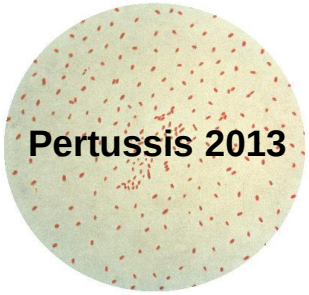

Pertussis 2013

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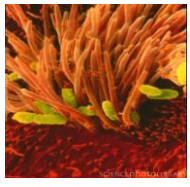
North Carolina Division of Public Health

Presentation Outline

I. Pertussis overview
II. Lab testing: Perils and pitfalls
III. Recent trends
IV. Control measures

Pertussis

- Highly contagious respiratory infection
- Spread by coughing or sneezing
  - >80% household contacts infected
- Caused by bacteria *Bordatella pertussis*
  - Attach to the cilia in upper respiratory tract
  - Release toxins, damage cilia and cause inflammation



Stages of Pertussis

Stage	Length	Clinical Features
Catarrhal	7–10 days; range 4–21	Runny nose, mild cough
Paroxysmal	1–6 weeks; up to 10	Paroxysmal cough
Convalescent	7–10 days; range 4–21	Less persistent cough; secondary infxn

Clinical Case Definition

- Cough illness lasting at least 2 weeks with one of the following:
  - Paroxysms of coughing
  - Inspiratory “whoop”
  - Post-tussive vomiting

Images of Pertussis

Source: www.immunize.org, courtesy of Thomas Schlenker, MD, MPH, Chief Medical Officer, Children's Hospital of Wisconsin and the Pennsylvania Chapter of the American Academy of Pediatrics

Infant Pertussis

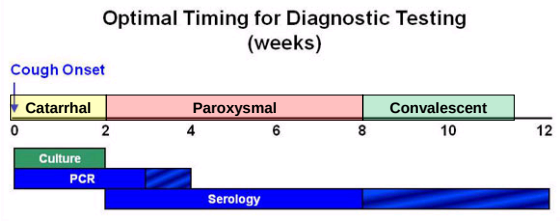
Source: ShotofPrevention.com. Brady passed away at 2 months from pertussis.

- Highest risk for complications
- Atypical symptoms
  - Catarrhal stage and cough minimal or absent
  - Whoop infrequent
  - Apnea (sometimes with seizures)
  - Sneezing
  - Gagging, choking, vomiting
- >50% require hospitalization
- 1% of hospitalized infants die

Adapted from http://www.cdc.gov/vaccines/ed/ciinc/Pertussis.htm

Pertussis Tests

TEST	**PROS**	**CONS**
PCR	•Sensitive •Fast	•False positives
Culture	•Specific •Gold standard	•Slow •Low sensitivity
Serology	•Detect late after onset	•Not standardized
DFA	•None (in 2012)	•Low sensitivity



http://www.cdc.gov/pertussis/clinical/diagnostic-testing/diagnosis-confirmation.html

Pertussis PCR Pitfalls

- False positives
  - Testing patients without signs/symptoms
  - Contamination of swab with vaccine DNA
- False negatives
  - Testing too late in illness
  - Improper specimen collection

Proper Technique for NP Swab

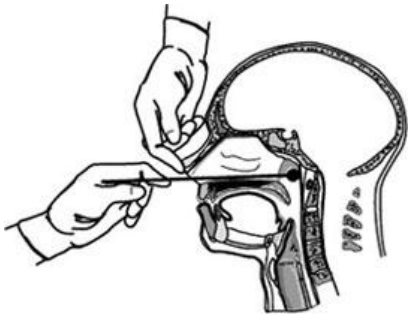


Image: Manual for the Surveillance of Vaccine-Preventable Diseases, 4th ed, 2008

Pertussis Culture

- High specificity
- Low sensitivity after first two weeks of cough
- Long time to results
- Important for
  - Control measures in outbreak settings
  - Antimicrobial resistance testing

The "Pertussis Epidemic that Wasn't"

Faith in Quick Test Leads to Epidemic That Wasn't

*New York Times, January 22, 2007

- 134 cases
- No positive cultures
- Confirmatory testing showed no evidence of a pertussis outbreak
- Outbreak of mild respiratory disease with no single etiology

