Whooping Cough

Dr.Yossra K.Al-Robaiaay
Assisstant professor
FICMS (FM)

Introduction:

Whooping cough, or **pertussis**, is a highly contagious infectious disease caused by **Bordetella pertussis**.

The disease is notable for its characteristic paroxysmal cough ending in a "whoop," which can lead to severe complications or even death in vulnerable groups.

Despite advances in vaccination, it is **endemic disease worldwide** , and remains a significant global public health concern, particularly affecting **infants** and **unvaccinated populations**.

Historical Background :

- The disease has been recognized since the 16th century.
- *B. pertussis* was isolated in 1906 by **Bordet** and **Gengou**.
- Before vaccines, pertussis was a leading cause of childhood mortality globally

Historical Background

Global Burden of Disease

- The World Health Organization (WHO) reported 151,074 pertussis cases globally. Based on 2008 data WHO estimated that there were **89,000 deaths**.

- A 2014 publication estimated 24.1 million pertussis cases and 160,700 deaths in children younger than 5 years worldwide

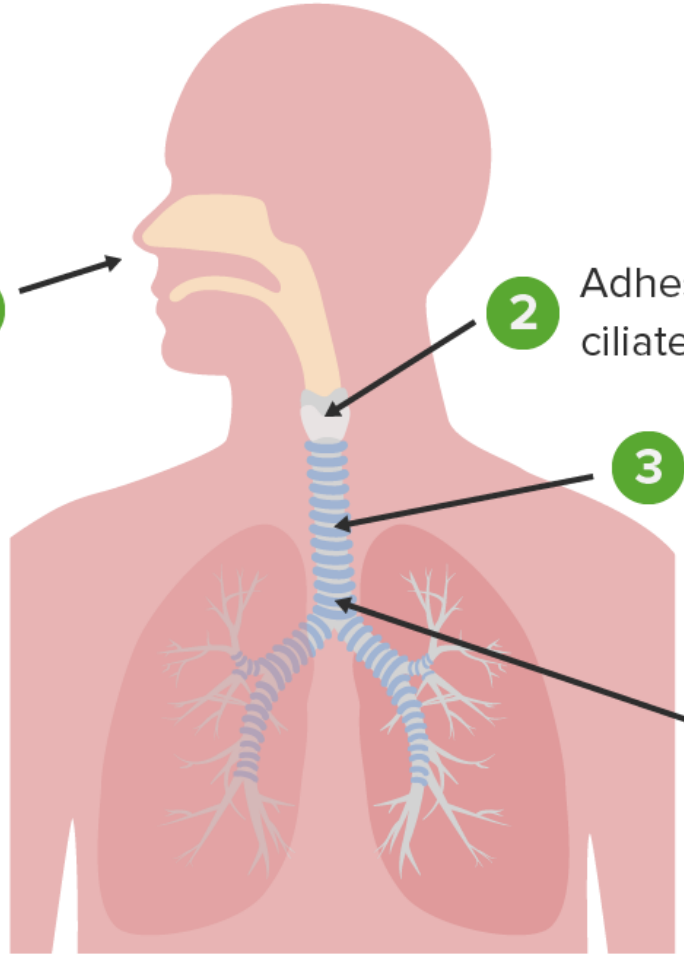
Pathogenesis :

Pertussis is **a acute**, highly **contagious pediatric disease.**

- **Adults and adolescents** are also effected
- **95%** due to B. pertussis
- About **5%** by B. parapertussis
- Only **0.1%** by B. bronchoseptica

Pathogenesis: …cont.

- Primarily whooping cough is **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).**



Pathogenesis of Whooping Cough

Epidemiological Determinants

I. Agent Factors

Causative Organism: *Bordetella pertussis* is a **gram-negative**, **aerobic** bacillus producing toxins **pertussis toxin (PT)** and **tracheal cytotoxin**, responsible for the disease's clinical manifestations.

.

I. Agent Factors

Reservoir of Infection:

- The **reservoir** for *Bordetella pertussis* is **humans**.
- The bacteria do not survive long in the environment outside the human body, making humans the sole reservoir.

.

