UNIVERSITÀ
DEGLI STUDI DI BARI
ALDO MORO

CORSO DI IGIENE

Scuola
di
Medicina

Pertussis

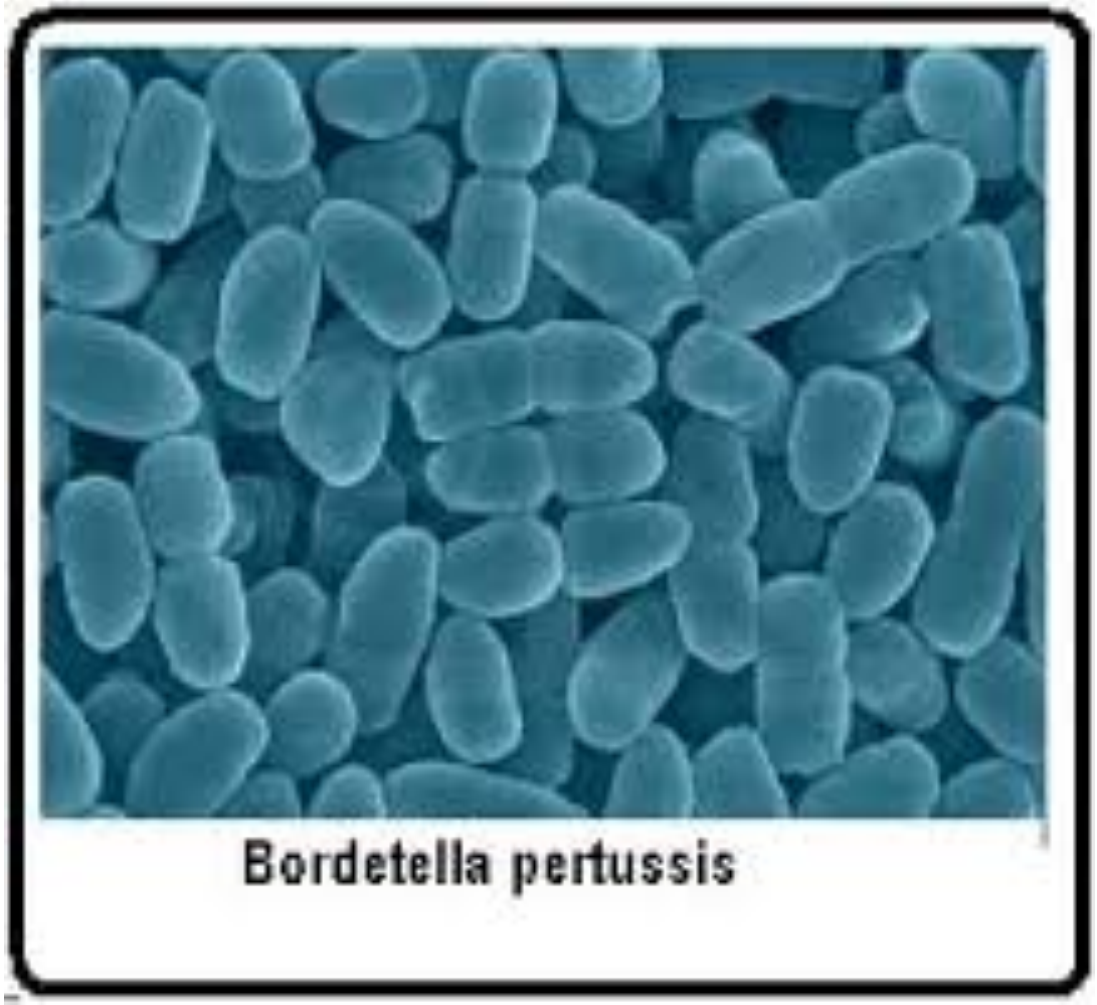
Pertussis

- Acute infectious disease caused by *Bordetella pertussis*
- Outbreaks first described in 16th century
- *Bordetella pertussis* isolated in 1906
- Estimated 195,000 deaths worldwide in 2008

