

2.2 VACCINATION FOR INTERNATIONAL TRAVEL

Introduction

The number of Australians who travel overseas has increased steadily over recent years and now between 3.5 and 4.5 million exits are made annually. Although many of these trips are to countries where health risks exist, the majority of Australians travelling overseas do not seek pre-travel health advice.¹ Every year, Australian travellers are injured, become ill, or even die, while travelling abroad. Some of the infectious diseases that cause some of this morbidity and mortality are preventable through vaccination.^{2,3}

There is a range of travel vaccines that target infectious diseases that are more common in different or less-developed environments, and therefore travel itineraries should be assessed for the level of risk for these diseases.³ Factors such as the interval between the initial presentation and the departure date, destination, length of stay, activities during travel, type of accommodation, personal medical history, age of the traveller, previous vaccination status and financial constraints, all have a potential impact on vaccine recommendations. It is important to identify travellers who may be at increased risk for travel related illness, such as pregnant women, children, people with chronic systemic illness or people with impaired immunity. Recent immigrants and their Australian-born children are at particular risk of acquiring some of these infections when they return to their country-of-origin to visit relatives and friends.⁴

Infections acquired by travellers

Common infections acquired by travellers include those which follow ingestion of contaminated food or water.^{2,5} Most of these are diarrhoeal diseases due to enteric pathogens, but infections with extra-intestinal manifestations, such as hepatitis A and typhoid, are also acquired this way. Vaccines are available for cholera, hepatitis A and typhoid.

Insect-borne (particularly mosquito) infections, such as malaria and dengue, are important causes of fever in Australian travellers returning from endemic areas, southeast Asia and Oceania in particular.⁵ Japanese encephalitis occurs throughout much of Asia and probably throughout Papua New Guinea. Yellow fever occurs only in parts of Africa and Central and South America, while tick-borne encephalitis occurs in parts of Europe and Asia. Vaccines are available for Japanese encephalitis, yellow fever and tick-borne encephalitis.

Vaccine-preventable infections transmitted via respiratory droplets include influenza, invasive meningococcal disease and measles; influenza may be the most frequent vaccine-preventable infection among travellers.⁶ Tuberculosis, although rare, is mostly acquired by expatriates who live in high-risk areas for long periods.

Blood-borne infections, such as hepatitis B, hepatitis C and human immunodeficiency virus (HIV), may pose a threat to some Australian travellers. In remote areas of some countries, there is the possibility that these viruses are transmitted by healthcare workers using non-sterile medical equipment. Hepatitis B vaccine is relevant to many travellers.

Travellers may be exposed to a variety of other exotic infections such as rabies from dog (and other mammal) bites in many countries, schistosomiasis after swimming in African lakes, and leptospirosis after rafting or wading in contaminated streams. Of these, only rabies can be prevented by vaccination.

Practical aspects of travel vaccine administration

Consider each traveller individually, in the context of the specific itinerary. There is no 'correct' list of vaccines for any single country. Ideally the vaccinations should be started early, to minimise any adverse events around the time of departure and allow sufficient time for adequate immunity to develop.

First, consider routine vaccines; all travellers should be up-to-date with current standard vaccine recommendations. Then consider any other vaccines that may be relevant to the individual's usual health status, occupation or lifestyle (eg. pneumococcal polysaccharide vaccine for an elderly person, hepatitis B vaccine for a first aid officer). These should be offered before consideration of the travel vaccines.

Travel vaccines should be considered according to risk. Priority should be given to vaccines for diseases that are common and of significant impact (such as influenza and hepatitis A), and to those diseases which, although less common, have severe potential adverse outcomes (such as Japanese encephalitis and rabies). Booster doses should be considered where appropriate (see Table 2.2.1); a 'rapid schedule' for a combined hepatitis A/B vaccine is available for those ≥ 16 years of age with limited time before travel (see the appropriate vaccine chapters). For children, consider the lower age limits for recommendation of selected vaccines (see Table 2.2.2).

It is important to document travel vaccines appropriately, not only in the clinic's record but also in a suitable record that can be carried by the traveller.

Vaccines

All intending travellers should have been vaccinated according to the recommended vaccination schedule for the traveller's age. All children should be vaccinated according to the National Immunisation Program (NIP) schedule. In exceptional circumstances, the NIP vaccines may be administered at the minimum age rather than the recommended age (see Section 1.3.5, *Catch-up*, Table 1.3.7 *Minimum age for the first dose of vaccine in exceptional circumstances*). Children vaccinated using the minimum age rather than the recommended age may require extra vaccine doses to ensure adequate protection. The minimum

interval between doses must be adhered to (see Section 1.3.5, *Catch-up*, Table 1.3.6 *Minimum dose intervals for NIP vaccines for children <8 years of age*).

