AMERICAN COLLEGE OF OCCUPATIONAL AND ENVIRONMENTAL MEDICINE

Travelers' Health and Vaccination

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As occupational and environmental medicine (OEM) physicians are responsible for developing and implementing a travelers' health program in the workplace, the American College of Occupational and Environmental Medicine (ACOEM) has developed this guidance to provide up-to-date information on what vaccines, and the timing thereof, are necessary for employees who travel.

Organizations should have a method to advise their employees concerning various travel-related issues such as prevention of jet lag, food- and water-borne diseases, local outbreaks of illness, motion sickness, and the need for medical care abroad. Vaccinations and information should be available to employees who may be exposed to a disease for which there is an effective vaccination (e.g., hepatitis A and B virus exposure in travel to certain areas). It is beneficial to have formal travel programs for domestic and international travelers/assignees as appropriate pre-trip and post-trip/expatriates' evaluation.

As part of the travel medicine program, immunizations should be given in compliance with national guidelines such as the Advisory Committee on Immunization Practices (ACIP) for appropriate groups for required routine (influenza, pneumococcal disease) and recommended vaccines (e.g., hepatitis A and B, typhoid, yellow fever, tetanus, Japanese encephalitis, meningitis, etc.). OEM physicians administer vaccines based on their region and supply and may be responsible for administering and documenting these vaccines; others may refer employees to a travel medicine program/clinic to receive the appropriate immunizations prior to traveling. All physicians and health care professionals who report to them are encouraged to take steps to help ensure that their adult patients are fully immunized. For additional guidance, please refer to the Centers for Disease Control and Prevention's (CDC) Standards for Adult Immunization Practice (SAIP) resource. Vaccination requirements/recommendations are dependent on the travel destination and the activity performed by the employee as well as the duration of travel. It is important that travelers contact their physician to know the best next steps. There are continually updated websites, such as the CDC – Travel Health website (https://wwwnc.cdc.gov/travel) and state public health departments.

The following table outlines the recommended vaccine schedule/dosing for travel-related vaccines.

Note: This table does not take into account travelers who are pregnant, immunosuppressed, elderly, or providing relief operations in armed conflict /disaster / outbreak/ political or geopolitical challenges at their travel destination. A risk/ benefit assessment of the prospective traveler needs to be performed prior to recommending any vaccine or other prophylaxis.

VACCINE	TRADE NAME (MANUFACTURER)	AGE	DOSE	ROUTE	SCHEDULE	BOOSTER
Cholera CVD 103-HgR vaccine	Vaxchora (Emergent Travel Health)	2-64 years	100 mL (reconstituted)	Oral	1 dose[1]	Determined by travel destination[2] Depending on the nature of the work involved, it could apply.
Hepatitis A vaccine, inactivated	Havrix (GlaxoSmithKline)	1–18 years	0.5 mL (720 ELISA units)	IM	0 and 6–12 months	None
		≥19 years	1.0 mL (1,440 ELISA units)	IM	0 and 6–12 months	None
Hepatitis A vaccine, inactivated	Vaqta (Merck & Co., Inc.)	1–18 years	0.5 mL (25 U)	IM	0 and 6–18 months	None
		≥19 years	1.0 mL (50 U)	IM	0 and 6–18 months	None
Hepatitis B vaccine, recombinant with novel adjuvant (1018)	Heplisav- B (Dynavax Technologies Corp.)	>18 years	0.5 mL (20 µg HBsAg and 3,000 µg of 1018)	IM	0, 1 month	None
Hepatitis B vaccine, recombinant[2]	Engerix-B (GlaxoSmithKline)	0–19 years	0.5 mL (10 µg HBsAg)	IM	0, 1, 6 months	None

VACCINE	TRADE NAME (MANUFACTURER)	AGE	DOSE	ROUTE	SCHEDULE	BOOSTER
		0–10 years (accelerated)	0.5 mL (10 µg HBsAg)	IM	0, 1, 2 months	12 months
		11–19 years (accelerated)	1 mL (20 µg HBsAg)	IM	0, 1, 2 month	12 months
		≥20 years (primary)	1 mL (20 µg HBsAg)	IM	0, 1, 6 months	None
		≥20 years (accelerated)	1 mL (20 µg HBsAg)	IM	0, 1, 2 months	12 months
Hepatitis B vaccine, recombinant[2]	Recombivax HB (Merck & Co., Inc.)	0–19 years (primary)	0.5 mL (5 µg HBsAg)	IM	0, 1, 6 months	None
		11–15 years (adolescent accelerated)	1 mL (10 µg HBsAg)	IM	0, 4–6 months	None
		≥20 years (primary)	1 mL (10 µg HBsAg)	IM	0, 1, 6 months	None
Combined hepatitis A and hepatitis B vaccine	Twinrix (GlaxoSmithKline)	≥18 years (primary)	1.0 mL (720 ELU HAV + 20µg HBsAg)	IM	0, 1, 6 months	None
		≥18 years (accelerated)	1.0 mL (720 ELU HAV + 20µg HBsAg)	IM	0, 7, and 21–30 days	12 months
Japanese encephalitis vaccine, inactivated	Ixiaro (Valneva)	2 months – 2 years	0.25 mL	IM	0, 28 days	≥1 year after primary series[4]
		3–17 years	0.5 mL	IM	0, 28 days	≥1 year after primary series[4]
		18–65 years	0.5 mL	IM	0, 7–28 days	≥1 year after primary series[4]

