
DIPHTHERIA,
PERTUSSIS &
TETANUS

INTRODUCTION

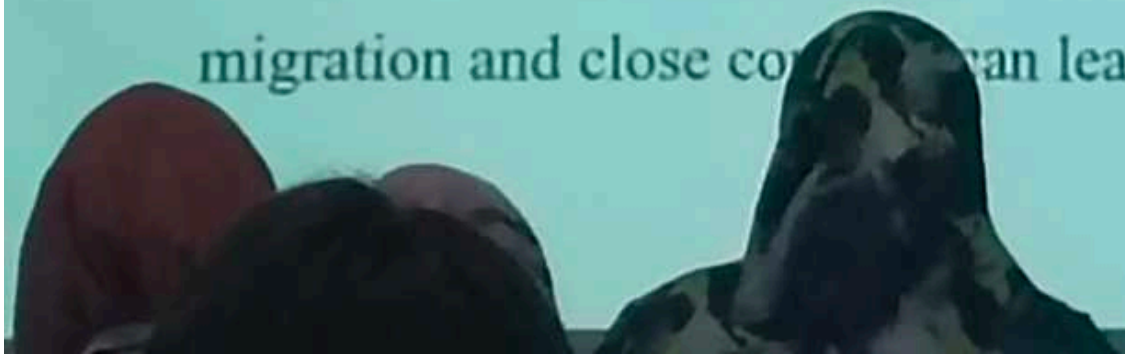
An acute **toxic** infection caused by *Corynebacterium diphtheria*; affects primarily the membranes of the upper respiratory tract with the formation of a gray – white membrane.

EPIDEMIOLOGY

- **Diphtheria is endemic in PAKISTAN**
- The single known reservoir of cornybacterium diphtherla is human being
- **Transmission:**
- airborne respiratory droplets, direct contact with respiratory secretions of symptomatic individuals, or exudates from infected skin lesions
- Skin infection and skin carriage are silent reservoirs and organisms can remain viable in dust or on fomites for up to 6 months
- smission thro aminated milk and an infected food been ted

EPIDEMIOLOGY

- Children aged 1-5yrs are commonly infected
- A herd immunity of 70% is required to prevent epidemics
- Contaminated objects like thermometers, cups, spoons, toys and pencils can spread the disease
- Overcrowding, poor sanitation and hygiene, illiteracy, urban migration and close co[illegible]can lead to outbreak



PATHOGENESIS

Entry into nose or mouth

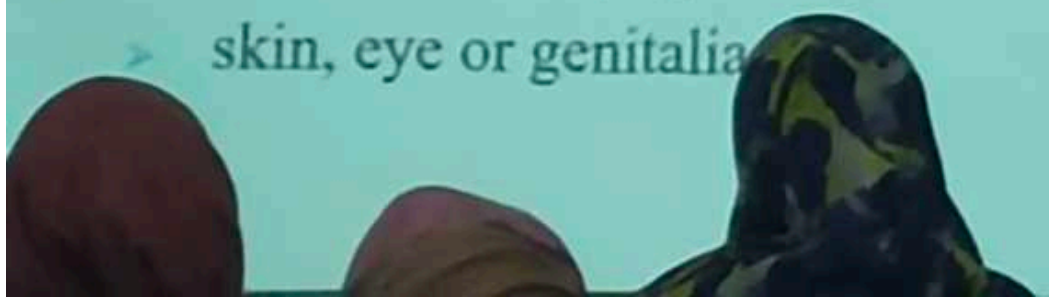
The organism remains in the superficial layers of skin lesions or respiratory tract mucosa, inducing local inflammatory reaction

The major virulence of the organism lies in its ability to produce the potent 62-kd polypeptide exotoxin, which inhibits protein synthesis and causes local tissue necrosis

Within the first few days of respiratory tract infection , a dense necrotic coagulum of organisms, epithelial cells, fibrin, leukocytes and erythrocytes forms, advances, and becomes a gray-brown, leather-like adherent pseudom[illegible]e . Removal is difficult and reveals a bleeding [illegible]rmatous submucosa

