The Medical Letter®
on Drugs and Therapeutics

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Expanded Table: Some Vaccines for Travelers

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Vaccine	Adult Dose	Pediatric Dose	Primary Schedule	General Recommendations[1]	Duration of Protection	Some Adverse Effects/Comments
Cholera						
Vaxchora (PaxVax)	18-64 yrs: 100 mL PO (reconstituted)	Not approved for <18 yrs	Single dose	▸ Travelers to endemic or epidemic areas who are at high risk of exposure (e.g. work in refugee camps or as healthcare providers, or staying for extended time in an affected area) or of poor clinical outcome (e.g. chronic medical conditions, blood type O, low gastric acidity) if infected ▸ For most tourists, the risk of exposure is very low ▸ **Pregnancy:** no data; not expected to result in fetal exposure	▸ Probably at least 6 months	▸ Live-attenuated vaccine ▸ Diarrhea can occur ▸ Shed in stool for ≥7 days; may be transmitted to close contacts ▸ Avoid administration to patients who have received systemic antibiotics within 14 days prior to vaccination ▸ Administer at least 10 days before starting antimalarial prophylaxis with chloroquine
Hepatitis A (HepA)						
Havrix (GSK) *Vaqta* (Merck)	1 mL IM (1440 EL.U) 1 mL IM (50 units)	1-18 yrs: 0.5 mL IM (720 EL.U) 1-18 yrs: 0.5 mL IM (25 units)	0 and 6-12 mos 0 and 6-18 mos	▸ All unvaccinated travelers going to countries with intermediate or high hepatitis A endemicity ▸ Some experts would recommend vaccination for all travelers, regardless of destination because there is a potential risk of foodborne hepatitis even in countries with low HAV endemicity ▸ **Pregnancy:** recommended for travel to areas with intermediate or high HAV endemicity	▸ Probably at least 12 mos after a single dose ▸ Probably lifelong after completion of primary series	▸ Both are inactivated vaccines ▸ Injection-site pain is common; swelling and erythema can occur ▸ Mild systemic complaints such as headache, low-grade fever, and fatigue can occur

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Expanded Table: Some Vaccines for Travelers (continued)

Vaccine	Adult Dose	Pediatric Dose	Primay Schedule	General Recommendations[1]	Duration of Protection	Some Adverse Effects/ Comments
Hepatitis B (HepB)						
Heplisav-B (Dynavax) *Engerix-B* (GSK) *Recombivax HB* (Merck)	0.5 mL IM (20 mcg) 1 mL IM (20 mcg) 1 mL IM (10 mcg)	Not approved <18 yrs Birth-19 yrs: 0.5 mL IM (10 mcg) Birth-19 yrs: 0.5 mL IM (5 mcg)	0 and 1 mo 0, 1, and 6 mos[2] (alternative is 0, 1, and 2 mos, followed by a 4th dose at 12 mos) 0, 1, and 6 mos[2] (alternative for 11-15 yrs: 0 and 4-6 mos)	▸ All travelers going to areas with intermediate or high levels of endemic HBV infection ▸ Travelers, regardless of destination, who may engage in behaviors that increase the risk of transmission (e.g. injection drug use, unprotected sexual contact, medical tourism) ▸ **Pregnancy:** recommended for women at risk	▸ Probably lifelong after completion of primary series	▸ All are recombinant inactivated vaccines ▸ Common adverse effects include Injection-site pain (more common with *Heplisav-B* than with *Engerix-B*),fatigue, headache, fever
Hepatitis A/B (HepA/HepB)						
Twinrix (GSK)	1 mL IM (720 EL.U/ 20 mcg)	Not approved <18 yrs	0, 1, and 6 mos (alternative is 0, 7, and 21-30 days)	▸ See HepA and HepB vaccines	▸ Booster recommended at 12 mos with accelerated schedule; otherwise probably lifelong after completion of primary series	▸ Inactivated vaccine ▸ Contains the same antigenic components as pediatric *Havrix* (HepA) and *Engerix-B* (HepB)
Japanese Encephalitis						
Ixiaro (Valneva)	0.5 mL IM	2 mos-<3 yrs: 0.25 mL IM ≥3 yrs: 0.5 mL IM	0 and 28 days (alternative is 0 and 7 days for adults 18-65 yrs old)[3]	▸ Recommended for travelers who expect a long stay (>1 mo) in endemic areas or heavy exposure to mosquitoes during the transmission season ▸ Should be considered for short-stay (<1 mo) travelers with increased risk of exposure to mosquitoes ▸ **Pregnancy:** no evidence of risk in animals; defer vaccination unless risk of infection is high	▸ A single booster ≥11 mos after completion of primary series is recommended for those ≥14 mos old with ongoing risk[4] ▸ Seroprotection appears to last at least 6 yrs after a booster dose[5]	▸ Inactivated vaccine ▸ Common adverse effects include Injection-site reactions, headache, myalgia, fever in children
Meningococcal (MenACWY)						
Menactra (Sanofi Pasteur) *Menveo* (GSK)	0.5 mL IM (4 mcg of each antigen) 0.5 mL IM (10 mcg serogroup A, 5 mcg serogroup C, Y, W135)	≥9 mos: 0.5 mL IM (4 mcg of each antigen) ≥2 mos: 0.5 mL IM (10 mcg serogroup A, 5 mcg serogroup C, Y, W135)	9-23 mos: 0 and 3 mos[6] ≥2 yrs: single dose[7] 2 mos: 2, 4, 6, and 12 mos 7-23 mos: 0 and 3 mos[8] ≥2 yrs: single dose[7,9]	▸ Recommended for travelers going anywhere in the "meningitis belt" of sub-Saharan Africa from December to June ▸ Should be considered for areas where epidemics of *Neisseria meningitidis* are occurring, particularly for travelers who will have prolonged contact with the local population ▸ Required for travel to Saudi Arabia for the Hajj or Umrah ▸ **Pregnancy:** can be administered	▸ Repeat every 5 yrs if ongoing risk (every 3 yrs for children vaccinated at <7 years old)	▸ Both are inactivated vaccines ▸ Common adverse effects include headache, fatigue, malaise, and injection-site reactions (pain, redness, induration)
Polio						
Ipol (Sanofi Pasteur)	0.5 mL IM or SC	≥6 wks: 0.5 mL IM or SC	Adults:Single dose[10] Children: 2, 4, and 6-18 mos, and 4-6 yrs[11]	▸ Travelers to countries with wild poliovirus circulation (Pakistan, Afghanistan) or with outbreaks of vaccine-derived poliovirus ▸ **Pregnancy:** can be administered	▸ Repeat boosters may be required for long-term travel to polio-affected countries	▸ Inactivated vaccine ▸ Injection-site reactions

