

# Pertussis (Whooping Cough)



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# Pertussis History

- In 1906 Belgian scientists, Jules Bordet and Octave Gengou isolated the bacteria that causes Pertussis (*Bordetella pertussis*).
- Before the vaccine in the 20th century, pertussis was one of the most common childhood diseases and a major cause of childhood mortality in the United States.
- Before the availability of pertussis vaccine in the 1940s, more than 200,000 cases of pertussis were reported annually.
- Since widespread use of the vaccine began, incidence has decreased more than 80% compared with the prevaccine era.

# Pertussis Vaccine History

- In 1944 American Academy of Pediatrics endorses use of Pertussis Vaccine.
- In 1948 DTP (Diphtheria, Tetanus, Pertussis) was introduced.
- DTP was a whole cell Pertussis vaccine which caused some adverse reactions.
- In 1991 DTap (an acellular vaccine containing only parts of the bacteria) was approved for the 4<sup>th</sup> and 5<sup>th</sup> vaccination in the series.
- In 1999 (some literature states 1997) DTap was approved for the entire series.
- In 2005 Tdap was approved for use in Adults and adolescents.

# Pertussis Clinical Features

- **Catarrhal Stage**-Coryza (runny nose), low grade fever, mild sore throat, mild cough becoming more severe after 1-2 weeks.
- **Paroxysmal Stage**- Case has a fit of rapid severe coughs (paroxysms) followed by cyanosis (turning blue), vomiting, exhaustion, whoop (may be absent in adults or older children), or fainting in older individuals. In between coughing fits the case feels fine. Attacks may occur more frequently at night. Generally this phase lasts 2-3 weeks (may be as long as 6 weeks).
- **Convalescent Stage**- Paroxysms occur less frequently. This stage lasts 2-3 weeks but paroxysms may return with respiratory illness.
- Adults, adolescents and vaccinated children may have a milder form of the illness.

# Pertussis in Infants

- According to the CDC the primary reason for pertussis outbreak control is to prevent morbidity and mortality in infants.
- Infants often have apnea (pause in breathing) which can be very dangerous.
- About one half of infants less than one year old with Pertussis will be hospitalized.
- One in 4 infants who are hospitalized for Pertussis will develop pneumonia.
- Other complications are seizure, brain damage and death.
- The best protection is vaccination of the community and those closest to the infant.

# Differentiating Pertussis from other illnesses

- Other illnesses that can resemble of Pertussis
- Adenovirus
- RSV (Respiratory syncytical virus)
- Mycoplasma pneumoniae
- Chlamydia pneumoniae
- Bordetella parapertussis
- And rarely Bordetella holmseii or Bordetella bronchiseptica.

# Differentiating Pertussis from other illness

- Pertussis symptoms:
  - Lack of fever or low grade fever
  - Lack of productive cough (unable to bring up sputum)
  - Lack of pharyngitis (no severe sore throat)
  - Feeling normal in between coughing episodes.
  - Fits of coughing often occurring more at night. (not the occasional cough all day long)

# Pertussis Laboratory Tests

- Culture
  - Considered the gold standard
  - Collect 1-4 weeks after onset of symptoms
  - Takes up to 10 days for final results
  - May be negative if collected after antibiotics have been given or collected too late in the illness.
  - Dependent upon correct collection technique (nasopharyngeal swab, not a throat swab).
  - Dependent upon correct storage and transport to the lab.

# Pertussis Laboratory Tests

- PCR (Polymerase Chain Reaction)
  - Increased sensitivity over culture
  - Results are reported more rapidly
  - False positives are a problem in some labs and FDA has not approved any of the PCR tests laboratories use.
  - Affected by the collection process.
  - N/P swab can be contaminated with vaccine Bordatella pertussis in the physician's office or the laboratory.
  - CDC recommends collecting the sample in a clean room where vaccines are not given.

# Pertussis Laboratory Tests

- **DFA** (Direct Fluorescent Antibody)
  - Rapid Results but low sensitivity.
- **Serology-**
  - When PCR and culture can not be performed, physicians request serology.
  - Disease and vaccination both remote and recent can both induce IgM, IgG and IgA antibodies.
  - Only a 4 fold increase in IgG from acute to convalescent samples is diagnostic for Pertussis.

