

# **Pertussis Outbreak Management Through Epidemiological Principles**

**The Only Vaccine Preventable Disease  
That Is Increasing in the U.S.**

**Iowa Department of Public Health**

# **Materials for Today**

## **IDPH Pertussis Resources**

- IDPH has posted a Pertussis PowerPoint presentation, additional resources and guidelines at:

**<http://www.idph.state.ia.us/adper/pertussis.asp>**



# Objectives

- **Describe pertussis, the disease**
- **Outline the principles of outbreak investigation and contact tracing, as would also be used in bioterrorism**
- **Discuss testing guidelines**
- **Reference treatment and prophylaxis guidelines**



# Steps in Outbreak Investigation

- **Surveillance**
- **Detection**
- **Verify Diagnosis**
- **Notification**
- **Investigation**
- **Control and Prevention**



# Pertussis

- **Mode of Transmission:** Respiratory droplet and direct contact with respiratory secretions
- **Infectious Agent:** *Bordetella pertussis*
- **Incubation Period:** 5-10 days (up to 21 days)
- **Infectious Period:** prior to cough onset and up to 21 days after the cough starts (generally during catarrhal and paroxysmal periods)



# Clinical Presentation

Pertussis has 3 characteristic stages:

- **Catarrhal: Upper respiratory infection, cough becomes more persistent, fever usually absent. 2 weeks**
- **Paroxysmal: Bursts or paroxysms of spasmodic cough with or without post-tussive vomiting. Inspiratory whoop. 1-6 weeks**
- **Convalescent: Symptoms gradually resolve over weeks to months. Even after proper treatment the patient may continue to cough, even though they are no longer contagious.**



# Pertussis

- **Pertussis should be considered when evaluating any patient with an acute cough illness characterized by paroxysms, whoop, post-tussive vomiting, or a cough  $\geq$  14 days.**
- **Infants may appear quite ill and present with apnea or cyanosis.**
- **Adults/Teens and vaccinated children often have milder symptoms that mimic bronchitis or asthma.**
- **Appear normal between attacks. Cough is worse at night. Usually have no fever.**



# Clinical Case Definition

**A cough illness lasting  $\geq 14$  days with at least 1 of the following:**

- **Paroxysms of cough.**
- **Inspiratory whoop.**
- **Post-tussive vomiting.**

Without other apparent cause as reported by a health care professional.

This case definition is for reporting only, during outbreaks use common sense on who potentially has pertussis



# **Cases Requiring Follow-Up During an Outbreak**

- Laboratory confirmed - symptoms of pertussis and lab test positive**
- Epi linked – symptoms and contact with a known case during contagious period & within the right incubation period**