I. Agent Factors

Host:

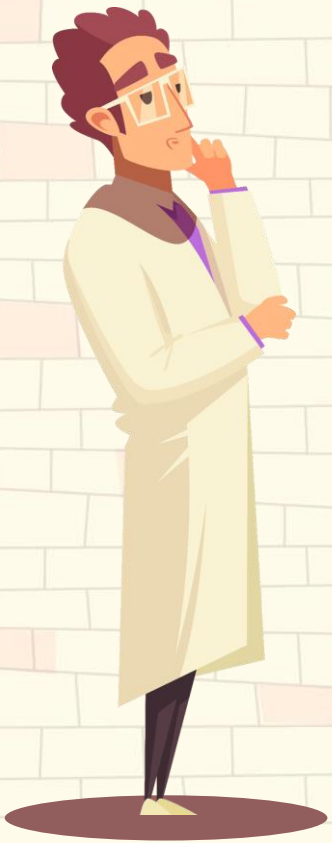
- The **host** of pertussis is also **human**, **primarily children**
- However, it can infect individuals of all ages, especially **those who are unvaccinated or have waning immunity from vaccination or previous infection**.

II. Host Factors

- **Age**:
  - Primarily affects infants and young children. Mortality is highest in those **under six months.**
  - Adolescents and adults can develop **milder forms and act as reservoirs, spreading the infection to infants.**
- **Sex**: Incidence and fatality rates are slightly higher in females

II. Host Factors CONT...

- **Immunity**:
  - Immunity after **infection** or **vaccination** is **not lifelong**, necessitating booster doses.
  - Maternal antibodies do not provide sufficient protection at birth.



III. Environmental Factors:

Seasonality: While pertussis occurs **year-round** , so no distinct seasonal pattern seen , but cases **may peak during winter and spring.**

Socioeconomic Conditions: Higher risk in lower-income groups living in **overcrowded** settings.

Source Of Infection :

B. pertussis infects only man.

The source of infection is **a case of pertussis**, more often, the source may be mild, missed and unrecognized cases.

- There is **no evidence** that infection is ever **subclinical** .
- A chronic carrier state does not exist.

IV. Modes of Transmission:

Droplet Infection: Primary mode; transmission occurs via respiratory droplets during coughing, sneezing, or close contact. **older siblings** who may be **harboring the bacteria in their nose and throat** can bring the disease home and infect an infant in the household.

Fomites: Plays a minimal role unless freshly contaminated.

IV. Disease Dynamics:

Incubation Period	Typically **7-14** days, up to **21** days.
Period of Communicability	Highest during the **catarrhal** stage and the **first three** weeks of the paroxysmal stage
Secondary Attack Rate	As high as **90%** among unimmunized household contacts

- If untreated, a person can transmit pertussis from onset of symptoms to 3 weeks after the onset of coughing episodes.

- The period of communicability is **reduced** to **5 days** after **treatment with antibiotics.**

V. Trends and Patterns:

Pertussis cases declined dramatically with vaccine introduction in the **1940s.**
Since the **1980s**, there has been **a resurgence** due to waning vaccine immunity and improved diagnostics.

Adolescents and children aged **7-10** years exhibit increasing incidence due to waning immunity from **a cellular vaccines**.

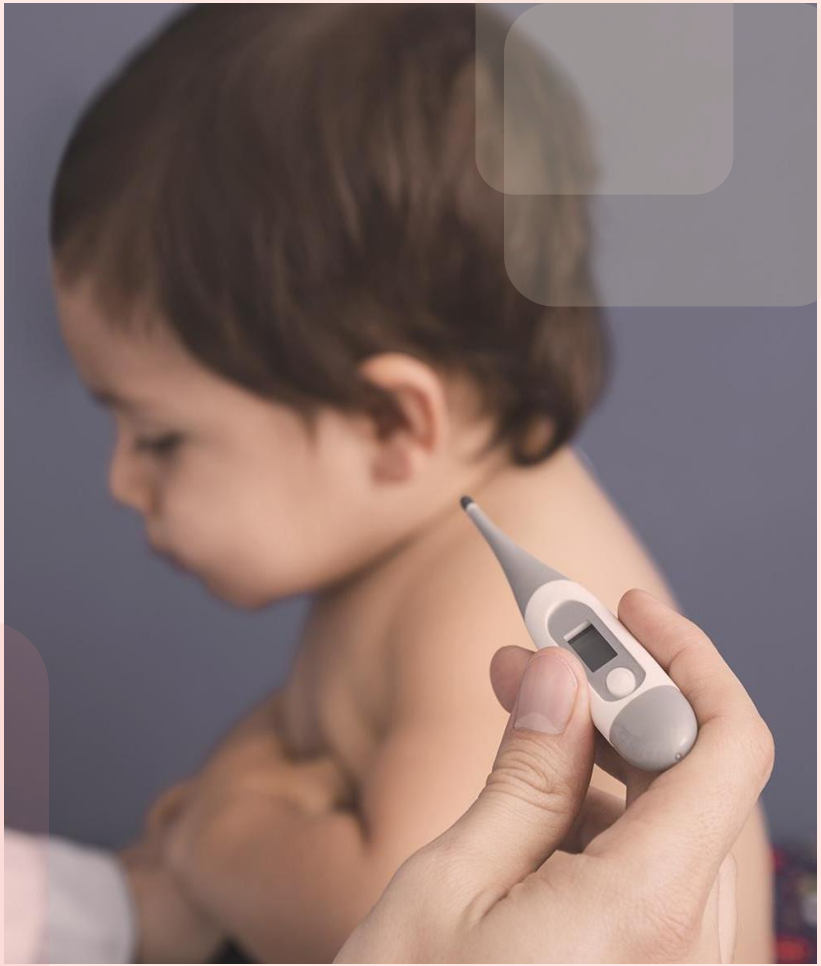
Clinical Features:

