Immunization in Special Circumstances

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Disclosures

- **The speaker is a federal government employee with no financial interest or conflict with the manufacturer of any product named in this presentation**
- **The speaker will discuss the off-label use of MMR and varicella vaccines**
- **The speaker will not discuss vaccines not currently licensed by the Food and Drug Administration**

To Vaccinate or Not To Vaccinate?

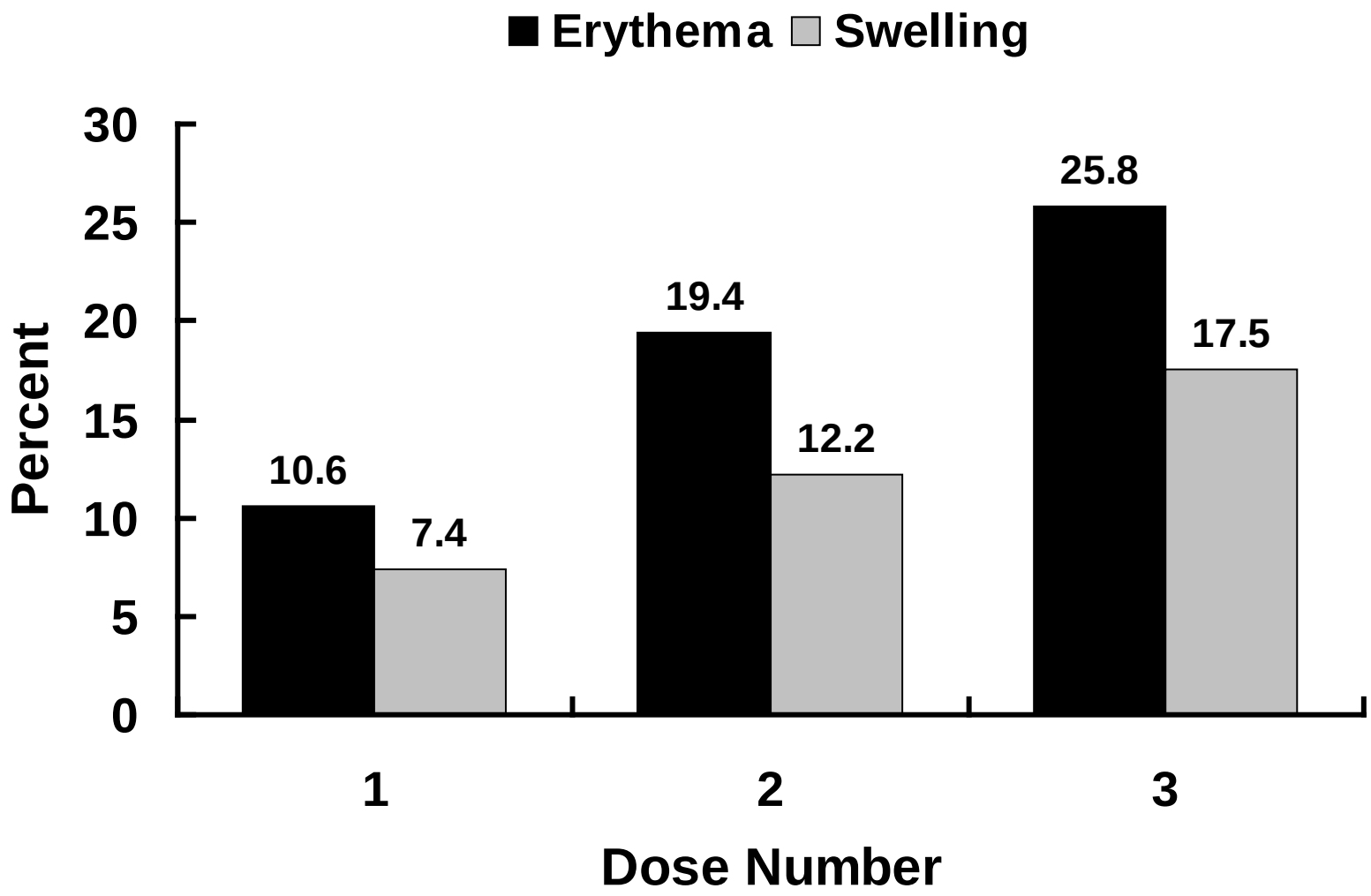
- **All vaccination decisions should be based on the benefit from vaccine (immunity) versus the risk from the vaccine (adverse reaction)**
- **Risk depends on characteristics of the vaccine and recipient**
- **Risk may be difficult to quantify for some special populations because of lack of data**