# Testing in Iowa

**Specimen from the posterior nasopharynx  
(either wash/aspirate or swab).**

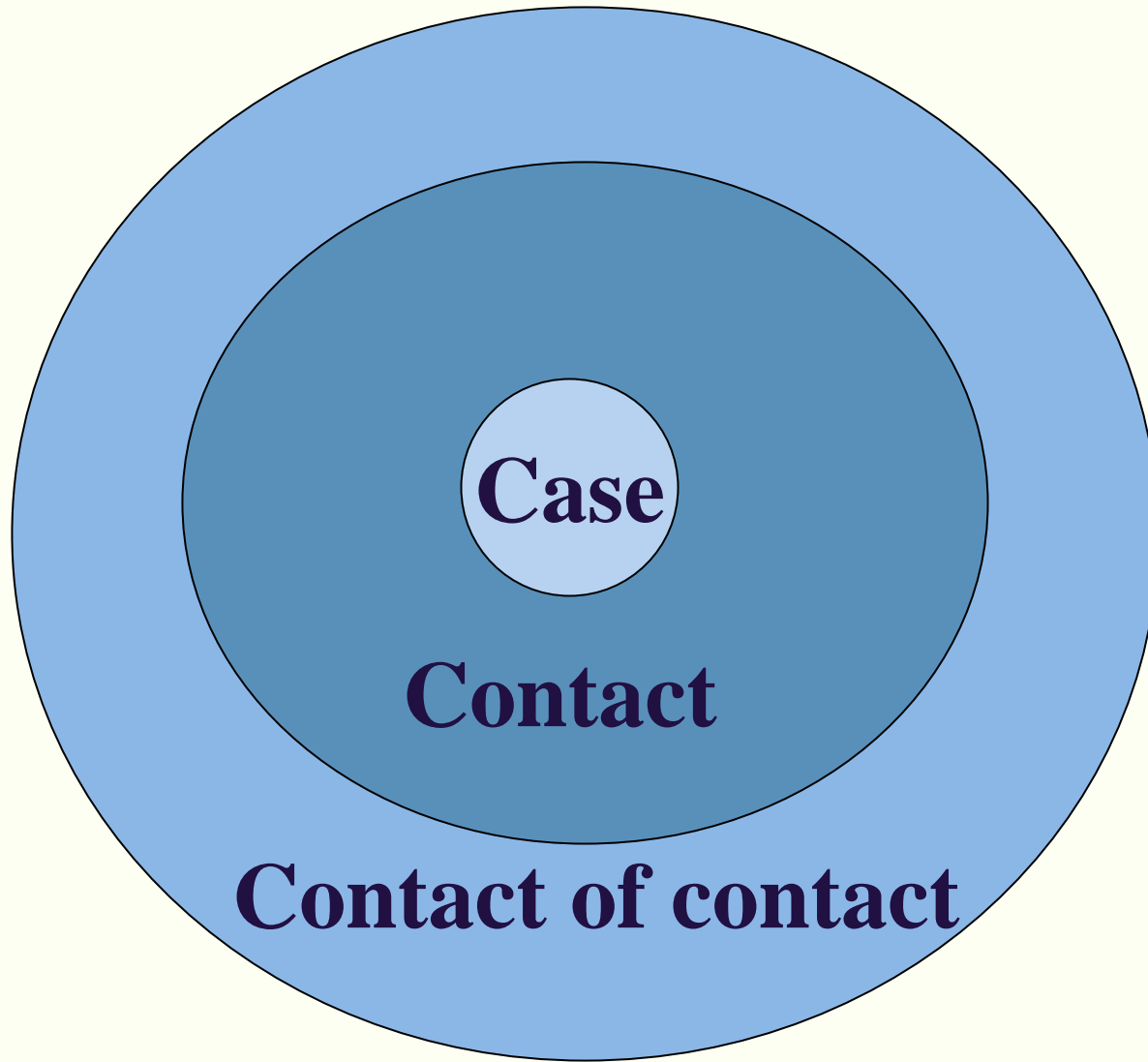
- **PCR (polymerase chain reaction)**
  - **Preferred test done at UHL, free**
- **Culture – Slow and many false negatives**
- **Blood test should not be used**

**No test is 100% correct, thus clinical signs,  
symptoms, and history must also be  
considered.**



# **Who Should Be Tested for Pertussis?**

- Any person presenting with symptoms consistent with pertussis (if a contact of a known case testing not needed)**
- Public health may recommend testing of a couple people once out 2 or more concentric circles from a lab positive case, to ensure that you are still dealing with pertussis**



**Case**

**Contact**

**Contact of contact**



# Who Should **Not** Be Tested for Pertussis?

- **Asymptomatic** persons, regardless of whether there was contact with a case or if there is an outbreak situation.
- The worried well.
- Persons who are **NOT** contacts and have symptoms other than pertussis.



