody responses or increasing rates of adverse reactions. Simultaneous administration of all indicated vaccines is encouraged for people who are the recommended age to receive these vaccines and for whom no contraindications exist. If not administered on the same day, an inactivated vaccine may be given at any time before or after a different inactivated vaccine or a live-virus vaccine.

The immune response to an injected or oral live-virus vaccine might be impaired if administered within 28 days of another live-virus vaccine (within 30 days for yellow fever vaccine). Whenever possible, injected live-virus vaccines administered on different days should be given at least 28 days apart (≥30 days for yellow fever vaccine). If two live-virus vaccines are not administered on the same day but less than 28 days apart (<30 days for yellow fever vaccine), the second vaccine should be re-administered more than 28 days (≥30 days for yellow fever vaccine) after the
second vaccine was administered. Live-virus vaccines can interfere with the response to tuberculin testing. Tuberculin testing, if otherwise indicated, can be done either on the day that live-virus vaccines are administered or 4–6 weeks later.

**Missed Doses and Boosters**

Travellers may forget to return for a booster at the specified time. It is unnecessary in these cases to restart the interrupted series or to add any extra doses. Information on booster doses of vaccines is listed in Table 2.

**Table 2**

<table>
<thead>
<tr>
<th>VACCINE</th>
<th>RECOMMENDATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hepatitis A (HAV)</td>
<td>Booster doses not recommended for adults and children who have completed the primary series (2 doses) according to the routine schedule¹</td>
</tr>
<tr>
<td>Hepatitis B (HBV)</td>
<td>Booster doses not recommended for adults and children who have completed the primary series (3 doses) according to the routine schedule²</td>
</tr>
<tr>
<td>Influenza</td>
<td>1 annual dose (children aged 6 months to 9 years, and certain incompletely vaccinated children, should receive 2 doses separated by ≥4 weeks the first time that influenza vaccine is administered)</td>
</tr>
<tr>
<td>Measles-mumps-rubella (MMR)</td>
<td>2 doses of MMR vaccine separated by at least 4 weeks. Revaccination is not recommended.</td>
</tr>
<tr>
<td>Meningococcal Quadrivalent A,C,Y,W-135</td>
<td>Revaccination every 5 years is recommended for persons who remain at risk</td>
</tr>
<tr>
<td>Polio vaccine (inactivated) or IPV</td>
<td>For adults travelling to areas where poliomyelitis cases are still occurring, a single lifetime booster dose is recommended for those who have documentation of having completed a primary series.</td>
</tr>
<tr>
<td>Rabies pre-exposure vaccine</td>
<td>No serologic testing or boosters recommended for travellers.</td>
</tr>
<tr>
<td>Rotavirus</td>
<td>Booster doses not recommended.</td>
</tr>
<tr>
<td>Tetanus, diphtheria (Td)</td>
<td>Tetanus and diphtheria booster dose is recommended every 10 years.</td>
</tr>
<tr>
<td>Typhoid intramuscular</td>
<td>Booster dose every 2 years for those who remain at continued risk.</td>
</tr>
<tr>
<td>Varicella</td>
<td>Revaccination is not recommended.</td>
</tr>
<tr>
<td>Yellow Fever</td>
<td>Every 10 years if risk remains.</td>
</tr>
</tbody>
</table>

¹A 3- or 4-dose series of combination hepatitis A-hepatitis B vaccine (Twinrix®) is also available.
²Booster dosing may be appropriate for certain populations, such as haemodialysis patients.
VACCINATION OF PEOPLE WITH ACUTE ILLNESSES

Every opportunity should be taken to provide appropriate vaccinations. The decision to delay vaccination because of a current or recent acute illness depends on the severity of the symptoms and their cause. Although a moderate or severe acute illness is sufficient reason to postpone vaccination, minor illnesses (such as diarrhea, mild upper respiratory infection with or without low-grade fever, cough and sniffles) are not contraindications to vaccination.

People with moderate or severe acute illness, with or without fever, should be vaccinated as soon as the condition improves. Antibiotic therapy is not a contraindication to vaccination, except that oral acyclovir may interfere with the response to varicella-containing vaccines.

VACCINATION SCHEDULING FOR LAST-MINUTE TRAVELLERS

As noted, for people anticipating imminent travel, most vaccine products can be given during the same visit. Unless the vaccines given are booster doses, they may require a month or more to induce a sufficient immune response. Furthermore, some vaccines require more than 1 dose for best protection and the recommended spacing should be maintained between doses. Doses given at less than minimum intervals can lessen the antibody response. It is important to note that if a traveller needs yellow fever vaccination to meet a country requirement under the International Health Regulations, the yellow fever vaccine is not considered valid until 10 days after administration.

Table 3 lists the recommended minimal interval between doses of vaccines. In certain cases, such as with combination Hep A and B vaccine, and with Hep. B vaccine, accelerated schedules can be carried out. However, these would require extra boosting.

