

Community-Wide Outbreak of Pertussis — Montgomery County, March 2014 – July 2014



Background

On March 26, 2014, a private laboratory notified the Kansas Department of Health and Environment's Infectious Disease Epidemiology and Response section (KDHE) of a person that tested positive for pertussis. Investigation by the Montgomery County Health Department (MCHD) revealed the person was a student at a school in Coffeyville, KS. On April 11, 2014, a second case of pertussis was reported by the school nurse. The Montgomery County Health Department, the school, and KDHE began an outbreak investigation to identify additional cases, exposed persons, and to implement prevention and control measures. Further investigation revealed additional epidemiologically-linked cases among other students at the school and other area schools.

Methods

A confirmed case was defined as a cough of at least 14 days with paroxysms, whoop, post-tussive vomiting, or apnea (in an infant less than one year old) with either laboratory confirmation [culture or polymerase chain reaction (PCR)] or with an epidemiologic link to a confirmed case in a student or staff member at one of the three affected schools or a Montgomery County resident with an epidemiological link to a confirmed case associated with one of the three schools.

A probable case was defined as a cough of at least 14 days with paroxysms, whoop, post-tussive vomiting or apnea (in an infant less than one year old), but without laboratory confirmation or an epidemiological link to a confirmed case in a student or staff member at one of the three affected schools or a Montgomery County resident with an epidemiological link to a confirmed case associated with one of the three schools.

Ill persons were interviewed to assess symptoms, onset date, duration of cough, and vaccination status. Antibiotic prophylaxis was recommended for household and high-risk contacts of ill persons. A high risk contact was defined as an individual who was in contact with a person with confirmed or probable pertussis who may be at risk for developing severe disease

or those who may expose persons at high risk for severe disease. This includes infants less than 12 months old, pregnant women in the third trimester of pregnancy, and all persons with pre-existing health conditions that may be exacerbated by a pertussis infection (i.e. immunocompromised individuals and individuals with moderate to severe medically treated asthma).

In accordance with Kansas Administrative Regulation (K.A.R.) 28-1-6, each case of pertussis in a student or staff member was excluded from school for three weeks after cough onset or until a five-day course of antibiotics was completed.

A susceptible contact was defined as a student who had not received any doses of pertussis containing vaccine and was exposed to an ill person with pertussis. According to K.A.R. 28-1-20, all persons that attend a school or childcare setting operated by a school in Kansas are required to be vaccinated against specific diseases. In Kansas, five doses of pertussis-containing vaccine are required for children in kindergarten through grade seven (four doses are acceptable if the fourth dose is given after the fourth birthday) and a single dose of Tdap is required at Grades 7-12 if no previous history of Tdap vaccination regardless of interval since the last vaccination.

In accordance with K.A.R. 28-1-6, susceptible contacts were either vaccinated within 24 hours of notification to KDHE or excluded for 21 days after the onset of the last reported case.