What are the Risks? Inactivated Vaccines

- **Local adverse reactions (pain, redness, swelling)**
  - **most studies indicate an increasing incidence of local reaction with increasing number of doses**
  - **higher with vaccines that contain adjuvant***
- **No evidence of increased risk of serious adverse events with increasing doses**

***aluminum hydroxide, aluminum phosphate, aluminum potassium sulfate**

Local Adverse Events Following DTaP

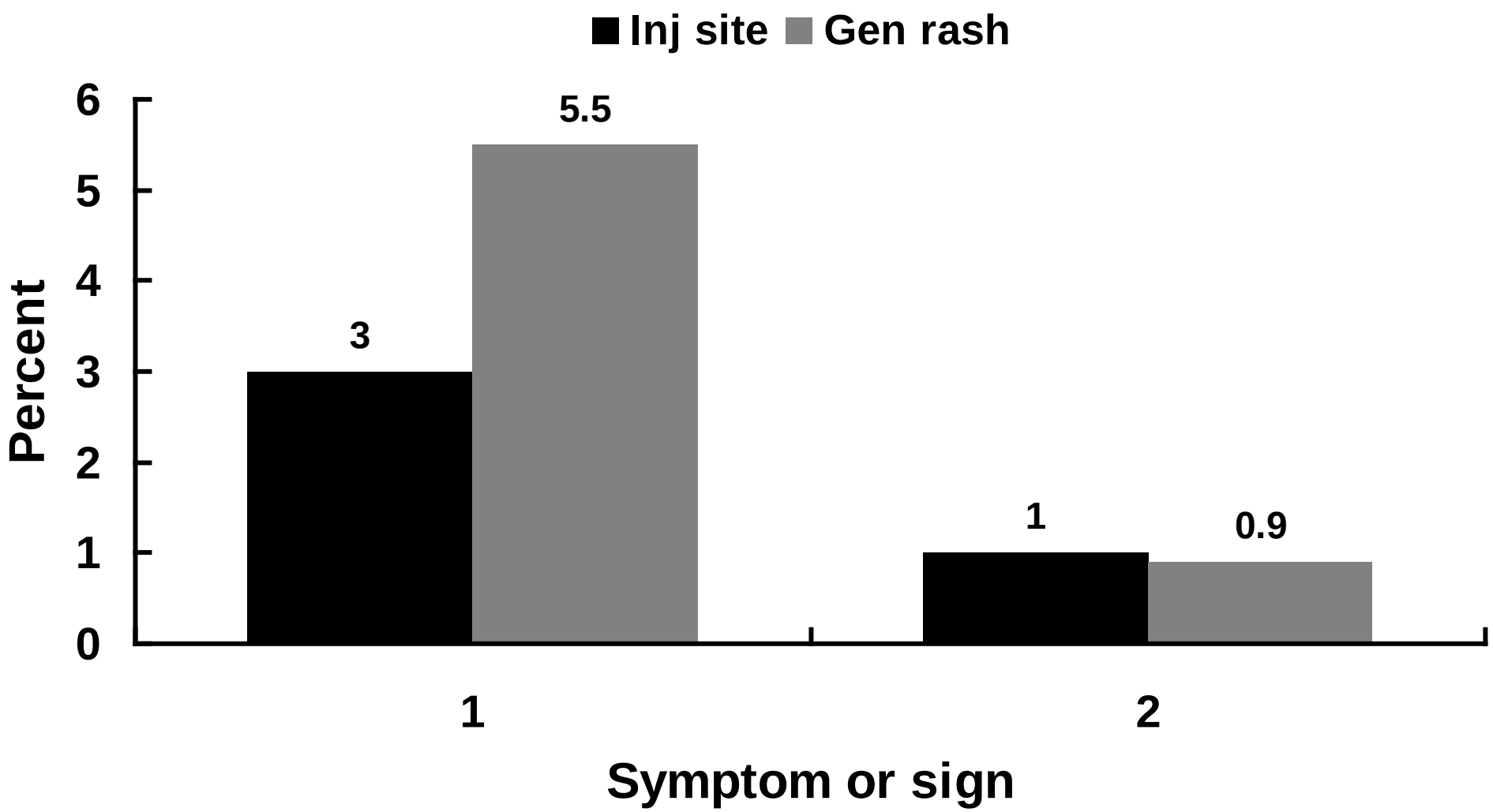


Bernstein et al, *Vaccine* 1995;13(17):1631-1635

What are the Risks?
Live Attenuated Vaccines

- **Adverse events (except allergic reactions) occur as a result of viral replication**
- **Susceptible immunocompromised person may experience overwhelming viremia and organ damage**
- **Viral replication is limited or does not occur in an immune person**
- **Immunity from previous infection or vaccination does not decrease as a result of immunocompromising conditions (except HSCT)**

