Immunization Update: New CDC Recommendations

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2012
Hib Epidemiology: Incidence of Hib Meningitis According to Age

- Incidence of meningitis cases
- Bacteria killed

Period of greatest risk

Years of age:
- 0
- 1
- 2
- 3
- 4
- 5
- 6
- 7
- Adult

Bacteria killed (millions):
- 0
- 10
- 20
- 30
- 40
- 50

Polysaccharide Vaccines

- Vaccine
  - Hib capsule polysaccharide
    - "PRP" (polyribose ribitol phosphate)
  - Not protective in infants <18 months of age
    - No memory immune response
    - T-cell-independent antigen
- Protective antibody levels
  - 1µg/mL long-term protection (>3 wks)
  - 0.15 µg/mL short-term protection (<3 wks)
Incidence of Meningococcal Disease by Age in California, Georgia, Maryland, Tennessee, Connecticut, Minnesota, and Oregon, 1992–1996

A Peak of Meningococcal Disease Incidence Occurs in 15- to 19-Year-Olds

Incidence per 100,000 population

Age (years)

Male
Female

Serogroup-C Disease Decreased Dramatically After C-Conjugate Vaccination in the UK

## Conjugate Vaccines Induce High-Quality Immune Responses

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</tr>
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</tr>
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</tr>
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## Mortality From Selected Vaccine-preventable Diseases

<table>
<thead>
<tr>
<th>Disease</th>
<th>Prevaccine</th>
<th>Postvaccine</th>
<th>% Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Peak Deaths (Year)</td>
<td>Average Annual Deaths (Years)</td>
<td>Deaths in 2005</td>
</tr>
<tr>
<td>Pertussis</td>
<td>7518(1934)</td>
<td>4034(1934-1943)</td>
<td>31</td>
</tr>
<tr>
<td>Diphtheria</td>
<td>3065(1936)</td>
<td>1822(1936-1945)</td>
<td>0</td>
</tr>
<tr>
<td>Polio (acute)</td>
<td>2720(1949)</td>
<td>1393(1941-1950)</td>
<td>0</td>
</tr>
<tr>
<td>Hib</td>
<td>n/a</td>
<td>~1000(1980s)</td>
<td>4</td>
</tr>
<tr>
<td>Tetanus</td>
<td>511(1947)</td>
<td>472(1947-1949)</td>
<td>1</td>
</tr>
<tr>
<td>Measles</td>
<td>552(1958)</td>
<td>440(1953-1962)</td>
<td>1</td>
</tr>
<tr>
<td><em>S. pneumoniae</em></td>
<td>n/a</td>
<td>~200</td>
<td>12</td>
</tr>
<tr>
<td>Meningococcal disease</td>
<td>699(1959)</td>
<td>146(2002-2005)</td>
<td>123</td>
</tr>
<tr>
<td>Varicella</td>
<td>138(1973)</td>
<td>105(1990-1994)</td>
<td>13</td>
</tr>
<tr>
<td>Mumps</td>
<td>50(1964)</td>
<td>39(1963-1968)</td>
<td>0</td>
</tr>
<tr>
<td>Rubella</td>
<td>24(1968)</td>
<td>17(1996-1968)</td>
<td>0</td>
</tr>
<tr>
<td>Rotavirus</td>
<td>n/a</td>
<td>37(1993-2003)</td>
<td>n/a</td>
</tr>
</tbody>
</table>
Vaccines. Plotkin and Orenstein. P 1145
Meningococcal Vaccines

- Quadrivalent polysaccharide vaccine
  - MPSV4 (Menomune, sanofi pasteur)

- Conjugate vaccines
  - MenACWY-D (Menactra, sanofi pasteur)
    - Approved for 9 months through 55 years
  - MenACWY-CRM (Menveo, Novartis)
    - Approved for 2 through 55 years
  - HibMenCY-TT (MenHibRix, GlaxoSmithKline)
    - Approved for infant vaccine at 2,4,5 and 12 months