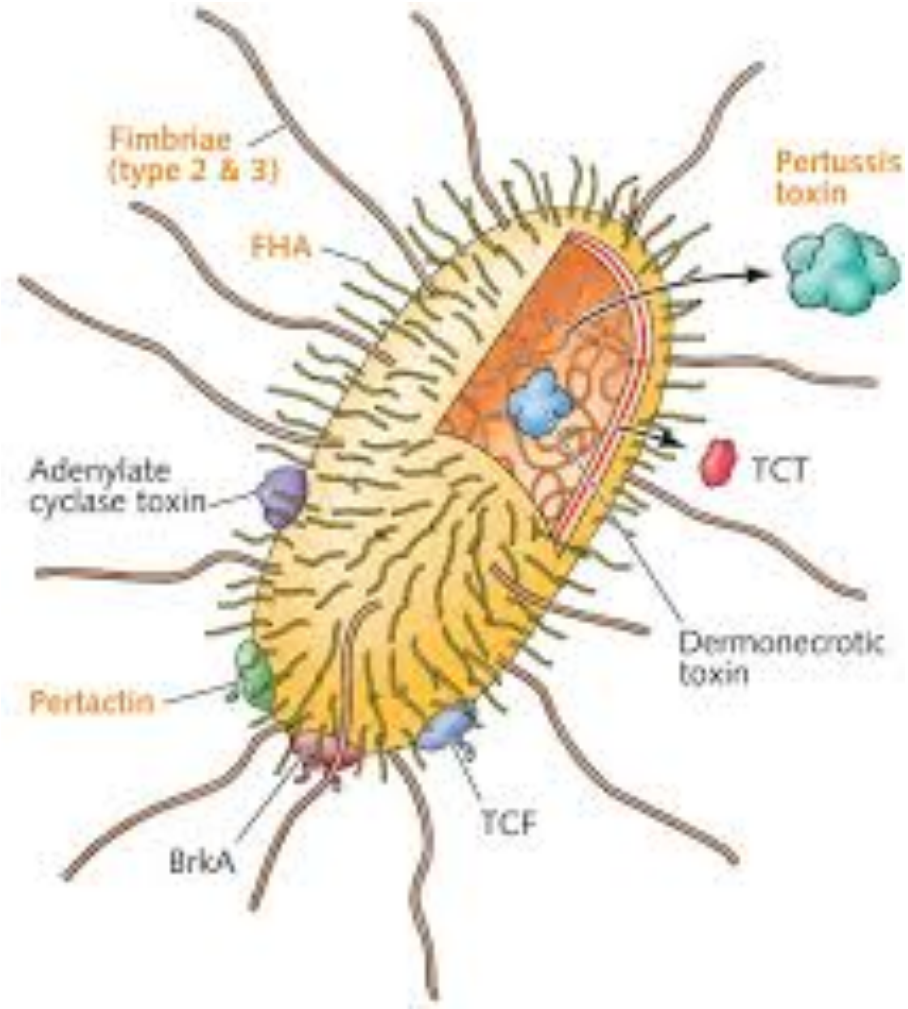
Bordetella pertussis

- Fastidious gram-negative bacteria
- Antigenic and biologically active components:
  - pertussis toxin (PT)
  - filamentous hemagglutinin (FHA)
  - agglutinogens
  - adenylate cyclase
  - pertactin
  - tracheal cytotoxin

Bordetella pertussis



Bordetella pertussis



Pertussis Pathogenesis

- Primarily a toxin-mediated disease
- Bacteria attach to cilia of respiratory epithelial cells
- Inflammation occurs which interferes with clearance of pulmonary secretions
- Pertussis antigens allow evasion of host defenses (lymphocytosis promoted but impaired chemotaxis)

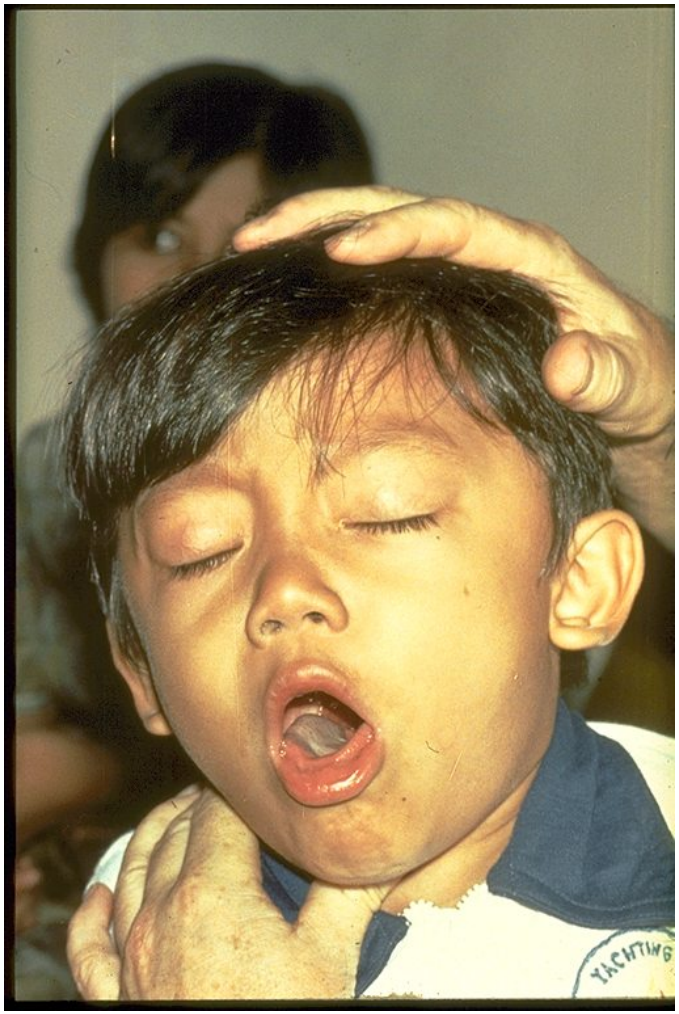
Pertussis Clinical Features

- Incubation period: 7-10 days (range 4-21 days)
- Insidious onset, similar to the common cold with nonspecific cough
- Fever usually minimal throughout course of illness
- **Catarrhal stage**: 1-2 weeks
- **Paroxysmal cough stage**: 1-6 weeks
- **Convalescence**: weeks to months

