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### **Arizona Vaccine News**

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## NEWS ABOUT PERTUSSIS VACCINE AND PERTUSSIS

### **Banner Year for Pertussis in Arizona and the United States**

- Arizona had [984](#) cases of pertussis and one infant death in 2012 according to data as of February 7, 2013. This was the first infant death in Arizona from pertussis since [2009](#) when there were two deaths.
- Arizona had [1,108](#) cases of pertussis in 2005, but then cases dropped to [210](#) in 2007. Cases have been rising steadily since then. Arizona had [546](#) cases of pertussis in 2010 and [867](#) cases of pertussis in 2011.
- The United States has reported 41,880 cases of pertussis in 2012 according to data available in *Morbidity and Mortality Weekly Report* (MMWR), [January 4, 2013](#). This represents the largest number of pertussis cases since 1955. (See [Appendix G-1](#) in *Epidemiology and Prevention of Vaccine-Preventable Diseases*, 12<sup>th</sup> edition for cases of and deaths from vaccine-preventable diseases since 1950.)
- The surge in pertussis cases is likely due to increased clinician awareness, better diagnostic tools, and waning vaccine immunity in adolescents and adults. See *New England Journal of Medicine* (NEJM), [August 30, 2012](#).

### **CDC Recommends Pertussis Vaccine for Pregnant Women during Every Pregnancy**

- In the [October 21, 2011](#) issue of the MMWR, tetanus, diphtheria, and acellular pertussis vaccine (Tdap) was recommended for use in pregnant women, preferably in the 3<sup>rd</sup> trimester or late 2<sup>nd</sup> trimester (after 20 weeks gestation).
- On October 24, 2012, the Advisory Committee on Immunization Practices (ACIP) of the Centers for Disease Control and Prevention (CDC) voted to recommend tetanus toxoid, reduced diphtheria toxoid and acellular pertussis vaccine (Tdap) for pregnant women with every pregnancy irrespective of previous Tdap history. An ACIP vote is a provisional recommendation until it is approved by the CDC. (See CDC's webpage of the ACIP [provisional recommendation](#)).
- ACIP provisional recommendations become official CDC recommendations once they are published in the MMWR.
- To maximize the maternal antibody response and passive antibody transfer to the infant, ACIP said that the *optimal timing* for Tdap administration is between 27 and 36 weeks gestation.
- For women not previously vaccinated with Tdap, if Tdap is not administered during pregnancy, Tdap should be administered immediately postpartum.

### **Contest for Health-Care Providers (HCPs) to Achieve 100% Staff Tdap Vaccination**

- Arizona Partners Against Pertussis (APAP) has launched a statewide campaign to encourage all HCPs and staff to get pertussis vaccine (Tdap).
- Employers who enroll and achieve a 100% Tdap immunization rate among their staff by April 1, 2013 will be entered into a random drawing to receive an iPad or one of five \$100 gift cards.
  - As of 2010, only about 20% of HCPs in the United States had received Tdap. (See MMWR, [February 3, 2012](#)).
  - HCPs of all ages should receive a single dose of Tdap if they have not previously received it, regardless of the time since the last tetanus-diphtheria (Td) vaccine dose. (See MMWR, [November 25, 2011](#)).

For more information, and to sign up to participate in the APAP campaign, go to The Arizona Partnership for Immunization (TAPI) website at <http://www.whyyimmunize.org/APAP>.

### **PERTUSSIS AND PERTUSSIS VACCINE LITERATURE**

#### **Risk Factors for Pertussis Complications in Older Adults**

- In a prospective study of 263,094 Australian adults over 45 years old, 205 adults were identified with pertussis. Five percent of these pertussis patients were hospitalized.
- Older patients were more likely to be hospitalized, although the incidence of pertussis did not differ by age.
- In patients over 65 years, 11.5% were hospitalized due to pertussis, in contrast to 2.4% of those between 45-64 years old.
- Patients with pertussis were 50-60% more likely to have obesity, preexisting asthma, or to be taking medications or supplements.

See the abstract in *Clinical Infectious Diseases*, [December 1, 2012](#).