- Investigational vaccine for infant use
  - MenACWY-CRM
HibMenCY-TT

- Non-inferior Hib responses when compared to Hib-TT
- Immunogenic against serogroups C and Y
  - Some children protected after 2\textsuperscript{nd} dose
  - Persistence data will be presented at October meeting
- Similar safety profile compared to Hib-TT
  - No increased rate of adverse events
Infant Meningococcal Recommendations

- October 2011 presentations presented Work Group rational for no routine recommendation for infant meningococcal vaccines
  - Declining disease rates now at historic lows
  - Low proportion of infant cases and deaths vaccine preventable
  - Multiple doses with potential need for booster doses
- Language around no routine use of any meningococcal vaccine for infants
  - Guidance for use and vote for each infant meningococcal vaccine as it is licensed.
### Infant Meningococcal Vaccines: Number Needed to Vaccinate (NNV)

<table>
<thead>
<tr>
<th>Meningococcal incidence (Year Range Data)</th>
<th>Cases prevented (4 dose infant series)</th>
<th>Death Prevented</th>
<th>NNV to prevent one case</th>
<th>NNV to prevent one death</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Incidence (1997-1999)</td>
<td>307</td>
<td>20-30</td>
<td>11,000</td>
<td>127,000</td>
</tr>
<tr>
<td>Base-case (1993-2009)</td>
<td>135</td>
<td>5-10</td>
<td>25,000</td>
<td>325,000</td>
</tr>
<tr>
<td>Low Incidence (2007-2009)</td>
<td>44</td>
<td>2-4</td>
<td>76,000</td>
<td>642,000</td>
</tr>
</tbody>
</table>

*Data from Ortega-Sanchez CE model, presented at ACIP, October 2011*
Possible Reasons Why DTP, DTaP, and Adolescent and Adult Formulated Tetanus and Diphtheria Toxoids and Acellular Pertussis Vaccine Fail

- Over expectation of efficacy because of case definition.
- Inflated estimates of efficacy because of observer bias.
- Other *Bordetella* sp are the cause of similar cough illnesses.
- Lack of initial potency.
- Decay in antibody over time.
- Incomplete antigen package.
- Incorrect balance of antigens in the vaccine.
- Genetic changes in $\beta$ *pertussis*.
Pertussis Immunity Wanes Over Time

Note: Based on data for 682 pertussis cases and 2,016 controls (Calif.), 521 cases and 224,378 controls (Minn.), and 99 cases and 179,011 controls (Ore.).
Source: Dr. Tartof
Pertussis Among Adolescents and Adults

- Prolonged cough (3 months or longer)
- Post-tussive vomiting
- Multiple medical visits and extensive medical evaluations
Pertussis Outbreaks in the U.S. in 2012

- **Washington state** – as of June 16
  - 2,520 reported cases
  - 1,300% increase compared to same period in 2011
  - highest number of cases reported since 1942

- **Nationwide** – as of July 19
  - nearly 18,000 reported cases
  - more than twice as many cases as same time in 2011
Adolescent and Adult Pertussis Vaccination

- **Primary objective**
  - protection from pertussis

- **Secondary objective**
  - reduce reservoir of *Bordetella pertussis*
  - potentially reduce incidence of pertussis in other age groups and settings
FIGURE 2: Recommended immunization schedule for persons aged 7 through 18 years—United States, 2012 (for those who fall behind or start late, see the schedule below and the catch-up schedule [Figure 3])