Table 3

<table>
<thead>
<tr>
<th>VACCINE AND DOSE NUMBER</th>
<th>RECOMMENDED AGE FOR THIS DOSE</th>
<th>MINIMUM AGE FOR THIS DOSE</th>
<th>MINIMUM INTERVAL TO NEXT DOSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>DTaP-IPV-Hib-1</td>
<td>2 months</td>
<td>6 weeks</td>
<td>4 weeks</td>
</tr>
<tr>
<td>DTaP-IPV-Hib-2</td>
<td>3 months</td>
<td>10 weeks</td>
<td>4 weeks</td>
</tr>
<tr>
<td>DTaP-IPV-Hib-3</td>
<td>4 months</td>
<td>14 weeks</td>
<td>6 months</td>
</tr>
<tr>
<td>DTaP-IPV-Hib-4</td>
<td>18 months</td>
<td>12 months</td>
<td>6 months</td>
</tr>
<tr>
<td>dT-IPV</td>
<td>16 years</td>
<td>6 years</td>
<td></td>
</tr>
<tr>
<td>Hepatitis A -1</td>
<td>12 months</td>
<td>6 months</td>
<td></td>
</tr>
<tr>
<td>HepA-2</td>
<td></td>
<td>18 months</td>
<td></td>
</tr>
<tr>
<td>Hepatitis B -1</td>
<td>12 months</td>
<td>Birth</td>
<td>4 weeks</td>
</tr>
<tr>
<td>Hep B-2</td>
<td>13 months</td>
<td>4 weeks</td>
<td>8 weeks</td>
</tr>
<tr>
<td>Hep B-3</td>
<td>18 months</td>
<td>12 weeks</td>
<td></td>
</tr>
<tr>
<td>VACCINE AND DOSE NUMBER</td>
<td>RECOMMENDED AGE FOR THIS DOSE</td>
<td>MINIMUM AGE FOR THIS DOSE</td>
<td>MINIMUM INTERVAL TO NEXT DOSE</td>
</tr>
<tr>
<td>--------------------------</td>
<td>-------------------------------</td>
<td>---------------------------</td>
<td>-------------------------------</td>
</tr>
<tr>
<td>Influenza, inactivated</td>
<td>≥6 months</td>
<td>6 months</td>
<td>4 weeks</td>
</tr>
<tr>
<td>Measles-mumps-rubella (MMR)-1</td>
<td>13 months</td>
<td>12 months</td>
<td>4 weeks</td>
</tr>
<tr>
<td>MMR-2</td>
<td>3-4 years</td>
<td>13 months</td>
<td></td>
</tr>
<tr>
<td>Meningococcal conjugate (Men C)-1</td>
<td>2 months</td>
<td>8 weeks</td>
<td></td>
</tr>
<tr>
<td>Men C-2</td>
<td>4 months</td>
<td>32 weeks</td>
<td></td>
</tr>
<tr>
<td>Men C-3</td>
<td></td>
<td>12 months</td>
<td></td>
</tr>
<tr>
<td>Note: If first dose is given over 12 months of age, only 1 dose necessary</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Meningococcus ACWY</td>
<td>2 years</td>
<td>5 years</td>
<td></td>
</tr>
<tr>
<td>Pneumococcal conjugate (PCV)-1</td>
<td>2 months</td>
<td>6 weeks</td>
<td>4 weeks</td>
</tr>
<tr>
<td>PCV-2</td>
<td>4 months</td>
<td>10 weeks</td>
<td>4 weeks</td>
</tr>
<tr>
<td>PCV-3</td>
<td>12 months</td>
<td>14 weeks</td>
<td></td>
</tr>
<tr>
<td>Pneumococcal polysaccharide (Pneumo-23)</td>
<td>2 years</td>
<td>5 years</td>
<td></td>
</tr>
<tr>
<td>Rabies-1 (pre-exposure)</td>
<td>No min. age</td>
<td>7 days</td>
<td></td>
</tr>
<tr>
<td>Rabies-2</td>
<td>7 days after dose 1</td>
<td>7 days after dose 1</td>
<td>14 days</td>
</tr>
<tr>
<td>Rabies-3</td>
<td>21-28 days after dose 1</td>
<td>21 days after dose 1</td>
<td>Note: For travellers returning to endemic areas a booster after 1 year and every 3-5 years thereafter</td>
</tr>
<tr>
<td>Tetanus and reduced diphtheria toxoids (Td)</td>
<td>16 years</td>
<td>7 years</td>
<td>10 years</td>
</tr>
<tr>
<td>Typhoid, inactivated</td>
<td>≥2 years</td>
<td>≥2 years</td>
<td>Booster every 2 years for repeated travel to high-risk areas.</td>
</tr>
<tr>
<td>Varicella</td>
<td>12 months</td>
<td>8 weeks</td>
<td></td>
</tr>
<tr>
<td>Yellow Fever</td>
<td>&gt;9 months</td>
<td>10 years</td>
<td></td>
</tr>
</tbody>
</table>
RECOMMENDING THE CORRECT VACCINES

The following links can be recommended as reference when deciding on which vaccines to administer to travellers after the respective travel plans have been discussed. These are:

DISEASES AND VACCINES

CHOLERA

Cholera is an acute bacterial, intestinal infection caused by toxigenic *Vibrio cholerae* bacteria. Toxigenic *V. cholerae* O1 and O139 are free-living bacterial organisms found in fresh and brackish water, often in association with crabs, shellfish, and aquatic plants. Cholera infections are most commonly acquired from drinking water in which *V. cholerae* is found naturally or into which it has been introduced from the faeces of an infected person. Other common vehicles include contaminated fish and shellfish, produce, or leftover cooked grains that have not been properly reheated. There is little or no transmission from person to person.

Cholera transmission is closely linked to inadequate environmental management. Typical at-risk areas include peri-urban slums, where basic infrastructure is not available, as well as camps for internally displaced people or refugees, where minimum requirements of clean water and sanitation are not met.

The consequences of a disaster – such as disruption of water and sanitation systems, or the displacement of populations to inadequate and overcrowded camps – can increase the risk of cholera transmission should the bacteria be present or introduced. Epidemics have never arisen from dead bodies.

Cholera remains a global threat to public health and a key indicator of lack of social development. Recently, the re-emergence of cholera has been noted in parallel with the ever-increasing size of vulnerable populations living in unsanitary conditions.

Cholera infection is most often asymptomatic or results in a mild gastroenteritis. Severe cholera is characterised by acute, profuse watery diarrhoea, described as “rice-water stools,” and often vomiting leading to dehydration. Signs and symptoms include tachycardia, loss of skin turgor, dry mucous membranes, hypotension, and thirst. If untreated, volume depletion can rapidly lead to hypovolaemic shock and death.