#### **Association of Childhood Pertussis with Not Receiving 5 Doses of Pertussis Vaccine and by Time since Last Vaccine Dose**

- During the 2010 California pertussis epidemic, many pertussis cases occurred in the 7- to 10-year-old age group despite high diphtheria, tetanus, and acellular pertussis vaccine (DTaP) coverage, suggesting waning immunity.
- A case control study of children 4-10 years old measured the time since completion of the 5-dose DTaP series, and the association between pertussis infection and whether the child had received the entire 5-dose DTaP series.
- As time increased since the 5<sup>th</sup> DTaP dose, the odds of getting pertussis increased, consistent with waning pertussis immunity each year after the final dose of DTaP.
- Children with pertussis infection were less likely to have received the entire 5-dose DTaP series.

See the *Journal of the American Medical Association* (JAMA), [November 28, 2012](#).

#### **Parental Refusal of Pertussis Vaccination Is Associated with an Increased Risk of Pertussis Infection in Children**

- Children who had not been vaccinated against pertussis were **23** times more likely to get pertussis than those who had been vaccinated.
- 11% of all pertussis cases were attributed to parental vaccine refusal.

See *Pediatrics*, [June 2009](#).

## **Individual and Community Risk of Pertussis and Measles Associated with Personal Exemptions to Immunizations**

- The risk of pertussis and measles cases were examined among Colorado children ages 3–18 years during 1987–1998 based on whether the children were vaccinated or unvaccinated due to personal exemptions.
- Exemptors were **5.9** times more likely to acquire pertussis and 22.2 times more likely to acquire measles than were vaccinated children.
- Schools with pertussis outbreaks had more exemptors than schools without outbreaks.

See the JAMA, [November 27, 2000](#).

## **Epidemic Pertussis in 2012—The Resurgence of a Vaccine-Preventable Disease**

- Whole cell pertussis immunization greatly decreased the burden of pertussis in the United States. Pertussis went from an average incidence of 157 cases per 100,000 population in the early 1940s to less than 1 per 100,000 in 1973.
- When adolescents and adults have prolonged cough, 13-20% of these illnesses are attributable to *Bordetella pertussis* infection.
- Cycles of pertussis outbreaks continue to occur, because neither infection nor immunization produces lifelong immunity to pertussis.
- Around 1982, the incidence of pertussis started to gradually increase; in 2005 and 2010, substantial epidemics occurred, and another epidemic is now under way.

For the full article, see the NEJM, [August 30, 2012](#).

## **Pertussis in Unvaccinated Infants Admitted for Bronchiolitis**

- Finnish investigators tested for *Bordetella pertussis* and viral infections in 142 infants less than 6 months old who were hospitalized for bronchiolitis.
- Co-infection of viruses with *B. pertussis* was present in 8.5% (N=12 of infants with clinical bronchiolitis).
- Coughing spells were more common in pertussis positive infants (41.7%) than in pertussis negative infants (14.7%). Otherwise, there were no clinical differences for those with only viral infections compared with those with co-infection with *B. pertussis*.
- Pertussis should be considered in all unvaccinated infants admitted for lower respiratory tract infections.

See the abstract in *Pediatric Infectious Disease Journal* (PIDJ), [November 2010](#).

## **Waning Protection after Acellular Pertussis Vaccines**

- The risk of pertussis in California children in relation to the time since their 5<sup>th</sup> dose of DTaP was measured from 2006 to 2011. Children who received whole-cell pertussis vaccine during infancy or who received any pertussis-containing vaccine after their 5<sup>th</sup> dose of DTaP were excluded from the study.
- Pertussis PCR-positive children were more likely to have received the 5<sup>th</sup> DTaP dose at a further distance in the past than children who were pertussis PCR-negative.
- Protection against pertussis waned during the 5 years after the 5<sup>th</sup> dose of DTaP with the odds of acquiring pertussis increasing by an average of 42% per year.

See the abstract from the NEJM, [September 13, 2012](#).