CLINICAL MANIFESTATIONS

- Influenced by the anatomic site of infection, the immune status of the host and the production and systemic distribution of toxin
- **Incubation period:** 1-6 days
- **Classification (location):**
  - nasal
  - pharyngeal
  - tonsillar
  - laryngeal or laryngotracheal
  - skin, eye or genitalia



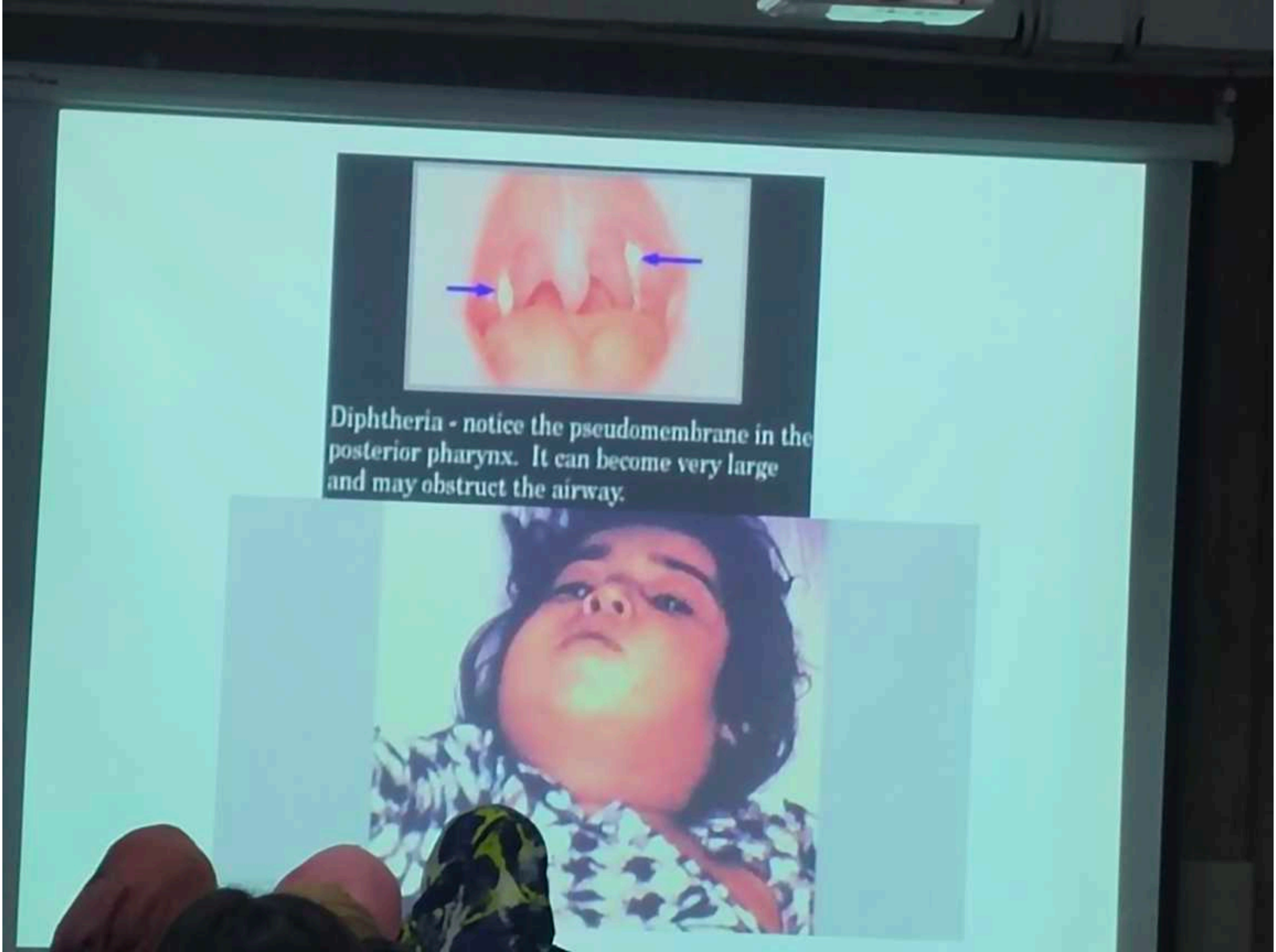
- ***Tonsillar and pharyngeal diphtheria:***