Cholera is confirmed through culture of a stool specimen or rectal swab. Cholera is a nationally notifiable disease. Rehydration is the cornerstone of therapy. Oral rehydration salts and if necessary, intravenous fluids and electrolytes should be administered in a timely manner. This should considerably reduce morbidity and mortality. Antibiotic therapy is indicated for severe cases which can be treated with tetracycline, doxycycline, furazolidine, erythromycin or ciprofloxacin.

**Vaccination**

There is a safe and effective oral cholera vaccine currently available on the market. One vaccine (Dukoral®) is WHO prequalified and licensed in over 60 countries. Dukoral® has been shown to provide short-term protection of 85–90% against *V. cholerae* O1 among all age groups at 4–6 months following immunisation.

Cholera vaccine is an oral preparation containing inactivated cholera bacteria and toxin. Each dose is added to 150ml of water and given in the following protocol:
Adults and Children over 6 years: 0 – 7 days

If more than 6 weeks have elapsed after the first dose, the course must be restarted.

The course must be completed at least 1 week prior to travel to an endemic area.

Children from 2 – 6 years: 0 – 7 days – 14 days

Continued Protection: A booster dose is necessary after 2 years for adults and children over 6 years and after 6 months for children aged 2 – 6 years.

WHO recommends that immunisation with currently available cholera vaccines be used in conjunction with the usually recommended control measures in areas where cholera is endemic as well as in areas at risk of outbreaks. Vaccines provide a short term effect while longer term activities like improving water and sanitation are put in place.

Today, no country requires proof of cholera vaccination as a condition for entry. Countries neighbouring cholera-affected areas are encouraged to strengthen disease surveillance and national preparedness to rapidly detect and respond to outbreaks should cholera spread across borders. Furthermore, information should be provided to travellers and the community on the potential risks and symptoms of cholera, together with precautions to avoid cholera and when and where to report cases.

HEPATITIS A

Hepatitis A virus (HAV) is an RNA virus classified as a picornavirus. Transmission can occur through direct person-to-person contact, through exposure to contaminated water, ice, or shellfish harvested from sewage-contaminated water, or from fruits, vegetables, or other foods that are eaten uncooked and that were contaminated during harvesting or subsequent handling. The virus is shed in the faeces of infected people and reaches peak levels 1–2 weeks before onset of symptoms. It diminishes rapidly after liver dysfunction or symptoms appear but infants and children may shed virus for up to 6 months after infection.

Map 1 indicates the various levels of endemicity worldwide. Levels of endemicity are related to hygienic and sanitary conditions in the area. The estimates show that all high-income regions have very low HAV endemicity levels, all low-income regions have high endemicity levels, and most middle-income regions have a mix of intermediate and low endemicity levels.
HAV infection is common throughout the developing world, where frequently infections are acquired during early childhood and usually are asymptomatic or mild, resulting in a high proportion of adults in the population that are immune to HAV and where epidemics of hepatitis A are uncommon. In developed countries, HAV infection is less common, but communitywide outbreaks may occur.

Hepatitis A is one of the most common vaccine-preventable infections acquired during travel. Risk is highest for those who live in or visit rural areas, trek in backcountry areas, or frequently eat or drink in settings of poor sanitation. However, cases of travel-related hepatitis A can also occur in travellers to developing countries with “standard” tourist itineraries, accommodations, and eating behaviours.

The incubation period for hepatitis A averages 28 days (range, 15–50 days). The clinical manifestations may range from asymptomatic to a mild illness lasting 1–2 weeks, to a severely disabling disease lasting several months. In symptomatic cases there is often abrupt onset of fever, malaise, anorexia, nausea, and abdominal discomfort, followed within a few days by jaundice. In children under 6 years of age, most infections are asymptomatic and if illness does occur, the duration is usually very short.

No specific treatment is available for people with Hepatitis A and treatment is purely supportive.

**Vaccination**

**Monovalent Vaccines**

Monovalent hepatitis A vaccines are licensed for use in persons over 1 year of age. A full vaccination series includes 2 doses, giving the second dose 6–12 months after...
the first. All hepatitis A vaccines should be administered intramuscularly in the deltoid muscle.

**Combination Vaccine**

A combined hepatitis A and hepatitis B vaccine (Twinrix®) is also available and may be used in persons over 1 year of age. Primary immunisation consists of 3 doses, given on a 0-, 1-, and 6-month schedule, the same schedule as commonly used for monovalent hepatitis B vaccine. An accelerated schedule (doses at days 0, 7, and 21–30) for travellers can also be used but in this case a booster dose should be given at 12 months to promote long-term immunity.

**Indications for Use**

All susceptible people travelling for any purpose, frequency, or duration to countries with high or intermediate hepatitis A endemicity should be vaccinated before departure. The first dose of hepatitis A vaccine should be administered as soon as travel to countries with high or intermediate endemicity is considered.

People who are travelling for international adoption should be advised that hepatitis A vaccination is recommended for all previously unvaccinated household members and other people who anticipate close personal contact with an international adoptee from a country of high or intermediate endemicity during the first 60 days after arrival of the adoptee. The first dose of hepatitis A vaccine should be administered as soon as adoption is planned and ideally more than 2 weeks before the arrival of the adoptee.

**Vaccine Administration**

One dose of monovalent hepatitis A vaccine administered at any time before departure can provide adequate protection for most healthy people. The vaccine series should be completed according to the licensed schedule for long-term protection. Post-vaccination testing for serologic response is not indicated.

**Other Vaccine Considerations**

Using the vaccines according to the licensed schedules is preferable. However, an interrupted series does not need to be restarted. Given their similar immunogenicity, a series that has been started with one brand of monovalent vaccine may be completed with the other brand. For children and adults who complete the primary series, booster doses of vaccine are not recommended.

Table 3 shows the recommended schedules for the different types of vaccine per age group.