# Arizona Department of Health Services (ADHS) Pertussis Case Definitions

- **Confirmed-**
  - **A cough illness lasting at least 2 weeks with at least one of the following:**
    - Paroxysms of coughing, inspiratory "whoop", posttussive vomiting, or (FOR INFANTS AGED <1 YEAR ONLY) apnea (with or without cyanosis), in the absence of a more likely diagnosis. **AND**
    - Culture positive or PCR positive for Pertussis or epidemiologically linked to a confirmed Pertussis Case.
- **Probable-**
  - In the absence of a more likely diagnosis, **A cough illness lasting at least 2 weeks with at least one of the following:**
    - Paroxysms of coughing, inspiratory "whoop," posttussive vomiting, or (FOR INFANTS AGED <1 YEAR ONLY) apnea (with or without cyanosis), in the absence of a more likely diagnosis. **AND**
    - No laboratory confirmation or epidemiological link to a confirmed case.



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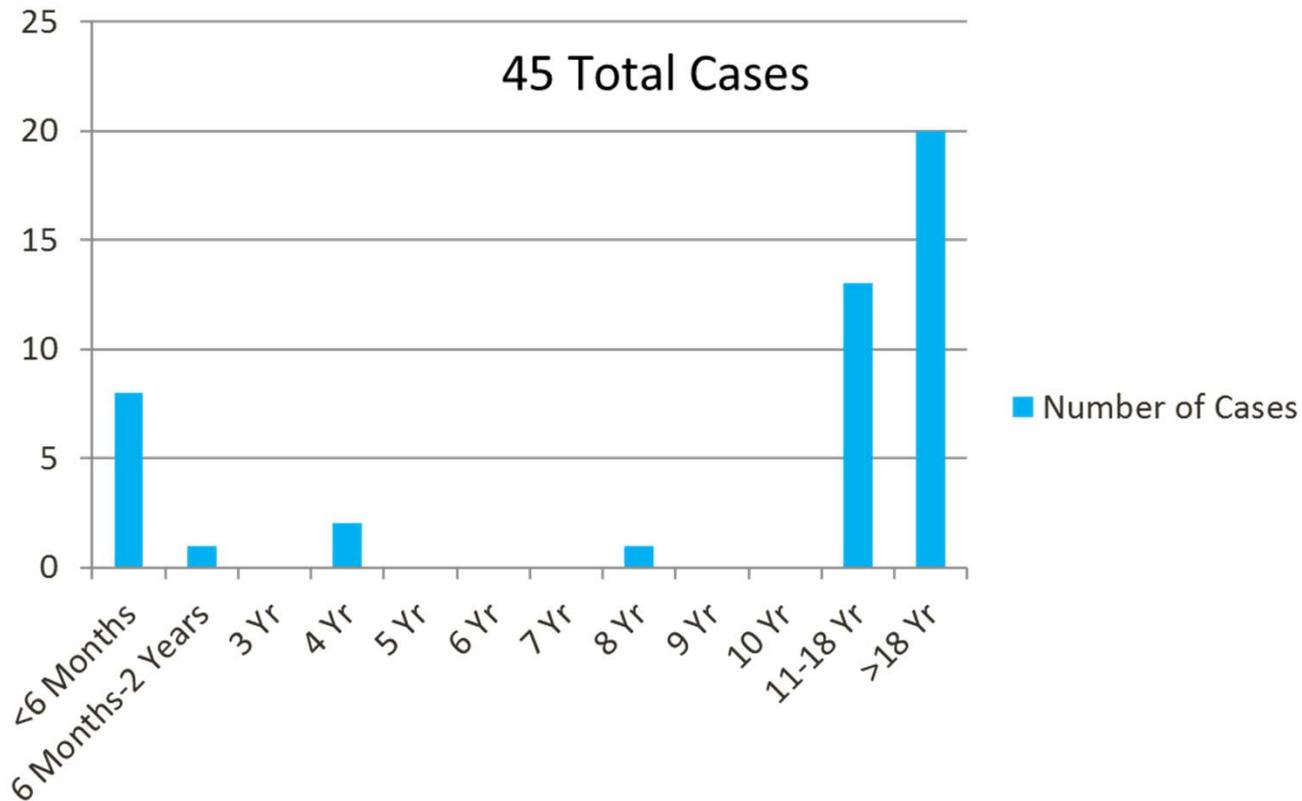
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# Arizona Department of Health Services Pertussis Case Definitions

