THEME

Travel medicine

Travel vaccination

BACKGROUND

Immunisation is very cost effective. It provides high level immunity against a range of general and travel specific pathogens. There are more vaccines available as research and development of vaccines progresses. Some vaccines require multiple doses to induce long lasting protective immunity, and some will only induce protective immunity for a limited period of time.

OBJECTIVE

This article outlines the principles of travel immunisation and reviews the use of each individual vaccine.

DISCUSSION

Pre-travel consultation is interactive and must be individualised. A systematic approach is required, as well as knowledge of disease risks and vaccine details. Recommendation of vaccines should be based on travel illness epidemiology, and be appropriate to the traveller's needs and budget. We need to update routine vaccinations relevant in Australia, recommend vaccines relevant to the traveller's usual lifestyle and occupation, and travel vaccines based on specific needs.

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Pre-travel vaccinations are an integral part of the travel medical consultation. The consultation is interactive and must be 'individualised', not 'cookbook' (reading off a list of tables). Vaccination requirements are specific for both the individual and the trip to be undertaken. A systematic approach is required, as well as knowledge of disease risks and vaccine details. Some travellers have a limited budget, therefore prioritising indicated vaccines may be necessary. For complex situations, referral to a specialist centre is appropriate.

Principles of travel immunisation

Immunisation is probably the most cost effective medical intervention. It provides a high level of immunity against a range of general and travel specific pathogens. There is an increasing range of vaccinations available as research and development of vaccines progresses. Some vaccines require multiple doses to induce long lasting protective immunity, and some will only induce protective immunity for a limited period of time. Practitioners need to understand the differences and consider booster immunisation where appropriate.

Underlying principles of immunisation

- Every single dose counts
- If courses have been interrupted, continue where left off, regardless of the time interval since the last dose (we do not have to restart an immunisation schedule all over again)
- Ideally separate administration of live vaccines by more than 4 weeks; otherwise give on the same day
- If required, perform and read a tuberculin (Mantoux) skin test before giving live vaccines
- Multiple vaccines can be co-administered, but increases the rate of local side effects
- It is critical to ensure a robust 'cool chain'
- Good documentation of vaccination is essential; record batch numbers.

We need to update routine vaccinations relevant in Australia, recommend vaccines relevant to the traveller's usual lifestyle and occupation, and give travel vaccines based on specific needs.

It is essential to issue travellers with an International Certificate of Vaccination – the vaccination record book ('yellow book'). All vaccines administered should be clearly detailed with date, vaccine type (including brand name), dose, name of clinic, and signed by the administrator. When referring to a specialist travel clinic, encourage the traveller to attend with their full vaccination record. *Table 1* and *2* provides a general overview of travel vaccines in adults and children.

Updating routine immunisation (Australia)

Diphtheria/tetanus/pertussis (DTPa)

Travellers may have a booster for tetanus (and diphtheria) if it is more than 10 years since the last dose, or 5 years in the case of travellers undertaking prolonged

Table 1. Dosage and route of administration of routine background vaccines in adult travellers

Vaccine	Brand	Main constituents	Dose	Route	Primary schedule	Duration of immunity/booster recommendations
Cholera	Dukoral	Kills *V. cholerae* 01 organisms and B subunit of cholera toxin	1 sachet	oral	0, 1–6 weeks	Cholera protection starts to wane in adults after 2 years, a single dose booster is recommended at 2–3 years for adults and after 6 months for children <5 years Avoid oral typhoid for 8 hours
Hepatitis A	Avaxim	160 EIA U inactivated HAV antigen	0.5 mL	IM	0, 6–12 months	Although not yet demonstrated, a completed 2 dose series of any hepatitis A vaccine provides >20 years protection; possibly lifetime immunity
	Havrix 1440	1440 EIA U inactivated HAV antigen	1.0 mL (16+ years)	IM	0, 6–12 months	
	VAQTA Adult	50 U inactivated HAV antigen	1.0 mL (18+ years)	IM	0, 6–18 months	
Hepatitis A/typhoid combined	Vivaxim	*S. typhi* polysaccharide 0.25 mg and 160 EIA inactivated HAV antigen	1 mL combined vaccine	IM	Single dose	A dose of monovalent hepatitis vaccine given 6–12 months later will provide long term (possibly lifetime) immunity. Duration of protection against typhoid is probably 3 years
Hepatitis A/ B combined	Twinrix (720/20)	720 EIA U inactivated HAV antigen and 20 µg recombinant hepatitis B virus surface antigen	1 mL (16+ years)	IM	0, 1, 6 months or *0, 6–12 months or **0, 7, 21 days and 12 months	A completed series may give lifetime immunity to hepatitis A and B
Hepatitis B	Engerix B	Hepatitis B surface antigen (rys) protein, 20 µg/mL	1.0 mL (20+ years)	IM	0, 1, 6 months or	A completed series may give lifetime immunity
	H B-Vax II	Hepatitis B surface antigen (recombinant) protein, 10 µg/mL	1.0 mL (20+ years)		**0, 7, 21 days and 12 months	
Influenza	Fluvax Vaxigrip Fluad Fluarix Influvac	15 µg haemagglutinin of two current influenza A and 1 influenza B strains	0.5 mL	SC/IM	Single dose	As different strains circulate from year to year, annual vaccination with appropriate formulation is recommended
Measles/ mumps/ rubella	Priorix	Live attenuated measles/ mumps/rubella vaccine	0.5 mL	IM/SC	Ideally two doses separated by at least 1 month A single dose will protect 95% of adults	Travellers born during or since 1966 who have not received a second dose of MMR vaccine or a 'catch up' dose during the 1998 campaign should be vaccinated before travelling