Measles

Most measles outbreaks now follow infection imported by inadequately vaccinated young travellers. Therefore, Australians born during or since 1966 who have not received 2 doses of a measles-containing vaccine should be vaccinated with MMR before travelling. Varicella vaccine should be offered to travellers who have not had clinical disease or where serology demonstrates lack of immunity (remembering that 2 doses, separated by at least a month, are required by those ≥ 14 years of age).

Tetanus

Adult travellers should be adequately protected against tetanus before departure, particularly if there could be delays in accessing health services. They should receive a booster dose of dT if more than 10 years have elapsed since the last dose. Protection against pertussis may also be offered at this opportunity (as dTpa) if no previous dose of dTpa has been given.

Poliomyelitis

All travellers should be age-appropriately immunised against polio. If travelling to countries where wild polio virus still exists (Afghanistan, India, Nigeria, and Pakistan), inactivated poliomyelitis vaccine (IPV) should be offered to those who have not completed a 3-dose primary course of any polio vaccine, and a single booster dose should be given to those who have previously completed the primary course. For an up-to-date list of affected countries see <http://www.polioeradication.org>.

Influenza and pneumococcal disease

Travellers aged ≥ 65 years, and those with any medical risk factor, should receive the seasonal influenza vaccine and should have received the 23-valent pneumococcal polysaccharide vaccine. All travellers should consider influenza vaccine, especially when heading to the northern hemisphere winter.

Hepatitis B

All children and adolescents should have been vaccinated against hepatitis B according to the NIP schedule. As they could be exposed to hepatitis B virus during unplanned medical procedures, all travellers intending to spend a month or more in Central and South America, Africa, Asia or Oceania should be vaccinated against hepatitis B.

Hepatitis A

Hepatitis A vaccine should be given to all travellers ≥ 1 year of age travelling to moderately to highly endemic countries (including all developing countries). There is no place for the routine use of normal human immunoglobulin to prevent hepatitis A in travellers (see Chapter 3.5, *Hepatitis A*).

Typhoid

Typhoid vaccine should be given to travellers ≥ 2 years of age travelling to endemic regions, which include the Indian subcontinent, most southeast Asian countries, many south Pacific nations and Papua New Guinea (see Chapter 3.23, *Typhoid*).

Cholera

Cholera vaccination is rarely indicated for travellers,³ as the risk of acquiring cholera is extremely low, and the protection is of relatively short duration. It is only indicated for those travellers at considerable risk, such as those working in humanitarian disaster situations. However, it can also be considered for those travellers with achlorhydria and for those at increased risk of severe or complicated diarrhoeal disease (see Chapter 3.2, *Cholera*).

Certification of cholera vaccination has been abandoned globally, and no countries have official entry requirements for cholera vaccination (see Chapter 3.2, *Cholera*).

Rabies

Travellers to rabies-endemic regions should be advised of the risk, and to avoid close contact with either wild or domestic animals, and they should be advised on what to do should they be either bitten or scratched by an animal while abroad (see Chapter 3.1, *Australian bat lyssavirus infection and rabies* and also refer to the World Health Organization website www.who.int).

Pre-travel (ie. pre-exposure) rabies vaccination (or, if appropriate, booster doses) is recommended for expatriates and travellers who will be spending prolonged periods (ie. more than a month) in rabies-endemic areas. (NB. This time interval, of more than a month, is arbitrary, and rabies has occurred in travellers following shorter periods of travel). Vaccination before travel simplifies the management of a subsequent exposure because fewer doses of vaccine are needed, and because rabies immunoglobulin (which is often difficult or even impossible to obtain in many developing countries) is not required.

Japanese encephalitis

Vaccination is recommended for travellers spending a month or more in either the rural areas of Asia or in Papua New Guinea, particularly if travel is during the wet season and/or there is considerable outdoor activity and/or the standard of accommodation is suboptimal. Vaccination is also recommended for expatriates spending a year or more in Asia, even if much of the stay is in urban areas (see Chapter 3.10, *Japanese encephalitis*).

Meningococcal infections

All children ≥ 12 months of age and all teenagers should have received the meningococcal C conjugate vaccine. In addition, the tetravalent meningococcal polysaccharide vaccine (4vMenPV) is recommended for those who intend travelling to parts of the world where epidemics of meningococcal disease occur, in particular the 'meningitis belt' of sub-Saharan Africa.⁷ Of note, large epidemics of meningococcal meningitis occurred in Delhi, India, in 1966, 1985 and 2005.⁸ The Saudi Arabian authorities require that all pilgrims attending the annual Hajj have evidence of recent vaccination with 4vMenPV⁹ (see Chapter 3.12, *Meningococcal disease*).