## CDC Updates Recommendations for Use of Tdap in Adults including Aged 65 Years and Older

- All adults aged 19 years and older who have not yet received a dose of Tdap should receive a single dose.
- Providers may administer either of the two brands of Tdap vaccine that they have available to all adults, including those 65 years and older.
- For tetanus prophylaxis in wound management for adults, Tdap is preferred over Td for in adults aged 19 years and older who have not received Tdap previously.
- Tdap should be administered regardless of interval since last tetanus or diphtheria toxoid-containing vaccine. After receipt of Tdap, persons should continue to receive Td for routine booster immunization against tetanus and diphtheria.
- ACIP has begun discussions on the need for additional doses of Tdap and the timing of revaccination of persons who have received Tdap previously.

See the MMWR, [June 29, 2012](#).

## EPIDEMIOLOGY OF PERTUSSIS

### Epidemiology of Pertussis

- Pertussis outbreaks tend to occur every 3-5 years.
- Pertussis is highly contagious through respiratory droplets.
- The incubation period of pertussis is 7-21 days.
- Immunity from pertussis vaccine wears off with time, so most adults and teenagers are susceptible to pertussis unless they have had a Tdap vaccine.

### The Problem of Pertussis in the United States

- In spite of childhood vaccination, pertussis is a common infection in the United States.
- People of any age can get infected with pertussis, but almost all the deaths from pertussis in the US are in infants under 12 months old. Infants are susceptible to pertussis from their first day of life.
- Since 2004, every year in the US there has been an average of 3,055 infant pertussis cases with more than 19 deaths. See MMWR, [October 21, 2011](#).
- Pertussis has been gradually increasing since the early 1980s. A total of 27,550 pertussis cases and 27 pertussis-related deaths were reported in 2010. See *Epidemiology and Prevention to Vaccine-Preventable Diseases*, 12<sup>th</sup> edition. [Pertussis](#).
- One study showed that 75% of infants with pertussis were infected by family members. Mothers were the source 32% of the time. Fathers were source 15% of the time, siblings were the source 20% of the time, and grandparents were the source 8% of the time. See the abstract in the PIDJ, [November 2004](#).

### The Problem of Pertussis in Arizona

- Arizona's last large outbreak of pertussis was in 2005. That year there were 1,108 pertussis cases and 1 infant death due to pertussis.
- Identified cases of pertussis represent only a small fraction of people who actually are infected with pertussis.

| Pertussis in AZ                     | 2005  | 2006 | 2007 | 2008 | 2009                             | 2010 | 2011 | 2012* |
|-------------------------------------|-------|------|------|------|----------------------------------|------|------|-------|
| Cases                               | 1,108 | 508  | 210  | 218  | 277                              | 546  | 867  | 984   |
| Deaths (all infants)                | 1     | 0    | 0    | 1    | 2                                | 0    | 0    | 1     |
| Source: AZ Dept. of Health Services |       |      |      |      | *Provisional data as of 2/7/2013 |      |      |       |

## DIAGNOSIS AND TREATMENT OF PERTUSSIS

### **Approach to Diagnosing and Treating Pertussis**

- Full blown whooping cough is fairly easy to diagnose when there are severe paroxysms of coughing, often accompanied by post-tussive vomiting or an inspiratory whoop.
- Subtle early symptoms of pertussis are a cough that has been increasing over a week or more in an otherwise afebrile and nontoxic patient.
- If you suspect that a patient could have pertussis, notify your county or tribal health department for assistance in testing and epidemiologic investigation. Obtain a nasopharyngeal swab for pertussis culture and/or polymerase chain reaction (PCR).
- A macrolide antibiotic is the treatment of choice for suspected or confirmed pertussis (azithromycin, clarithromycin, or erythromycin).
- Do not wait for the results of laboratory testing before starting antibiotic treatment.
- Giving appropriate treatment early on in pertussis can decrease the length of illness. Giving antibiotics once the cough paroxysms are fully established can shorten the period of infectivity but usually does not shorten the period of severe coughing.

### **CDC Video Demonstrating Specimen Collection for Pertussis**

- This [CDC video](#) shows the proper way to collect a nasopharyngeal specimen for pertussis testing (culture and/or PCR).
- Contact a commercial laboratory to obtain swabs and transport media for testing.
- Notify your [county health department](#) when you are considering the diagnosis of pertussis and/or when you are testing for pertussis.