Results

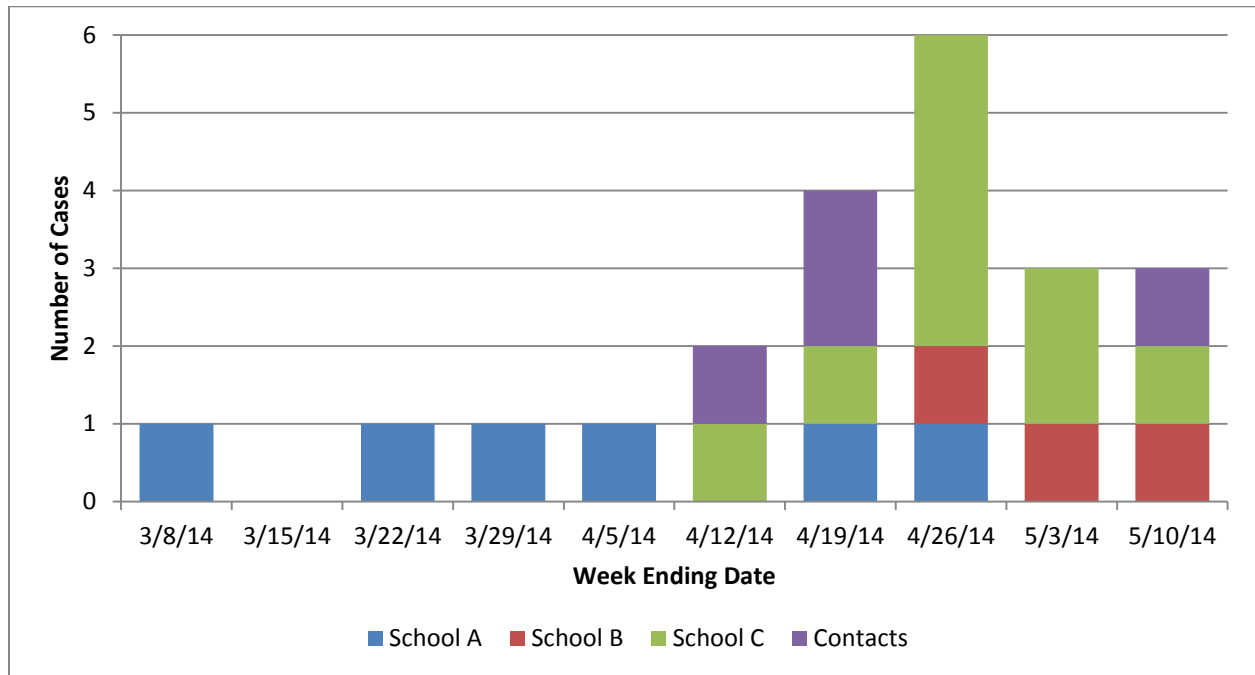
There were 17 confirmed cases identified; fifteen were PCR-positive for *Bordetella pertussis* and two were culture positive. Additional five cases were classified as probable. A total of 74 susceptible contacts were identified and chemoprophylaxis was recommended (Table 1). Two of the individuals who were identified as susceptible contacts eventually became symptomatic with pertussis. The index case was in a student at School A (Figure 1).

Table 1: Number of cases and contacts per setting

Setting	Number of Cases (%) (n=22)	Number of Contacts (%) (n=74)
School A	6 (27.2)	27 (36.5)
School B	3 (13.6)	10 (13.5)
School C	9 (40.9)	30 (40.5)
Contacts	4 (18.2)	7 (9.5)

The outbreak was declared over on June 18, 42 days past the last ill person's cough onset date.

Figure 1: Probable and confirmed pertussis cases associated with persons in three schools, by week of cough onset date (n=22)



Ill persons ranged from one to 41 years of age with a median of 14.5 years (Table 2). Twelve were male (54.5%).

Table 2: Distribution of case-patients by age group (n=22)

Age Group	Number of Cases (%)
0-10 years	4 (18.2)
10-14 years	7 (31.8)
15-19 years	9 (40.9)
20+ years	2 (9.1)

Complete clinical information was available for 21 of the 22 cases. Twenty-two experienced a paroxysmal cough and 9 reported post-tussive vomiting (Table 3). No hospitalizations were reported.

Table 3: Clinical information for probable and confirmed cases (n=22)

Symptoms	Cases with Symptoms (%)
Cough	22 (100.0)
Paroxysmal Cough	22 (100.0)
Post-tussive Vomiting*	9 (42.9)
Apnea*	1 (4.8)
Cyanosis*	0 (0.0)

* Symptoms unknown for one ill individual

Vaccination records were available for 20 of the 22 cases. Nineteen (95.0%) cases were vaccinated against pertussis. One case, not of school age, was unvaccinated due to religious exemption (Table 4).

