Pneumococcal vaccines in the elderly

Pneumococcal disease accounts for approximately 1.6 million deaths around the world each year. The elderly are one of the populations at the highest risk, especially in developed countries. With antimicrobial resistance on the rise, effective anti-pneumococcal vaccination is becoming a necessity. This issue of CLIPS briefly summarizes an article that addresses pneumococcal disease in the elderly and recent advances in relevant vaccines. If you need further information, please contact the Samford University Drug Information Service at (205) 726-2659.


Pneumococcal Polysaccharide Vaccine (PPV)
- The 23-valent vaccine (PPV23) is currently recommended for high-risk adults and elderly patients.
- Those who may not respond adequately to the vaccine include some high-risk patients, such as "ambulatory elderly people with certain medical comorbidities such as cirrhosis, chronic pulmonary diseases, diabetes mellitus, or chronic nephropathy."
- This vaccine contains 23 of the common pneumococcal serotypes, which, at the time of vaccine licensure (1983), accounted for about 90% of all invasive pneumococcal disease (IPD) infections.
- PPV23 provides immunity for an estimated 5 – 10 years; the vaccine does not stimulate a T-cell-dependent immune response, so there are no memory B cells and this limits the length of protection provided.
- Efficacy of revaccination is questionable; however, the current recommendation is to revaccinate five years post first dose for patients who received the first dose while <65 years old, 5 years post first dose.
- PPV23 does not provide complete protection, but may be effective against about 40-60% of IPD.
- PPV23 is inexpensive, and has been proven to be cost-effective for patients > 65 years old.

Pneumococcal Conjugate Vaccine (PCV)
- Unlike the PPV23, the protein-polysaccharide combination vaccine is T cell-dependent, allowing it to induce an immune response and prepare for a memory response upon exposure.
- PCV7 contained 7 serotypes and was approved for use in young infants in 2000.
- Considerable reductions seen in the overall disease burden likely due to PCV7.
- This vaccine shows efficacy in decreasing nasopharyngeal colonization.
- In 2011, PCV13 was approved to replace the older PCV7 for use in children; the vaccine contains 13 serotypes.
- The disease burden of pneumococcal disease, specifically of the serotypes covered in PCV13, may be significantly reduced via indirect effects of the vaccine used in pediatrics and this may decrease the necessity of the pneumococcal conjugate vaccine.
- PCV13 was recently approved to prevent IPD and pneumonia in the elderly (>50 years).
- Immune response in high-risk groups and elderly patients is improved with the use of PCV13 as opposed to PPV23.
- PCV13 is expensive and there is not currently any available data in the elderly population.

Experimental Protein-Based Pneumococcal Vaccines (PbPV)
- PbPV should theoretically provide full protection against all serotypes.
- These vaccines “are composed by distinct non-capsular pneumococcal proteins or virulence factors.”

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Experimental Protein-Based Pneumococcal Vaccines (PbPV) (continued)

- A number of PbPVs are being evaluated and the results from animal models against nasopharyngeal colonization and IPD are promising.
- These new vaccines are needed since the percentage of IPD-causing serotypes covered by the current available vaccines is decreasing (see Table 1).
- These vaccines present the possible advantage of an oral or intranasal administration route, making it more likely that they will be less expensive than the current pneumococcal vaccines.
- The trials thus far are suggestive that PbPV may “represent a short term option in the control of pneumococcal diseases.”

Table 1 Vaccine serotype coverage for IPD in the USA reported in people > 65 years old

<table>
<thead>
<tr>
<th>Study</th>
<th>Period</th>
<th>PCV13</th>
<th>PPV23</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hicks et al.</td>
<td>1998-1999</td>
<td>73.8</td>
<td>84.1</td>
</tr>
<tr>
<td></td>
<td>2004</td>
<td>54.2</td>
<td>70.8</td>
</tr>
<tr>
<td>Pilishvili et al.</td>
<td>2006-2007</td>
<td>49.9</td>
<td>64.7</td>
</tr>
<tr>
<td>CDC</td>
<td>2010</td>
<td>33</td>
<td>58</td>
</tr>
</tbody>
</table>

Summary

- The data provided for efficacy of PCVs in children is suggestive that PCVs provide a better response than PPV23 in high-risk patients and the elderly; however, there is currently no data of PCV13 efficacy in the elderly population.
- The CDC still recommends the use of PPV23 in all adults greater than 65 years old.
- The tactic of sequential vaccination (using both PPV23 and PCV13) in high-risk groups could be a possibility, but there are concerns of hyporesponsiveness after PPV23 vaccination that need to be evaluated.
- New options for pneumococcal vaccines, such as protein-based pneumococcal vaccines are being evaluated and experts predict that one for *S. pneumoniae* will be available in approximately 5 to 10 years.