Vaccination of Persons with Primary and Secondary Immune Deficiencies

PRIMARY				
Category	**Specific Immunodeficiency**	**Contraindicated Vaccines[a]**	**Risk-Specific Recommended Vaccines[a]**	**Effectiveness & Comments**
B-lymphocyte (humoral)	Severe antibody deficiencies (e.g., X-linked agammaglobulinemia and common variable immunodeficiency)	OPV[b] Smallpox[c] LAIV BCG Ty21a (live typhoid) Yellow fever MMR MMRV	Pneumococcal Hib (children 12-59 months of age)[d]	The effectiveness of any vaccine is uncertain if it depends only on the humoral response (e.g., PPSV23 or MPSV4). IGIV interferes with the immune response to measles vaccine and possibly varicella vaccine.
	Less severe antibody deficiencies (e.g., selective IgA deficiency and IgG subclass deficiency)	OPV[b] BCG Yellow fever[e] Other live vaccines appear to be safe.	Pneumococcal Hib (children 12-59 months of age)[d]	All vaccines likely effective. Immune response might be attenuated.
T-lymphocyte (cell-mediated and humoral)	Complete defects (e.g., SCID disease, complete DiGeorge syndrome)	All live vaccines[f],[g],[h]	Pneumococcal Hib (children 12-59 months of age)[d]	Vaccines likely to be effective.
	Partial defects (e.g., most patients with DiGeorge syndrome, Wiskott-Aldrich syndrome, ataxia-telangiectasia)	All live vaccines[f],[g],[h	Pneumococcal Meningococcal Hib (children 12-59 months of age)[d]	Effectiveness of any vaccine depends on degree of immune suppression.
	Interferon-gamma/Interleukin 12 axis deficiencies	All live bacterial vaccines (All live vaccines contraindicated in Interferon-gamma or interferon-alpha deficiencies.)	None	
Complement	Persistent complement, properdin, or factor B deficiency	None	Pneumococcal Meningococcal Hib (children 12-59 months of age)[d]	All routine vaccines likely effective.
	Taking eculizumab (Soliris)	None	Meningococcal	
Phagocytic function	Chronic granulomatous disease	Live bacterial vaccines[f]	None	Live viral vaccines likely safe and effective.
	Phagocytic deficiencies that are undefined or accompanied by defects in T-cell and NK cell dysfunction (such as Chediak-Higashi syndrome, Leukocyte Adhesion Deficiency [LAD], and myeloperoxidase deficiency).	Live viral and bacterial vaccines[f],[g]	Pneumococcal	All inactivated vaccines safe and likely effective.

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SECONDARY			
Specific Immunodeficiency	**Contraindicated Vaccines[a]**	**Risk-Specific Recommended Vaccines[a]**	**Effectiveness & Comments**
HIV/AIDS	OPV[b] Smallpox BCG LAIV MMRV Withhold MMR, varicella, and zoster in severely immunocompromised persons. Yellow fever vaccine might have a contraindication or a precaution depending on clinical parameters of immune function.[i]	Pneumococcal Hib[d],[j] HepB	MMR and Varicella vaccine in those with mild immunosuppression, rotavirus, and all inactivated vaccines, including inactivated influenza as per routine vaccination schedule, might be effective.[k]
Generalized malignant neoplasm, transplantation, immunosuppressive or radiation therapy	Live viral and bacterial, depending on immune status.[f],[g],[l]	Pneumococcal Hib[m]	Effectiveness of any vaccine depends on degree of immune suppression.
Asplenia	LAIV	Pneumococcal Meningococcal Hib[d],[n]	All routine vaccines likely effective.
Chronic renal disease	LAIV	Pneumococcal HepB[o]	All routine vaccines likely effective.

ABBREVIATIONS: AIDS = acquired immunodeficiency syndrome; **BCG** = bacille Calmette-Guérin; **HepB** = hepatitis B; **Hib** = *Haemophilus influenzae* type b; **HIV** = human immunodeficiency virus; **IG** = immunoglobulin; **IGIV** = immune globulin intravenous; **IgA** = immune globulin A; **IgG** = immune globulin G; **LAIV** = live, attenuated influenza vaccine; **MMR** = measles, mumps, and rubella; **MMRV** = measles, mumps, rubella, and varicella; **MPSV4** = quadrivalent meningococcal polysaccharide vaccine; **OPV** = oral poliovirus vaccine (live); **PPSV23** = pneumococcal polysaccharide vaccine; **SCID** = severe combined immunodeficiency; **Ty21a** = live oral typhoid vaccine.