**Vaccine Safety and Adverse Reactions**

Among adults, the most frequently reported side effects occurring 3–5 days after a vaccine dose are tenderness or pain at the injection site or headache. Among children, the most common side effects reported are pain or tenderness at the injection site, feeding problems, or headache. No serious adverse events in children or adults have been found that could be definitively attributed to the vaccine, nor have increases in serious adverse events among vaccinated people compared with baseline rates been identified.
Precautions and Contraindications

These vaccines should not be administered to travellers with a history of hypersensitivity to any vaccine component. Twinrix® should not be administered to people with a history of hypersensitivity to yeast. Because hepatitis A vaccine consists of inactivated virus, and hepatitis B vaccine consists of a recombinant protein, no special precautions are needed for vaccination of immunocompromised travelers.

Personal Protection Measures

Boiling or cooking food and beverage items for more than a minute to 85°C inactivates HAV. Foods and beverages heated to this temperature and for this length of time cannot serve as vehicles for HAV infection, unless they become contaminated after heating.

Table 3.
Licensed doses and schedules for monovalent Hep A vaccine

<table>
<thead>
<tr>
<th>AGE (Years)</th>
<th>VOLUME</th>
<th>NUMBER DOSES</th>
<th>OF SCHEDULE (MONTHS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1–15</td>
<td>0.5 mL</td>
<td>2</td>
<td>0, 6–12</td>
</tr>
<tr>
<td>&gt;15</td>
<td>1.0 mL</td>
<td>2</td>
<td>0, 6–12</td>
</tr>
</tbody>
</table>

Licensed doses and schedules for combination Hep A + B vaccine

<table>
<thead>
<tr>
<th>AGE (Years)</th>
<th>VOLUME</th>
<th>NUMBER DOSES</th>
<th>OF SCHEDULE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1–15 (Primary schedule)</td>
<td>0.5ml</td>
<td>3</td>
<td>0, 1, 6 months</td>
</tr>
<tr>
<td>&gt;15 (primary schedule)</td>
<td>1.0 mL</td>
<td>3</td>
<td>0, 1, 6 months</td>
</tr>
<tr>
<td>1–15 (accelerated schedule)</td>
<td>0.5</td>
<td>4</td>
<td>0, 7, 21-30 days + 12 months</td>
</tr>
<tr>
<td>&gt;15 (accelerated schedule)</td>
<td>1.0 mL</td>
<td>4</td>
<td>0, 7, 21–30 days + 12 months</td>
</tr>
</tbody>
</table>
HEPATITIS B

Hepatitis B is caused by hepatitis B virus. The virus is transmitted by activities that involve contact with blood, blood products, and other body fluids. Such activities include the following:

- Unprotected sexual contact
- Injection drug use with shared needles
- Transfusions with blood or blood products that have not been screened for HBV
- Work in health care fields (medical, dental, laboratory) that entails exposure to human blood
- Dental, medical, or cosmetic (tattooing, body piercing) procedures with needles or other equipment that may be contaminated with blood
- Exposure to potentially contaminated blood through non-intact skin or mucous membranes

Map 2 shows the prevalence of chronic HBV infection globally. The risk for HBV infection among international travelers is low. However, the risk of HBV infection is considered higher in countries where the prevalence of chronic HBV infection is intermediate or high. Expatriates, missionaries, and long-term aid workers may be at increased risk for HBV infection.

Map 2. Prevalence of chronic infection with hepatitis B virus, 2006
The incubation period for hepatitis B is 60 to 150 days. Early symptoms include malaise, fatigue, and anorexia for about 1–2 weeks. This is followed by the typical clinical signs and symptoms that include nausea, vomiting, abdominal pain and jaundice. In some cases, skin rashes, joint pain, and arthritis may occur. HBV infection is typically asymptomatic in children aged under 5 years and immunocompromised adults.

Acute hepatitis B progresses to chronic HBV infection in 30%–90% of people infected as infants or young children and in around 5% of people infected during adolescence or adulthood. Chronic infection with HBV results in chronic liver disease including liver cirrhosis and malignancy.

There is no specific treatment for acute hepatitis B but antiretroviral drugs may be used to treat chronic hepatitis B.

**Vaccination**

Hepatitis B vaccination should be administered to all unvaccinated people travelling to areas with intermediate or high prevalence of chronic hepatitis B.

**Vaccine Administration**

The vaccine is usually administered as a 3-dose series on a 0-, 1-, 6-month schedule. The second dose should be given 1 month after the first dose; the third dose should be given 5 months after the second dose and 6 months after the first dose. A 3-dose series that has been started with one brand of vaccine may be completed with another brand. The combination Hepatitis A + B vaccine (Twinrix®) may be used in the same way. Primary immunisation consists of 3 doses, given at 0, 1, and 6 months.

Ideally, vaccination should begin 6 months before travel so the full vaccine series can be completed before departure. Because some protection is provided by 1 or 2 doses, the vaccine series should be initiated, if indicated, even if it cannot be completed before departure. Optimal protection, however, is not conferred until after the final vaccine dose is received. An accelerated vaccine schedule may be used for those travelling to endemic areas at short notice and facing imminent exposure or for emergency responders to disaster areas. An accelerated vaccination schedule with Twinrix® can also be used (doses at 0, 7, and 21–30 days). In this situation, a booster dose should be given at 12 months to promote long-term immunity. For children and adults with normal immune status who received the recommended vaccine series, pre-travel booster doses are not recommended. Serologic testing to assess antibody levels is not necessary for most fully vaccinated people.