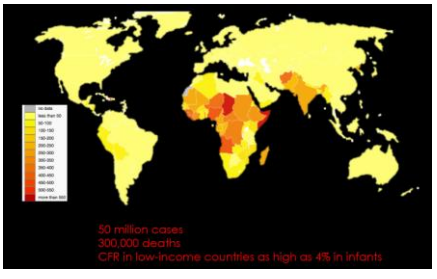
Adapted from Lauri Hicks, CDC, March 17, 2008

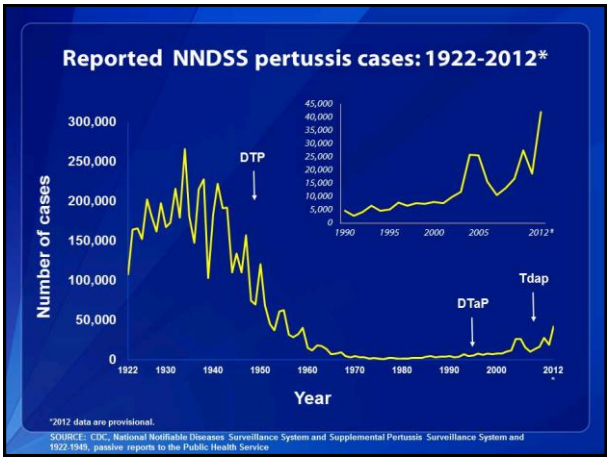
Pertussis Labs: Take Home

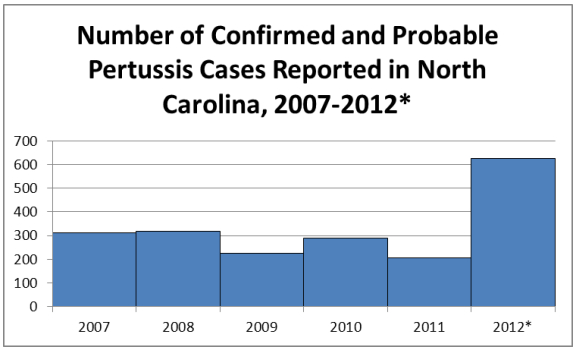
- There is no perfect test
- Need to educate clinicians about appropriate PCR testing
- Send swabs for culture confirmation to avoid "pseudo-outbreaks"
- Limited role for serologies, DFA

Trends / Burden of Disease

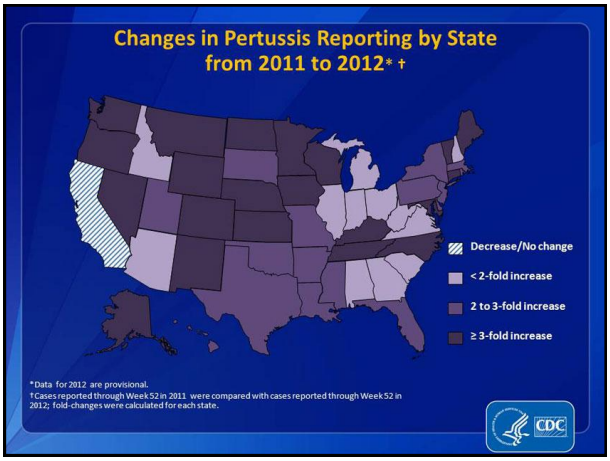
- 30–50 million cases,
  300,000 deaths per year worldwide







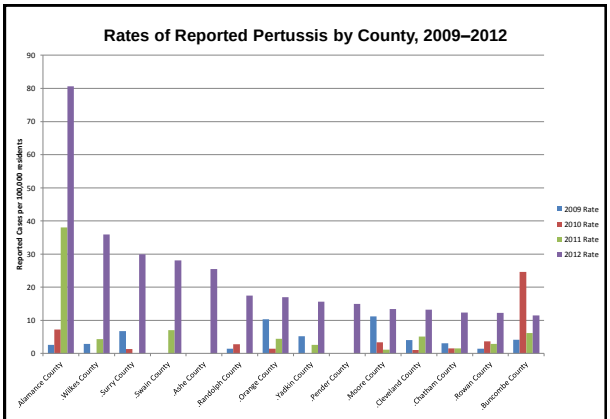
*Data are provisional and subject to change



