Preventing pertussis in infants: ACIP's Tdap cocooning recommendations

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Pertussis immunization in the US

- **Infants/children**
  - DTaP at 2, 4, 6 months; 15-18 months; 4-6 years

- **Adolescents/adults**
  - Single Tdap, preferred at 11-12 years
Reported pertussis incidence by age group — 1990–2010

Incidence rate (per 100,000)

Year

1990 1995 2000 2005 2010*

SOURCE: CDC, National Notifiable Diseases Surveillance System and Supplemental Pertussis Surveillance System
## Reported pertussis-related deaths by age-groups, U.S., 1980-2009

<table>
<thead>
<tr>
<th>Age-Group</th>
<th>1980-1989(^1)</th>
<th>1990-1999(^1)</th>
<th>2000-2009(^2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-1 month</td>
<td>38</td>
<td>68</td>
<td>152</td>
</tr>
<tr>
<td>2-3 month</td>
<td>11</td>
<td>16</td>
<td>24</td>
</tr>
<tr>
<td>4-5 month</td>
<td>5</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>6-11 month</td>
<td>7</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>1-4 years</td>
<td>13</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>5-10 years</td>
<td>1</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>11-18 years</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>&gt;18 years</td>
<td>1</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>77(^*)</strong></td>
<td><strong>103</strong></td>
<td><strong>194</strong></td>
</tr>
</tbody>
</table>

* Includes one case with unknown age


\(^2\) National Notifiable Diseases Surveillance System, CDC, 2009
Source of pertussis transmission to infants

- <50% of infants with pertussis had a potential source identified
- Of identified sources, household members responsible for 75%–83%
- Parents and siblings were common sources
  - Parents (55%)
  - Siblings (16%-20%)
  - Aunts/uncles (10%)
  - Friends/cousins/others (10%-24%)
  - Grandparents (6%)
  - Caretakers (2%)

ACIP 2005 “Cocooning”

The strategy of vaccinating all close contacts of infants aged less than 12 months with Tdap to reduce the risk of transmission of pertussis to these infants.

- Ideally at least 2 weeks before contact with the infant.
- Parents, siblings, grandparents, child-care providers and health-care personnel
- Pregnant women vaccinated immediately post-partum*

*2005 ACIP Recommendation
Can cocooning work?

- Yes

- Successful examples
  - Houston, TX – Ben Taub General Hospital
  - Nevada - 18 birthing hospitals

- Important success factors
  - Champion for the cause
  - “It’s the right thing to do”
  - Donated healthcare provider time
  - Free Tdap
Challenges to implementation of postpartum immunization & cocooning

- Immunization platform with little infrastructure
- Pertussis awareness
- Two populations
  - Postpartum women
  - Families
- New immunization providers
- Reimbursement issues

Six years later, is cocooning working?

- **No, not at a national level**
  - No wide spread implementation
  - Difficult for all close contacts of newborns to be vaccinated
  - Poor uptake of Tdap when made available at birthing hospitals
  - No demonstration of program sustainability or scale-up
  - Effectiveness unknown - no system to measure coverage
Shifting the timing of mother’s Tdap dose: postpartum to pregnancy

- Provides earlier benefit to mother, thereby protecting infant at birth
- High levels of transplacental maternal antibodies in infants of mothers vaccinated during pregnancy
  - Likely provides direct immunity to infant
Concerns about use of Tdap in pregnant women

- **Safety to woman and fetus**
  - Td and TT used extensively in pregnant women
  - Data and expert opinion support Tdap acceptably safe to pregnant woman and fetus

- **Effectiveness of maternal antibodies preventing infant pertussis not yet known**

- **Blunting of infant immune response to primary DTaP**
  - Transplacental antibodies may interfere with infant’s antibody production following DTaP
  - Degree of interference not yet known
  - Clinical importance not clear
  - Benefits of protection outweigh risk of less protection later in infancy
Decision Analysis: Tdap Vaccination to Prevent Pertussis in Infants - Number of Infant Cases
## Cost Effectiveness Study: Mean Reduction in Pertussis Morbidity and Mortality Relative to Base Case

<table>
<thead>
<tr>
<th></th>
<th>Pregnancy</th>
<th>Postpartum</th>
<th>+ Father</th>
<th>+Grandparent</th>
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</thead>
<tbody>
<tr>
<td><strong>Cases</strong></td>
<td>33%</td>
<td>20%</td>
<td>29%</td>
<td>32%</td>
</tr>
<tr>
<td><strong>Hospitalizations</strong></td>
<td>38%</td>
<td>18%</td>
<td>28%</td>
<td>32%</td>
</tr>
<tr>
<td><strong>Deaths</strong></td>
<td>49%</td>
<td>16%</td>
<td>25%</td>
<td>29%</td>
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</table>

**Program cost (72% coverage)**

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<tr>
<td><strong>Tdap during pregnancy</strong> prevents the most infant pertussis at less program cost**</td>
<td><strong>$171 million</strong></td>
<td><strong>$171 million</strong></td>
<td><strong>$342 million</strong></td>
<td><strong>$513 million</strong></td>
</tr>
</tbody>
</table>
ACIP 2012 “Cocooning”

- The strategy of vaccinating all close contacts of infants aged less than 12 months with Tdap to reduce the risk of transmission of pertussis to these infants.
  - Ideally at least 2 weeks before contact with the infant.
  - Parents, siblings, grandparents, child-care providers and health-care personnel
  - Pregnant women vaccinated preferably during the third or late second trimester. Alternatively, administer Tdap immediately postpartum.

*Updated ACIP recommendation 2012*
Thank you

For more information please contact Centers for Disease Control and Prevention

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Telephone, 1-800-CDC-INFO (232-4636)/TTY: 1-888-232-6348
E-mail: cdcinfo@cdc.gov  Web: www.cdc.gov

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.