**Vaccine Safety and Adverse Reactions**

Hepatitis B vaccines have been shown to be safe for people of all ages. Pain at the injection site and fever are the most frequently reported side effects among vaccine recipients. These vaccines should not be administered to people with a history of hypersensitivity to any vaccine component, including yeast. The vaccine contains a recombinant protein (hepatitis B surface antigen) that is non-infectious.
Limited data indicate no apparent risk of adverse events to the developing foetus when hepatitis B vaccine is administered to pregnant women. HBV infection in a pregnant woman can result in serious disease for the mother and chronic infection for the newborn. Neither pregnancy nor lactation should be considered a contraindication for vaccination.

**Personal Protection Measures**

As part of the pre-travel education process, all travellers should be given information about the risks for hepatitis B and other blood borne pathogens from contaminated medical equipment, injection drug use, unprotected sexual activity, and other methods of transmission and be informed about prevention measures. Travellers should consider the health risks when deciding to get a tattoo or body piercing in areas where adequate sterilisation or disinfection procedures might not be available or practiced.

**MALARIA**

Malaria is caused by the protozoan parasite *Plasmodium*. Human malaria is caused by four different species of *Plasmodium*: *P. falciparum, P. malariae, P. ovale* and *P. vivax*. All species are transmitted by the bite of an infected female *Anopheles* mosquito. Occasionally, transmission occurs by blood transfusion, organ transplantation, needle sharing, or congenitally from mother to foetus.

Malaria transmission occurs in large areas of Africa, Central and South America, parts of the Caribbean, Asia, the Middle East, Eastern Europe and the South Pacific. The risk for acquiring malaria differs substantially from region to region and from traveller to traveller even within a single country. This variability is a function of the intensity of transmission within the various regions and the itinerary, duration, season and type of travel. In many countries or area at risk, the main urban areas – but not necessarily the outskirts of towns – are free of malaria transmission. However, malaria can occur in the main urban areas of Africa and, to a lesser extent, India. There is usually less risk at altitudes above 1500 m, although in favourable climatic conditions the disease can occur at altitudes up to almost 3000 m. The risk of infection may also vary according to the season, being highest at the end of the rainy season or soon after. There is no risk of malaria in many tourist destinations in south-east Asia, the Caribbean and Latin America.

However, one must note that factors that can change rapidly and from year to year such as local weather conditions, mosquito vector density and prevalence of infection can markedly affect local malaria transmission patterns. For this reason it is advisable to check updated information before advising on malaria prophylaxis or otherwise. This information may be found on [https://extranet.who.int/ihrportal/report.aspx?id=65](https://extranet.who.int/ihrportal/report.aspx?id=65) or [http://wwwnc.cdc.gov/travel/destinations/list.htm](http://wwwnc.cdc.gov/travel/destinations/list.htm)

Malaria is characterized by fever and influenza-like symptoms, including chills, headache, myalgia, and malaise. These symptoms can occur at intervals. Uncomplicated disease may be associated with anaemia and jaundice. In severe disease, seizures, mental confusion, kidney failure, acute respiratory disease syndrome (ARDS), coma and death may occur. Malaria symptoms can develop as
early as 7 days after initial exposure in a malaria-endemic area and as late as several months or more after departure. Suspected or confirmed malaria, especially \textit{P. falciparum}, is a medical emergency, requiring urgent intervention as clinical deterioration can occur rapidly and unpredictably. It is important that the possibility of falciparum malaria is considered in all cases of unexplained fever starting at any time between 7 days after the first possible exposure to malaria and even 3 months after the last possible exposure. Any individual who experiences a fever in this interval should immediately seek diagnosis and effective treatment, and inform medical personnel of the possible exposure to malaria infection. Falciparum malaria may be fatal if treatment is delayed beyond 24 h after the onset of clinical symptoms.

\textbf{Precautions for Travellers}

Travellers and their advisers should note the four principles – the ABCD – of malaria protection:

- \textbf{Be Aware} of the risk, the incubation period, the possibility of delayed onset, and the main symptoms.
- \textbf{Avoid being Bitten} by mosquitoes, especially between dusk and dawn.
- \textbf{Take Chemoprophylaxis} (antimalarial drugs) when appropriate, to prevent infection from developing into clinical disease.
- \textbf{Immediately seek Diagnosis} and treatment if a fever develops 1 week or more after entering an area where there is a malaria risk and up to 3 months after departure from a risk area.

\textbf{Mosquito Avoidance Measures}

Because of the nocturnal feeding habits of \textit{Anopheles} mosquitoes, malaria transmission occurs primarily between dusk and dawn. Contact with mosquitoes can be reduced by remaining in well-screened areas, using mosquito bed nets (preferably insecticide-treated nets), using a pyrethroid-containing insect spray in living and sleeping areas during evening and night hours and wearing clothes that cover most of the body.

All travellers should use an effective mosquito repellent which should be applied to exposed parts of the skin when mosquitoes are likely to be present. If travellers are also wearing sunscreen, sunscreen should be applied first and insect repellent second.

\textbf{Chemoprophylaxis}

All recommended primary chemoprophylaxis regimens involve taking the medication before, during, and after travel to an area with malaria. In choosing an appropriate drug regimen before travel, a number of factors should be considered. The travel itinerary should be reviewed in detail and compared with the information on where malaria transmission occurs within a given country. Additional factors to consider are the patient’s other medical conditions, medications being taken (to assess potential drug interactions), the cost of the medicines, and the potential side effects. Travellers should be strongly discouraged from obtaining anti-malarial medication while abroad. The quality of these products is not known; they may not be protective and could be
dangerous. These medications may have been produced by substandard manufacturing practices, or may contain contaminants. Table 4 lists some of the benefits and limitations of medicines used for malaria chemoprophylaxis.