UNIVERSITÀ
DEGLI STUDI DI BARI
ALDO MORO

SCUOLA DI MEDICINA
CORSO DI IGIENE

Pertussis Clinical Features

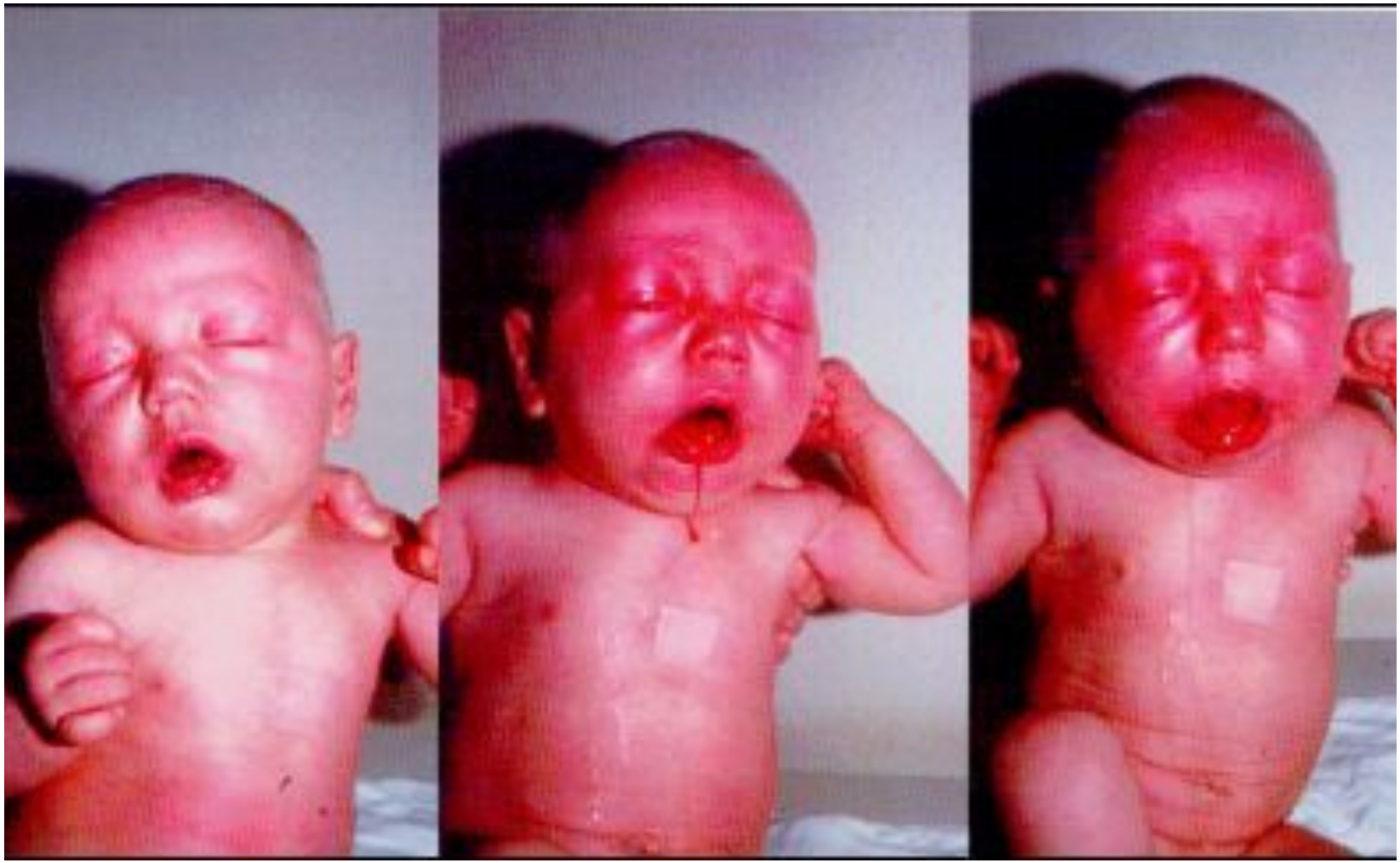


SCUOLA DI MEDICINA

CORSO DI IGIENE

UNIVERSITÀ DEGLI STUDI DI BARI ALDO MORO

Pertussis Clinical Features



SCUOLA DI MEDICINA

CORSO DI IGIENE

UNIVERSITÀ DEGLI STUDI DI BARI ALDO MORO

Pertussis Among Children, Adolescents and Adults

- Disease often milder than in infants and young children
- Infection may be asymptomatic, or may present as classic pertussis
- Persons with mild disease may transmit the infection
- Older persons often source of infection for children

Pertussis Complications in Children

- Secondary bacterial pneumonia – most common
- Neurologic complications – seizures, encephalopathy more common among infants
- Otitis media
- Anorexia
- Dehydration
- Pneumothorax
- Epistaxis
- Subdural hematomas
- Hernias
- Rectal prolapse