  sore throat is the universal early symptom

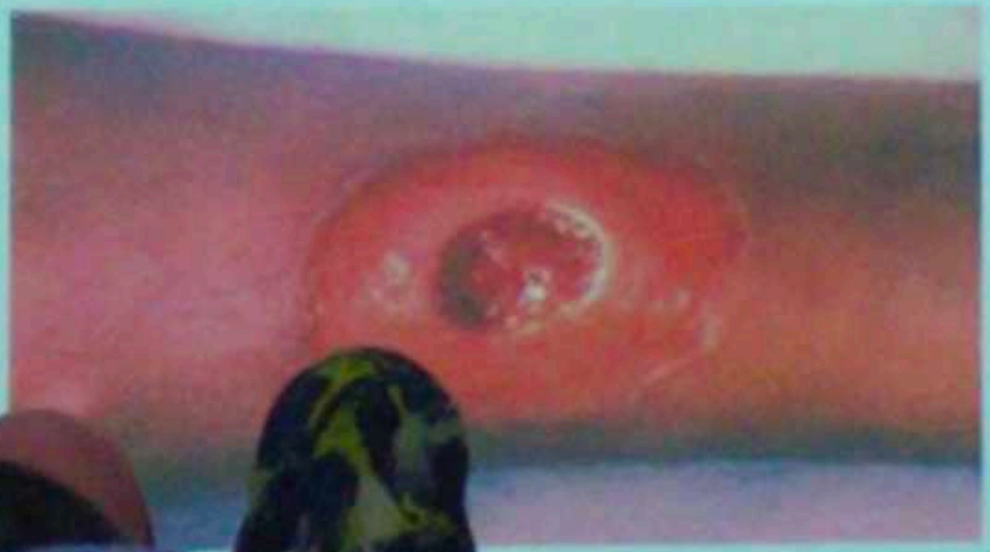
- Only half of patients have fever and fewer have dysphagia, hoarseness, malaise, or headache

- Mild pharyngeal injection → unilateral or bilateral tonsillar membrane formation → extend to involve the uvula, soft palate, posterior oropharynx, hypopharynx, or glottic areas

  derlying soft tis ma and enlarged lymph nodes: ***bull-***


Diphtheria - notice the pseudomembrane in the posterior pharynx. It can become very large and may obstruct the airway.

- ***Laryngeal diphtheria:*** At significant risk for suffocation because of local soft tissue edema and airway obstruction by the diphtheritic membrane
- Classic ***cutaneous diphtheria*** is an indolent, nonprogressive infection characterized by a superficial, ecthymic, nonhealing ulcer with a gray-brown membrane



Diagnosis

- Clinical features
- Culture: from the nose and throat and any other mucocutaneous lesion. *A portion of membrane should be removed and submitted for culture along with underlying exudate*
- Elek test: rapid diagnosis (16-24 hrs)
- Enzyme immunossay
- PCR for A or B portion of the toxic gene "tox"
- Hypoglycemi osuria, BUN, or abnormal ECG
  fo kidn heart involvement

Differential diagnosis:

Common cold

Congenital syphilis snuffle

Sinusitis

Adenoiditis and foreign body in nose

Streptococcal pharyngitis

Infectious mononucleosis

TREATMENT

1. ***Antitoxin:***

- Mainstay of therapy
- Neutralizes **only free toxin**, efficacy diminishes with elapsed time
- Antitoxin is administered as a single empirical dose of 20,000-120,000 U based on the degree of toxicity, site and size of the membrane, and duration of illness

