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Pertussis—Connecticut, 2002–2006

This report describes the epidemiology of pertussis cases reported to the Connecticut Department of Public Health (DPH) during 2002–2006. Pertussis, or whooping cough, is a highly contagious bacterial infection of the respiratory tract, caused by the bacterium *Bordetella pertussis*. The number of reported pertussis cases in the United States increased from a historic low of 1,010 in 1976 to 25,616 cases in 2005 (1). Clinical diagnosis of pertussis is hindered by non-specific symptoms that cannot be distinguished from other causes of prolonged cough illness, such as viruses (i.e. adenovirus, parainfluenza, respiratory syncytial virus), other *Bordetella* species (i.e. *B. parapertussis* and *B. holmesii*), *Mycoplasma,* and *Chlamydia* species (2,3). Adequate laboratory diagnosis is important for the control and prevention of pertussis.

In Connecticut, pertussis is a physician and laboratory reportable disease. Suspected pertussis cases are reported to the DPH via telephone and the Reportable Disease Confidential Case Report Form PD-23. In addition, laboratories are required to report positive serologies, cultures, polymerase chain reaction (PCR), and direct fluorescent antibody (DFA) results using the Laboratory Report of Significant Findings Form OL-15C.

A clinical case is defined as an acute cough illness lasting ≥14 days in a person with at least one symptom characteristic of pertussis (i.e., paroxysmal cough, posttussive vomiting, or inspiratory whoop). A confirmed case is defined as 1) a cough illness of any duration with isolation by culture of *B. pertussis* or 2) a case that is consistent with the clinical case definition and is confirmed by PCR testing or by epidemiologic linkage to a laboratory-confirmed case. A probable case is defined as a case that is consistent with the clinical case definition but does not have laboratory confirmation or an epidemiologic link. "Positive" serologic test results are insufficient to confirm a clinically probable pertussis case.

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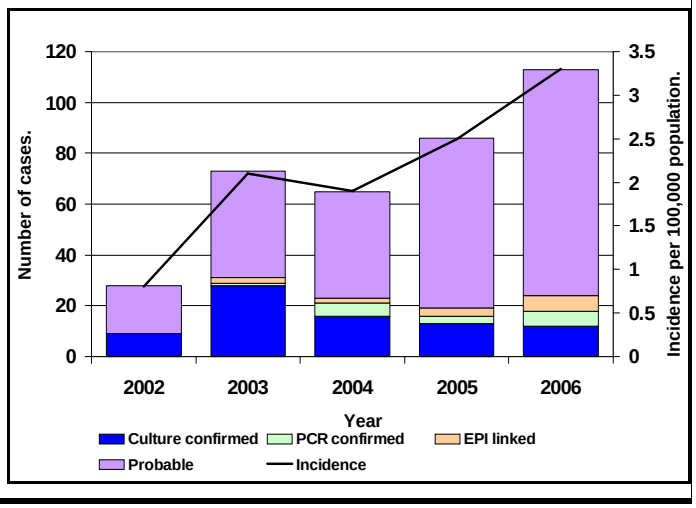
During 2002–2006, there were 365 cases of pertussis reported in Connecticut; 106 (29%) of these cases were confirmed. Of the confirmed cases, 78 (74%) were confirmed by culture, 15 (14%) by PCR, and 13 (12%) by epidemiological linkage to a confirmed case (Figure 1). The number of confirmed cases did not vary significantly by year. However, the proportion of all reported cases that were confirmed steadily decreased from a high of 43% in 2003 to a low of 21% in 2006 (p=0.002, chi square for trend). There was a steady increase in the number of probable cases. Of the 259 probable cases, 178 (69%) reported a positive pertussis serology.