<table>
<thead>
<tr>
<th>Vaccine</th>
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<th>11–12 years</th>
<th>13–18 years</th>
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<tr>
<td>Tetanus, diphtheria, pertussis</td>
<td></td>
<td>1 dose (if indicated)</td>
<td>1 dose</td>
<td>1 dose (if indicated)</td>
</tr>
<tr>
<td>Human papillomavirus²</td>
<td></td>
<td>see footnote²</td>
<td>3 doses</td>
<td>Complete 3-dose series</td>
</tr>
<tr>
<td>Meningococcal³</td>
<td></td>
<td>See footnote³</td>
<td>Dose 1</td>
<td>Booster at 16 years old</td>
</tr>
<tr>
<td>Influenza⁴</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pneumococcal⁵</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hepatitis A⁶</td>
<td></td>
<td></td>
<td></td>
<td>Complete 2-dose series</td>
</tr>
<tr>
<td>Hepatitis B⁷</td>
<td></td>
<td></td>
<td></td>
<td>Complete 3-dose series</td>
</tr>
<tr>
<td>Inactivated poliovirus³</td>
<td></td>
<td></td>
<td></td>
<td>Complete 3-dose series</td>
</tr>
<tr>
<td>Measles, mumps, rubella⁸</td>
<td></td>
<td></td>
<td></td>
<td>Complete 2-dose series</td>
</tr>
<tr>
<td>Varicella¹⁰</td>
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This schedule includes recommendations in effect as of December 23, 2011. Any dose not administered at the recommended age should be administered at a subsequent visit, when indicated and feasible. The use of a combination vaccine generally is preferred over separate injections of its equivalent component vaccines. Vaccination providers should consult the relevant Advisory Committee on Immunization Practices (ACIP) statement for detailed recommendations, available online at [http://www.cdc.gov/vaccines/pubs/acip-list.htm](http://www.cdc.gov/vaccines/pubs/acip-list.htm). Clinically significant adverse events that follow vaccination should be reported to the Vaccine Adverse Event Reporting System (VAERS) online ([http://www.vaers.hhs.gov](http://www.vaers.hhs.gov)) or by telephone (800-822-7967).
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<td>Influenza (yearly)</td>
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Use of Tdap Among Children 7 Through 10 Years of Age

- Children 7 through 10 years of age who are not fully vaccinated against pertussis and who do not have a contraindication to pertussis vaccine should receive a single dose of Tdap
- Either brand of Tdap may be used
“Fully Vaccinated Against Pertussis”

- 5 doses of DTaP, or
- 4 doses of DTaP if the fourth dose was administered on or after the fourth birthday
Use of Tdap Among Adults 19 Years of Age and Older

- One-time dose of Tdap to replace the next 10-year Td booster
- Should be administered as soon as feasible to all previously unvaccinated pregnant and postpartum women, close contacts of infants younger than 12 months of age, and healthcare personnel with direct patient contact
Interval Between TD and Tdap

- Tdap can be administered regardless of interval since the last tetanus toxoid-containing vaccine.
- Longer intervals between Td and Tdap vaccination could decrease the occurrence of local reactions.
- The benefit of protection against pertussis outweighs the potential risk for an adverse event.
Use of Tdap Among Adults 65 Years of Age or Older

- Adults 65 years of age and older who previously have not received Tdap, should receive a single dose of Tdap
- When feasible, B Tdap should be used for adults 65 years of age and older
- Administer ATdap if BTdap is not available
Persons Without Documentation of Pertussis Vaccination

- Preferred schedule:
  - single dose of Tdap
  - Td at least 4 weeks after the Tdap dose
  - second dose of Td at least 6 months after the prior Td dose
Tdap and Pregnancy

- Tdap is preferred during pregnancy if no prior Tdap dose
- Vaccinate during third trimester or late in second trimester (after 20 weeks gestation)
- Use Tdap for routine tetanus and diphtheria booster or wound management if no prior Tdap dose
Pneumococcal Polysaccharide Vaccine (PPSV23) Recommendations

- Unvaccinated adults 65 years of age and older
- Adults 19 through 64 years of age with chronic conditions
  - cardiovascular disease
  - pulmonary disease (including asthma)
  - diabetes mellitus
  - alcoholism
  - chronic liver disease
- Cigarette smokers
PPSV23 Recommendations for Adults at Highest Risk of Invasive Pneumococcal Disease (IPD)

- Adults should receive two doses of PPSV23 separated by at least 5 years
  - functional or anatomic asplenia
  - cerebrospinal fluid (CSF) leak
  - cochlear implant
  - immunocompromised for any reason, including disease and immunosuppressive drugs or therapy
Pneumococcal Conjugate Vaccine (PCV13) for Adults

- On December 30, 2011, PCV13, was approved for use among adults 50 years of age and older
- FDA approved expanded age indication through the Accelerated Approval Pathway
Pneumococcal Conjugate Vaccine (PCV13) for Adults

