Immunization in Special Circumstances

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CDC
Immunization

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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

Symptom or sign | Percent
--- | ---
Inj site | 3
Gen rash | 5.5

Symptom or sign | Percent
--- | ---
Inj site | 1
Gen rash | 0.9
# Contraindications and Precautions

<table>
<thead>
<tr>
<th>Condition</th>
<th>Live</th>
<th>Inactivated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allergy to Component</td>
<td>C</td>
<td>C</td>
</tr>
<tr>
<td>Encephalopathy</td>
<td>---</td>
<td>C</td>
</tr>
<tr>
<td>Pregnancy</td>
<td>C</td>
<td>V*</td>
</tr>
<tr>
<td>Immunosuppression</td>
<td>C+</td>
<td>V</td>
</tr>
<tr>
<td>Severe illness</td>
<td>P</td>
<td>P</td>
</tr>
<tr>
<td>Recent blood product</td>
<td>P**</td>
<td>V</td>
</tr>
</tbody>
</table>

*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

Vaccinate

No or little suppression

<table>
<thead>
<tr>
<th>Asplenia</th>
<th>Autoimmune diseases</th>
<th>Intermittant/Immunomodulators</th>
<th>High dose steroids</th>
<th>Post-transplant Rx</th>
<th>Chemotherapy</th>
<th>SCIDS</th>
<th>BM ablation</th>
</tr>
</thead>
</table>

Severe suppression

Do not vaccinate* or poor response

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

*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, levamisole

• 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

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>Asymptomatic</th>
<th>Symptomatic*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Varicella</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Zoster</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>MMR</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>LAIV</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Rotavirus+</td>
<td>Consider</td>
<td>Consider</td>
</tr>
<tr>
<td>Yellow fever</td>
<td>Consider</td>
<td>No</td>
</tr>
</tbody>
</table>

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, hematopoietic 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/