Adverse Events Reported Following Varicella Vaccine By Dose



Contraindications and Precautions

Condition	Live	Inactivated
Allergy to Component	C	C
Encephalopathy	---	C
Pregnancy	C	V*
Immunosuppression	C+	V
Severe illness	P	P
Recent blood product	P**	V

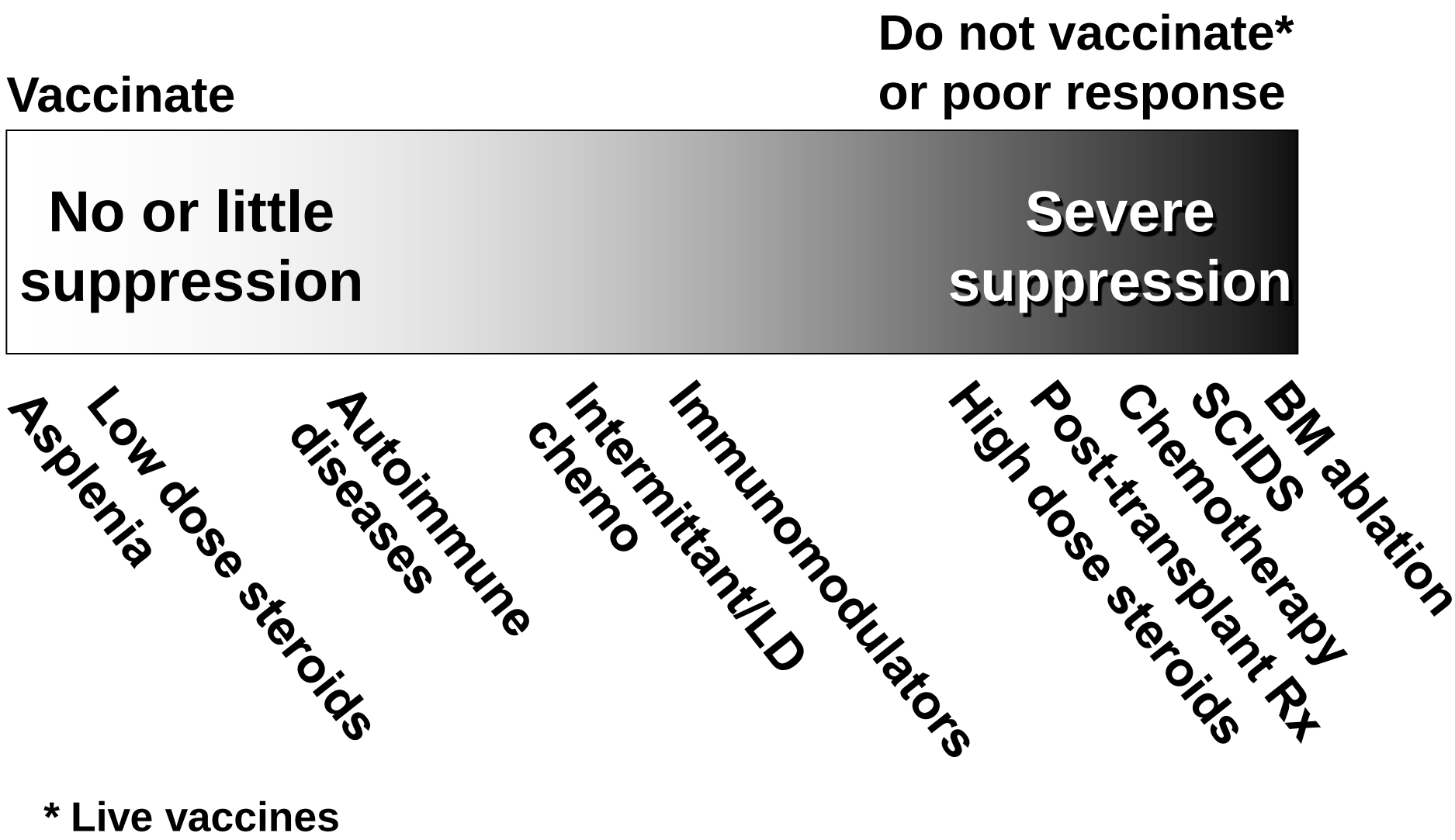
C=contraindication P=precaution V=vaccinate if indicated