Stages of Illness

1. **Catarrhal Stage (1–2 weeks):** Similar to a common cold with sneezing, runny nose, and mild cough.
2. **Paroxysmal Stage (1–6 weeks):** Characterized by severe coughing fits, inspiratory "whoop," cyanosis, and vomiting.
3. **Convalescent Stage (weeks to months):** Gradual recovery with occasional recurrence of symptoms.

Complications:

- **Common:** Pneumonia, otitis media, dehydration.
- **Severe:** Neurological complications like seizures and encephalopathy



Clinical Management

a. Diagnosis:

- Based on clinical history and confirmed with:
  - **Culture:** Gold standard but **low** sensitivity **after two weeks.**
  - **PCR:** Highly sensitive, ideal during **early illness.**
  - **Serology:** Useful in **later stages** when other tests are negative

b. Treatment:

Antibiotics: **Effective in early stages** to **reduce severity and transmission.**

- Recommended drugs: **Azithromycin, clarithromycin, erythromycin**.
- **Not effective** in altering the course during **the paroxysmal stage.**

Supportive Care: Includes **oxygen therapy and hydration.**

C. Complication Management:

- Secondary bacterial infections may require specific treatments like antibiotics for pneumonia

Control and Prevention

a. Case Management

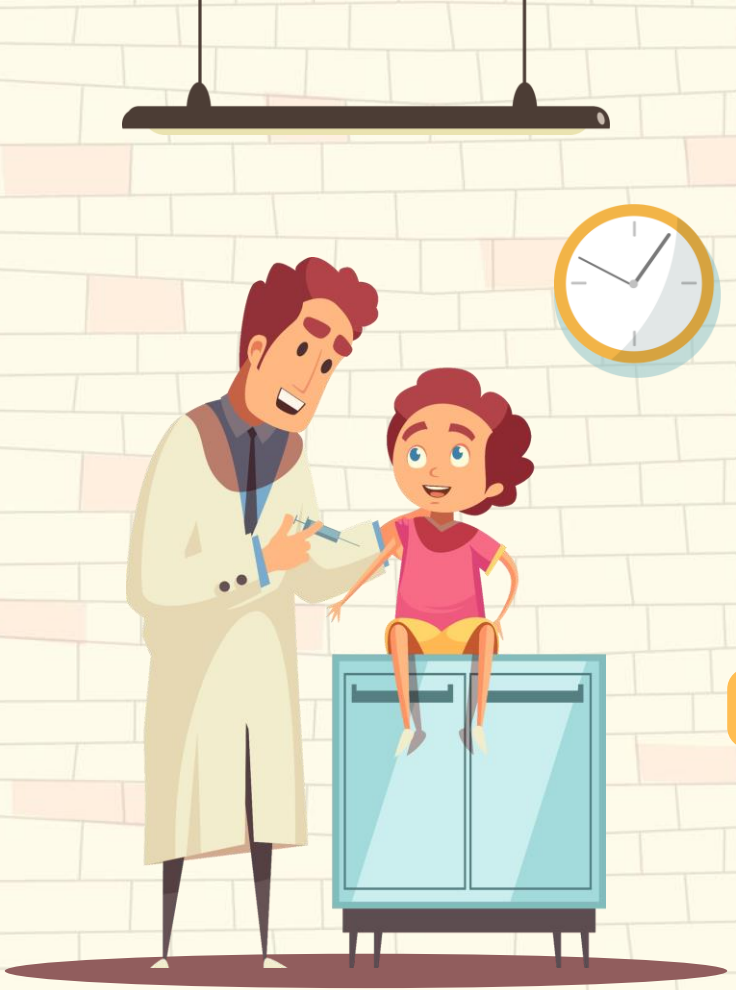
Isolation during the infectious period (catarrhal stage to three weeks into paroxysmal stage). Early antibiotic treatment reduces transmission.

b. Contact Management

Prophylactic antibiotics for **close contacts** especially **unimmunized infants**

C. Immunization

Essential to achieving **herd immunity**.
Booster doses are critical to counter waning of immunity.