**Table 4. Drugs used in the prophylaxis of malaria**

<table>
<thead>
<tr>
<th>DRUG</th>
<th>USAGE</th>
<th>ADULT DOSE</th>
<th>PEDIATRIC DOSE</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Atovaquone-proguanil (Malarone®)</strong></td>
<td>Prophylaxis in all areas</td>
<td>Adult tablets contain 250 mg atovaquone and 100 mg proguanil hydrochloride. 1 adult tablet orally, daily</td>
<td>6mg/Kg atovaquone and 2.5mg/Kg proguanil</td>
<td>Begin 1–2 days before travel to malaria areas. Take daily at the same time each day while in the malaria area and for 7 days after leaving such areas. <strong>Contraindicated in people with severe renal impairment</strong> Malarone should be taken with food or a milky drink. Not recommended for children weighing &lt;5 kg, pregnant women, and women breastfeeding infants weighing &lt;5 kg.</td>
</tr>
<tr>
<td><strong>Chloroquine phosphate</strong></td>
<td>Prophylaxis only in areas with chloroquine-sensitive malaria</td>
<td>500 mg orally, once/week</td>
<td>8.3 mg/kg once/week, up to maximum adult dose of 500 mg</td>
<td>Begin 1–2 weeks before travel to malaria areas. Take weekly on the same day of the week while in the malaria area and for 4 weeks after leaving such areas.</td>
</tr>
<tr>
<td><strong>Doxycycline</strong></td>
<td>Prophylaxis in all areas</td>
<td>100 mg orally, daily</td>
<td>≥8 years of age: 2.2 mg/kg up to adult dose of 100 mg/day</td>
<td>Begin 1–2 days before travel to malaria areas. Take daily at the same time each day while in the malaria area and for 4 weeks after leaving such areas. <strong>Contraindicated in children &lt;8 years of age</strong></td>
</tr>
<tr>
<td>DRUG</td>
<td>USAGE</td>
<td>ADULT DOSE</td>
<td>PEDIATRIC DOSE</td>
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<tr>
<td>Mefloquine</td>
<td>Prophylaxis in areas with mefloquine-sensitive malaria</td>
<td>250mg orally, once/week</td>
<td>≤9 kg: 5 mg/kg orally, once/week</td>
<td>Begin ≥2 weeks before travel to malaria areas. Take weekly on the same day of the week while in the malaria area and for 4 weeks after leaving such areas. Contraindicated in people allergic to mefloquine or quinidine compounds and in people with history of depression, generalized anxiety disorder, psychosis, schizophrenia, other major psychiatric disorders, or seizures. Not recommended for persons with cardiac conduction abnormalities.</td>
</tr>
<tr>
<td>Primaquine</td>
<td>Prophylaxis for short-duration travel to areas with principally P. vivax</td>
<td>30 mg base orally, daily</td>
<td>0.5 mg/kg base up to adult dose orally, daily</td>
<td>Begin 1–2 days before travel to malaria areas. Take daily at the same time each day while in the malaria area and for 7 days after leaving such areas. Contraindicated in people with G6PD deficiency. Also contraindicated during pregnancy and lactation.</td>
</tr>
</tbody>
</table>
MENINGOCOCCAL DISEASE

Meningococcal disease is caused by a gram-negative diplococcus, *Neisseria meningitidis*. Meningococci are classified into serogroups on the basis of the composition of the capsular polysaccharide. The 5 major meningococcal serogroups associated with disease are A, B, C, Y, and W-135.

Person-to-person transmission occurs by close contact with respiratory secretions or saliva. *N. meningitidis* is found worldwide. Invasive disease is rare in non-epidemic areas. The incidence of meningococcal disease is highest in the “meningitis belt” of sub-Saharan Africa (Map 3).

Map 3. Areas with frequent epidemics of meningococcal meningitis

Although most common in the African meningitis belt, meningococcal outbreaks can occur anywhere in the world. Serogroup A predominates in the meningitis belt, although serogroups C, X, and W-135 are also found.

Young children have the highest risk for meningococcal disease, but 60% of cases occur in adolescents and adults. Risk is highest in travellers who have prolonged contact with local populations in the meningitis belt during an epidemic. The Hajj pilgrimage to Saudi Arabia has been associated with outbreaks of meningococcal disease in returning pilgrims and their contacts.

Meningococcal disease generally occurs 1–14 days after exposure. Meningococcal disease presents as meningitis in most cases. Meningococcal meningitis is characterised by sudden onset of headache, fever, and stiffness of the neck,
sometimes accompanied by nausea, vomiting, photophobia or altered mental status. Meningococcal septicemia occurs in around 20% of cases. This is characterised by sudden onset of fever and a petechial or purpuric rash and may progress to multi-organ failure and death. Among infants and children aged under 2 years, meningococcal disease may have nonspecific symptoms and neck stiffness, usually seen in people with meningitis, may be absent.

PREVENTIVE MEASURES FOR TRAVELLERS

Vaccine

Indications for Use
Vaccination against meningococcal disease is recommended for people who travel to or reside in countries where *N. meningitidis* is endemic, particularly if contact with the local population will be prolonged. Note that proof of receipt of quadrivalent vaccination against meningococcal disease is required for people travelling to Mecca during the annual Hajj and Umrah pilgrimages.

Vaccine Administration

A tetravalent polysaccharide vaccine against serogroups A, C, Y, W-135 is available. This is given as a single dose to persons over 2 years of age. The vaccine is not recommended for children under 2 years of age as antigenicity of the vaccine is low in this age group and antibodies persist for shorter duration. The vaccine should be administered at least 2 weeks before departure and a booster dose may be necessary every 3 – 5 years if travel to endemic areas continues. Adverse reactions are limited to mild local ones and fever is very rare following vaccination.

Monovalent serogroup C conjugate vaccines were first licensed for use in 1999 and are now incorporated in national vaccination programmes in an increasing number of countries. In contrast to polysaccharide vaccines, the group C conjugate vaccine elicits adequate antibody responses and immunological memory even in infants. Men. C conjugate vaccine may be given to infants from the age of 2 months. A 2-dose primary vaccination schedule, followed by a booster dose in the second year of life provides immunity against serogroup C meningococcal disease, although a boost at around 12 years of age may be necessary to sustain immunity through adolescence. Children from 1 year of age and adults require one dose of meningococcus C conjugate vaccine. Cross-protection for other serogroups does not occur and travellers immunised with conjugate vaccine against serogroup C are not protected against other serogroups.