*except HPV and Tdap. +except RV. **MMR and varicella-containing (except zoster vaccine) only

Causes of Immunosuppression

- Disease
  - Congenital immunodeficiency
  - Leukemia or lymphoma
  - Generalized malignancy
- Chemotherapy
  - Alkylating agents
  - Antimetabolites
  - Radiation
- Corticosteroids
- Immunomodulators

The Spectrum of Altered Immunocompetence



* Live vaccines

TABLE 11. Vaccination of persons with primary and secondary immune deficiencies

Category	Specific immunodeficiency	Contraindicated vaccines*	Risk-specific recommended vaccines*	Effectiveness and comments
Primary				
B-lymphocyte (humoral)	Severe antibody deficiencies (e.g., X-linked agammaglobulinemia and common variable immunodeficiency)	Oral poliovirus (OPV)† Smallpox Live-attenuated influenza vaccine (LAIV) BCG Ty21a (live oral typhoid)	Pneumococcal Influenza (TIV) Consider measles and varicella vaccination	The effectiveness of any vaccine will be uncertain if it depends only on the humoral response; intravenous immune globulin 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† Other live-vaccines appear to be safe	Pneumococcal Influenza (TIV)	All vaccines probably effective. Immune response may be attenuated
T-lymphocyte (cell-mediated and humoral)	Complete defects (e.g., severe combined immunodeficiency [SCID] disease, complete DiGeorge syndrome)	All live vaccines §,¶	Pneumococcal Influenza (TIV)	Vaccines may be ineffective
	Partial defects (e.g., the majority of patients with DiGeorge syndrome, Wiskott-Aldrich syndrome, ataxia- telangiectasia)	All live vaccines §,¶	Pneumococcal Meningococcal *Haemophilus influenza* type b (Hib) (if not administered in infancy) Influenza (TIV)	Effectiveness of any vaccine depends on degree of immune suppression
Complement	Deficiency of early	None	Pneumococcal	All routine vaccines

***MMWR* 2006; 55(RR-15)**

Immunosuppression Due To Corticosteroid Therapy

- The amount or duration of corticosteroid therapy needed to increase adverse event risk is not well defined
- Dose generally believed to be a concern:
  - 20 mg or more per day for 2 weeks or longer
  - 2 mg/kg or more per day
  - NOT aerosols, topical, alternate day, short courses (less than 2 weeks)
- Delay live vaccines for at least 1 month after discontinuation of high dose therapy

MMWR 2006; 55(RR-15)

Vaccination of Immunocompromised Persons – Inactivated Vaccines

- **Immunocompromised persons may receive inactivated, recombinant, subunit, conjugate and toxoid vaccines when indicated**
- **Response to vaccine may be suboptimal**
- **Persons vaccinated during immuno-suppressive therapy or radiation should be revaccinated 3 months or longer after therapy discontinued**

***MMWR* 2006; 55(RR-15)**

Vaccination of Immunocompromised Persons – Inactivated Vaccines

- **It is preferable to vaccinate* an immunocompromised person and obtain a less-than-optimal response than to withhold the vaccine and obtain NO response**

***inactivated vaccines only**

Vaccination of Immunocompromised Persons – Live Vaccines

- **Susceptible immunocompromised persons are at increased risk of adverse events following live vaccines**
- **Live vaccines may be administered 3 months or longer following termination of therapy (at least 1 month after high-dose steroids)**
- **MMR and varicella vaccines should be administered to susceptible household and other close contacts**

***MMWR* 2006; 55(RR-15)**

Revaccination Following Immunosuppressive Therapy

- **Immunity to vaccine-preventable diseases established prior to immunosuppression is not lost because of the immunosuppression***
- **Routine revaccination following immunosuppression is not necessary except for vaccines received during immunosuppression**

***except HSCT recipients**

New Categories of Immunosuppressive Agents

- Immune mediators
  - Colony stimulating factors, interferons, interleukins
- Immune modulators
  - BCG, levamisol
- Isoantibodies
  - Tumor necrosis factor inhibitors (Humira, Remicade, Enbrel)
- Effect of these agents on the safety of live vaccine is not certain
- Prudent to manage like high-dose steroids