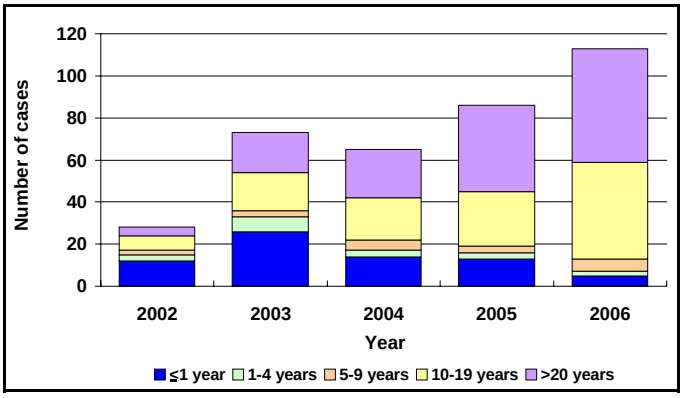
Among all 365 reported cases, 204 (56%) were females. Using 2000 census population estimates,

Figure 1. Incidence and Number of Reported Pertussis Cases by Confirmation Status and Year, 2002–2006.



the average annual incidence was 2.1 cases per 100,000 population. A total of 70 (19%) cases were children aged <1 year (including 67 aged <6 months), 18 (5%) were aged 1–4 years, 19 (5%) were aged 5–9 years, 117 (32%) were aged 10–19 years, and 141 (39%) were aged ≥20 years. The number of cases among each group <10 years of age decreased during the five year reporting period. In contrast, the number of reported cases among persons aged 10–19 years and ≥20 years increased each year (Figure 2). Average annual incidence by age group was highest among children aged <1 year (32.8 per 100,000 population) and lower in children aged 1–4 years (2.0), children aged 5–9 years (1.6), persons aged 10–19 years (5.1), and persons aged ≥20 years (1.1). One confirmed school-related outbreak involving 12 cases occurred during the reporting period.

Figure 2. Number of Pertussis Cases by Year and Age Group, 2002–2006.



Race and ethnicity data were evaluated independently. Data on race were available for 344 (94%) cases, of which, 316 (92%) were white, 17 (5%) were black, 5 (1%) were Asian/Pacific Islander, 1 (0%) was American Indian/Alaska Native, and 5 (1%) were identified as "other race." Data on ethnicity were available from 331 (91%) cases. Of these, 33 (10%) were Hispanic. The proportion of cases by race and ethnicity approximated the population demographics in Connecticut.

Of the 365 pertussis cases reported, 55 were hospitalized and 13 had radiographically confirmed pneumonia. The median length of hospital stay was 6 days. Infants aged <6 months accounted for 89% of the hospitalizations and 7% of the radiographically confirmed pneumonias, as well as a single report each of seizures and encephalopathy. One pertussis-related death occurred in an adult with cystic fibrosis.

Reported by: K Kudish DVM, MSPH, Immunizations Program; J Hadler MD, MPH, Infectious Diseases Section; Connecticut Department of Public Health.

Editorial Note:

Nationwide and in Connecticut, the number of reported pertussis cases has been steadily increasing since 1976, with a substantial increase among persons aged 10–19 years (1). Reasons for the increase include waning immunity approximately 6–10 years following vaccination with acellular pertussis containing vaccines (4), recognition that pertussis is an important cause of prolonged cough illness among teenagers and adults (5), and increasing availability of serologic tests. The relative importance of these factors in the increase in reported pertussis among adolescents and adults is unclear. Nonetheless, it is likely that the rates observed in Connecticut are an underestimate of what is actually occurring. A population-based, active surveillance study during 1995–1996 estimated pertussis incidence at 507 per 100,000 population aged 10–49 years, indicating that passive pertussis surveillance is capturing only a fraction of cases among older persons (6).

Serologic tests may detect evidence of pertussis infection more than 2 weeks after onset of symptoms, when culture and PCR become highly insensitive. Although serologic testing has come into increasing use, most available tests have not been fully validated. Recognizing the need to evaluate the characteristics of serologic tests for pertussis, the CDC is working with selected public health departments to validate them. Until this work is complete, "positive" serologic test results should be viewed with caution. Few of the adolescent and adult cases of pertussis reported in Connecticut have been confirmed by either culture or PCR. Of note, most infants and children <10 years of age continue to be diagnosed by culture and their incidence has declined slightly.

