

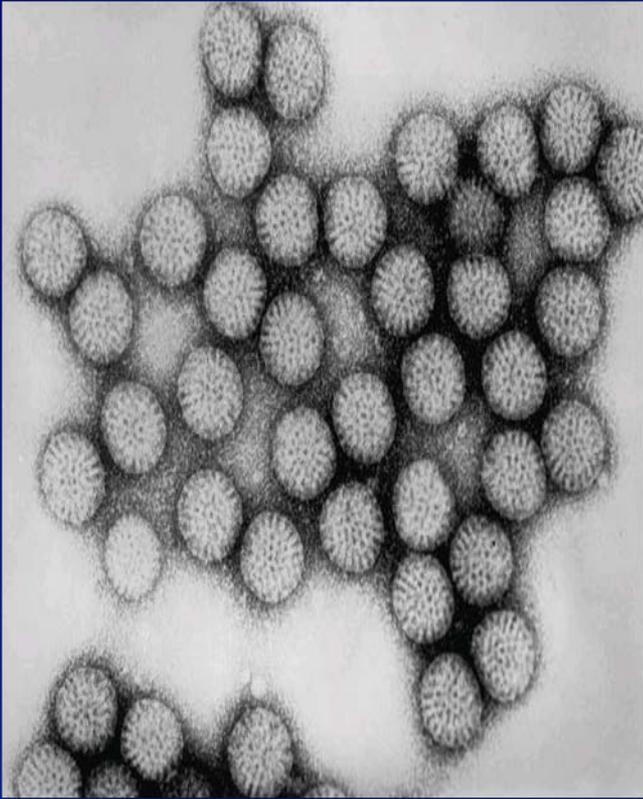
Rotavirus and Hepatitis A

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Rotavirus

- ❑ **First identified as a cause of diarrhea in 1973**
- ❑ **Most common cause of severe gastroenteritis in infants and young children**
- ❑ **Nearly universal infection by age 5**
- ❑ **Responsible for up to 500,000 diarrheal deaths each year worldwide**

Rotavirus



- ❑ From 1996-2005, five predominate strains in the U.S. (G1-G4, G9) accounted for 90% of the isolates
- ❑ G1 strain accounts for 75% of infections
- ❑ Very stable and may remain viable for weeks or months if not disinfected

Rotavirus Immunity

- ❑ Antibody against VP7 and VP4 probably important for protection**
- ❑ First infection usually does not lead to permanent immunity**
- ❑ Reinfection can occur at any age**
- ❑ Subsequent infections generally less severe**

Rotavirus – Clinical Features

- ❑ Short incubation period
- ❑ First infection after 3 months of age generally most severe
- ❑ May be asymptomatic or result is severe dehydrating diarrhea with fever and vomiting
- ❑ Gastrointestinal symptoms generally resolve in 3-7 days

Rotavirus Epidemiology

❑ Reservoir

- Human – GI tract and stool

❑ Transmission

- Fecal-oral, fomites

❑ Temporal pattern

- Fall and winter (temperate areas)

❑ Communicability

- 2 days before to 10 days after onset of symptoms

Rotavirus Disease in the United States Prevaccine Era

- ❑ **Annually responsible for:**
 - 3 million infections
 - More than 400,000 physician visits
 - 200,000 emergency dept. visits
 - 55,000-70,000 hospitalizations
 - 20-60 deaths
- ❑ **\$1 billion in direct and indirect costs**



Rotavirus Vaccines

- ❑ **RV5 (RotaTeq)**
 - Contains five reassortant rotaviruses developed from human and bovine parent rotavirus strains
- ❑ **RV1 (Rotarix)**
 - Contains one strain of live, attenuated human rotavirus (type G1PA[8])
- ❑ **Both rotavirus vaccines**
 - Live, attenuated
 - Contain no preservatives or thimerosal

Rotavirus Vaccine Efficacy

- ❑ **Any rotavirus gastroenteritis**
 - 74%-87%
- ❑ **Severe gastroenteritis**
 - 85%-98%
- ❑ **Both vaccines significantly reduced physician visits for diarrhea and reduced rotavirus-related hospitalizations**
- ❑ **No ACIP preference for one product (RV5 vs. RV1) over the other**

Rotavirus Vaccination Schedule

Vaccine	Birth	1 mo	2 mos	4 mos	6 mos	9 mos	12 mos	15 mos	18 mos	19-23 mos	2-3 yrs	4-6 yrs
Rotavirus [†] (RV1) RV1 (2-dose series); RV5 (3-dose series)			1 st dose	2 nd dose	See footnote 2							

- ❑ **Two RV1 or three RV5 oral doses beginning at 2 months of age**
 - May be started as early as 6 weeks of age
- ❑ **For both rotavirus vaccines:**
 - Maximum age for first dose is 14 weeks, 6 days*
 - Minimum interval between doses is 4 weeks
 - Maximum age for any dose is 8 months, 0 days

*This is an off-label recommendation for both vaccines because the labeled maximum age for the first dose of RV5 is 12 weeks .