Vaccination

You can enter a subtitle here if you need it

a. Vaccine Types:

- **Whole-cell Vaccine (wP):** Effective but associated with **more side effects**.
- **Acellular Vaccine (aP):** Contains purified components of *B. pertussis*, **safer** but associated with waning immunity.

a. Vaccine Types:

1. Whole-cell Pertussis Vaccine (wP)

Composition: Contains killed *Bordetella pertussis* bacteria.

Immunogenicity: High; induces strong and long-lasting immunity.

Side Effects: Higher risk of adverse events such as fever, swelling, redness, and pain at the injection site compared to acellular vaccines.

Usage: Predominantly used in low- and middle-income countries due to cost-effectiveness.

Efficacy: Shown to provide robust protection, but higher reactogenicity limits its use in some populations.

a. Vaccine Types:

2. Acellular Pertussis Vaccine (aP)
Composition: Contains purified antigens of *Bordetella pertussis*, such as pertussis toxin (PT), filamentous hemagglutinin (FHA), pertactin, and fimbriae.
Immunogenicity: Moderate; immunity wanes faster compared to wP.
Side Effects: Fewer side effects; better tolerated in infants and adults.
Usage: Commonly used in high-income countries due to improved safety profiles. Often combined with diphtheria and tetanus toxoids
Efficacy: Effective in reducing disease severity and transmission but associated with shorter duration of protection. Booster doses are often required.

Pertussis-Containing Vaccines Storage and Handling :

- Stored at 35°–46°F (2°–8°C) at all times
  Must never be frozen
- Vaccine exposed to freezing temperature must not be administered and should be discarded
- Do not be used after the expiration date printed on the box or label

a. Vaccine Types:

2. Acellular Pertussis Vaccine (aP)
Composition: Contains purified antigens of *Bordetella pertussis*, such as pertussis toxin (PT), filamentous hemagglutinin (FHA), pertactin, and fimbriae.
Immunogenicity: Moderate; immunity wanes faster compared to wP.
Side Effects: Fewer side effects; better tolerated in infants and adults.
Usage: Commonly used in high-income countries due to improved safety profiles. Often combined with diphtheria and tetanus toxoids (e.g., DTaP for children, Tdap for adolescents and adults).
Efficacy: Effective in reducing disease severity and transmission but associated with shorter duration of protection. Booster doses are often required.

Combination Vaccines:

Both wP and aP are frequently combined with vaccines for diphtheria and tetanus (DTP or DTaP).

DTaP: Diphtheria, Tetanus, and acellular Pertussis (used in children under 7 years).

Tdap: Tetanus, reduced-dose diphtheria, and acellular Pertussis (used in adolescents and adults).

B. Vaccination Schedule:

- **Primary Series:** DTaP at **2, 4**, and **6** months with **boosters** at **15–18** months and **4–6** years.
- **Adolescents and Adults:** Tdap at **11–12** years, then every **10** years.
- **Pregnant women:** are advised to receive Tdap during **each** pregnancy **(27–36 weeks)** to protect newborns.

.

DPT adverse reaction:

- (pain, redness, swelling) 20-40%
- Temp of 101°F (38.3) or higher 3%-5%

More severe adverse reactions not common
Local adverse reactions and fever increased with 4th and 5th doses of DTaP.

Reports of swelling of entire limb.
Extensive swelling after 4th dose NOT a contraindication to 5th dose.

DTP Precautions:

- Moderate or severe acute illness
  Temperature ≥105°F (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, occurring within 48 hours
- Convulsions with or without fever occurring within 3 days.

DTP 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.

C. Challenges :

- **Waning immunity** leads to resurgence in older age groups.

- **Coverage gaps** in certain populations exacerbate outbreaks.

Scientific References:

- Park,s Text Book Of Preventive And Social Medicine 23rd Edition
- Guiso, N., et al. (2011). "Acellular pertussis vaccines and resurgence of pertussis." Emerging Infectious Diseases, 17(4), 696-702.
- World Health Organization (WHO). Pertussis Vaccines Position Paper, 2015.Cherry, J. D. (2019).
- "The history of pertussis and pertussis vaccines." Frontiers in Immunology, 10, 1124.


VACCINE

Thanks