

## Preventing Vaccine-Preventable Diseases in Children and Adolescents with HIV Infection (Last updated October 25, 2019; last reviewed October 25, 2019)

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Vaccines are an extremely effective primary prevention tool, and vaccines that protect against 16 diseases are recommended for routine use in children and adolescents in the United States. Vaccination schedules for children from birth through 18 years of age are published annually by the Centers for Disease Control and Prevention. For more information see:

- [Recommended Child and Adolescent Immunization Schedule for Ages 18 years or Younger, United States, 2019](#);
- [Recommended Child and Adolescent Immunization Schedule by Medical Condition, United States, 2019](#); and
- [Altered Immunocompetence: General Best Practice Guidelines for Immunization: Best Practices Guidance of the Advisory Committee on Immunization Practices](#)

These schedules are compiled from approved, vaccine-specific policy recommendations which are standardized in collaboration with the major vaccine policy-setting and vaccine-delivery organizations (i.e., the Advisory Committee on Immunization Practices [ACIP], the American Academy of Pediatrics [AAP], the American Academy of Family Physicians [AAFP], and the American College of Obstetricians and Gynecologists [ACOG]) (see the [ACIP Recommendations](#)).

Children with HIV infection should be protected from vaccine-preventable diseases. Most vaccines recommended for routine use can be administered safely to children who are exposed to or have contracted HIV. The recommended vaccination schedule for children aged 0 through 18 years who are HIV-exposed or HIV-positive corresponds to the ACIP-approved schedule for all children with ACIP-approved additions specific to children with HIV infection incorporated (see Figure 1).

All inactivated vaccines—whether killed whole organism or subunit, recombinant, toxoid, polysaccharide, or polysaccharide protein-conjugate—can be administered safely to individuals with altered immunocompetence. In addition, because of the risks of increased disease severity in children with HIV infection, specific vaccines like pneumococcal and *Haemophilus influenzae* type b conjugate vaccine are also recommended for children with HIV beyond the routinely recommended ages for healthy children (if not previously administered at routinely recommended ages in early childhood). Additional vaccines are also recommended, such as pneumococcal polysaccharide vaccine for children aged  $\geq 2$  years following receipt of pneumococcal conjugate vaccine, and MenACWY vaccine, recommended beginning at age 2 months. Other vaccines might be recommended outside the routine age window in children with HIV, including pneumococcal conjugate vaccine (PCV13), or human papillomavirus vaccine in males. Live attenuated influenza vaccine (LAIV) is **contraindicated** for children with HIV. Annual, age-appropriate influenza vaccination is recommended for children with HIV as part of routine prevention for influenza.<sup>1</sup> The effectiveness of any vaccine may be suboptimal in an individual with an immunocompromising condition.<sup>2-4</sup>

Compared to children who are immunocompetent, children with HIV are at higher risk for complications of some diseases for which only live vaccines are available. Based on limited safety, immunogenicity, and efficacy data in children with HIV, single-antigen varicella vaccine should be considered for children and adolescents with HIV infection with CD4 T lymphocyte (CD4) cell percentages  $\geq 15\%$ . Eligible children should receive 2 doses 3 months apart, with the first dose administered as soon as possible after the child's first birthday. Two doses of measles, mumps, and rubella (MMR) vaccine are recommended for all individuals with HIV aged  $\geq 12$  months who do not have evidence of current severe immunosuppression.<sup>5</sup>

Oral typhoid vaccine **should not be administered** to children with HIV.

If recommended, yellow fever vaccine (YFV) can be administered to children aged 9 months to 6 years with CD4 percentages > 24% of total lymphocytes or to children aged ≥6 years with a CD4 count of ≥500 per mm<sup>3</sup>. Providers should ensure that patients do not have AIDS or other clinical manifestations of HIV, which is a contraindication.

Precautions to administering YFV vaccination should be followed and administering YFV may be considered for people with HIV aged ≥6 years with a CD4 count 200 to 499/mm<sup>3</sup> or children aged 6 months to 6 years with a CD4 percentage of 15% to 24% of total lymphocytes. Providers should ensure that patients do not have AIDS or other clinical manifestations of HIV, which is a contraindication. If international travel requirements rather than an increased risk for acquiring YFV infection are the only reason to vaccinate in someone with a precaution, the person should be excused from vaccination and issued a medical waiver to fulfill health regulations.