Rotavirus Vaccination Schedule

- ❑ **ACIP did not define a maximum interval between doses**
- ❑ **No rotavirus vaccine should be administered to infants older than 8 months, 0 days***
- ❑ **It is not necessary to restart the series or add doses because of a prolonged interval between doses**

This is an off-label recommendation for both vaccines because the labeled maximum age for RV1 is 24 weeks, and the labeled maximum age for RV5 is 32 weeks .

Rotavirus Vaccine Recommendations

- ❑ **ACIP recommends that providers do not repeat the dose if the infant spits out or regurgitates the vaccine**
- ❑ **Any remaining doses should be administered on schedule**
 - Doses of rotavirus vaccine should be separated by at least 4 weeks
- ❑ **Complete the series with the same vaccine product whenever possible**

Rotavirus Vaccine Recommendations

- If product used for a prior dose or doses is not available or not known, continue or complete the series with the product that is available**
- If any dose in the series was RV5 (RotaTeq) or the vaccine brand used for any prior dose is not known, a total of 3 doses of rotavirus vaccine should be administered**
- Infants documented to have had rotavirus gastroenteritis before receiving the full course of rotavirus vaccinations should still begin or complete the 2- or 3-dose schedule**

Vaccine Administration

- ❑ **Preparation:**
 - RV5: None
 - RV1: Must be reconstituted BEFORE administering
- ❑ **Route:**
 - Both vaccines are administered ORALLY (PO)
- ❑ **The infant may eat or drink immediately following vaccine administration**
- ❑ **RV vaccine may be administered simultaneously with other vaccines**

Rotavirus Vaccine Contraindications

- ❑ **Severe allergic reaction to a vaccine component (including latex) or following a prior dose of vaccine**
 - RV1 oral applicator contains latex rubber
- ❑ **History of intussusception**
- ❑ **Severe combined immunodeficiency (SCID)**

Rotavirus Vaccine Precautions*

- ❑ **Altered immunocompetence, (except SCID, which is a contraindication)**
 - Limited data do not indicate a different safety profile in HIV-infected versus HIV-uninfected infants
 - HIV diagnosis not established in infants due for rotavirus vaccine
 - Vaccine strains of rotavirus are attenuated
 - These considerations support rotavirus vaccination of HIV-exposed or infected infants
- ❑ **Acute, moderate, or severe gastroenteritis or other acute illness**

*The decision to vaccinate if a precaution is present should be made on a case-by-case risk and benefit basis.

Rotavirus Vaccine Adverse Events

□ Intussusception

- RV1 postlicensure evaluation— 1-3 excess cases per 100,000 first doses, possible risk for RV5 cases too small to confirm
- VAERS – reports show events cluster in 3-6 days following RV5
- Vaccine Safety Datalink
 - No increased risk of intussusception – unable to assess RV1

Rotavirus Vaccine Adverse Reactions

□ RV5

- Diarrhea 18.1%
- Vomiting 11.6%
- Also greater rates of otitis media, nasopharyngitis, and bronchospasm

□ RV1

- Irritability 11.4%
- Cough or runny nose 3.6%
- Flatulence 2.2%

HEPATITIS A AND HEPATITIS A VACCINES

Hepatitis A

- ❑ Epidemic jaundice described by Hippocrates
- ❑ Differentiated from hepatitis B in 1940s
- ❑ Serologic tests developed in 1970s
- ❑ Vaccines licensed in 1995 and 1996

Hepatitis A Clinical Features

- ❑ Incubation period 28 days (range 15-50 days)
- ❑ Illness not specific for hepatitis A
- ❑ Likelihood of symptomatic illness directly related to age
- ❑ Children generally asymptomatic, adults symptomatic

Hepatitis A Epidemiology

- ❑ **Reservoir** Human
- ❑ **Transmission** Fecal-oral
- ❑ **Temporal pattern** None
- ❑ **Communicability** 2 weeks before to 1 week after onset of jaundice