2. ***Antimicrobial therapy***

- Halt toxin production, treat localized infection and prevent transmission of the organism to contacts
- **erythromycin** (40-50 mg/kg/day 6 hrly [PO] or [IV]), aqueous **crystalline penicillin G** (100,000-150,000 U/kg/day 6 hrly IV or [IM]), **procaine penicillin** (50,000 U/kg/day 12 hrly IM) for **14 days**

- Elimination of the organism should be documented by negative results of at least 2 successive cultures of specimens from the nose and throat (or skin) obtained 24 hr apart after completion of therapy

COMPLICATIONS

1. Respiratory tract obstruction by pseudomembranes: bronchoscopy or intubation and mechanical ventilation
2. Toxic Cardiomyopathy:

-in 10-25% of patients

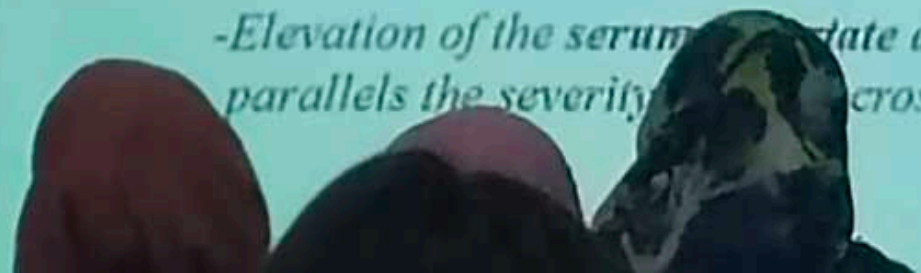
-responsible for 50-60% of deaths

-the risk for significant complications correlates directly with the extent and severity of exudative local oropharyngeal disease as well as delay in administration of antitoxin

-**Tachycardia out of proportion to fever**

-prolonged PR interval and changes in the ST-T wave

-*Elevation of the serum* ***...date aminotransferase*** *concentration closely parallels the severity ...crosis*

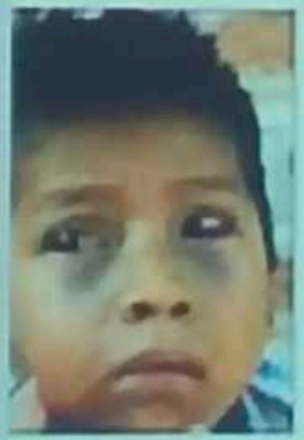


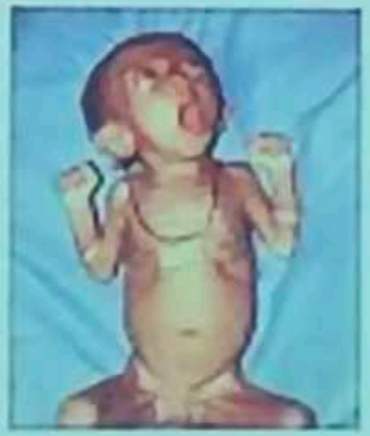
Complications

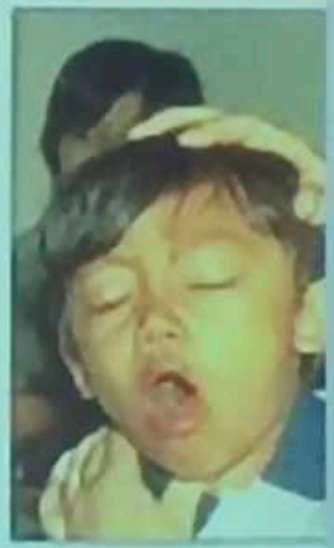
1. Toxic Neuropathy:

- Acutely or 2-3 wk after: hypoesthesia and soft palate paralysis
- Afterwards weakness of the posterior pharyngeal, laryngeal, and facial nerves : a nasal quality in the voice, difficulty in swallowing and risk for aspiration
- Cranial neuropathies (5th wk): oculomotor and ciliary paralysis- strabismus, blurred vision, or difficulty with accommodation
- Symmetric polyneuropathy (10 days to 3 mo): motor deficits with diminished deep tendon reflexes
- Monitoring for paralysis of the diaphragm muscle

