Review: acellular vaccines prevent pertussis as effectively as whole-cell vaccines with fewer adverse events


QUESTION: In children ≤ 6 years of age, how well do acellular vaccines (compared with whole-cell vaccines) protect against pertussis disease (whooping cough)?

Data sources
Studies were identified using Medline (1966–97) and the Cochrane Controlled Trials Register.

Study selection
Studies were selected if they were randomised, double-blind, controlled trials of the efficacy or safety of acellular pertussis vaccines. Efficacy studies had to have active follow-up of participants and laboratory confirmation of pertussis.

Data extraction
Data were extracted on study quality, case definition (whooping cough or pertussis disease), immunisation schedule and vaccine characteristics, efficacy results (absolute or relative efficacy), and adverse events.

Main results
45 studies were included; all 45 addressed safety, and 6 studies addressed efficacy. 4 efficacy trials included placebo or diphtheria toxoid (DT) as the control therapy and thus permitted calculation of absolute efficacy: Acellular vaccines were more efficacious than placebo or DT in preventing whooping cough (absolute efficacy range 36% to 85%); 3 of the 4 trials showed greater efficacy of acellular vaccines in preventing pertussis disease (absolute efficacy range 23% to 78%). Acellular vaccines with ≥ 3 components were more efficacious than vaccines with 1–2 components. 4 trials directly compared acellular vaccines with whole-cell vaccines. The acellular vaccines were relatively more efficacious than 1 type of whole-cell vaccine but less efficacious than 2 other types of whole-cell vaccine in preventing whooping cough. For most safety outcomes, including death from infection, acellular vaccine and whole-cell vaccines did not differ. 8 of 9 minor adverse events—anorexia, fever, irritability, prolonged crying, vomiting, pain or tenderness, redness, and swelling or induration—were reduced with acellular vaccines; drowsiness was not reduced. Non-completion of the primary series because of adverse effects was reduced in recipients of acellular vaccines (table).

Conclusion
Acellular pertussis vaccines are efficacious in preventing pertussis disease (whooping cough) in children ≤ 6 years of age and are associated with fewer adverse events than whole-cell vaccines.

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Number of studies</th>
<th>Acellular (95% CI)</th>
<th>Whole cell (95% CI)</th>
<th>RRR (95% CI)</th>
<th>NNT (CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-completion of primary series</td>
<td>14</td>
<td>0.37%</td>
<td>1.17%</td>
<td>72%</td>
<td>125</td>
</tr>
</tbody>
</table>

*Abbreviations defined in glossary: RRR, NNT, and CI calculated from data in article.