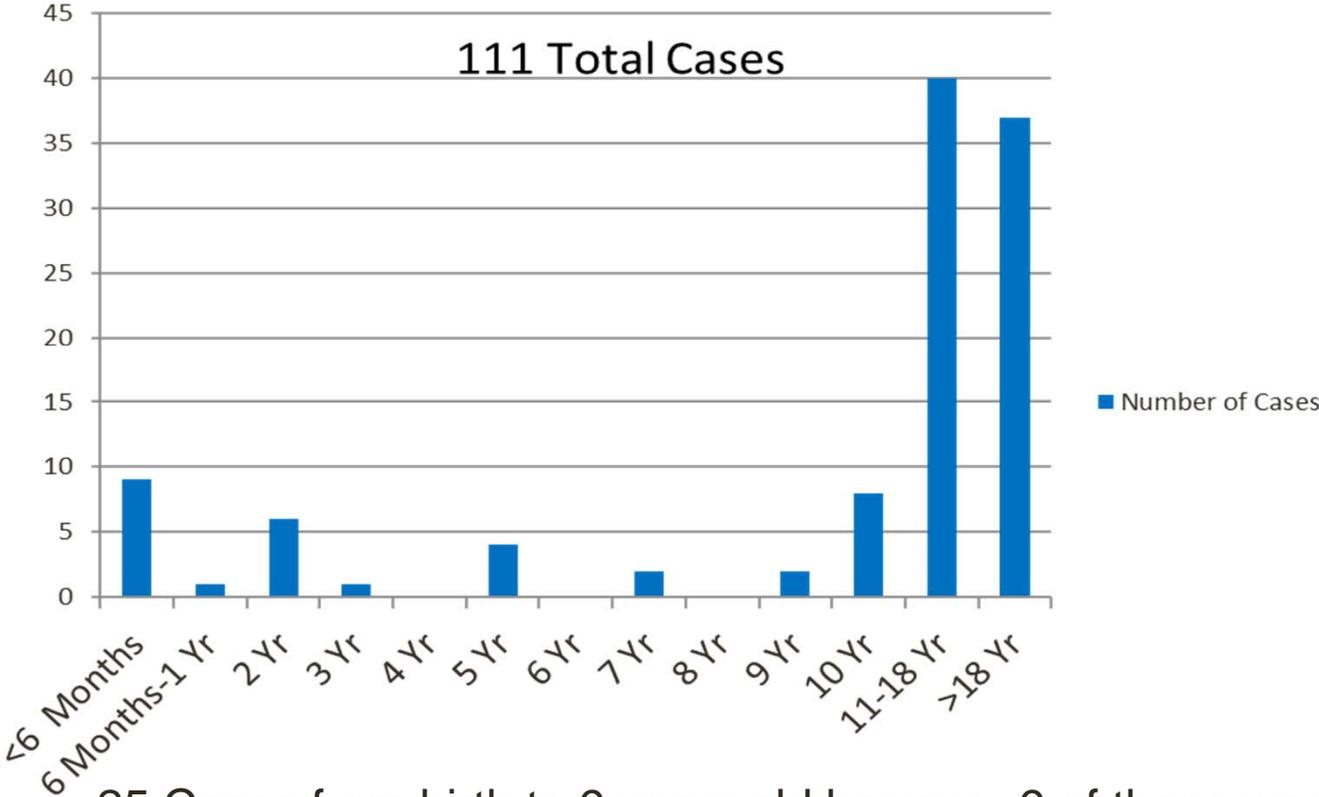
- *Suspect-*
- In the absence of a more likely diagnosis, a case that has positive serological tests against *B. pertussis* with unknown clinical symptoms. Cases with positive serology, in the absence of other positive test pertussis test results, that are known to not meet the clinical case definition should be ruled out.