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Expanded Table: Some Vaccines for Travelers (continued)

Vaccine	Adult Dose	Pediatric Dose	Primary Schedule	General Recommendations[1]	Duration of Protection	Some Adverse Effects/Comments
Rabies						
RabAvert (GSK) *Imovax* (Sanofi Pasteur)	1 mL IM (≥2.5 IU of rabies antigen)	≥Birth: 1 mL IM (≥2.5 IU of rabies antigen)	0, 7, and 21 or 28 days[12]	▸ PrEP recommended for: travelers with an occupational risk of exposure; those visiting endemic areas where access to medical treatment is limited; outdoor-adventure travelers ▸ **Pregnancy:** PrEP recommended only for substantial risk; PEP can be administered	▸ Routine boosters generally not necessary; for those engaging in high-risk activities (e.g. cavers, veterinarians), serologic testing is recommended every 6 mos with booster doses if low levels[13]	▸ Both are inactivated vaccines ▸ Most common adverse effects: injection-site reactions, flu-like symptoms, arthralgia, dizziness, lymphadenopathy, nausea, rash ▸ Rare: hypersensitivity reactions (more likely with *Imovax)*, neurological and neuroparalytical events
Typhoid						
Vivotif (PaxVax)	1 cap PO (contains 2.0-10.0x10^9 viable CFU of *S. typhi* Ty21a)	≥6 yrs: 1 cap PO (contains 2.0-10.0x10^9 viable CFU of *S. typhi* Ty21a)	1 cap every other day x 4 doses	▸ Travelers to areas where there is increased risk, especially those who expect a long stay or will be visiting friends or relatives or traveling outside routine tourist destinations ▸ **Pregnancy:** *Vivotif i*s contraindicated; *Typhim VI* may be considered when exposure risk is high	▸ Repeat every 5 yrs if ongoing risk	▸ Live-attenuated vaccine ▸ Infrequent mild adverse events include abdominal pain, nausea, headache, fever, diarrhea, vomiting, and skin rash ▸ Anaphylaxis has been reported rarely[14]
Typhim Vi (Sanofi Pasteur)	0.5 mL IM (25 mcg of vi polysaccharide)	≥2 yrs: 0.5 mL IM (25 mcg of polysaccharide)	Single dose		▸ Repeat every 2 yrs (3 yrs in Canada) if ongoing risk	▸ Inactivated vaccine ▸ Common adverse effects include fever, headache, and pain at the injection site ▸ Anaphylaxis, chest pain, liver damage, neurological problems, and reactive arthropathy have been reported
Yellow Fever						
YF-Vax (Sanofi Pasteur)[15]	0.5 mL SC (4.74 $\log_{10}$ plaque forming units of 17D204 attenuated YF virus)	≥9 mos: 0.5 mL SC (4.74 $\log_{10}$ plaque forming units of 17D204 attenuated YF virus)	Single dose	▸ Travelers going to endemic areas; administer at least 10 days before travel ▸ Some countries require proof of vaccination or physician's waiver letter (updated list available at ww.cdc.gov/travel) ▸ **Pregnancy:** vaccination recommended if exposure is likely; transmission of virus to fetus is possible; vaccine efficacy may be reduced	▸ Possibly lifelong ▸ Additional dose(s) still recommended for certain populations if they continue to be at risk: women who were pregnant when they received initial dose; hematopoietic stem cell transplant recipients; persons with HIV infection; travelers at increased risk of exposure	▸ Live-attenuated vaccine ▸ Mild adverse reactions: headache, myalgia, low-grade fever, injection-site discomfort[16] ▸ Rare serious adverse events: hypersensitivity reactions and vaccine-associated viscerotropic and neurologic disease[16]