Yellow fever

The World Health Organization no longer routinely reports on yellow fever 'infected areas'. Rather, the yellow fever vaccine is now recommended for travellers to yellow fever-endemic countries, in particular those that have reported yellow fever since 1950 (see Chapter 3.25, *Yellow fever*, Table 3.25.1 *Yellow fever endemic countries*).¹⁰

Briefly, provided there is no specific contraindication, the vaccine is recommended for all those ≥ 9 months of age travelling anywhere in any country in West Africa, and for all those ≥ 9 months of age travelling outside urban areas of all other yellow fever-endemic countries (see Table 3.25.1).

Tuberculosis

Vaccination is generally recommended for tuberculin-negative children < 5 years of age who will be living in developing countries for more than 3 months. There is less evidence of the benefit of vaccination in older children and adults, although consideration should be given to vaccination of tuberculin-negative children < 16 years of age who may be living for long periods in high-risk countries (defined as having an incidence ≥ 100 per 100 000 population) (see Chapter 3.22, *Tuberculosis*).

Tick-borne encephalitis

This disease is prevalent in central and northern Europe and across northern Asia during the summer months. The vaccine is available only through Special Access Scheme arrangements in Australia.

Table 2.2.1: Dose and routes of administration of commonly used vaccines in adult travellers (≥15 years of age)

Vaccine (adults)	Brand name	Main constituents	Dose (adults)	Route	Primary schedule	Duration of immunity/booster recommendations
Hepatitis A	Avaxim Havrix 1440 VAQTA Adult	160 EIA U inactivated HAV antigen 1440 EIA U inactivated HAV antigen 50 U inactivated HAV antigen	0.5 mL 1 mL 1 mL	IM IM IM	0, 6 to 12 months 0, 6 to 12 months 0, 6 to 18 months	All probably give life-long immunity.
Hepatitis A/B combined	Twinrix (720/20)	720 EIA U inactivated HAV antigen and 20 µg recombinant hepatitis B virus surface antigen	1 mL	IM	0, 1, 6 months, or *0, 7, 21 days, and 12 months	A completed series probably gives life-long immunity to both hepatitis A and B.
Hepatitis A/ typhoid combined	Vivaxim* NB. Only for use in people ≥16 years of age	25 µg <i>S. typhi</i> polysaccharide and 160 EIA U inactivated HAV antigen	1 mL combined vaccine	IM	Single dose	A dose of monovalent hepatitis A vaccine given 6–36 months later probably gives life-long immunity. The duration of protection against typhoid is probably 3 years.
Hepatitis B	Engerix-B H-B-VAX II	20 µg hepatitis B surface antigen protein 10 µg hepatitis B surface antigen protein	1 mL 1 mL	IM IM	0, 1, 6 months, or 0, 1, 2, 12 months, or *0, 7, 21 days, and 12 months 0, 1, 6 months	A completed series probably gives life-long immunity.
Influenza	Various	15 µg haemagglutinin of 2 current influenza A and 1 influenza B strains	0.5 mL	IM	Single dose	As different strains circulate from year to year, annual vaccination with the current formulation is necessary.
Japanese encephalitis	JE-VAX	Inactivated Japanese encephalitis virus	1 mL	SC	0, 7, 28 days	Boosters at 3-yearly intervals.
Measles-mumps-rubella	Priorix	Live attenuated measles-mumps-rubella viruses	0.5 mL	IM/SC	Australians born during or since 1966 who do not have documented evidence of having received 2 doses of a measles-containing vaccine should receive at least 1 dose of MMR before travel.	