### **Serology Is Not a Good Tool for Diagnosis of Acute Pertussis**

- There has been an increase in Arizona providers ordering serology to diagnose pertussis.
- The tests of choice for acute pertussis are nasopharyngeal swabs for culture and/or PCR.
- Serology has limitations because commercially available serologic tests are not FDA approved and antibody levels may not be elevated in the first few weeks of pertussis.

For more information on the laboratory diagnosis of pertussis, see the [CDC pertussis website](#).

| <b>Summary of When to Suspect Pertussis</b>  |                           |  |
|--|---------------------------|--|
| <b>Symptoms</b>  | <b>Level of Suspicion</b> | <b>Actions</b>   |
| Acute febrile respiratory disease  | Low                       | Evaluate as indicated for upper and lower respiratory infections caused by other bacteria, viruses (including influenza), mycoplasma, valley fever, tuberculosis, etc. |
| Toxic appearing patient with respiratory symptoms  | Low                       |  |
| Runny nose and cough that are worst in the first few days                                      | Low                       |  |
| Any cough or cold-like symptoms in someone with known exposure to pertussis                    | Moderate                  | →Contact local or county health department about possible pertussis<br>→Nasopharyngeal swab for pertussis for culture and/or PCR                                       |
| Escalating cough in a non-toxic and afebrile patient   | High                      | →Macrolide antibiotic (e.g. azithromycin, clarithromycin, erythromycin)  |
| Severe, paroxysmal cough that has worsened over several weeks in an otherwise non-toxic person | High                      | →Droplet isolation until 5 full days of effective antibiotics  |

## GUIDANCE ON PERTUSSIS VACCINATION

### **Places for Adults to Get Tdap Vaccines**

- Many adults can get pertussis vaccine (Tdap) through their health care provider, although not all adult health care providers carry Tdap in their offices.
- Arizona pharmacies can give most immunizations (including Tdap) to adults without a prescription.
- Pharmacies often charge cash for vaccines due to insurance contract issues, although this can vary by pharmacy. The retail cost of Tdap is generally \$65-\$70. Call ahead for insurance and cost questions.
- There are additional locations where adults can get Tdap besides their health care provider's office or pharmacies. However, there may be a charge depending on their health insurance status, so call ahead for insurance and cost questions. These locations include:
  - Travel or immunization clinics.
  - [County health departments](#).
  - [Community health centers](#).
  - Indian Health Service sites for Native Americans.
- There are no locations in Arizona that routinely offer free Tdap for uninsured adults. However, "2-1-1 Arizona" is a 24 hour a day community information and referral service that may be able to help people to find where to get vaccines. See [www.cir.org](http://www.cir.org) (under Health and Dental Care), or call 2-1-1 within Arizona, or 1-877-211-8661 from anywhere.
- The Arizona Partnership for Immunizations ([TAPI](#)) also has a site with detailed information about where to go for shots.

### **Pertussis Vaccination after a History of Pertussis**

- Teenagers or adults with a history of pertussis still need a single dose of Tdap since immunity following pertussis infection is not permanent.
- When young children have had a documented pertussis infection, they may have received just diphtheria and tetanus vaccine (DT) instead of the childhood pertussis vaccine (DTaP) to finish their childhood tetanus and diphtheria vaccination series. However, even pertussis-infected children will eventually need a Tdap booster as a teenager.
- When a child is suspected to have had a pertussis infection, but their laboratory testing was negative for pertussis, it is reasonable to use DTaP to complete their childhood tetanus and diphtheria series.

See *Epidemiology and Prevention of Vaccine-Preventable Diseases*, 12<sup>th</sup> ed., [Pertussis](#), p. 225.

