TABLE 149-1 VACCINES COMMONLY USED FOR TRAVEL IN ADULTS

Vaccine	Primary Series	Booster Interval
Cholera (Dukoral[a] inactivated whole-cell recombinant subunit; available in Canada and Europe)	1 dose	2 years
Hepatitis A (Havrix), 1440 enzyme immunoassay U/mL	2 doses, 6–12 months apart, IM	None required
Hepatitis A (VAQTA, AVAXIM, EPAXAL)	2 doses, 6–18 months apart, IM	None required
Hepatitis A/B combined (Twinrix)	3 doses at 0, 1, and 6 months 0, 7, and 21–30 days plus booster at 1 year, IM	None required *except* 12 months (once only, for accelerated schedule)
Hepatitis B (Engerix B): accelerated schedule	3 doses at 0, 1, and 2 months 0, 7, and 21 days plus booster at 1 year, IM	12 months, once only
Hepatitis B (Engerix B or Recombivax): standard schedule	3 doses at 0, 1, and 6 months, IM	None required
Immune globulin (hepatitis A prevention)	1 dose IM	Intervals of 3–5 months, depending on initial dose
Japanese encephalitis (Ixiaro)	2 doses at 0 and 28 days, IM	>1 year after primary series (optimal booster schedule not yet determined)
Meningococcus, quadrivalent (Menomune [polysaccharide], Menactra, Menveo [conjugate])	1 dose (Menactra/ Menveo IM; Menomune SC)	>3 years (optimal booster schedule not yet determined)
Rabies human diploid cell vaccine (Imovax), rabies vaccine absorbed (RVA), or purified chick embryo cell vaccine (RabAvert)	3 doses at 0, 7, and 21 or 28 days, IM	None required except with exposure
Typhoid Ty21a, oral live attenuated (Vivotif)	1 capsule every other day × 4 doses	5 years
Typhoid Vi capsular polysaccharide, injectable (Typhim Vi)	1 dose IM	2 years
Yellow fever	1 dose SC	10 years

[a]Cross-protects against enterotoxigenic *Escherichia coli* and provides 30–50% protection against travelers' diarrhea.

vaccine is given only by state-authorized yellow fever centers, and its administration must be documented on an official International Certificate of Vaccination. A registry of U.S. clinics that provide the vaccine is available from the CDC (*www.cdc.gov/travel*). Recent data suggest that fewer than 50% of travelers entering areas endemic for yellow fever are immunized; this lack of coverage is a serious problem, as 13 countries in Central and South America and 30 countries in Africa harbor the illness. Severe adverse events associated with this vaccine have recently increased in incidence. First-time vaccine recipients may present with a syndrome characterized as either neurotropic (1 case per 125,000 doses) or viscerotropic (overall, 1 case per 250,000 doses; among persons 60–69 years of age, 1 case per 100,000 doses; and among persons ≥ 70 years of age, 1 case per 40,000 doses). Immunosuppression and thymic disease increase the risk of these adverse events (*www.cdc.gov/vaccines/hcp/vis/vis-statements/yf.pdf*).

MENINGOCOCCAL MENINGITIS Protection against meningitis with one of the quadrivalent (preferably conjugate) vaccines is required for entry into Saudi Arabia during the Hajj (Chap. 180).

INFLUENZA Both seasonal and pandemic H1N1 vaccines (the latter, where available) were required for entry into Saudi Arabia during the Hajj in 2013.

Hepatitis A (Chap. 360) is one of the most common vaccine-preventable infections of travelers. The risk is six times greater for travelers who stray from the usual tourist routes. The mortality rate for hepatitis A increases with age, reaching almost 2% among individuals over age 50. Of the four hepatitis A vaccines currently available in North America (two in the United States), all are interchangeable and have an efficacy of >95%. Hepatitis A vaccine is currently given to all children in the United States. Since the most frequently identified risk factor for hepatitis A in the United States is international travel, and since morbidity and mortality increase with age, it seems appropriate that all adults be immune prior to travel.

Long-stay overseas workers appear to be at considerable risk for hepatitis B infection (Chap. 360). The recommendation that all travelers be immunized against hepatitis B before departure is supported by two studies showing that 17% of the assessed travelers who received health care abroad had some type of injection; according to the World Health Organization, nonsterile equipment is used for up to 75% of all injections given in parts of the developing world. A 3-week accelerated schedule of the combined hepatitis A and B vaccine has been approved in the United States. Although no data are available on the specific risk of infection with hepatitis B virus among U.S. travelers, ~240 million people in the world have chronic infection. All children and adolescents in the United States are immunized against this illness. Hepatitis B vaccination should be considered for all travelers.

TYPHOID FEVER Most cases of typhoid fever in North America are due to travel, with ~300 cases seen per year in the United States. The attack rate for typhoid fever (Chap. 190) is 1 case per 30,000 travelers per month of travel to the developing world. However, attack rates in India, Senegal, and North Africa are tenfold higher; rates are especially high among travelers to relatively remote destinations and among immigrants and their families who have returned to their homelands to visit friends or relatives (VFRs). Between 1999 and 2006 in the United States, 66% of imported cases involved the latter group. Unfortunately, data show that the causative organism has become increasingly resistant to fluoroquinolone antibiotics (especially in those cases acquired on the Indian subcontinent). Both of the available vaccines—one oral (live) and the other injectable (polysaccharide)—have efficacy rates of ~70%. In some countries, a combined hepatitis A/typhoid vaccine is available.

MENINGOCOCCAL MENINGITIS Although the risk of meningococcal disease among travelers has not been quantified, it is likely to be higher among travelers who live with poor indigenous populations in overcrowded conditions (Chap. 180). Because of its enhanced ability to prevent nasal carriage (compared with the older polysaccharide vaccine), a quadrivalent conjugate vaccine is the product of choice (regardless of age) for immunization of persons traveling to sub-Saharan Africa during the dry season or to areas of the world where there are epidemics. The vaccine, which protects against serogroups A, C, Y, and W-135, has an efficacy rate of >90%.

JAPANESE ENCEPHALITIS The risk of Japanese encephalitis (Chap. 233), an infection transmitted by mosquitoes in rural Asia and Southeast Asia, can be as high as ~1 case per 5000 travelers per month of stay in an endemic area. Most infections are asymptomatic, with a very small proportion of infected persons becoming ill. However, among those who do become ill, severe neurologic sequelae are common. Most symptomatic infections among U.S. residents have involved military personnel or their families. The vaccine efficacy rate is >90%. The vaccine is recommended for persons staying >1 month in rural endemic areas or for shorter periods if their activities (e.g., camping, bicycling, hiking) in these areas will increase exposure risk.

CHOLERA The risk of cholera (Chap. 193) is extremely low, with ~1 case per 500,000 journeys to endemic areas. Cholera vaccine, not currently available in the United States, was rarely recommended but was considered for aid and health care workers in refugee camps or in disaster-stricken/war-torn areas. A more effective oral cholera vaccine is available in other countries.