Hepatitis A Vaccines

- ❑ **Inactivated vaccines**
- ❑ **Pediatric and adult formulations**
 - Pediatric formulation of both vaccines is approved for children 1 through 18 years
 - Adult formulations approved for persons 19 years and older

Hepatitis A Vaccine Efficacy

□ HAVRIX (GSK)

- 40,000 Thai children 1 to 16 years of age
- Vaccine efficacy 94%

□ VAQTA (Merck)

- 1,000 New York children 2 to 16 years of age
- Vaccine efficacy 100%

Twinrix

❑ **Combination vaccine of:**

- Hepatitis A (pediatric dose)
- Hepatitis B (adult dose)

❑ **Schedules**

- 0, 1, 6 months or
- 0, 7, 21-30 days and booster dose at 12 months

❑ **Approved for persons 18 years of age and older**

Twinrix and Single Component Hepatitis A Vaccine

- ❑ Adult formulation hepatitis A vaccine may be used to complete a schedule begun with Twinrix and vice versa**
- ❑ Acceptable schedules**
 - 2 Twinrix and 1 Hepatitis A (adult formulation)
 - 1 Twinrix and 2 Hepatitis A (adult formulation)
- ❑ Maintain spacing recommended for Twinrix**

* For persons 19 years of age or older

Hepatitis A Vaccination of Children

Vaccine	Birth	1 mo	2 mos	4 mos	6 mos	9 mos	12 mos	15 mos	18 mos	19-23 mos	2-3 yrs	4-6 yrs	7-10 yrs	11-12 yrs	13-15 yrs	16-18 yrs
Hepatitis A ¹¹ (HepA)							← 2-dose series, See footnote 11 →									

- ❑ All children should receive vaccine at 12 through 23 months of age
- ❑ Vaccination should be integrated into the routine vaccination schedule
- ❑ Children who are not vaccinated by 2 years of age can be vaccinated at subsequent visits

Hepatitis A Vaccination of Children (2)

- ❑ Existing hepatitis A vaccination programs for children 2-18 years of age should be maintained**
- ❑ New efforts for routine vaccination of children 12 months of age should enhance, not replace, ongoing vaccination programs for older children**
- ❑ Areas without an existing hepatitis A vaccination program can consider catch-up vaccination for unvaccinated children 2-18 years of age**

Recommended Adult Immunization Schedule—United States - 2015

Note: These recommendations must be read with the footnotes that follow containing number of doses, intervals between doses, and other important information.

Figure 1. Recommended adult immunization schedule, by vaccine and age group¹

VACCINE ▼	AGE GROUP ►	19-21 years	22-26 years	27-49 years	50-59 years	60-64 years	≥ 65 years	
Influenza ^{*2}		1 dose annually						
Tetanus, diphtheria, pertussis (Td/Tdap) ^{*3}		Substitute 1-time dose of Tdap for Td booster; then boost with Td every 10 yrs						
Varicella ^{*4}		2 doses						
Human papillomavirus (HPV) Female ^{*5}		3 doses						
Human papillomavirus (HPV) Male ^{*5}		3 doses						
Zoster ⁶						1 dose		
Measles, mumps, rubella (MMR) ^{*7}		1 or 2 doses						
Pneumococcal 13-valent conjugate (PCV13) ^{*8}		1-time dose						
Pneumococcal polysaccharide (PPSV23) ⁸		1 or 2 doses					1 dose	
Meningococcal ⁹		1 or more doses						
Hepatitis A ^{*10}		2 doses						
Hepatitis B ^{*11}		3 doses						
<i>Haemophilus influenzae</i> type b (Hib) ^{*12}		1 or 3 doses						

^{*}Covered by the Vaccine Injury Compensation Program

Figure 2. Vaccines that might be indicated for adults based on medical and other indications¹