VACCINE	TRADE NAME (MANUFACTURER)	AGE	DOSE	ROUTE	SCHEDULE	BOOSTER
		>65 years	0.5 mL	IM	0, 28 days	≥1 year after primary series[4]
Meningo-coccal polysaccharide diphtheria toxoid conjugate vaccine (MenACWY-D)[5]	Menactra (Sanofi Pasteur)	9–23 months	0.5 mL	IM	0, 3 months	If at continued risk[7]
		≥2 years	0.5 mL	IM	1 dose[6]	If at continued risk[7]
Meningo-coccal oligosaccharide diphtheria CRM[197] conjugate vaccine (MenACWY-CRM)[5]	Menveo (GSK)	2–6 months	0.5 mL	IM	0, 2, 4, 10 months	If at continued risk[7]
		7–23 months	0.5 mL	IM	0,3 months (2nd dose administered in 2nd year of life)	
		≥2 years	0.5 mL	IM	1 dose[6]	
Mumps, Measles and Rubella (MMR)	MMR	>1 years	0.5 mL	SC	1 or 2 doses (depending on risk factors) For adults: 0, and 4 weeks (if second dose indicated).	None
Polio vaccine, inactivated	Ipol (Sanofi Pasteur)	≥18 years	0.5 mL	SC or IM	1 dose if patient has completed a pediatric series If unvaccinated, then two doses are separated	Repeat boosters may be needed for long-term travelers to polio-affected countries; see Chapter 4, Polio of

VACCINE	TRADE NAME (MANUFACTURER)	AGE	DOSE	ROUTE	SCHEDULE	BOOSTER
					by 1 to 2 months, and a third dose 6 to 12 months after the second dose.	the Yellow Book (CDC)
Rabies vaccine (human diploid cell)	Imovax (Sanofi Pasteur)	Any	1 mL	IM	Pre-exposure series: 0, 7 days	None; see Chapter 4 of the Yellow Book (CDC), Rabies for postexposure immunization
Rabies vaccine (purified chick embryo cell)	RabAvert (Novartis)	Any	1 mL	IM	Pre-exposure series: 0, 7 days	None; see Chapter 4 of the Yellow Book (CDC), Rabies for postexposure immunization
Tick-borne encephalitis (TBE)	TicoVac (Pfizer)	1-15 years	0.25 mL	IM	0, 1-3, 5-12 months	A fourth dose may be given at least 3 years after completion of the primary vaccination schedule if ongoing exposure or re-exposure is expected.
		≥16years	0.5 mL	IM	0, 14days – 3 months, 5-12 months	
Typhoid vaccine (oral, live, attenuated	Vivotif (Emergent Travel Health)	≥6 years	1 capsule[8]	Oral	0, 2, 4, 6 days	Repeat primary series after 5 years

VACCINE	TRADE NAME (MANUFACTURER)	AGE	DOSE	ROUTE	SCHEDULE	BOOSTER
Typhoid vaccine (Vi capsular polysaccharide)	Typhim Vi (Sanofi Pasteur)	≥2 years	0.5 mL	IM	1 dose	2 years
Yellow fever	YF-Vax (Sanofi Pasteur)	≥9 months[9]	0.5 mL[10]	SC	1 dose	Not recommended for most[9] Should be repeated when traveling to areas with ongoing outbreaks of Yellow Fever and repeated for post-bone marrow transplant recipients who previously had a Yellow Fever vaccination.

Abbreviations: ACIP, Advisory Committee on Immunization Practices; ELU, ELISA units of inactivated HAV; HAV, hepatitis A virus; HBsAg, hepatitis B surface antigen; IM, intramuscular; U, units; SC, subcutaneous

[1] Must be administered in a health care setting.
[2] In a clinical trial, vaccine efficacy was 90% at 10 days postvaccination and declined to 80% at 3 months postvaccination in prevention of severe diarrhea after oral cholera challenge.
Long- term immunogenicity is unknown. Clinicians advising travelers who are at continued or repeated risk over an extended period may consider revaccination, although the appropriate interval and efficacy are unknown.
[3] Consult the prescribing information for differences in dosing for hemodialysis and other immunocompromised patients.
[4] If potential for Japanese encephalitis virus exposure continues.
[5] If an infant is receiving the vaccine before travel, 2 doses may be administered as early as 8 weeks apart.
[6] For people with HIV, anatomic or functional asplenia, and people with persistent complement component deficiencies (C3, C5- 9, properdin, factor D, and factor H or people taking
eculizumab [Soliris]) should receive a 2-dose primary series 8–12 weeks apart.
[7] Revaccination with meningococcal conjugate vaccine (MenACWY-D or MenACWY-CRM) is recommended after 3 years for children who received their last dose at <7 years of age.

Revaccination with meningococcal conjugate vaccine is recommended after 5 years for people who received their last dose at ≥7 years of age, and every 5 years thereafter for people who are at continued risk.

[8] Must be kept refrigerated at 35.6°F–46.4°F (2°C–8°C); administer with cool liquid no warmer than 98.6°F (37°C).

[9] Ages 6–8 months and ≥60 years are precautions and age <6 months is a contraindication to the use of yellow fever vaccine. The yellow fever vaccine is lifetime lasting.

[10] YF Vax is available in single-dose and multiple-dose (5-dose) vials.

[11] For full details regarding revaccination, see "Vaccine Administration" in Chapter 4, Yellow Fever in the Yellow Book (CDC)

Adapted from Gatewood J. Appendix B: Travel Vaccine Summary Table. In *CDC Yellow Book 2020: Health Information for International Travel*. Brunette GW, Nemhauser JB (Eds.). Oxford University Press; 2020. Available at: https://wwwnc.cdc.gov/travel/yellowbook/2020/appendices/appendix-b-travel-vaccine-summary-table.

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