Table 1. Dosage and route of administration of routine background vaccines in adult travellers (continued)

Vaccine	Brand	Main constituents	Dose	Route	Primary schedule	Duration of immunity/booster recommendations
Poliomyelitis	IPOL	Inactivated virus strains	0.5 mL	SC	In unimmunised 3 doses at 1–2 month intervals If >10 years since last primary course, single dose required	A single dose given as an adult in previously immunised individuals confers lifetime protection
Tetanus and diphtheria (+/- pertussis)	ADT	Tetanus toxoid 6 Lf, diphtheria toxoid 2 Lf	0.5 mL	IM	Single dose	Provides good protection for 10 years providing pertussis immunity is preferred
	Boostrix (includes pertussis) Adacel	Tetanus toxoid 5 Lf, diphtheria toxoid 2.5 Lf, purified antigen of *B. pertussis*	0.5 mL	IM	Single dose	
Tetanus/diphtheria/ pertussis/polio	Boostrix IPV Adacel polio	As per individual components	0.5 mL	IM	Single dose	As per individual components Adacel-IPV will soon be available in Australia
Typhoid	Vivotif oral	Live attenuated typhoid bacteria	Single capsule	Oral	Days 1, 3 and 5 (+/- day 7)‡	Repeat course after 3 years if 3 dose series given; after 5 years if 4 dose series given
	Typherix	25 µg purified Vi capsular polysaccharide	0.5 mL	IM	Single dose	3 yearly
	Typhim Vi	25 µg purified Vi capsular polysaccharide	0.5 mL	IM	Single dose	3 yearly
Japanese encephalitis	JE-VAX	Inactivated Japanese encephalitis virus	1 mL	SC	0, 7, 21–28 days	Single booster dose after 2–3 years
††Meningococcal (tetravalent polysaccharide)	Mencevax ACWY	50 µg capsular polysaccharides from *N. meningitidis* serogroups A, C, W135 and Y	0.5 mL	SC	Single dose	Revaccinate 3–5 yearly if at ongoing risk
	Menomune	50 µg capsular polysaccharides from *N. meningitidis* serogroups A, C, W135 and Y	0.5 mL	SC	Single dose	Revaccinate 3–5 yearly if at ongoing risk

Varicella	Varilrix	Live attenuated Oka strain virus >2000 pfu	0.5 mL	SC	0, 6 weeks or later	Duration of protection is unknown, possibly lifetime immunity
	Varivax	Live attenuated Oka/merck strain virus >1350 pfu	0.5 mL	SC	0, 4–8 weeks	
Rabies (pre-exposure prophylaxis)	Mérieux inactivated rabies vaccine (human diploid cell)	2.5 IU inactivated rabies virus antigens	1 mL	IM	3 doses on 0, 7 and 21–28 days#	If at ongoing high risk of exposure, measure rabies antibody titres 2 yearly If reported as inadequate, give booster
	Rabipur (purified chick embryo cell)	2.5 IU inactivated rabies virus antigens	1 mL	IM	3 doses on 0, 7 and 21–28 days	
Tick borne encephalitis	FSME-Immun	Inactivated whole cell TBE virus	0.5 mL	IM	0, 1–3 months, 9–12 months ***0, 7, 21 days with booster at 12–18 months	Boost 3 yearly Available through SAS only
Yellow fever	Stamaril	Live attenuated yellow fever virus	0.5 mL	IM/SC	Single dose	10 yearly boosters if at ongoing risk

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

**This 'rapid' schedule should only be used if there is very limited time until departure to endemic regions

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††Young adult travellers who intend staying more than a month in either Europe or North America should be vaccinated against meningococcal group C disease, using either the conjugate or polysaccharide vaccine