VACCINE ▼	INDICATION ►	Pregnancy	Immuno-compromising conditions (excluding human immunodeficiency virus [HIV]) ^{4,6,7,8,15}	HIV infection CD4+ T lymphocyte count ^{4,6,7,8,15}		Men who have sex with men (MSM)	Kidney failure, end-stage renal disease, receipt of hemodialysis	Heart disease, chronic lung disease, chronic alcoholism	Asplenia (including elective splenectomy and persistent complement component deficiencies) ^{8,12}	Chronic liver disease	Diabetes	Healthcare personnel
				< 200 cells/µL	≥ 200 cells/µL							
Influenza ^{2,3}			1 dose IIV annually				1 dose IIV or LAIV annually	1 dose IIV annually				1 dose IIV or LAIV annually
Tetanus, diphtheria, pertussis (Td/Tdap) ^{2,3}		1 dose Tdap each pregnancy	Substitute 1-time dose of Tdap for Td booster; then boost with Td every 10 yrs									
Varicella ⁴		Contraindicated					2 doses					
Human papillomavirus (HPV) Female ⁵			3 doses through age 26 yrs				3 doses through age 26 yrs					
Human papillomavirus (HPV) Male ⁵			3 doses through age 26 yrs				3 doses through age 21 yrs					
Zoster ⁶		Contraindicated					1 dose					
Measles, mumps, rubella (MMR) ⁷		Contraindicated					1 or 2 doses					
Pneumococcal 13-valent conjugate (PCV13) ⁸							1 dose					
Pneumococcal polysaccharide (PPSV23) ⁸							1 or 2 doses					
Meningococcal ⁹							1 or more doses					
Hepatitis A ¹⁰							2 doses					
Hepatitis B ¹¹							3 doses					
Haemophilus influenzae type b (Hib) ¹²			post-HSCT recipients only				1 or 3 doses					

¹Covered by the Vaccine Injury Compensation Program

For all persons in this category who meet the age requirements and who lack documentation of vaccination or have no evidence of previous infection; zoster vaccine recommended regardless of prior episode of zoster

Recommended if some other risk factor is present (e.g., on the basis of medical, occupational, lifestyle, or other indications)

No recommendation



U.S. Department of Health and Human Services
Centers for Disease Control and Prevention

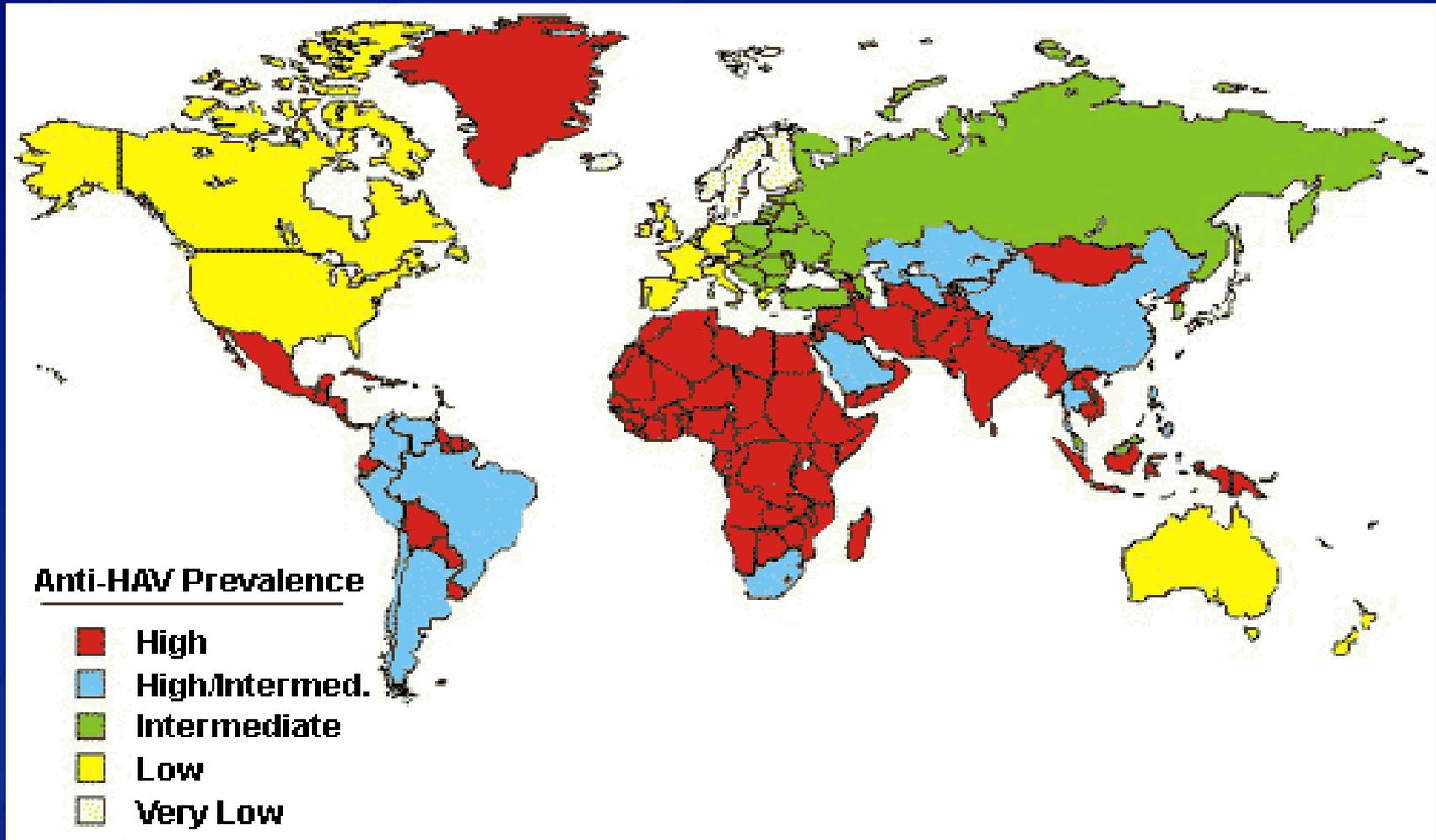
These schedules indicate the recommended age groups and medical indications for which administration of currently licensed vaccines is commonly recommended for adults ages 19 years and older, as of February 1, 2015. For all vaccines being recommended on the Adult Immunization Schedule, a vaccine series does not need to be restarted, regardless of the time that has elapsed between doses. Licensed combination vaccines may be used whenever any components of the combination are indicated and when the vaccine's other components are not contraindicated. For detailed recommendations on all vaccines, including those used primarily for travelers or that are issued during the year, consult the manufacturers' package inserts and the complete statements from the Advisory Committee on Immunization Practices (www.cdc.gov/vaccines/hcp/acip-recs/index.html). Use of trade names and commercial sources is for identification only and does not imply endorsement by the U.S. Department of Health and Human Services.