YFV is **contraindicated** for all children aged <6 months. YFV is also **contraindicated** for all children with AIDS, other clinical manifestations of HIV, and children with CD4 counts <200 per mm<sup>3</sup> or <15% of total lymphocytes for children aged <6 years. If a person with severe immunosuppression based on CD4 counts (<200 per mm<sup>3</sup> or <15% total), AIDS, or symptomatic HIV cannot avoid traveling to an area in which yellow fever is endemic, a medical waiver should be provided and counseling on protective measures against mosquito bites should be emphasized. People who were HIV positive at the time of the initial dose of YFV should receive a booster dose every 10 years if they continue to travel or live in areas that put them at risk for yellow fever virus infection. See [Yellow Book](#) and [ACIP recommendations](#) for detailed listings of precautions and contraindications for yellow fever vaccination.

Limited data are available from clinical trials on the safety of rotavirus vaccines in infants known to have HIV infection who were clinically asymptomatic or mildly symptomatic when vaccinated.<sup>6</sup> The data available do not suggest that the safety profile of rotavirus vaccines in infants with clinically asymptomatic or mildly symptomatic HIV infection is different from that in infants who do not have HIV infection.<sup>7,8</sup> Two other considerations support rotavirus vaccination of infants exposed to or infected with HIV: first, the diagnosis of perinatal HIV infection may not be established in infants born to mothers with HIV infection before the oldest age at which the rotavirus vaccine series can be administered;<sup>9</sup> and second, vaccine strains of rotavirus are attenuated suggesting that if vaccine induced-disease occurred, it would be mild. Consultation with an immunologist or infectious disease specialist is advised for infants with known or suspected altered immunocompetence, such as infants with HIV infection with low CD4 percentage or counts, before rotavirus vaccine is administered.

For certain vaccines (such as hepatitis A) the response to vaccination may be greater with immune reconstitution following antiretroviral therapy (ART),<sup>10</sup> or there may be variation in immunogenicity based on viral load (e.g., improved immune response with lower HIV viral load), such as with YFV.<sup>11</sup> For most vaccines, patients with higher CD4 counts have improved immune response, which also means that response (e.g., to vaccination for influenza, MMR, yellow fever) likely would be improved after ART is initiated.<sup>1,12,11,13</sup> Concern about the lack of protection from vaccines administered before a child begins ART has prompted debate about the need for routine re-immunization once a child is on effective ART.<sup>11,14</sup> On the basis of low rates of measles seroprotection in children with HIV who received MMR before starting ART and the safety and high rates of measles seroprotection associated with MMR re-immunization once the children were receiving ART,<sup>15</sup> the ACIP made specific recommendations for routine MMR re-immunization after initiation of ART.<sup>5</sup> Individuals with perinatal HIV infection who were vaccinated prior to establishment of effective ART should receive two appropriately spaced doses of MMR vaccine once effective ART has been established, unless they are severely immunosuppressed or have other acceptable current evidence of measles immunity.<sup>5</sup> For some vaccines (e.g., for hepatitis B), ACIP recommends performing post-vaccination serology to ensure immune response.

Children living in a household with an adult or child with HIV can receive MMR vaccine because the viruses in this vaccine are not transmitted from person to person. All members of a household aged >6 months can

receive yearly influenza vaccines. Immunization against varicella is encouraged for all household contacts of children with HIV infection with evidence of immunity to varicella.<sup>15</sup> Transmission of varicella vaccine virus from an immunized, immunocompetent individual to a household contact is rare.

Consult the specific ACIP statements (available at [ACIP Vaccine Recommendations and Guidelines](#)) for more detail regarding recommendations, precautions, and contraindications for use of specific vaccines (see [Prevention of Pneumococcal Disease](#) and [Use of a 2-Dose Schedule for Human Papillomavirus Vaccination](#)).<sup>10,12,15,16-27</sup>

## References

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