UNIVERSITÀ
DEGLI STUDI DI BARI
ALDO MORO

SCUOLA DI MEDICINA
CORSO DI IGIENE

Pertussis Complications in Adolescents and Adults

- Difficulty sleeping
- Urinary incontinence
- Pneumonia
- Rib fracture

Pertussis Laboratory Diagnosis

- Culture – gold standard
- Polymerase Chain Reaction (PCR)
  - can confirm pertussis in an outbreak
  - highly sensitive
  - high false-positive rate
- Serology
  - can confirm illness late in the course of infection
  - many tests have unproven or unknown clinical accuracy
- Direct fluorescent antibody test
  - low sensitivity
  - variable specificity
  - should not be used for laboratory confirmation

Medical management

- Antibiotics
  - azithromycin
  - clarithromycin
  - erythromycin
  - Trimethoprim-sulfamethoxasole
- supportive therapy

Contacts management

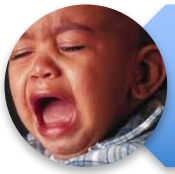
- **All close contacts** of persons with pertussis must receive **antibiotics**
- All close contacts **younger than 7 years** of age who have not completed the four-dose primary series should c**omplete the series** with the minimal intervals
- Close contacts who are **4–6 years of age** and who have not yet received the booster dose **should be vaccinated**.

Pertussis Epidemiology

- Reservoir
  - Human Adolescents and adults
- Transmission
  - Respiratory droplets
- Communicability
  - Maximum in catarrhal stage
  - Secondary attack rate up to 80%