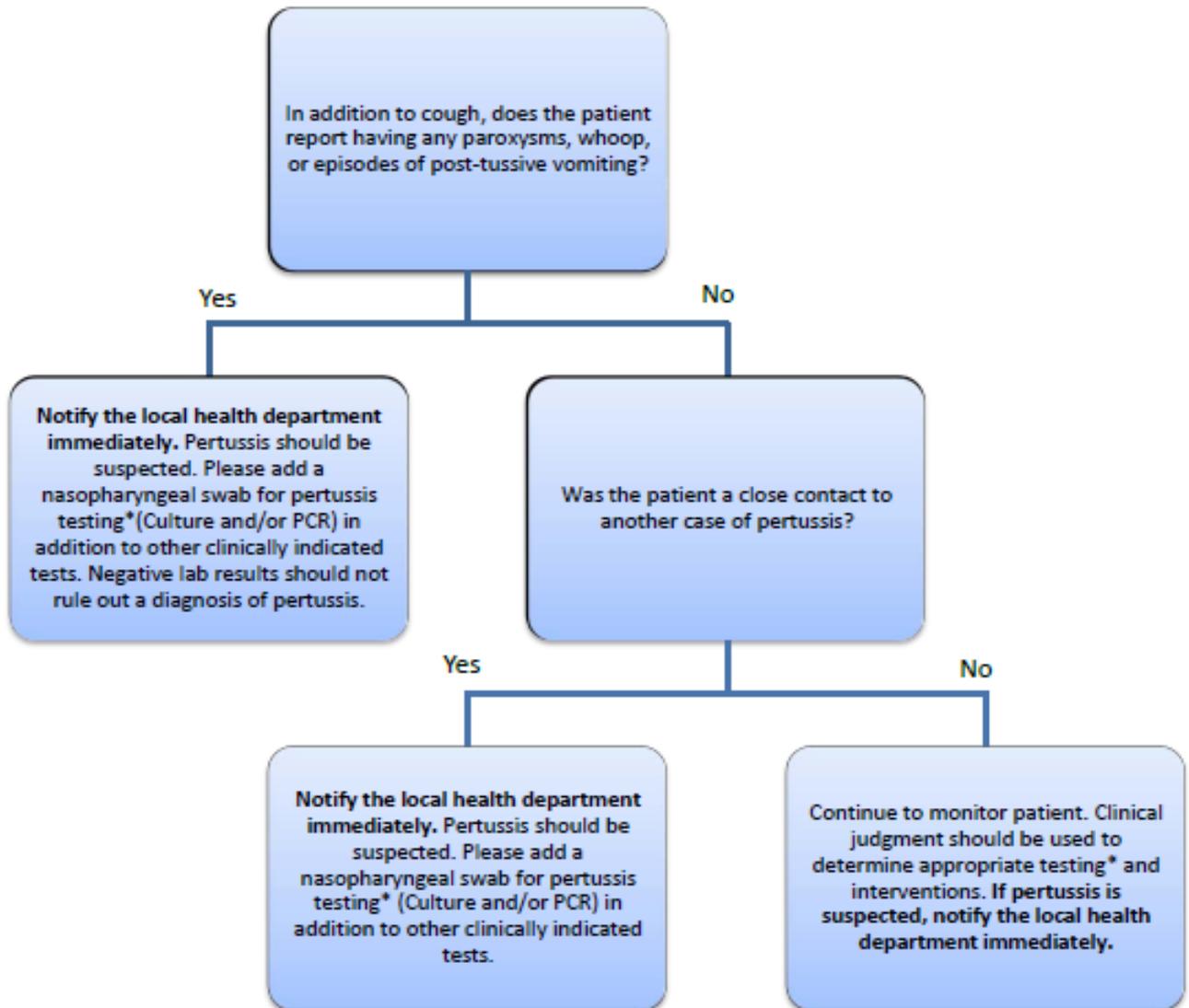
## ADDITIONAL CDC PERTUSSIS VACCINE AND PERTUSSIS REFERENCES

- Centers for Disease Control and Prevention (CDC). *Epidemiology and Prevention of Vaccine-Preventable Diseases*, 12<sup>th</sup> Edition. Pertussis, Chapter 15. <http://www.cdc.gov/vaccines/pubs/pinkbook/downloads/pert.pdf>
- CDC. Tdap for Pregnant Women Website. <http://www.cdc.gov/vaccines/vpd-vac/pertussis/tdap-pregnancy-hcp.htm>
- CDC. Updated Recommendations for Use of Tetanus Toxoid, Reduced Diphtheria Toxoid, and Acellular Pertussis (Tdap) Vaccine in Adults Aged 65 Years and Older. MMWR, June 29, 2012. [http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6125a4.htm?s\\_cid=mm6125a4\\_w](http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6125a4.htm?s_cid=mm6125a4_w)
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- CDC. Prevention of Pertussis, Tetanus, and Diphtheria Among Pregnant and Postpartum Women and Their Infants. MMWR, May 30, 2008. <http://www.cdc.gov/mmwr/PDF/rr/rr5704.pdf>
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- CDC. Recommended Antimicrobial Agents for Treatment and Postexposure Prophylaxis of Pertussis. MMWR December 9, 2005. <http://www.cdc.gov/mmwr/PDF/rr/rr5414.pdf>

- Please feel free to distribute ADHS' *Arizona Vaccine News* to any of your partners who may be interested. Past issues of *Arizona Vaccine News* can be found at: <http://www.azdhs.gov/phs/immun/index.htm>

## Algorithm for Pertussis Laboratory Testing (Cough Illnesses)

*Typical characteristics of pertussis include a worsening cough  
in a non-toxic and afebrile patient.*



*\* Serologic testing is not the preferred method of testing for pertussis.*



**ADHS Algorithm for Pertussis Laboratory Testing (Cough Illnesses)  
Supplemental Information**

**Updated 11/6/2012**

A high index of suspicion combined with early clinical diagnosis, treatment, and reporting of suspected cases is recommended for optimal control of pertussis infection. Providers are asked to report to their local health department *as soon as pertussis is suspected and especially if testing is ordered*, so that the health department may promptly initiate investigation and, if needed, begin control measures.

1. Consider pertussis in patients that present with or report history of cough and at least one of the following:
  - Cough that is increasing in severity
  - Cough that includes history of paroxysms, post-tussive vomiting, and/or inspiratory whoop
  - Cough with cyanosis