The declining pertussis rates in children aged <10 years despite more potential for exposure from adolescents and adults may be due in part to high early childhood vaccination rates. National Immunization Survey (NIS) estimates of vaccination coverage in Connecticut for ≥4 doses of pertussis-containing vaccine by age 24 months exceeded 90% during 2002–2006.

To combat waning immunity to pertussis from childhood vaccination, the Advisory Committee on Immunization Practices (ACIP) recently recommended persons aged 11–64 years receive a single dose of one of the recently licensed tetanus toxoid, reduced diphtheria toxoid, and acellular pertussis vaccines (Tdap) to replace tetanus and diphtheria toxoids vaccine (Td) (1). One of the two formulations of Tdap vaccine, Boostrix®, is available to participating providers for vaccination of any adolescent aged 11–18 years regardless of insurance status through the Immunization Program's vaccine distribution program. As early as September 2009, a Tdap booster at 11–12 years could be required for entry into seventh grade. For more information on Tdap vaccine, please contact the DPH Immunization Program at 860-509-7929.

References:

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4. Jenkinson D. Duration of effectiveness of pertussis vaccine: evidence from a 10-year community study. BMJ 1988;296:612--4.
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Recommendations for the Use of Pertussis-Containing Vaccines in Adolescents and Adults

Among the diseases for which universal childhood vaccination is recommended in the United States, only pertussis has had an overall increase in reported cases since 1980. While infants <12 months remain at highest risk for pertussis-related complications, the greatest increase in the number of reported cases has occurred among adolescents and adults. Recent studies describe waning immunity to pertussis approximately 5–10 years after completion of childhood vaccination. To protect the older at-risk population and their contacts from pertussis, two new tetanus toxoid, reduced diphtheria toxoid, and acellular pertussis vaccines (Tdap) were licensed in 2005; BOOSTRIX® is licensed for use in adolescents aged 10–18 years, and ADACEL™ is licensed for use in persons aged 11–64 years of age.

The Advisory Committee on Immunization Practices (ACIP) recommends that persons aged 11–64 years receive a single dose of Tdap to replace tetanus and diphtheria toxoids vaccine (Td) for booster immunization against tetanus, diphtheria, and pertussis (1,2). The preferred age for routine Tdap vaccination is 11–12 years. A single dose of Tdap is preferred to Td in persons who require tetanus toxoid-containing vaccine as part of wound management. If an individual has previously received Td, an interval of at least 5 years between Td and Tdap is encouraged to reduce the risk for reactions after Tdap vaccination. However, an interval less than 5 years between Td and Tdap can be used. The benefit of using Tdap at a shorter interval to protect against pertussis generally outweighs the risk for local and systemic reactions after vaccination in settings with increased risk of pertussis. The safety of an interval as short as approximately 2 years between Td and Tdap is supported by a Canadian study (3). Persons who received incomplete vaccination for tetanus, diphtheria, or pertussis should be vaccinated with Tdap and/or Td according to guidance for catch-up vaccination (1). A single dose of Tdap can be used

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to substitute for any one of the Td doses in the series. **It is important to note that Tdap is not licensed for multiple administrations**. After receipt of Tdap, adolescents and adults should receive Td booster immunization against tetanus and diphtheria according to previously published guidelines.

Special effort should be made to vaccinate the following persons with Tdap:

- Adolescents and adults who have or who anticipate having close contact with an infant aged <12 months (e.g., parents, siblings, grandparents, health-care personnel (HCP), and child-care providers). Women should receive the vaccine before pregnancy or during the immediate postpartum period provided Tdap was not previously given. Household contacts, especially parents, are an important source of pertussis transmission to infants (4).
- HCP should receive a single dose of Tdap as soon as feasible if they have not previously received Tdap.

For additional information regarding the Tdap vaccine, including contraindications and precautions to vaccination, visit the adolescent and adult Tdap ACIP statement links:

http://www.cdc.gov/mmwr/PDF/rr/rr5503.pdf
http://www.cdc.gov/mmwr/PDF/rr/rr5517.pdf

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