Pertussis paradox


No vaccination


High incidence in the first year of age


Frequent natural booster


Immunity in adolescents/adults


Disease prevaling in young children


High coverage rate in pediatric age

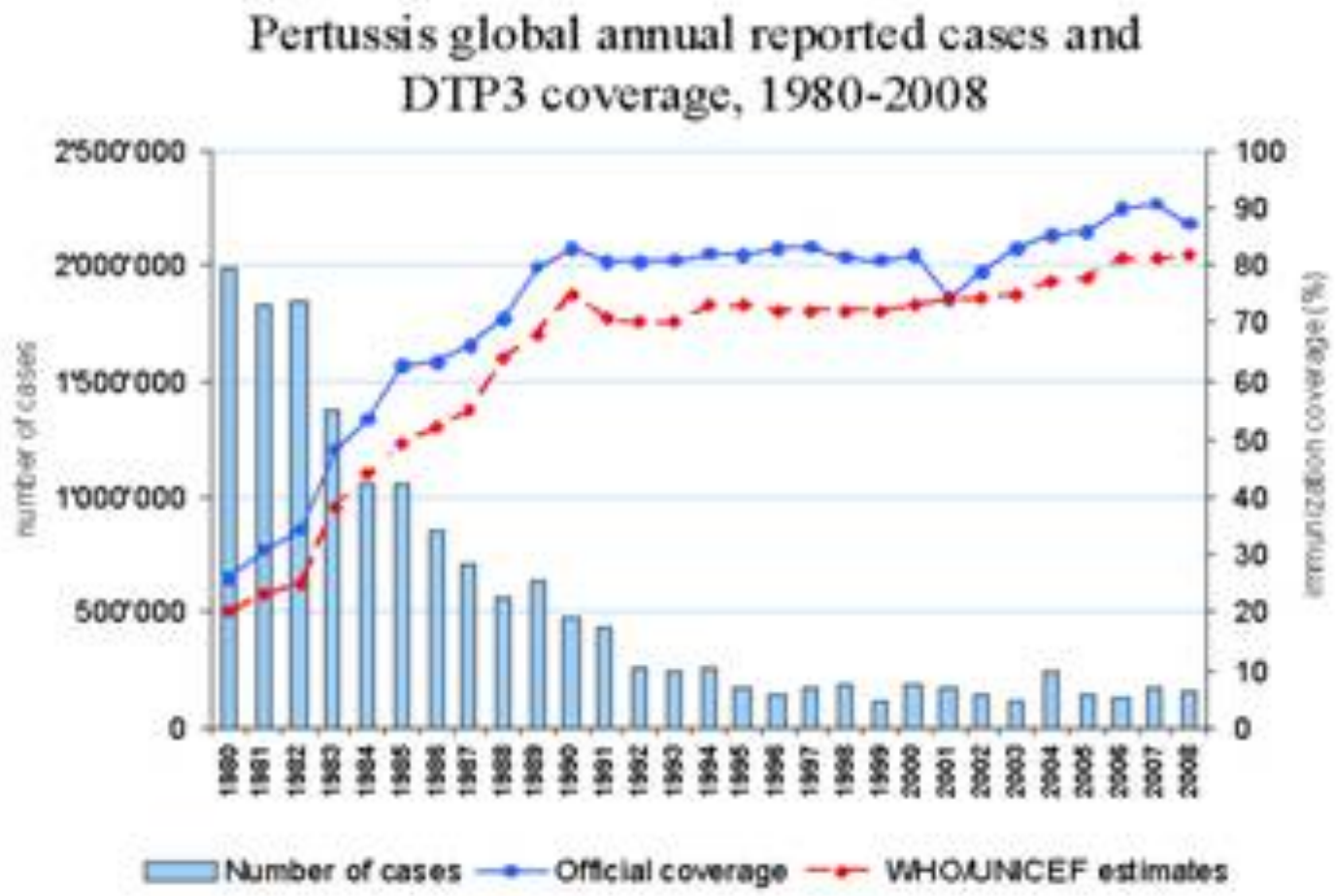

Low incidence


Less frequentnatural booster


Waining immunity in adolescents/adults


Disease most frequent in infants (< 6 months) and adolescents/adults

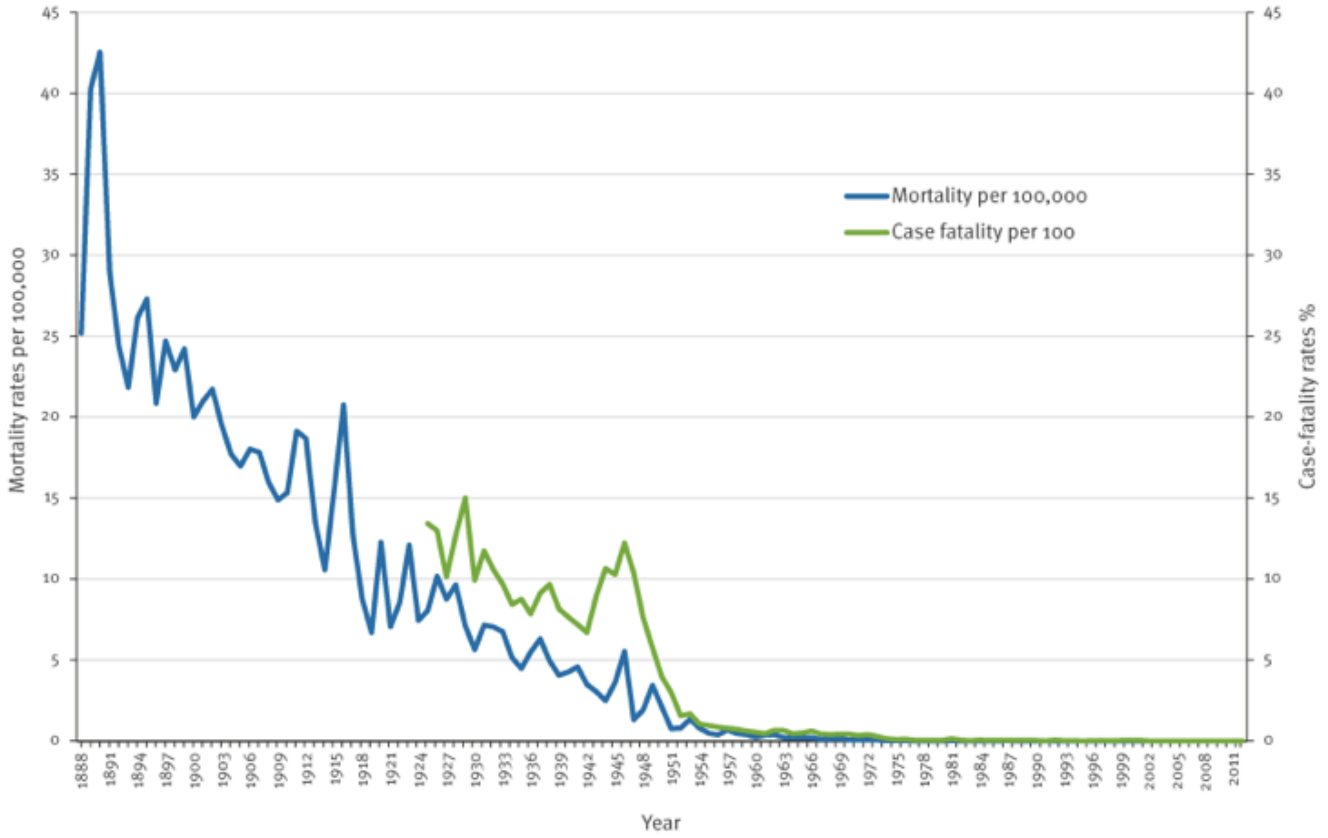
Pertussis epidemiology



Epidemiology of pertussis, Italy, 1888-2012

FIGURE 1

Pertussis mortality and case fatality, Italy, 1888–2012 and 1925–2012 respectively