NOTES

(a) Other vaccines that are universally or routinely recommended should be given if not contraindicated. An exception is patients with B-cell deficiencies receiving immunoglobulins, who should not receive either live or inactivated vaccines, due to safety (live vaccines) and efficacy (live and inactivated vaccines) concerns.

(b) OPV is no longer available in the United States.

(c) This table refers to contraindications for nonemergency vaccination (i.e., the ACIP recommendations); emergency response recommendations are addressed in the clinical guidance for smallpox vaccine use in an emergency.

(d) Children 12-59 months: if unimmunized or received zero or only 1 dose, and that dose was administered before 12 months of age, should receive 2 Hib doses, 8 weeks apart; if received 2 or more doses before age 12 months, and none after 12 months, should receive 1 Hib dose 8 weeks after the last dose; if completed a primary series and received a booster dose at age 12 months or older, no additional Hib doses are recommended.

(e) There are no data to support IgA deficiency as a contraindication for yellow fever vaccine.

(f) Live bacterial vaccines: BCG, adenovirus, and oral Ty21a *Salmonella Typhi* vaccine.

(g) Live viral vaccines: MMR, MMRV, OPV, LAIV, yellow fever, zoster, rotavirus, varicella, and vaccinia (smallpox). Nonemergency smallpox vaccination is not recommended for children younger than 18 years or the general public.

(h) Regarding T-lymphocyte immunodeficiency as a contraindication for rotavirus vaccine, data exist only for SCID.

(i) Symptomatic HIV infection or CD4+ T-lymphocyte count of <200/mm3 or <15% of total lymphocytes for children aged <6 years is a contraindication to yellow fever vaccine administration. Asymptomatic HIV infection with CD4+ T-lymphocyte count of 200-499/mm3 for persons aged ≥6 years or 15%-24% of total lymphocytes for children aged <6 years is a precaution for yellow fever vaccine administration. Details of yellow fever vaccine recommendations are available from CDC (https://www.cdc.gov/mmwr/pdf/rr/rr5907.pdf)

(j) Patients 5-18 years of age who have not received a Hib primary series and a booster dose or at least one Hib dose after 14 months of age.

(k) HIV-infected children should be considered for varicella vaccine if CD4+ T-lymphocyte count is ≥15% and should receive MMR vaccine if they are aged ≥12 months and do not have 1) evidence of current severe immunosuppression (i.e., individuals aged ≤5 years must have CD4+T lymphocyte [CD4] percentages ≥15% for ≥6 months; and individuals aged >5 years must have CD4+percentages ≥15% and CD4+≥200 lymphocytes/mm3 for ≥6 months) and 2) other current evidence of measles, rubella, and mumps immunity. In cases when only CD4+cell counts or only CD4+percentages are available for those older than age 5 years, the assessment of severe immunosuppression can be based on the CD4+values (count or percentage) that are available. In cases when CD4+percentages are not available for those aged ≤5 years, the assessment of severe immunosuppression can be based on age-specific CD4+counts at the time CD4+counts were measured; i.e., absence of severe immunosuppression is defined as ≥6 months above age-specific CD4+count criteria: CD4+count >750 lymphocytes/mm3 while aged ≤12 months and CD4+count ≥500 lymphocytes/mm3 while aged 1 through 5 years (https://www.cdc.gov/mmwr/pdf/rr/rr6204.pdf).

(l) Withholding inactivated vaccines also is recommended with some forms of immunosuppressive therapy, like anti-CD20 antibodies, induction or consolidation chemotherapy, or patients with major antibody deficiencies receiving immunoglobulins. Inactivated influenza vaccine is an exception, but consideration should be given to repeating doses of any inactivated vaccine administered during these therapies.

(m) Persons younger than 60 months undergoing chemotherapy or radiation therapy who have not received a Hib primary series and a booster dose or at least one Hib dose after 14 months of age; HCT patients of any ages, regardless of Hib vaccine history.

(n) Persons older than 59 months who are asplenic and persons 15 months or older who are undergoing elective splenectomy who have not received a Hib primary series and a booster dose or at least one Hib dose after 14 months of age.

(o) Indicated based on the risk from dialysis-based bloodborne transmission.