# Pertussis Testing

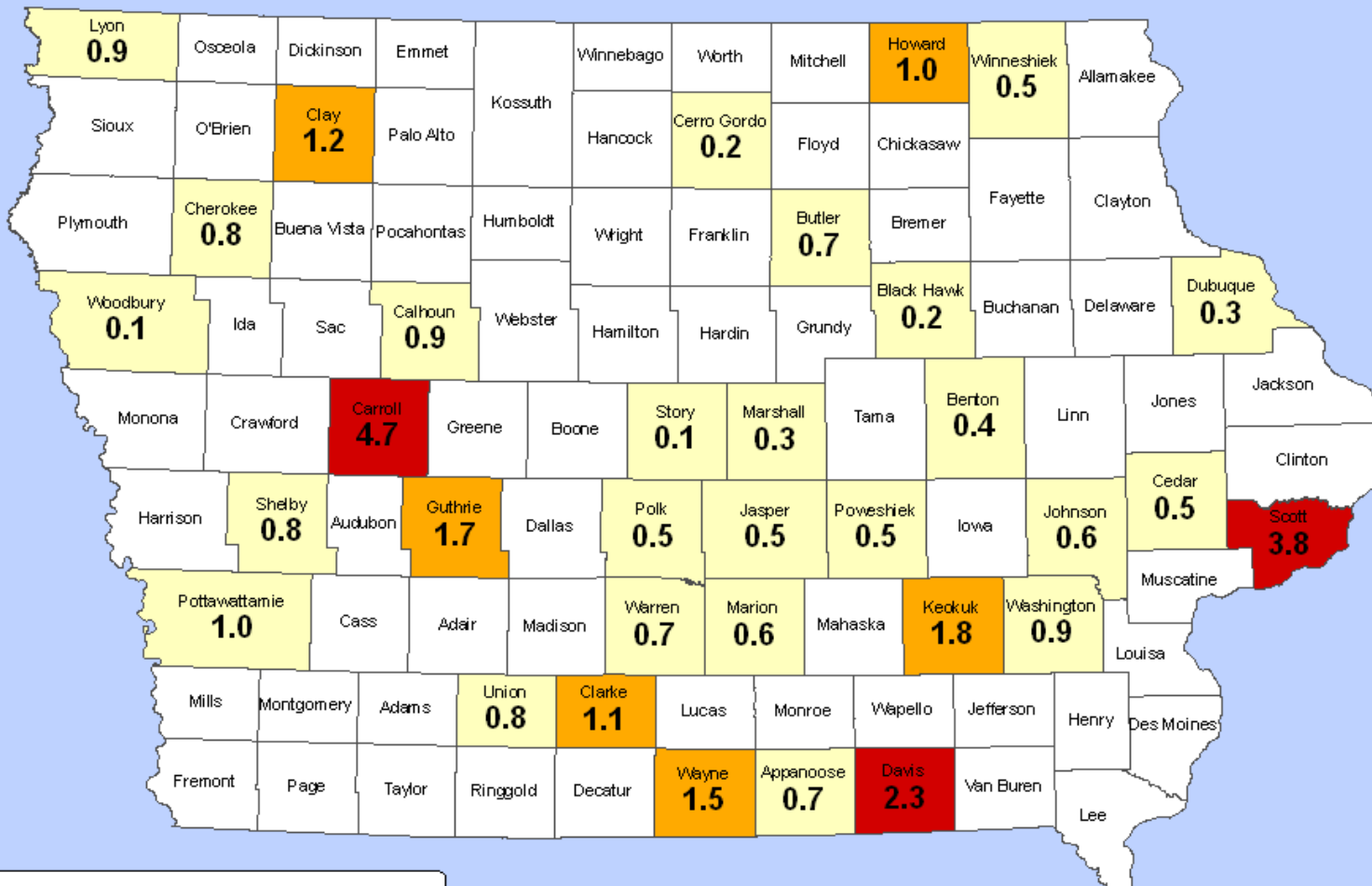
- **PCR (Polymerase Chain Reaction) Detection of *B. Pertussis* DNA**
- **Fast (current UHL TAT 48-72h from time of receipt)**
- **A positive PCR result is NOT 100% specific diagnosis of pertussis.**
- **A negative PCR is NOT 100% assurance that they don't have pertussis.**
- **Diagnosis of ALL patients should be made on the basis of clinical and epidemiologic criteria.**