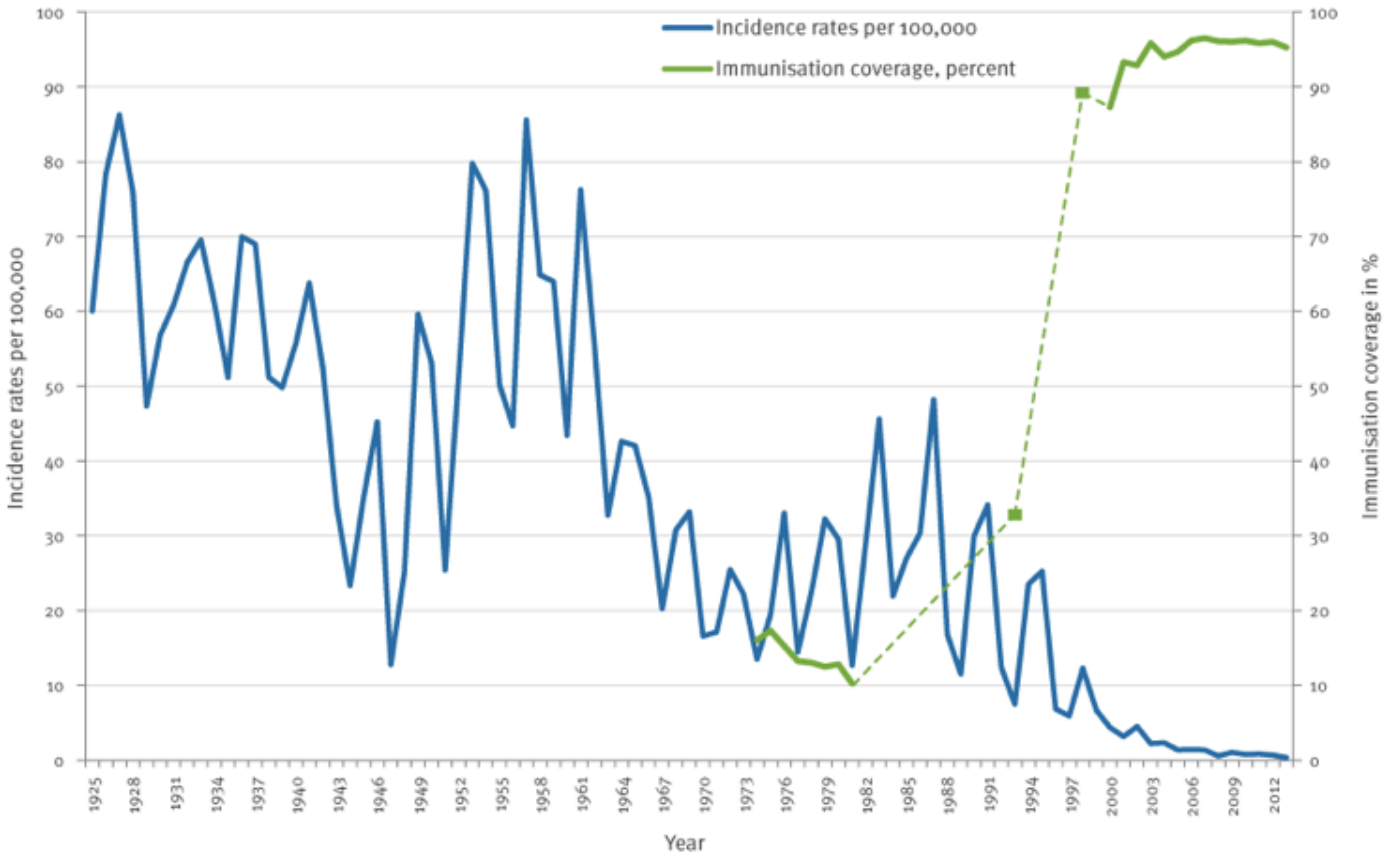


Preliminary data for 2012

Epidemiology of pertussis, Italy, 1925-2003

FIGURE 2

Pertussis incidence and pertussis immunisation coverage at 24 months, Italy, 1925–2013