‡ A fourth capsule of oral typhoid vaccine on day 7 is recommended as it confers more prolonged immunity than the 3 capsule regimen as well as providing higher level of protection. There are 3 capsules in each Vivotif oral pack. Travel clinic may dispense 3 or 4 capsules. Dispensing 4 capsules through retail pharmacies may incur cost of a second pack

Intradermal (ID) course of 0.1 mL on days 0, 7 and 21–28 may be used for travellers with budget constraints and if travelling in at risk countries for <1 year. Postvaccination serology check is recommended. ID route should only be used by experienced practitioners skilled in giving ID injection

NB: Routine use of cholera vaccine is not recommended, as the risk to travellers is very low

IM = intramuscular injection

SC = subcutaneous injection

or remote travel. This avoids travellers having to seek a routine booster after an injury during travel when hygiene standards, cost and access may be problematic.

New dTpa vaccines are available for boosting, particularly for individuals who have close contact with children, in view of the ever increasing incidence of pertussis in older people in recent years.

Measles/mumps/rubella and varicella zoster

These common childhood illnesses circulate widely in developing countries. The illnesses tend to be more severe in adults. The highest risk cohort for measles are those born after 1966 and before 1986, where only partial immunity might have been achieved.[1] A history of the illness or two vaccinations should be sought. Antibody

Table 2. Travel vaccines for children

Vaccine	Lower age limit	Dose/route	Primary schedule	Comments
Cholera				
Dukoral	2 years	1 sachet orally	3 doses over 2–6 weeks	Boost after 6 months in children <5 years Rarely indicated
Hepatitis A				
Avaxim	2 years	0.5 mL IM	0, 6–12 months	Recommended for travel to developing countries
Havrix Junior	2 years	0.5 mL IM	0, 6–12 months	
VAQTA paediatric/ adolescent	1 year	0.5 mL IM	0, 6–18 months	
Hepatitis A and B				
Twinrix Junior (360/10)	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, 6–12 months	
Japanese encephalitis				
JE-VAX	1 year	1–3 years of age: 0.5 mL SC	0, 7, 21–28 days	Only for travellers spending more than 4 weeks in high risk rural areas or those staying in urban areas of Asia (except Singapore) for more than 1 year
		Over 3 years of age: 1.0 mL SC	0, 7, 21–28 days	
Meningitis ACWY				
Menomune Mencevax	2 years	0.5 mL SC	Single dose	Revaccinate 3–5 yearly if at continuing risk Should be preferably preceded by MenCCV by at least 2 weeks or MenCCV delayed for at least 6 months after 4vMenPV
Rabies				
MIRV (HDCV) Rabipur (PCECV)	1 year	1.0 mL IM	0, 7, 21–28 days	Children are at greater risk of disease than adults
Rotavirus				
Rotateq	2 months	2.0 mL orally	2, 4, 6 months	Minimum interval between doses 4 weeks
Rotarix		1.0 mL orally	2, 4 months	
Typhoid				
Vivotif oral (oral live vaccine)	6 years	Oral capsule	One capsule on 1, 3, 5 (and 7) days	Children often cannot swallow capsules
Typherix or Typhim Vi (injectable killed)	2 years	0.5 mL IM	Single dose	Do not give live oral vaccine with antibiotics, sulphonamides or proguanil
Yellow fever				
Stamaril	9 months	0.5 mL IM/SC	Single dose	Yellow fever vaccine should not be given to infants aged under 9 months due to the risk of encephalitis

IM = intramuscular injection SC = subcutaneous injection

levels can guide when unsure, and those with inadequate protection should be offered vaccination.

Influenza

Influenza vaccination should be offered to all international travellers as influenza is the commonest vaccine preventable disease encountered by travellers, and influenza virus circulates all year in tropical zones. Airports, lounges and waiting areas are common sites of infection. Annual vaccine should be encouraged. The overlap of content of the two hemisphere influenza vaccines is often high, so our vaccine is usually adequate. The vaccine does not protect against avian influenza. Pneumococcal vaccine should be offered to travellers in high risk categories.

Choosing travel vaccinations

Hepatitis A

Hepatitis A is a common illness for travellers, distributed widely across the developing world. The severity of hepatitis A infection is highly correlated with the increasing age of the subject (and previous liver disease). All travellers to developing countries should be vaccinated.

Modern vaccines are very immunogenic and protection is probably 100% and lifetime after two doses, although anecdotal cases of vaccine failure have been reported. The vaccine offers immediate protection after a single dose, so can be given up to the day of departure, with the second dose given after 6 months, or years later.[2] All brands of vaccine are interchangeable. Routine postimmunisation serological surveillance is not recommended.

Hepatitis A vaccine is also presented as a combination vaccine with typhoid or hepatitis B. Hepatitis A protection is achieved after two doses of Twinrix given 4 weeks apart, or three doses given over 3 weeks. A single dose of Twinrix may not be adequate for hepatitis A protection (see product information). In cases of time constraint, a single dose of hepatitis A vaccine should be given instead of Twinrix.