Vaccine (adults)	Brand name	Main constituents	Dose (adults)	Route	Primary schedule	Duration of immunity/booster recommendations
Meningococcal (tetavalent polysaccharide)	Mencevax ACWY or Menomune	50 µg capsular polysaccharides from <i>N. meningitidis</i> serogroups A, C, W, & Y ¹³⁵	0.5 mL	SC	Single dose	Revaccinate 3–5-yearly if at continuing risk.
Rabies (pre-exposure prophylaxis)	Mérieux Inactivated Rabies Vaccine Rabipur Inactivated Rabies Vaccine	2.5 IU inactivated rabies virus antigens 2.5 IU inactivated rabies virus antigens	1 mL 1 mL	IM/SC IM	0, 7, 28 days 0, 7, 28 days	If at continued high risk of exposure, either measure rabies antibody titres (and boost if titres reported as inadequate) or give single booster dose 2-yearly.
Tetanus, diphtheria (dT)	ADT Booster	≥20 IU tetanus toxoid, ≥2 IU diphtheria toxoid	0.5 mL	IM		Provides protection for 10 years.
+ pertussis (dTpa)	Boostrix or Adacel	≥20 IU tetanus toxoid, ≥2 IU diphtheria toxoid, purified antigens of <i>B. pertussis</i>	0.5 mL	IM		Providing pertussis (as well as tetanus and diphtheria) immunity is preferred.
Typhoid	Vivotif Oral Typherix or Typhim Vi	Live attenuated typhoid bacteria 25 µg purified Vi capsular polysaccharide	A single capsule 0.5 mL	Oral IM	Days 1, 3 and 5 (+/- day 7) [†] Single dose	Repeat 3-dose course after 3 years if 3 doses given initially; 4-dose course after 5 years if 4 doses given initially. Booster doses at 3-yearly intervals
Yellow fever	Stamnil	Live attenuated yellow fever virus	0.5 mL	IM/SC	Single dose	10-yearly boosters if at ongoing risk.

* Vivaxim is registered for use in people aged ≥16 years.

† This 'rapid' schedule should be used only if there is very limited time before departure to endemic regions.

‡ A fourth capsule of oral typhoid vaccine can be given on day 7 (see Chapter 3.23, *Typhoid*).

Vaccinating the traveller with special risk factors

See Chapter 2.3, *Groups with special vaccination requirements* and the specific vaccine chapters for recommendations for travellers who are either pregnant or have impaired immunity. Children should receive the relevant travel vaccines, according to age (see Table 2.2.2). Particular effort should be made to encourage the families of recent migrants to Australia to seek health advice before travelling to their country of origin to visit relatives and friends.¹¹

Table 2.2.2: Recommended lower age limits of travel vaccines for children

Vaccine	Lower age limit	Dose/route	Primary schedule	Comments
Hepatitis A				
Avaxim	2 years	0.5 mL IM	0, 6 to 12 months	Recommended for travel to developing countries.
Havrix Junior	2 years	0.5 mL IM	0, 6 to 12 months	
VAQTA Paediatric/ Adolescent	1 year	0.5 mL IM	0, 6 to 18 months	
Hepatitis A/B combined				
Twinrix Junior (660/10)	1 year	0.5 mL IM	0, 1, 6 months	Recommended for travel to developing countries.
Twinrix (720/20)	1 year	1.0 mL IM	*0, 6 to 12 months	
Japanese encephalitis				
JE-VAX	1 year	1–3 years of age: 0.5 mL SC >3 years of age: 1.0 mL SC	0, 7, 28 days 0, 7, 28 days	Recommended for travellers spending more than 4 weeks in rural areas of Asia and Papua New Guinea, or those staying in urban areas of Asia for more than 1 year.
Meningococcal ACW_Y				
Mencevax ACWY or Menomune	2 years	0.5 mL SC	Single dose	Revaccinate 3–5-yearly if at continuing risk. Should be preceded by MenCCV by at least 2 weeks.
Rabies				
Mérieux	No lower age limit	1.0 mL IM/SC	Pre-exposure: 0, 7, 28 days	The doses of rabies vaccines for pre-exposure are the same for both children and adults (1.0 mL).
Rabipur		1.0 mL IM	0, 7, 28 days	

Vaccine	Lower age limit	Dose/route	Primary schedule	Comments
Typhoid				
Vivotif Oral (oral live vaccine)	6 years	Oral capsule	One capsule on days 1, 3, and 5 (+/- day 7) [†]	Recommended for travel to developing countries. Do not give live oral vaccine with antibiotics or anti-malarials. Do not give within 8 hours of inactivated oral cholera vaccine.
Typhex or Typhim Vi (parenteral vaccine)	2 years	0.5 mL IM	Single dose	
Yellow fever				
Stamartil	9 months	0.5 mL IM/SC	Single dose	Yellow fever vaccine is contraindicated in infants <9 months of age.

* This schedule is not recommended if prompt protection against hepatitis B is required.

† A fourth capsule of oral typhoid vaccine can be given on day 7 (see Chapter 3.23, *Typhoid*).

Further information

It should be noted that information on travellers' risks is changing constantly. Up-to-date knowledge requires an understanding of the changing epidemiology of a variety of infectious and emerging diseases. The World Health Organization's comprehensive publication *International Travel and Health* is available at www.who.int/ith and the CDC's publication *Health Information for International Travel, 2005–2006 (the 'Yellow Book')* is available at www.cdc.gov/travel/index.htm. As recommendations for specific countries change frequently, such sources should be checked regularly.

References

Full reference list available on the electronic *Handbook* or website <http://immunise.health.gov.au>.