PERTUSSIS (WHOOPING COUGH)







Cough of 100 days

Whoopin h: whooping sound made when
fit of coughing

ETIOLOGY

- *Bordetella pertussis* – aerobic gram-negative coccobacilli
- Produces **toxins** namely pertussis toxin, filamentous hemagglutinin, hemolysin, adenylate cyclase toxin, dermonecrotic toxin and tracheal cytotoxin- responsible for clinical features (toxin mediated disease) and the immunity

PATHOGENESIS

The organism get attached to the respiratory cilia and toxin causes paralysis of cilia

muocopurulent-sanguineous exudate forms in the respiratory tract

-This exudate predisposes to atelectasis, cough, cyanosis and pneumonia
-Organism causes local tissue damage and systemic effects mediated through its toxin

CLINICAL MANIFESTATIONS

- Incubation period: 7-10 days
- Infection lasts for 6 weeks – 10 weeks
- **Stage I (catarrhal stage; 1-2 weeks):** insidious onset of coryza, sneezing, low grade fever and occasional cough
- **Stage II (paroxysmal cough stage; 1-6 weeks):** due to difficulty in expelling the thick mucous form the tracheobronchial tree
- At the end of paroxysm long inspiratory effort is followed by a whoop
- [illegible]tween episodes c[illegible]ok well. During episode of cough [illegible]may become [illegible]ed, followed by vomiting, [illegible]nd seizu[illegible]

CLINICAL MANIFESTATIONS

- Cough increase for next 2-3 weeks and decreases over next 10 weeks
- Absence of whoop and/or post-tussive vomiting does not rule out clinical diagnosis of pertussis

  paroxysmal cough>2 weeks with or without whoop and/or post-tussive vomiting is the hallmark feature of pertussis
- **Stage III (convalecence stage):** period of gradual recovery even up to 6 months

Differential diagnosis:

1. B. parapertussis, adenovirus, mycoplasma pneumonia, and chlamydia trachomatis
2. **Foreign body aspiration**, endobronchial tuberculosis and a mass pressing on the airway

DIAGNOSIS

1. Suspected on the basis of history and clinical examination and is confirmed by culture, genomics or serology
2. Elevated WBC count with lymphocytosis. The absolute lymphocyte count of **≥20,000** is highly suggestive
3. Culture: gold standard specially in the catarrhal stage. A saline nasal swab or swab from the posterior pharynx is preferred and the swab should be taken using dacron or calcium alginate and has to be plated on to the selective medium

DIAGNOSIS

However culture are not recommended in clinical practice as the yield is poor because of previous vaccination, antibiotic use, diluted specimen and faulty collection and transportation of specimen.

4. PCR: most sensitive to diagnose; can be done even after antibiotic exposure. *It should always be used in addition with cultures*
5. Direct fluorescent antibody testing: low sensitivity and variable specifity

COMPLICATIONS

1. Secondary pneumonia (1 in 5) and apneic spells (50%; neonates and infant<6 months of age)
2. Neurological complications: seizures (1 in 100) and encephalopathy (1 in 300) due to the toxin or hypoxia or cerebral hemorrhage
3. Otitis media, anorexia and dehydration, rib frcture, pneumothorax, subdural hematoma, hernia and rectal prolapse

TREATMENT

1. Avoidance of irritants, smoke, noise and other cough promoting factors
2. Antibiotics: effective only if started early in the course of illness. **Erythromycin** (40-50 mg/kg/day 6 hrly orally for **2 weeks** or **Azithromycin** 10 mg/kg for **5 days** in children<6 months and for children>6 months 10 mg/kg on day 1, followed by 5mg/kg from day2-5 or **Clarithromycin** 15 mg/kg 12 hrly for 7 **days**
3. Supplemental oxygen, hydration, cough mixtures and bronchodilators (in individual cases)