What do we know about the impact of vaccines on transmission?

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Overview

• What is transmission?
• Effects of vaccination - individual
• Evidence of vaccine effects
• Implications
• Conclusions
What is transmission?

- Transfer of *Bordetella pertussis* bacterium between hosts

Regulated by:
- Natural immunity
- Vaccination coverage and efficacy
- Antibiotic use
- Adequate contact

Consequences may be detrimental or beneficial
Possible effects of vaccination - individual

- For vaccinated person:
  - Reduction in susceptibility to infection
  - Reduction in disease severity
  - Reduction in infectiousness

- For unvaccinated person:
  - Reduced proportion of contacts infected
  - Infected contacts less infectious
  - Herd immunity
Possible effects of vaccination - individual

• For vaccinated person:
  – Reduction in susceptibility to infection
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  – Reduction in infectiousness

• For unvaccinated person:
  – Reduced proportion of contacts infected
  – Infected contacts less infectious
  – Herd immunity
Evidence of vaccine effects

- Number of cases overall
Evidence of vaccine effects

Notification rate for pertussis in South Australia, 1893 to 1996

Evidence of vaccine effects

• Number of cases overall

• Infectiousness of vaccinated cases
Evidence of vaccine effects

Senegal household study

Index case: vaccinated vs unvaccinated

Status of index case

Vaccinated

Unvaccinated

Evidence of vaccine effects

• Number of cases overall
• Infectiousness of vaccinated cases
• Changes in the inter-epidemic period
Evidence of vaccine effects

Change in periodicity in top ten cities in England and Wales

Evidence of vaccine effects

- Number of cases overall
- Infectiousness of vaccinated cases
- Changes in the inter-epidemic period
- Changes in rates in unvaccinated population
Evidence of vaccine effects

Reduction in incidence in unvaccinated population - UK

Evidence of vaccine effects

Increase in incidence in unvaccinated population - US

What does this evidence suggest?

- **South Australian reduction in cases**
  - vaccination at least reduces typical disease

- **Senegal study**
  - vaccination reduces infectiousness
  - effect may reduce over time

- **Changes in inter-epidemic period**
  - uncertain

- **Rates in unvaccinated infants**
  - uncertain
What are the implications?

- Disease severity versus infectiousness
- Duration of protection against infectiousness
- Measuring subclinical cases
- Problems caused by reducing transmission
- Short term versus long term effects
- Whole cell versus acellular
Conclusion

• The impact of pertussis vaccination on transmission is uncertain

• Targeted vaccination strategies rely on vaccination interrupting transmission

• Long term impact of vaccination on transmission requires integration of all factors
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Questions