Pertussis Trends, 2012

- National
  - 41,880 cases reported
  - 15 infant deaths
  - Highest number of cases since 1955
- North Carolina
  - 625 cases reported
  - 20% from Alamance outbreak
  - 65 counties with cases

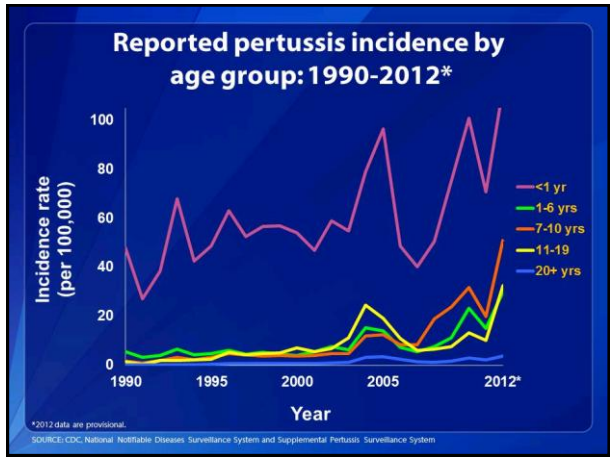
Provisional data; subject to change



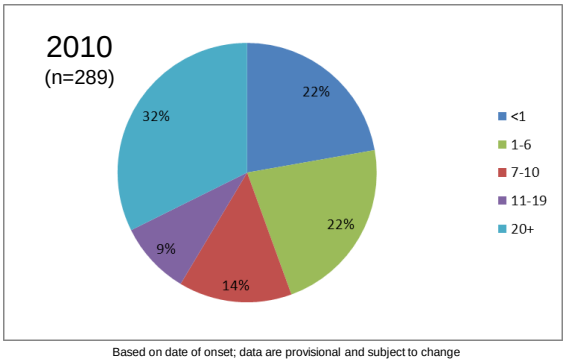
Data are provisional and subject to change. Counties with <10 cases per 100,000 pop. not shown

Reasons for Increase

- Waning immunity from DTaP
- Better diagnostic testing (PCR)
- Increased recognition and reporting
- Natural 3–5 year cycles
- New strains



Proportion of Cases by Age Group



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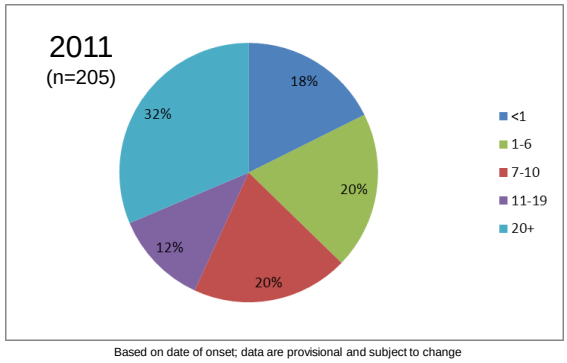

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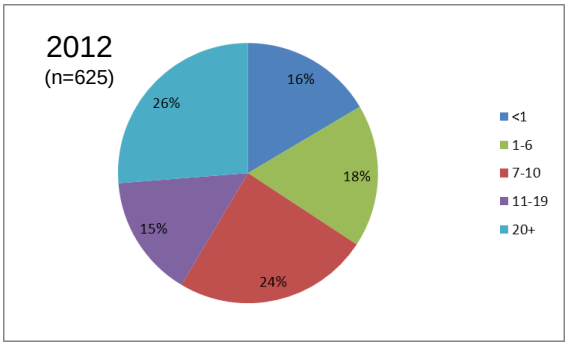
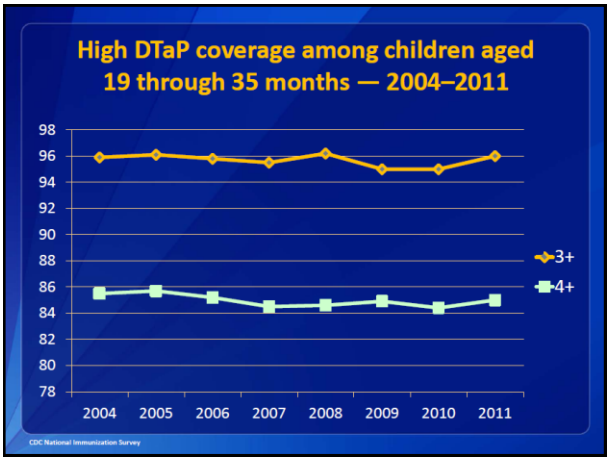