- Immunogenicity of PCV13 was found to be non-inferior to PPSV23

- Indication
  - prevention of pneumococcal disease, including pneumonia and invasive disease caused by the 13 *Streptococcus pneumoniae* serotypes in PCV13
Incidence of IPD in adults aged 18--64 years with selected underlying conditions, United States, 2009

- 20 fold increased risk: HIV/AIDS (186 cases per 100,000 persons)
- 3-7 fold increased risk: CVD (26 cases per 100,000 persons), DIABETES (28 cases per 100,000 persons), PULMONARY (32 cases per 100,000 persons), KIDNEY (41 cases per 100,000 persons), LIVER (52 cases per 100,000 persons), ALCOHOL (59 cases per 100,000 persons), HEMATOLOGICAL CANCER (8 cases per 100,000 persons)

Cases per 100,000 persons: HEALTHY (8 cases per 100,000 persons)
ACIP Recommendations June 2012 PCV13 for Immunocompromised Adults

- Benefits outweigh any risks
- Indirect effects of PCV13 use in children not likely to eliminate IPD due to PCV13 serotypes in adults
- PCV13 use alone may not provide adequate coverage
- Combined use of PCV13 and PPSV23 more effective than either vaccine alone
Pneumococcal Vaccine-Naïve Immunocompromised Adults

- Adults 19 through 64 years of age with immunocompromising conditions, functional or anatomic asplenia, CSF leak, or a cochlear implant who are vaccine naïve, should receive a single dose of PCV13 followed by a dose of PPSV23 at least 8 weeks later.

- A second dose of PPSV23 is recommended 5 years after the first dose of PPSV23.
2012-2013 Influenza Vaccine Composition

- A/California/7/2009 (H1N1)-like
- A/Victoria/361/2011(H3N2)-like
- B/Wisconsin/1/2010
Proposed 2012-2013 Algorithm for Children 6 Mos. through 8 yrs.

Has the child ever received influenza vaccine?

- Yes

Did the child receive a total of 2 or more doses of seasonal influenza vaccine since July 1, 2010?

- Yes
  - 1 dose

- No/Don’t know
  - 2 doses*

  - No/Don’t know
    - 2 doses*†

*Doses should be administered at least 4 weeks apart.

† For simplicity, this algorithm takes into consideration only doses of seasonal influenza vaccine received since July 1, 2010. However, if a child 6 months through 8 years of age is known to have received at least 2 seasonal influenza vaccines during any prior season, and at least 1 dose of a 2009(H1N1)-containing vaccine—i.e., either 2010-2011 or 2011-2012 seasonal vaccine or the monovalent 2009(H1N1) vaccine—then the child needs only 1 dose for 2012-2013.
Flu-V High-Dose TIV

- Approved only for persons 65 years of age and older
- Each dose contains 4 times as much hemagglutinin as the standard formulation of Fluzone for adults
Live Attenuated Influenza Vaccine (LAIV)

- Approved for healthy persons 2 through 49 years of age who are not pregnant
  - healthcare personnel
  - persons in close contact with high-risk groups such as household contacts
Timing of Influenza Vaccination

- Immunization providers should begin offering vaccine as soon as it becomes available.
- Providers should offer vaccine during routine healthcare visits or during hospitalizations whenever vaccine is available.
Timing of Influenza Vaccination

- Continue to offer influenza vaccine throughout the influenza season, especially to healthcare personnel and those at high risk of complications
- Continue to vaccinate even after influenza activity has been documented in the community
U.S. Measles Outbreaks in 2012

- 44 reported measles cases as of July 14
- Most measles cases associated with importation
  - travelers from other countries coming into the U.S. who are infected
  - returning U.S. citizens infected while traveling internationally
US Measles Cases Reach 15-year High

The figure above shows the origin of reported measles cases in the United States during 2011. During 2011, a provisional total of 222 measles cases were reported from 31 states.
Controlling Measles Outbreaks

- Healthcare personnel should:
  - be sure they are immune to measles
  - continue to encourage high vaccination rates
  - review patients’ vaccination history, especially anyone planning international travel
Measles Immunization for Infants Traveling Internationally

- Infants 6 months through 11 months of age
  - should receive a single dose of MMR
  - still need routinely recommended doses at 12 months and 4 to 6 years of age