VACCINE ▼	INDICATION ►	Pregnancy	Immuno-compromising conditions (excluding human immunodeficiency virus [HIV]) ^{4,6,7,8,15}	HIV infection CD4+ T lymphocyte count ^{4,6,7,8,15}		Men who have sex with men (MSM)	Kidney failure, end-stage renal disease, receipt of hemodialysis	Heart disease, chronic lung disease, chronic alcoholism	Asplenia (including elective splenectomy and persistent complement component deficiencies) ^{8,14}	Chronic liver disease	Diabetes	Healthcare personnel
				< 200 cells/µL	≥ 200 cells/µL							
Hepatitis A ^{12,1}							2 doses					

Hepatitis A Immunization Recommendations for Adults

- ❑ International travelers
- ❑ Close contacts with an international adoptee from a country of high or intermediate endemicity
- ❑ Men who have sex with men
- ❑ Persons who use illegal drugs
- ❑ Persons who have a clotting-factor disorder
- ❑ Persons with occupational risk
- ❑ Persons with chronic liver disease, including hepatitis C

Hepatitis A and International Travel



Hepatitis A for International Travelers

- ❑ The first dose of hepatitis A vaccine should be administered as soon as travel is considered
- ❑ For healthy persons 1 through 40 years of age:
 - 1 dose of single-component vaccine administered at any time before departure

Hepatitis A for International Travelers (2)

- ❑ **Persons at risk of severe disease from hepatitis A planning to travel in 2 weeks or sooner should receive the first dose of vaccine and also can receive immune globulin**

Vaccination for Close Contacts of Newly Arriving International Adoptees

- Hepatitis A vaccination for unvaccinated persons who anticipate close personal contact during the first 60 days after arrival of an international adoptee from a country of high or intermediate endemicity.**
- Administer dose 1 as soon as adoption is planned, ideally 2 or more weeks before the arrival of the adoptee**

Hepatitis A Immunization

Other Recommendations

- ❑ **Not routinely recommended for:**
 - Health care personnel
 - Child care center staff
 - Sewer workers or plumbers
- ❑ **Food handlers may be considered based on local circumstances**

Hepatitis A Serologic Testing

□ Prevaccination

- Not indicated for children
- May be considered for some adults and older adolescents

□ Postvaccination

- Not indicated

Hepatitis A Vaccine Contraindications and Precautions

- ❑ Severe allergic reaction to a vaccine component or following a prior dose
- ❑ Moderate or severe acute illness

Hepatitis A Vaccine Adverse Reactions

- ❑ **Local reaction** 20%-50%
- ❑ **Systemic reactions
(malaise, fatigue)** Less than 10%
- ❑ **No serious adverse
reactions reported**

Vaccine Storage and Handling

- ❑ **Store hepatitis A vaccine in a refrigerator between 36°- 46° F (2°- 8° C)**

- ❑ **Store pediatric and adult formulations:**
 - In their original packaging with the lids closed
 - In separate bins
 - Away from each other-not next to each other