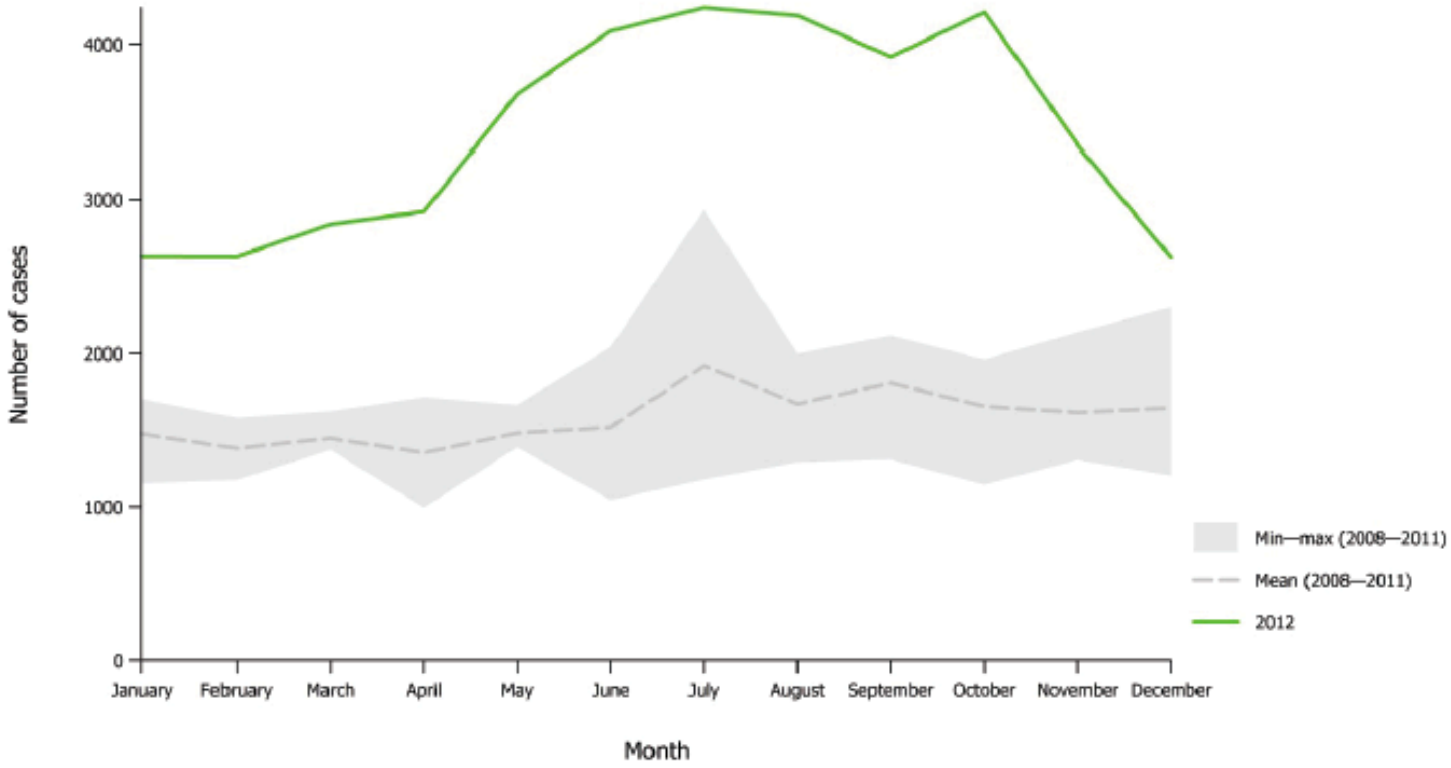


UNIVERSITÀ
DEGLI STUDI DI BARI
ALDO MORO

SCUOLA DI MEDICINA
CORSO DI IGIENE

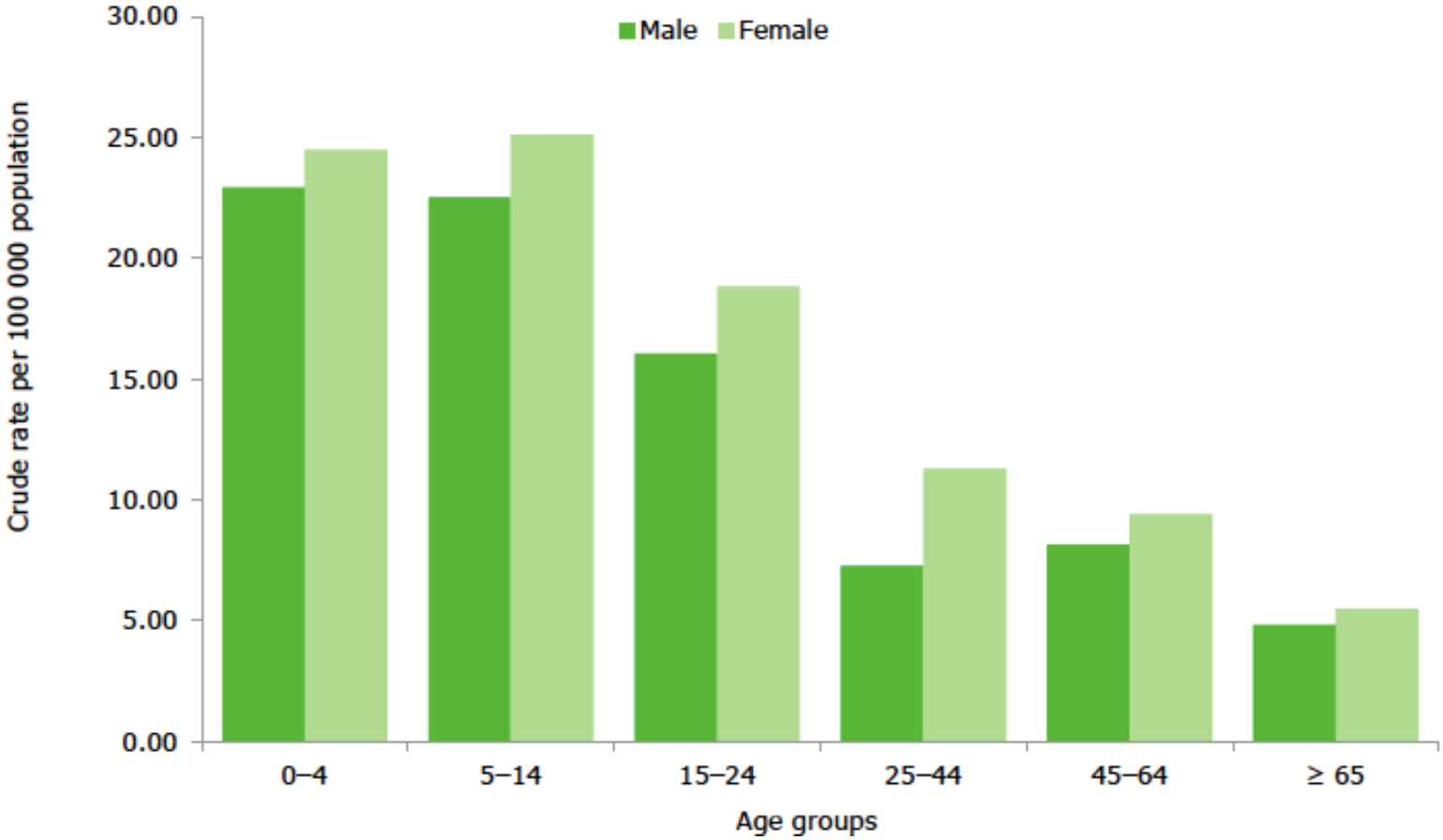
Epidemiology of pertussis, Europe 2008-2011