Based on date of onset; data are provisional and subject to change

Pertussis Vaccines

- Most effective way to prevent pertussis
- DTP (1940s) and DTaP (1990s) for infants and children
- Tdap (2005) for pre-teens, teens and adults



DTaP: Effectiveness and Duration

- DTaP efficacy 80%–85%*
  - Highly effective, but can't rule out infection based on vaccination status
- Protection fades over time
  - General estimate 4–12 years
  - Recent studies suggest shorter duration with DTaP

*Following 3 doses

Pertussis Disease among Unvaccinated compared to Vaccinated Children – California, 2010

Vaccination Status	Pertussis Case	Pertussis Control	OR (95% CI) *
Unvaccinated	53	19	**8.9 (4.9 – 16.1)**
5 DTaP doses	629	1,997	

* Accounting for clustering by county and provider

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Overall Vaccine Effectiveness — California, 2010

Model *	Case (n)	Control (n)	VE, %	95% CI
Overall VE, All Ages				
0 dose	53	19	Ref	--
5 doses	629	1,997	88.7	79.4 – 93.8
Time since 5th dose				
0 doses	53	19	Ref	--
< 12 months	19	354	98.1	96.1 – 99.1
12 – 23 months	51	391	95.3	91.2 – 97.5
24 – 35 months	79	366	92.3	86.6 – 95.5
36 – 47 months	108	304	87.3	76.2 – 93.2
48 – 59 months	141	294	82.8	68.7 – 90.6
60+ months	231	288	71.2	45.8 – 84.8

* Accounting for clustering by county and provider

Overall VE & Duration of Protection Estimates

Model *	Case (n)	Control (n)	VE, %	95% CI
Overall VE, All Ages				
0 dose	53	19	Ref	--
5 doses	629	1,997	88.7	79.4 – 93.8
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* Accounting for clustering by county and provider

Tdap: Recommendations

- Adolescents 11–18
  - Preferably at age 11–12
- Adults ≥19, especially if in close contact with infants
- Children 7–10 who are not fully immunized against pertussis

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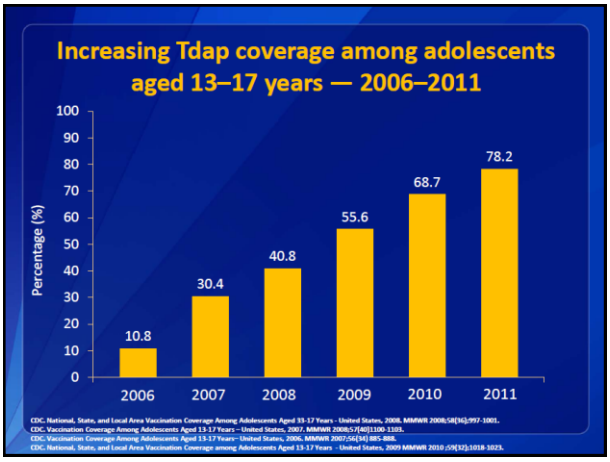
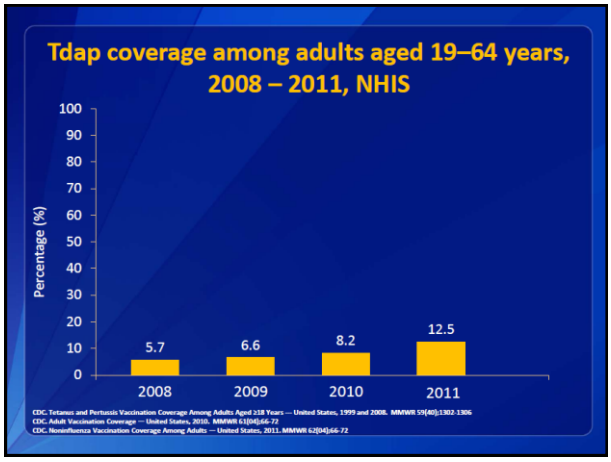




