

Pertussis: The Whooping Cough



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KEYWORDS

- Bordetella pertussis • Whooping cough • Tdap and DTaP vaccine
- Paroxysmal cough

KEY POINTS

- Pertussis is characterized by 3 stages: catarrhal, paroxysmal, convalescent.
- Pertussis vaccine or infection does not confer lifelong immunity and thus requires booster immunizations.
- Infants are the most susceptible to infection and have the highest morbidity and mortality from pertussis.
- The prevalence of pertussis is likely higher than suspected due to its nonspecific presentation, but is still a cause of significant morbidity including missed work.

INTRODUCTION

Before the advent of the pertussis vaccine in the 1940s, there were up to 266,000 reported cases of pertussis in the United States. In the 1980s, the number of reported cases reached its nadir, dipping to just more than 1000 reported cases.¹ Unfortunately, in the past decade, the number of reported cases has risen to 20,000 to 40,000 confirmed and presumed cases a year.¹ Overall, the incidence of pertussis has decreased more than 80% with introduction of this vaccine (**Fig. 1**).¹ However, this number is likely underestimated, as these incident rates are dependent on clinician recognition and report of the disease. The long duration of the disease, possibly spanning months, can make the prevalence of pertussis difficult to track.²

It is spread via infectious droplets and is extremely contagious. Due to its highly infectious nature, most patients will be required to abstain from work for 5 to 7 days after starting antimicrobial treatment, resulting in significant personal and economic morbidity. On average, however, adults missed 9.8 days of work. Adolescents, on the other hand, missed 5.5 days from school. Thirty-eight percent of adolescents were still coughing 106 days after cough onset and adults 94 days after.³

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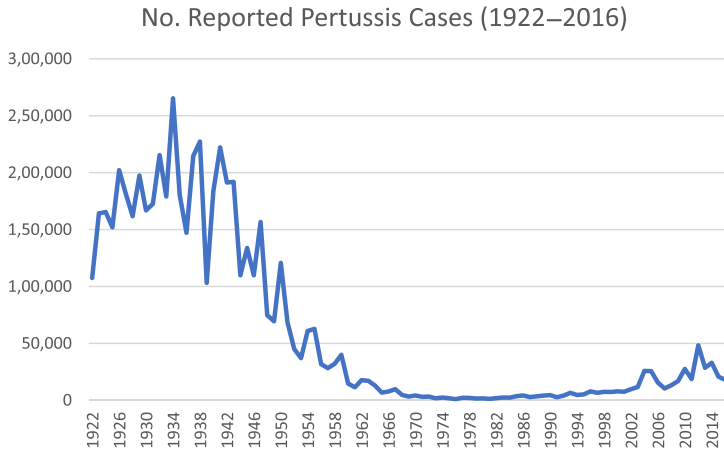


Fig. 1. Number of reported pertussis cases to CDC. (Data from Centers for Disease Control and Prevention. Pertussis cases by year (1922–2015). Available at: <https://www.cdc.gov/pertussis/surv-reporting/cases-by-year.html>. Accessed February 11, 2018.)

BACKGROUND AND PATHOPHYSIOLOGY

Pertussis, also known as whooping cough and the 100-day cough, is an infection caused by the bacterium, *Bordetella pertussis*.¹ *B pertussis* is a gram-negative bacterium that requires special media for isolation. It produces various toxins and multiple antigens that attacks respiratory cells, causing inflammation and paralysis of cilia.¹ It is these various antigens that contribute to the different stages of pertussis.¹ Recent research has detected the bacterium in alveolar macrophages. This interferes with pulmonary secretion clearance and is the basis of the clinical symptoms.¹

It is spread via infectious droplets and is extremely contagious, infecting approximately 80% of household contacts in one identified case.¹ There is no temporal, seasonal pattern associated with pertussis, but it does have a slight increase in incidence in the summer and fall.¹

Before the introduction of the pertussis vaccine, children were naturally susceptible to the infection. Childhood infection would confer immunity to adolescents and adults. The transmission of maternal antibodies would provide natural immunity to neonates until these antibodies waned. As the infants aged, they would become susceptible to pertussis infection. In contrast, during this postvaccination time, children are immune to pertussis after childhood vaccinations but will then develop waning vaccine immunity as they get older. Thus, adolescents and adults are susceptible to pertussis infection and can transmit it to infants.⁴

The pertussis vaccine is 95% effective initially and then reduces to 42% efficacy after 5 years.⁵ Other observational studies note that the pertussis vaccine confers immunity for 4 to 20 years, but not lifelong. Local reactions to the vaccine (redness, swelling, pain at injection site) was more common in those patients receiving whole-cell DTP (diphtheria, tetanus, pertussis) vaccines. Due to the frequency of these local reactions, a more purified, acellular, vaccine was created. Acellular vaccines have fewer side effects.⁶ Only the acellular vaccine is available in the United States.^{1,7} The vaccine contains inactivated components of *B pertussis*. It is combined with diphtheria and tetanus toxoids and is approved for administration to infants as young as 6 weeks old.¹ In a study of 1391 persons, 195 adverse reactions were reported, ranging from

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