Typhoid

Typhoid fever from *Salmonella typhi* infection is less common than hepatitis A. A high level of endemicity exists in south Asia, Africa, South America and other developing countries, and travellers make up approximately 70% of cases reported in industrialised countries.[3] Multi-drug resistant strains are now reported in Asia, the Middle East and Latin America.[3] Risk is generally low to travellers who are cautious with food and water precautions. Both injectable and oral vaccines are available and are of similar efficacy; in the order of 50–70%. Oral vaccine provides better and longer protection if four doses are given.[2] Small children cannot take the capsules, therefore injectable vaccine is preferred for children. Oral typhoid vaccine comes in a three dose pack, so a fourth dose means that the patient needs to purchase a second pack, and therefore incurs additional cost.

Hepatitis B

Long term and frequent travellers should be immunised against hepatitis B, which can be transmitted through sexual contact and accidental body fluid exposure. Accessing medical interventions in developing countries is a risk factor for hepatitis B.

Poliomyelitis

Restricted to a few countries until 2003, recent spread has increased the number of infected countries, notably Africa and the Indian subcontinent. There was an outbreak in Indonesia in 2005. Travellers to endemic countries should have a booster if it is more than 10 years since their last dose. Current international recommendations are that a single booster of inactivated polio vaccine (IPV) given in adult life to those fully vaccinated in childhood will confer lifetime immunity.[4,5]

Cholera

Cholera is not generally a disease of travellers, despite its widespread distribution. Most travellers simply need to be counselled to avoid drinking local water and basic hygiene measures. Cholera vaccination is not required of any traveller for border crossings.

For specific individuals vaccine may be required, and oral vaccine is now available. It is an efficacious vaccine against cholera and is well tolerated, protecting against cholera for 2 years.[2] It has a protective effect of about 3 months against enterotoxigenic *Escherichia coli* (ETEC), a common cause of traveller's diarrhoea. In view of the rarity of cholera affecting travellers, but for its action against ETEC, the indications for vaccination are:

- water scientists, health or aid workers likely to be working in disaster areas where cholera is possible
- travellers to endemic areas who have a condition or treatment likely to reduce gastric acidity or where traveller's diarrhoea is unacceptable.

Meningococcal disease

In developing countries, outbreaks of meningococcal disease are mainly caused by serogroup A, W135 and C. Tetravalent vaccine, not the monovalent group C vaccine, is indicated for those where an increased risk of meningococcal disease exists. This includes:

- the meningococcal belt of sub-Saharan Africa

- pilgrims on the Hajj
- those in isolated, crowded conditions (remote trekking, refugee camps), and
- those entering areas of existing outbreaks.

Yellow fever

Yellow fever vaccination is the only mandatory vaccination and protects against disease where it is prevalent. A valid vaccination certificate is required for entry from infected areas into countries vulnerable to introduction of yellow fever, including Australia. The vaccine must be administered at an approved yellow fever vaccination centre. Vaccination is contraindicated or problematic in the following individuals and specialist advice should be sought:

- elderly patients (>65 years of age)
- infants <1 year (particularly <9 months)
- those with impaired immune status or anaphylactic type of hypersensitivity to eggs or previous yellow fever vaccination, and
- those with a past history of thymus gland problems.

Japanese encephalitis

Japanese encephalitis is transmitted by mosquitoes in many countries across Asia and into Oceania. It is relatively rare, and is generally resticted to rural areas. Vaccine is indicated for people living in endemic areas or travellers spending more than 1 month in rural areas.

The vaccine is associated with high rates of adverse reactions; local reactions in 20% of vaccinated individuals, and systemic symptoms in 10%. Urticarial reactions have been reported and observation recommended postvaccination for 30 minutes. Hypersensitivity reactions occur in 0.5% of cases.

Rabies

Rabies is transmitted through the bite or scratch of animals, mainly dogs, in many countries of the world, especially Africa and Asia, and travellers are at risk from exposure in an unpredictable way. While all travellers to endemic areas should be counselled about prevention, vaccines should be considered for long term travellers and expatriates. Children are at higher risk. The vaccines are expensive, but are safe and effective, and pre-immunised individuals can be managed by vaccine only after subsequent exposure. Routine boosters for travellers previously immunised are no longer recommended.

Other vaccines

Rotavirus vaccine is relevant to infants travelling to the developing world. BCG (TB) vaccine may still have a role for children under 5 years of age who may be at high risk, and for selected adults where tuberculosis risk is high (eg. health workers). Tick borne encephalitis vaccine is available through the special access scheme.

Conflict of interest: none declared.

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