**Kits can be ordered from the University Hygienic Lab at (319)-335-4500.**

# **UHL 2008 Pertussis PCR Testing**

- **193 positive of 2853 tests (6.8% positive)**
- **Don't miss other diseases**
- **Don't test when not indicated**

# Pertussis Activity in Iowa 2007



## Pertussis Activity 2007



CADE Surveillance Data

3/12/2009



# How to Define Exposure

**Transmission can be expected with:**

- **Direct face-to face contact with a case, regardless of duration.**
- **Shared confined space in close proximity for a prolonged period of time such as  $\geq 1$  hour, with a symptomatic case-patient.**
- **Four or more hours of household-type contact.**
- **Direct contact with respiratory, oral or nasal secretions from a case (e.g. explosive cough in the face, sharing eating utensils).**



# Other Exposure Considerations

- **Each situation should be evaluated separately and exposure should be defined according to information acquired through the investigation.**
- **Take into consideration the risk of pertussis to the individual and the specifics of exposure.**

# **High Risk Exposures**

**Groups where less exposure may result in disease, thus prophylaxis is particularly important:**

- Infants.**
- Un-immunized children.**
- Immunocompromised individuals.**
- Pregnant women.**
- Individuals with chronic respiratory illness.**



# **Pertussis Vaccine**

- Pertussis vaccine is 70-90% effective but immunity wanes 5-10 years after the last dose of pertussis vaccine**
- Most vaccinated children at 10-12 years of age and older will be susceptible.**
- Currently no licensed pertussis vaccine for those > 7 years of age in the United States.**
- Vaccination status does not matter when investigating pertussis.**



# **New Pertussis Vaccines**

- **Two vaccine manufacturers have applied to FDA for licensure of pertussis containing vaccine for individuals over 7 years of age – perhaps available in mid-2005**
- **TDaP**



# Control Measures

- **Pertussis is a reportable disease, notify IDPH and LPHA.**
- **LPHA's should notify area health care providers (HCP) that pertussis has been identified in the community.**
- **Control measures should be implemented after initial case is laboratory confirmed.**



# Control Measures

- **LPHA, with HCP should make sure the case is on appropriate antibiotics.**
- **Isolate the case during the infectious period.**
  - **Infectious prior to cough onset and up to 21 days after cough starts, or until after received antimicrobial therapy for 5 days (even though cough may last much longer).**



# Control Measures

- **Recommend household contacts take post-exposure prophylaxis and assess them for symptoms.**
- **LPHA with community partners (school nurses, etc.) identify other contacts that have had significant exposure to the case during the infectious period.**
- **The antibiotics used for treatment and prophylaxis are the same.**

**Preventive antibiotics  
should be recommended  
to all contacts,  
regardless of  
immunization status.**

# Treatment & Prophylaxis

Drug	Child	Adult
Erythromycin (drug of choice)	40-50 mg/kg per day orally in 4 divided doses for 14 days (maximum of 2 grams per day)	1-2 grams per day orally in 4 divided doses for 14 days (maximum of 2 grams per day)
Trimethoprim-sulfamethoxazole (Bactrim) (alternative, but efficacy is unknown)	Trimethoprim 8 mg/kg per day, sulfamethoxazole 40 mg/kg per orally in 2 divided doses for 14 days	trimethoprim 320mg per day, sulfamethoxazole 1,600mg per day orally in 2 divided doses for 14 days
Clarithromycin (Biaxin) (alternative, but efficacy is unknown)	15 mg/kg per day orally in 2 divided doses for 10-14 days (maximum 1 gram/day)	500 mg orally 2 times per day for 10-14 days
Azithromycin (alternative, but efficacy is unknown)	10-12 mg/kg per day orally in 1 dose, maximum 500 mg/day for 5-7 days.	500 mg orally per day for 5-7 days. or
Azithromycin (Zithromax) (alternative, but efficacy is unknown)	Day 1, 10 mg/kg orally (maximum 500 mg/day). Day 2 through 5, 5mg/kg orally (maximum 250 mg/day)	Day 1, 500 mg/day. Day 2 through 5, 250 mg/day.