# Pertussis in Pima County 2012



12 cases from birth to 9 years old however 8 of the 12 were <6 months old had not received 3 DTaps. One case was undervaccinated. Thirteen cases in the next 9 years ages 10-18 years old.

# Pertussis in Pima County 2013



25 Cases from birth to 9 years old however 9 of these were <6 months old and had not received 3 DTaps. Three of these were not vaccinated or under- vaccinated. Forty eight cases in the next 9 years from ages 10-18 years old.



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# Pertussis Graphs

- In both graphs we see Pertussis in children less than two years old since those less than one year may not be fully vaccinated.
- Pertussis wanes in the 2-4 year old group as the children become more fully vaccinated.
- In the 5-9 year olds Pertussis remains decreased but begins to trend upward around age 10 and increases in the 11-18 year old group and adult age group as immunity wanes.
- Pertussis also has a cyclic nature often peaking every 3-5 years.

# Pima County Investigation

- A positive pertussis test is received through the electronic reporting system or from a call from a provider.
- Medical Records are requested to provide a health care professionals description of the illness and also test results including alternative diagnoses.
- The case is interviewed to gather a description of the illness, onset date of the cough, prior exposure to Pertussis, susceptible contacts of the case.
- If case meets the ADHS clinical case definition (symptoms and cough for at least 2 weeks duration) and has positive lab results then we will classify this a confirmed, probable or suspect “Pertussis Case”.

# Pima County Investigation

- The epidemiologist with advice from the Chief Medical Officer may notify household family members of the case and advise prophylactic antibiotic therapy or advise them to visit their physician for diagnosis and treatment.
- If case attends a school or day care center, the facility will be notified so susceptible close contacts can be notified of the exposure and parents can visit with their physician for advice on prophylactic antibiotics, antibiotic treatment, or vaccination.



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# Treatment and Prophylaxis

- **Treatment** of diagnosed cases or suspect cases.
  - Azithromycin (5 day regimen) or Erythromycin (14 day regimen)
  - Respiratory isolation of ill individuals until all antibiotics have been taken.
  - **Symptoms will not disappear since they are caused by a bacterial toxin but case will not be contagious to others and can return to school or work.**
- **Prophylaxis-for close contacts of the case (1 hour within 3 feet of case or household members)**
  - Azithromycin (5 day regimen) or Erythromycin (14 day regimen)
  - **Isolation of close contacts who have a cough until antibiotics are completed.**
  - **Close contacts who have no symptoms may attend school and work while on prophylactic antibiotic therapy.**

# Recommendations for Schools

- Once a confirmed case has been identified, start a cough log in the classroom.
- Exclude confirmed cases or physician suspected cases from school until all antibiotics have been completed.
- Exclude close contacts (classmates, sports teams, band, etc.) of confirmed cases, who exhibit symptoms of Pertussis (coughing), until they have been evaluated by a physician and determined to have a different illness or have finished prophylactic antibiotics.

# Recommendations for Schools

- Close contacts who do not have symptoms may attend school while on prophylactic antibiotic therapy.
- Check school records for the immunocompromised, pregnant, or respiratory debilitated student or teacher **who may have had close contact with the case** and advise them to consult with their physician about prophylaxis.
- Pima County Health Department (PCHD) can provide a letter with a list of symptoms and recommendations to send to parents of classmates of the case.

# Recommendations for Schools

- PCHD recommends only sending the letter to the classmates, sports teams, etc. of the case and not the entire school.
- If it has been determined by the Pima County Health Department in consultation with Arizona Department of Health Services that an outbreak has occurred at a school, students with DTap/Tdap exemptions will be excluded from school until 21 days (incubation period for Pertussis) after the last Pertussis case exposure or until they receive the Pertussis vaccine.