  - Cough in patients with close contacts who are also having or recently had similar pertussis-like symptoms. These could be family contacts, friends, school contacts, or work contacts.
  - Any other presentation that would increase clinical suspicion of pertussis infection, such as sleep disturbance or exhaustion attributed to coughing attacks.
  
2. If pertussis is suspected:
  - Report suspected case to your local health department, who can advise regarding testing and can assist with contact investigation and contact prophylaxis if needed.
  - Collect nasopharyngeal swabs for pertussis culture and/or PCR. Swabs and appropriate media can be obtained by contacting your local commercial laboratory. Culture and PCR are the methods of testing preferred by the Arizona Department of Health Services. Serologic testing is not a replacement for culture or PCR testing. For instructions on how to appropriately take and submit a nasopharyngeal swab, please see the link to CDC instructional videos located at the end of this document in the "Additional Resources" section.
  - On a case by case basis, nasopharyngeal swabs for pertussis culture testing may be requested at the Arizona State Public Health Laboratory. Testing can be arranged by contacting your local health department.
  - Testing should not be done if symptoms are not present. It is unlikely that the organism will be recovered through testing if no symptoms are present.
  - If pertussis is suspected, physicians should prescribe antibiotics to reduce the severity and duration of symptoms and decrease communicability. The following antibiotics are recommended for pertussis treatment: azithromycin, erythromycin, and clarithromycin. Where possible, please remember to collect nasopharyngeal specimens for pertussis testing prior to prescribing antibiotics. Treatment of suspected pertussis should be started immediately and not deferred due to pending laboratory tests. More information regarding treatment of pertussis cases may be obtained by contacting your local health department or by consulting the CDC MMWR release on pertussis treatment in the "Additional Resources" section at the end of this document.
  - If you are aware of any contacts to the suspected case that have symptoms suggestive of pertussis, please notify your local health department of these contacts so that they may investigate.
  - CDC recommends that close contacts of pertussis cases received antimicrobial therapy. If possible, physicians may want to consider providing prophylaxis to family members of a suspected pertussis case.