Table 4: Number of pertussis-containing vaccines received among Ill Persons (n=20*)

<i>Number of DTaP/Tdap Previously Received</i>	<i>Number of Cases (%)</i>
0	1 (5.0)
1	0 (0.0)
2	0 (0.0)
3	0 (0.0)
4	4 (20.0)
5	6 (30.0)
6	9 (45.0)

* Vaccination status unknown for two ill persons

Conclusions

During the course of the outbreak, 22 cases of pertussis were identified among students and faculty in three schools in Montgomery County as well as among community contacts of these persons. The disease onset of the index case in the school district occurred in a student on March 8, 2014 with additional reports of pertussis reported among students in two other schools. The index case was initially diagnosed with bronchitis, which caused a two-week delay in pertussis testing. By the time the positive pertussis laboratory result was reported, the child had been coughing for 18 days. This delay may have created additional opportunities for disease transmission.

School nurses at all three schools reviewed the vaccination status of all contacts of persons with pertussis. Letters were sent home with students on April 6th to ensure that parents were aware of pertussis at the school and to contact their medical provider if their child developed pertussis-like symptoms. Another letter was sent on April 26th after a second school was affected. The MCHD issued a press release and sent a letter to all medical providers in the county on April 27th to increase community awareness of pertussis.

The pertussis vaccine is a safe, effective way to prevent disease. The Advisory Committee for Immunization Practices (ACIP) recommends DTaP at 2 months, 4 months, 6 months, 15-18 months, and 4-6 years as well as a Tdap booster at 11-12 years.¹ The Centers for Disease Control and Prevention (CDC) estimates that at least 9 out of 10 children are fully protected from pertussis when they receive the five recommended doses of DTaP on schedule; vaccination also lowers the likelihood of a severe infection.² There is a modest decrease in vaccine effectiveness in each year following the completion of the five dose series, which may result in previously vaccinated individuals developing pertussis. Roughly 7 out of 10 kids are

fully protected 5 years after getting their last dose of DTaP. For children in middle school one dose of Tdap between the ages of 11 and 12 years old is recommended to account for waning vaccine effectiveness of the DTaP series, which may reduce morbidity and transmission to at-risk populations.^{3,4}

The children with the earliest onset of symptoms in this outbreak were between the ages of 12 and 14, which is the age group required to receive the second dose of Tdap. Considering that only one of the four initial cases had the recommended number of doses of pertussis-containing, waning vaccine effectiveness over time could have contributed to the spread of disease. This also solidifies the importance of being up-to-date on immunizations among the adolescent population.

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¹ Centers for Disease Control and Prevention. Use of Diphtheria Toxoid-Tetanus Toxoid-Acellular Pertussis Vaccine as a Five-Dose Series. Supplemental Recommendations of the Advisory Committee on Immunization Practices (ACIP). MMWR 2000;49(RR-13):1-8. Accessed October 21, 2014,

<http://www.cdc.gov/mmwr/preview/mmwrhtml/rr4913a1.htm>

² Centers for Disease Control and Prevention. Pertussis: Frequently Asked Questions. Accessed October 21, 2014,

<http://www.cdc.gov/pertussis/about/faqs.html>

³ Centers for Disease Control and Prevention. Preventing Tetanus, Diphtheria, and Pertussis Among Adolescents: Use of Tetanus Toxoid, Reduced Diphtheria Toxoid and Acellular Pertussis Vaccines. Recommendations of the Advisory Committee on Immunization Practices (ACIP). MMWR 2006;55(RR-03):1-34. Accessed October 21, 2014,

<http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5503a1.htm>

⁴ Centers for Disease Control and Prevention. Preventing Tetanus, Diphtheria, and Pertussis Among Adults: Use of Tetanus Toxoid, Reduced Diphtheria Toxoid and Acellular Pertussis Vaccine. Recommendations of the Advisory Committee on Immunization Practices (ACIP) and Recommendation of ACIP, supported by the Healthcare Infection Control Practices Advisory Committee (HICPAC), for Use of Tdap Among Health-Care Personnel. MMWR 2006;55(RR-17):1-33. Accessed October 21, 2014, <http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5517a1.htm>