RABIES

Rabies is an acute, progressive, fatal encephalomyelitis caused by neurotropic viruses in the family Rhabdoviridae. Virus is present in the saliva of the biting rabid mammal. Transmission almost always occurs by an animal bite that injects virus into wounds. Virus inoculated into a wound does not enter the bloodstream but is taken up at a nerve synapse to travel to the brain, where it causes encephalitis. Virus may enter the nervous system fairly rapidly or may remain at the bite site for an extended period before gaining access to the nervous system. The hands and face, because of the relative density of nerve endings, are considered higher-risk exposures. All mammals are believed to be susceptible to infection, but major reservoirs are
carnivores and bats. Although dogs are the main reservoir in developing countries, the epidemiology of the disease from one region or country to another differs enough to warrant the medical evaluation of all mammal bites. Bat bites anywhere in the world are a cause of concern and an indication for prophylaxis. Rabies is found on all continents, except Antarctica.

Clinical illness is compatible with acute, progressive encephalitis. After infection, the incubation period is highly variable, but it lasts approximately 1–3 months. The disease progresses acutely from a nonspecific, prodromal phase with fever and vague symptoms, to a neurologic phase, characterized by anxiety, paresis, paralysis, and other signs of encephalitis. Spasms of swallowing muscles can be stimulated by the sight, sound, or perception of water (hydrophobia). Delirium and convulsions can develop, followed rapidly by coma and death.

Once clinical signs manifest, most patients die in 7–14 days.

**PREVENTIVE MEASURES FOR TRAVELERS**

**Avoiding Animal Bites**

Travellers to rabies-enzootic countries should be warned about the risk of acquiring rabies and educated in animal bite-prevention strategies. Travellers should avoid stray animals, be aware of their surroundings so that they do not accidentally surprise a stray dog, avoid contact with bats and other wildlife, and not carry or eat food while nonhuman primates are near. Visitors should be educated not to handle bats or other wildlife. Many bats have tiny teeth, and not all wounds may be apparent, compared with the lesions caused by carnivores. Any suspected or documented bite or scratch from a bat should be grounds for seeking post-exposure prophylaxis.

**Pre-exposure Vaccination**

Pre-exposure vaccination may be recommended for veterinarians, animal handlers, field biologists, cavers, missionaries, and certain laboratory workers. Travellers with extensive outdoor exposure in rural areas – such as might occur while running, bicycling, hiking, camping, backpacking, etc. – may be at risk, even if the duration of travel is short. Pre-exposure vaccination is advisable for children living in or visiting countries or areas at risk, where they provide an easy target for rabid animals. Pre-exposure vaccination is also recommended for individuals travelling to isolated areas or to areas where immediate access to appropriate medical care is limited or to countries or areas where modern rabies vaccines are in short supply and locally available rabies vaccines might be unsafe and/or ineffective.

Rabies vaccine consists of inactivated rabies virus produced from cultivated cell lines. Pre-exposure rabies vaccination consists of three intramuscular doses of vaccine given on days 0, 7 and 21 or 28. Periodic booster injections are not recommended for general travellers. Periodic booster injections are recommended only for people whose occupations put them at continuous or frequent risk of rabies exposure, e.g. rabies researchers or staff in diagnostic laboratories where rabies virus is present. For individuals at continuous or frequent risk of rabies exposure who have previously received pre-exposure rabies vaccination, a booster vaccination is administered if the serological titre falls below 0.5 IU/ml, the antibody level considered to be protective.
If 3 doses of rabies vaccine cannot be completed before travel, the traveller should not start the series, as it would be problematic to plan post-exposure prophylaxis after a partial immunisation series. Pre-exposure vaccination does not eliminate the need for additional medical attention after a rabies exposure, but it simplifies post-exposure prophylaxis.

Any animal bite or scratch should be thoroughly cleaned with copious amounts of soap and water and iodine, if available. This local care will substantially reduce the risk for rabies.

Post-exposure Prophylaxis

In Travellers Who Received Pre-exposure Vaccination

In the event of a possible rabies exposure in someone who received pre-exposure rabies vaccination, 2 boosters of rabies vaccine are given on days 0 and 3 after the exposure. Rabies immunoglobulin is not required for previously vaccinated patients.

In Travellers Who Did Not Receive Pre-exposure Vaccination

If pre-exposure rabies vaccination has not been given, post-exposure prophylaxis consists of injections of Rabies Immunoglobulin (20 IU/kg) into the wound/s and intramuscularly and a series of 4 injections of rabies vaccine over 14 days. Post-exposure prophylaxis, including immunoglobulin, should be initiated after a possible bite exposure even if there has been a considerable delay between the exposure and the traveller presenting for evaluation.

The post-exposure regimen for healthy exposed people who receive wound care plus high-quality rabies immunoglobulin consists of four doses administered i.m. on days 0, 3, 7 and 14. Once initiated, rabies post-exposure prophylaxis should not be interrupted or discontinued because of local or mild systemic reactions to rabies vaccine.

TYPHOID FEVER

Typhoid fever is an acute, life-threatening febrile illness caused by the bacterium Salmonella typhi. Humans are the only source of these bacteria. Typhoid fever is most often acquired through consumption of water or food that has been contaminated by faeces of an acutely infected or convalescent person or a chronic, asymptomatic carrier. Travellers to southern Asia are at highest risk for infections that are multidrug-resistant. Although the risk of acquiring typhoid or paratyphoid fever increases with the duration of stay, travellers have acquired typhoid fever even during short visits to countries where the disease is endemic.