# Treatment of Contacts

## Symptomatic contacts:

- Should be referred to their physician for treatment. Testing may be considered.
- Should be placed on antibiotics and may return to school/work after 5 days of antibiotics.
- If elect not to take antibiotics, should be excluded from school/child care and other community activities until have coughed for at least 21 days (I.e. no longer infectious).



# Treatment of Contacts

## **Asymptomatic Contacts: (Not infectious)**

- Recommend antibiotics for prophylaxis.
  - Can not force them to take antibiotics.
  - Can not exclude as long as remain asymptomatic.
- Azithromycin prophylaxis for 5 days protects for an additional 5 days after completion of antibiotic.



# Vaccination/DTaP

- **Contacts that are < 7 years of age who are un-immunized or under-immunized should have immunization initiated and complete the series with the minimum intervals.**



# Guidelines

- **IDPH pertussis control guidelines contains:**
- Attachment 2 Pertussis fact sheet.
- Attachment 3 Dear Parent-suspect case.
- Attachment 4 Dear Parent-contact case.
- Attachment 5 Dear Parent-information & control.
- Attachment 6 Dear Staff-information & control.
- Attachment 7 Dear Healthcare Provider.



# Surveillance Zones of Exposure

- **Household contact**
- **Daycare contact**
- **Play group**
- **School contacts**
- **Bus contacts**
- **Boyfriend/girlfriend**
- **Core group of friends**
- **Sports activities**
- **Extracurricular-  
(band, church, etc.)**
- **Babysitting**
- **Internships in a  
school or medical  
setting**



# **Child Care, Preschool, Elementary School**

- If there is one case and minimal interaction, prophylax those near the case, or in the case's play group.**
- If there is more than one case and a number of coughing students, consideration should be given to prophylaxis for the entire class.**



# **Middle, Junior & High School**

- Think in terms of zones of exposure to find patterns that would increase exposure time among a group.**
- It is very rare for pertussis to spread school wide.**
- Closing school does not limit the spread of pertussis and makes it more difficult to control spread.**



# Continued Surveillance

- **Surveillance should continue for 2 incubation periods (42 days) after the cough onset of the last case identified.**
- **Pursue contacts of cases not contacts of contacts.**

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# Scenario One

You receive a call from a company in Ames that employs 635 people, the administrators are concerned because a husband and wife employed there have daughters who were exposed to pertussis. The daughters have been tested and are on antibiotics. The family was all placed on antibiotics 2 days ago. Many people the family knows have pertussis or have been exposed to pertussis.

What should the employer do? They really don't want the husband and wife to work today.



# Scenario Two

**A public health nurse, new to the position, calls you, its 4:30 pm, no one else is in the office, just received a +PCR slip for pertussis on a client and needs to work it up**

**Can you offer assistance?**

**What help will you offer?**

**Work through a step by step process of working this case up with the new employee.**



# Scenario Three

**A LPHN calls you asking for help with a pertussis case. The patient coughed for 6 days, was seen by a HCP, and placed on Augmentin for an upper respiratory infection.**

**The patient also is not able to always cover her mouth when she coughs.**

**Fifteen days later she is still coughing, returns to the physician, a NP swab is done and sent for testing for pertussis. She was placed on a Z-Pac.**

**Two days later the PCR is + for pertussis. One other sibling in the home is coughing as well.**

**The PHN asks you what she should do now?**



# Scenario Four

**You receive a frantic call from the Little Flock Child Care, lots of the children are coughing.**

**It is the middle of winter, it could be upper respiratory infections but one of the parents told the director she was exposed to pertussis.**

**You call the LPHN. Do they know about any pertussis cases in the community? Yes a mom is a contact to a case and she is on prophylaxis.**

**How should they proceed with the daycare?**