Vaccination of Asplenic Persons

- **Persons with functional or anatomic asplenia are at increased risk of infection with encapsulated bacteria**
- **Vaccines recommended (in addition to those routinely recommended for age):**
  - **Pneumococcal polysaccharide (2 doses 5 years apart)***
  - **Meningococcal conjugate (2 through 55 years of age) or polysaccharide (56 or older)**
  - **Hib**

***Children with anatomic or functional asplenia 24-59 months of age are also candidates for pneumococcal conjugate vaccine. *MMWR* 2008;57(51&52).**

MCV4 Revaccination Recommendations

- **Children through age 18 years who received their first dose of MCV4 or MPSV4 at ages 2 through 6 years and remain at increased risk for meningococcal disease should receive an additional dose of MCV4 three years after their first dose**
- **Persons through age 55 years who received a dose of MCV4 or MPSV4 after age 6 years and remain at increased risk for meningococcal disease should receive an additional dose of MCV4 five years after their previous dose**

***MMWR* 2009;58(No. 37):1042-3**

MCV4 Revaccination Recommendations

- **High-risk persons who should be revaccinated with MCV4:**
  - **persistent complement component deficiency**
  - **anatomic or functional asplenia**
  - **Microbiologists with prolonged exposure to *Neisseria meningitidis***
  - **frequent travelers to or persons living in areas with high rates of meningococcal disease**

***MMWR* 2009;58(No. 37):1042-3**

MCV4 Revaccination Recommendations

- **MCV4 revaccination is NOT recommended for persons whose only risk factor is living in on-campus housing (i.e., college student living in a dormitory)**
- **Persons who remain in one of these increased risk groups indefinitely should continue to be revaccinated at 5-year intervals**

***MMWR* 2009;58(No. 37):1042-3**

Persons with HIV Infection

- **Persons with HIV/AIDS are at increased risk for complications of measles and varicella**
- **Increased risk of complications of influenza and pneumococcal disease**

Recommendations for Routine Immunization of Persons with HIV/AIDS

- Documented Td series with booster doses every 10 years (Tdap once)
- Annual influenza vaccination (TIV)
- Pneumococcal polysaccharide (2 doses separated by 5 years)
- Hepatitis A and B (and other inactivated vaccines) if indicated
- Certain live vaccines (MMR and varicella) depending on level of immuno-suppression*

*off-label ACIP recommendation. *MMWR* 2006;55(RR-15)

Live Attenuated Vaccines for Persons with HIV/AIDS

Vaccine	Asymptomatic	Symptomatic*
Varicella	Yes	No
Zoster	No	No
MMR	Yes	No
LAIV	No	No
Rotavirus+	Consider	Consider
Yellow fever	Consider	No

Yes=vaccinate No=do not vaccinate

+children only. * See specific ACIP recommendations for details.

The Special Case of Rotavirus Vaccine

- **Children who are immunocompromised because of congenital immunodeficiency, hematopoetic transplantation, or solid organ transplantation may experience severe or prolonged rotavirus gastroenteritis**
- **No safety or efficacy data are available for the administration of rotavirus vaccine to infants who are immunocompromised or potentially immunocompromised**
- **Immunosuppression is a precaution for rotavirus vaccines**

***MMWR* 2009;58(RR-2):18**

Vaccination of Hematopoietic Stem Cell Transplant Recipients

- **Antibody titers to VPDs decline during the 1-4 years after allogeneic or autologous HSCT if the recipient is not revaccinated**
- **HSCT recipients may be at increased risk of some VPDs, particularly pneumococcal disease**
- **Revaccination recommended beginning 6-12 months post-transplant**

***MMWR* 2000;49(RR-10)**

Vaccination of Hematopoietic Stem Cell Transplant Recipients

- **Inactivated influenza vaccine at least 6 months following transplant and annual thereafter**
- **Inactivated vaccines (DTaP/Td, IPV, hepatitis B, Hib, PCV, PPSV) at 12 months**
- **MMR and varicella vaccines at 24 months if immunocompetent**
- **Meningococcal and Tdap vaccines – clinician discretion**

***MMWR* 2000;49(RR-10) and *MMWR* 2006;55(RR-15)**

Vaccination of Household Contacts of Immunosuppressed Persons

- **Healthy household contacts of immunosuppressed persons should receive MMR and varicella vaccines and annual influenza vaccination**

***MMWR* 2006; 55(RR-15)**

CDC Vaccines and Immunizations

Contact Information

- **Telephone 800.CDC.INFO**
- **Email nipinfo@cdc.gov**
- **Website www.cdc.gov/vaccines/**
- **Vaccine Safety**
  http://www.cdc.gov/od/science/iso/