The incubation period of typhoid and paratyphoid infections is 6–30 days. The onset of illness is insidious, with gradually increasing fatigue and a fever that increases daily from low-grade to as high as 102°F–104°F (38°C–40°C) by the third to fourth day of illness. Headache, malaise, and anorexia are nearly universal. Hepatosplenomegaly can often be detected. A transient, macular rash of rose-colored spots can occasionally be seen on the trunk. Fever is commonly lowest in the morning, reaching a peak in late afternoon or evening. Untreated, the disease can last for a month. The serious complications of typhoid fever generally occur after 2–3 weeks of illness and may include intestinal haemorrhage or perforation, which can be life threatening.
PREVENTIVE MEASURES FOR TRAVELLERS

Vaccine

Indications for Use

Typhoid vaccine is recommended for travellers to areas where there is an increased risk of exposure to S. Typhi. Travellers should be reminded that typhoid immunisation is not 100% effective, and typhoid fever could still occur.

The vaccine consists of an inactivated Vi capsular polysaccharide type for intramuscular use. Primary vaccination consists of one dose administered intramuscularly. One dose of this vaccine should be given 2 weeks or more before expected exposure. The vaccine is not recommended for infants and children aged less than 2 years.

A booster dose may be given every 2 – 3 years if exposure risk persists.

Adverse reactions are commonly headaches and local reaction at the injection site. These effects are self-limiting and subside after a few days.

YELLOW FEVER

Yellow fever virus (YFV) is a single-stranded RNA virus that belongs to the genus Flavivirus. Transmission occurs via the bite of an infected mosquito. Nonhuman and human primates are the main reservoirs of the virus. Humans infected with Yellow Fever experience the highest levels of viraemia and can transmit the virus to mosquitoes shortly before onset of fever and for the first 3–5 days of illness. Given the high level of viraemia, blood-borne transmission theoretically can occur via transfusion or needle sticks.

Yellow fever occurs in sub-Saharan Africa and tropical South America, where it is endemic and intermittently epidemic. In Africa, natural immunity accumulates with age, and thus, infants and children are at highest risk for disease. In South America, yellow fever occurs most frequently in unimmunised young men who are exposed to mosquito vectors through their work in forested or transitional areas.

Further updated information regarding the prevalence of Yellow Fever in different regions of Africa and South America is available at http://wwwnc.cdc.gov/travel/yellowbook/2012/chapter-3-infectious-diseases-related-to-travel/yellow-fever.htm#2853

A traveller’s risk for acquiring yellow fever is determined by various factors, including immunisation status, location of travel, season, duration of exposure, occupational and recreational activities while travelling, and local rate of virus transmission at the time of travel. Yellow Fever transmission in rural West Africa is seasonal, with an elevated risk during the end of the rainy season and the beginning of the dry season (usually July–October). The risk for infection in South America is highest during the rainy season (January–May, with a peak incidence in February and March).

The risk of acquiring yellow fever in South America is lower than that in Africa, because the mosquitoes that transmit the virus between monkeys in the forest
canopy in South America do not often come in contact with humans. Additionally, there is a relatively high level of immunity in local residents because of vaccine use, which might reduce the risk of transmission.

Asymptomatic infection is believed to occur in most people infected with Yellow Fever. For people who develop symptomatic illness, the incubation period is typically 3–6 days. The initial illness presents as a nonspecific influenza-like syndrome with sudden onset of fever, chills, headache, backache, myalgia, prostration, nausea, and vomiting. Most patients improve after the initial presentation. After a brief remission of hours to a day, some patients progress to a more serious or toxic form of the disease characterised by jaundice, haemorrhage, and eventually shock and multisystem organ failure.

Treatment is symptomatic only. Rest, fluids, and use of analgesics and antipyretics may relieve symptoms of fever and aching. Infected people should be protected from further mosquito exposure (staying indoors or under a mosquito net) during the first few days of illness, so they do not contribute to the transmission cycle.

PREVENTIVE MEASURES FOR TRAVELLERS

Personal Protection Measures

The best way to prevent mosquito-borne diseases, including yellow fever, is to avoid mosquito bites (see section on prevention of Malaria).

Vaccine

Yellow fever is preventable by a relatively safe, effective vaccine. The yellow fever vaccine is a live-attenuated viral vaccine. It is recommended for people aged over 9 months who are travelling to or living in areas at risk for yellow fever transmission in South America and Africa. In addition, some countries require proof of yellow fever vaccination for entry.

Vaccination is the single most important measure for preventing yellow fever. Preventive vaccination can be offered to travellers to yellow fever endemic area. The yellow fever vaccine is safe and provides effective immunity against yellow fever within one week for 95% of those vaccinated. A single dose provides protection for 30–35 years or more, and probably for life. Serious side effects are extremely rare. The risk of death from yellow fever is far greater than the risks related to the vaccine. People who should not be vaccinated include:

- children aged less than 9 months for routine immunization (or less than 6 months during an epidemic);
- pregnant women – except during a yellow fever outbreak when the risk of infection is high;
- people with severe allergies to egg protein; and
- people with severe immunodeficiency due to symptomatic HIV/AIDS or other causes, or in the presence of a thymus disorder.

Travellers, particularly those arriving to Asia from Africa or Latin America must have a certificate of yellow fever vaccination. If there are medical grounds for not getting vaccinated, International Health Regulations state that this must be certified by the appropriate authorities.
For all eligible people, a single injection of 0.5 mL of reconstituted vaccine should be administered subcutaneously. The International Health Regulations (IHR) published by the World Health Organization (WHO) require revaccination at 10-year intervals.

Reactions to yellow fever vaccine are generally mild; 10%–30% of vaccinees report mild systemic adverse events. Reported events typically include low-grade fever, headache, and myalgia that begin within days after vaccination and last 5–10 days.

Promote safe travel — VACCINATE