Figure 3. Distribution of confirmed pertussis reported cases by month in 2012 compared with 2008–2011 data, EU/EEA



Epidemiology of pertussis, Europe 2012

Figure 2. Rates of confirmed pertussis reported cases by age and gender, EU/EEA, 2012



Whole-Cell Pertussis Vaccine

- Developed in 1930s and used widely in clinical practice through mid-1940s
- DTP - 70%-90% effective after 4 doses
- Little to no protection after 5-10 years
- Local adverse reactions common

Pertussis-containing Vaccines

- DTaP (pediatric)
  - approved for children 6 weeks through 6 years (to age 7 years)
- Tdap (adolescent and adult)
  - approved for persons 10 years and older (Boostrix) and 10 through 64 years (Adacel)

Composition* of Acellular Pertussis Vaccines

Product	PT	FHA	PERT	FIM
Infarix	25	25	8	--
Daptacel	10	5	3	5
Boostrix	8	8	2.5	--
Adacel	2.5	5	3	5

**mcg per dose*

Interchangeability of Different Brands of DTaP Vaccine

- Series should be completed with same brand of vaccine if possible
- Limited data suggest that “mix and match” DTaP schedules do not adversely affect safety and immunogenicity
- Use different brand of DTaP if necessary

UNIVERSITÀ DEGLI STUDI DI BARI ALDO MORO
SCUOLA DI MEDICINA
CORSO DI IGIENE

Routine DTaP Primary Vaccination Schedule

Dose	USA	Italy
Primary 1	2 months	3 months
Primary 2	4 months	5-6 months
Primary 3	6 months	11-12 months
Primary 4	15-18 months	Not indicated
Booster 1	4-6 years	5-6 years
Booster 2	11-12 years	13-14 years
Periodical booster*	Every ten years	Every ten years

**for close contact of newborns*

Tdap Recommendations

A single dose of Tdap is recommended for

- adolescents 11 through 18 years of age
- adults 19 and older
- children 7-10 years of age who are not fully vaccinated against pertussis

Tdap Recommendations for Pregnant Women

- Providers of prenatal care should implement a Tdap vaccination program for pregnant women who previously have not received Tdap
- Administer Tdap in each pregnancy, preferably at **27 through 36 weeks gestation**
- If not administered during pregnancy, Tdap should be administered immediately **postpartum**, for women not previously vaccinated with Tdap

Tdap Vaccine and Healthcare Personnel

- Healthcare personnel should receive a **single dose of Tdap as soon as feasible** if they have not previously received Tdap
- Priority should be given to vaccination of healthcare personnel who have direct **contact with infants 12 months of age and younger**

Tdap For Persons Without A History of DTP or DTaP

- All adolescents and adults should have documentation of having received a series of DTaP, DTP, DT, or Td
- Persons without documentation should receive **a series of 3 vaccinations**
- **One dose should be Tdap**, preferably the first

Pertussis Vaccine Use in Children with Underlying Neurologic Disorders

Undelying condition	Recommendation
Prior seizure	Delay and assess*
Suspected neurologic disorder	Delay and assess*
Neurologic event between doses	Delay and assess*
Stable/resolved neurologic condition	Vaccinate

**vaccinate after treatment initiated and condition stabilized*

DTaP/Tdap Contraindications

- Severe allergic reaction to vaccine component or following a prior dose
- Encephalopathy not due to another identifiable cause occurring within 7 days after vaccination

DTaP Precautions

- Moderate or severe acute illness
- Temperature (40.5°C) or higher within 48 hours with no other identifiable cause
- Collapse or shock-like state (hypotonic-hyporesponsive episode) within 48 hours
- Persistent, inconsolable crying lasting 3 hours or longer, occurring within 48 hours
- Convulsions with or without fever occurring within 3 days

Tdap Precautions

- History of Guillain-Barré syndrome within 6 weeks after a prior dose of tetanus toxoid-containing vaccine
- Progressive neurologic disorder until the condition has stabilized
- History of a severe local reaction (Arthus reaction) following a prior dose of a tetanus and/or diphtheria toxoid-containing vaccine
- Moderate or severe acute illness

DTaP Adverse Reactions

- Local reactions (pain, redness, swelling) 20%-40%
- Temp of 38° C
  - 3%-5% or higher
- More severe adverse reactions
  - not common
- Local reactions more common following 4th and 5th doses

Tdap Adverse Reactions

- Local reactions (pain, redness, swelling)
  - 21%-66%
- Temp of 38°C or higher
  - 1.4%
- Adverse reactions occur at approximately the same rate as Td alone (without acellular pertussis vaccine)