Tdap: Effectiveness and Duration

- Effectiveness 66–78% in field observational studies
- Preliminary data suggest effectiveness wanes within 3–4 years among acellular recipients

http://www.cdc.gov/vaccines/acip/meetings/downloads/slides-feb-2013/03-Pertussis-Clark.pdf

Tdap: Recent Changes

- Recently approved for
  - Pregnant women
  - People ≥65 years of age
- Expectant mothers should receive Tdap during *each pregnancy*, preferably at 27–36 weeks

Pertussis Vaccines: Take Home

- Best way to prevent pertussis
  - Decreased severity, duration, and infectivity with breakthrough cases
- DTaP and Tdap protection wanes within 5 years
  - Likely contributor to increasing incidence, especially among children 7–10
  - Highlights need for booster doses

Post-Exposure Prophylaxis (PEP)

- Primary objective: Prevent death and serious complications in individuals at increased risk of severe disease

Post-Exposure Prophylaxis (PEP)

- No data to indicate that widespread use of PEP effectively controls or limits the scope of pertussis outbreaks
- Concerns re: overuse of antibiotics

Who Gets PEP?

- All household contacts
- Close contact at high risk for severe illness
  - Infants, women in 3rd trimester
  - Those with pre-existing health conditions that may be exacerbated by a pertussis infection
- Close contact who are themselves in close contact with a someone else at high risk for severe illness

Who Gets PEP?

- All contacts in high risk settings that include infants aged <12 months or women in the third trimester of pregnancy
- Examples:
  - Neonatal intensive care units
  - Childcare settings
  - Maternity wards

Broader Use of PEP?

- Consider in situations with
  - Small number of cases
  - Limited closed settings
  - No ongoing, community-wide outbreak
- Consultation with health department

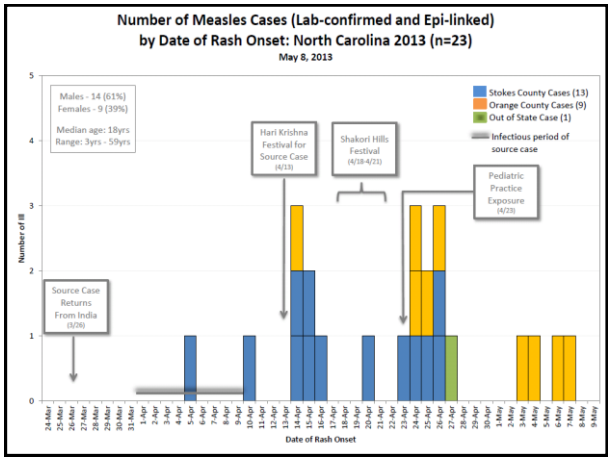
Summary

- Pertussis is an increasing problem
  - Increasing incidence likely related to shorter duration of immunity with current vaccines
- There is no perfect test for pertussis
- Vaccination is the best tool for prevention, but we need for new strategies for prevention and response

Acknowledgments

- Some slides adapted from Stacey Martin, MSc : “Coughing up the Facts on Pertussis – Emerging Trends and Vaccine Recommendations”, available at http://www.cdc.gov/vaccines/ed/ciinc/Pertussis.htm

Questions?



Vaccine Preventable Diseases: Transition from NC Immunization Branch to Communicable Disease Branch

Why?

- Increased responsibility for site visits
- Increased complexities in diseases

Benefits

- One place to call
- Physician support
- Etc., Etc., Etc.,

Who to call?

Communicable Disease Branch:

- Vaccine Preventable Disease control and outbreak support

Immunization Branch:

- Vaccine clinical questions
- Ordering, storage, and handling
- Coverage criteria