CFU = coloy-forming units; EL.U - ELISA Units; HAV = hepatitis A virus; HBV = hepatitis B virus; PEP = post-exposure prophylaxis; PrEP = pre-exposure prophylaxis

1. Detailed advice for travel to specific destinations is available from the Centers for Disease Control and Prevention(CDC) at www.cdc.gov/travel/destinations/list.
2. An accelerated schedule (0, 7, and 21-30 days followed by a booster dose at 12 months) that is FDA-approved for use with *Twinrix* may also be used, if necessary, with hepatitis B vaccine.
3. In healthy adults, the accelerated schedule was noninferior to the standard schedule in terms of immunogenicity and safety at one month and one year after avccination (T Jelinek et al. J Travel Med 2016; 22:225; JP Cramer et al. J Travel Med 2016; 23[3]). One double dose of the vaccine (not FDA-approved) has been shown to produce 60% protection for at least one month (E Schulte et al. Vaccine 2009; 27:2188).
4. One study found that a single dose of *Ixiaro* effectively boosted immunity in travelers previously vaccinated with *JE-VAX* (EO Err et al. Vaccine 2013; 32:119), but until more data become available, the ACIP recommends that adults previously vaccinated with *JE-Vax* receive a primary series of *Ixiaro* (MMWR Morb Mortal Wkly Rep 2011; 60:661).
5. In an observational study in adults who had completed a primary series and received a booster dose 15 months later, the seroprotection rate was 96% six years after the booster (M Paulke-Korinek et al. Vaccine 2015; 33:3600).
6. The second dose can be administered 8 weeks after the first if required before travel.
7. Although FDA-licensed for persons <56 years old, the CDC states that *Menveo* or *Menactra* may be administered to travelers aged ≥56 years.
8. The second dose should be given at age ≥12 months and ≥3 months after the first, but can be administered as early as 8 weeks after the first dose if needed before travel.
9. For children 2-5 years old at continued high risk, a second dose may be administered 2 months after the first.
10. If primary series completed. Previously unvaccinated adults should receive 2 doses 4-8 weeks apart, followed by a third dose 6-12 months after the second.
11. Alternative for previously unvaccinated children ≥6 weeks old is a primary series consisting of 3 doses given ≥4 weeks apart, followed by a fourth dose 6 months after the third.
12. Regimen for PrEP. If a previously vaccinated traveler is exposed to a potentially rabid animal, PEP with 2 additional vaccine doses separated by 3 days should be initiated as soon as possible.
13. Minimal acceptable antibody level is complete virus neutralization at a 1:5 serum dilution by the rapid fluorescent focus inhibition test.
14. NL Hass et al. A case report of anaphylaxis to typhoid vaccine live oral Ty21a (Vivotif). J Travel Med 2017; 24(5).
15. *YF-Vax* is currently (November 2018) out of stock. Supplies are expected to be available by the middle of 2019. Another single-dose, live vaccine *(Stamaril)*, which is licensed in Europe, is available at some US clinics (www.cdc.gov/travel/page/search-for-stamaril-clinics).
16. NP Lindsey et al. Adverse event reports following yellow fever vaccination, 2007-13. J Travel Med 2016; 23(5).