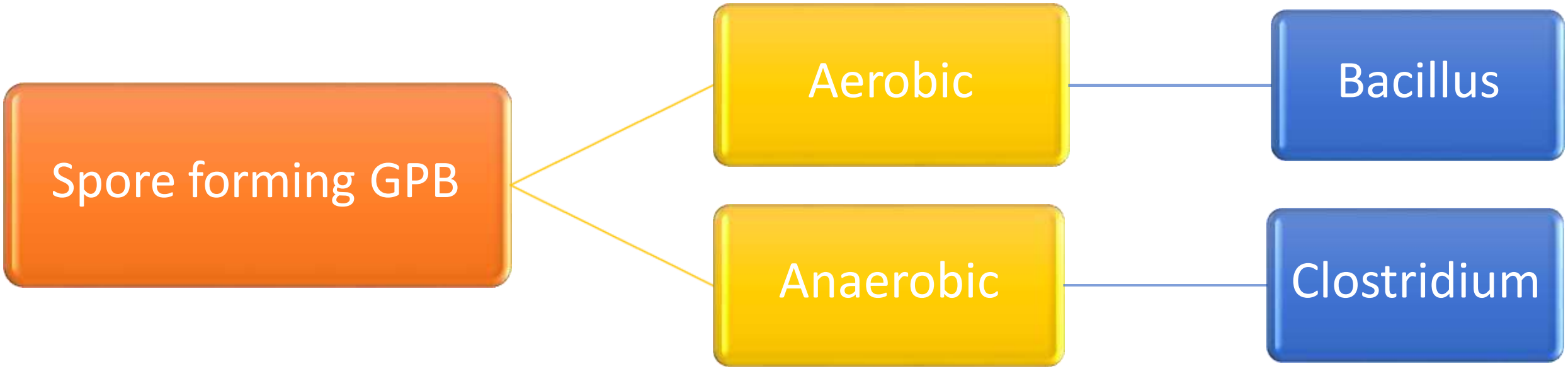
**Tishk International University**
**Faculty of Science**
**Medical Analysis Department**

# ..... Medical Microbiology.....

## TOPIC: Spore forming Gram positive bacteria

**2nd Grade- Spring Semester 2019-2020**

# CLASSIFICATION



# CLOSTRIDIUM

- Anaerobic, endospore former, gram positive rod
- Clostridia are ubiquitous in soil, water, and sewage
- Part of the normal microbial population in the GI tracts of animals and humans

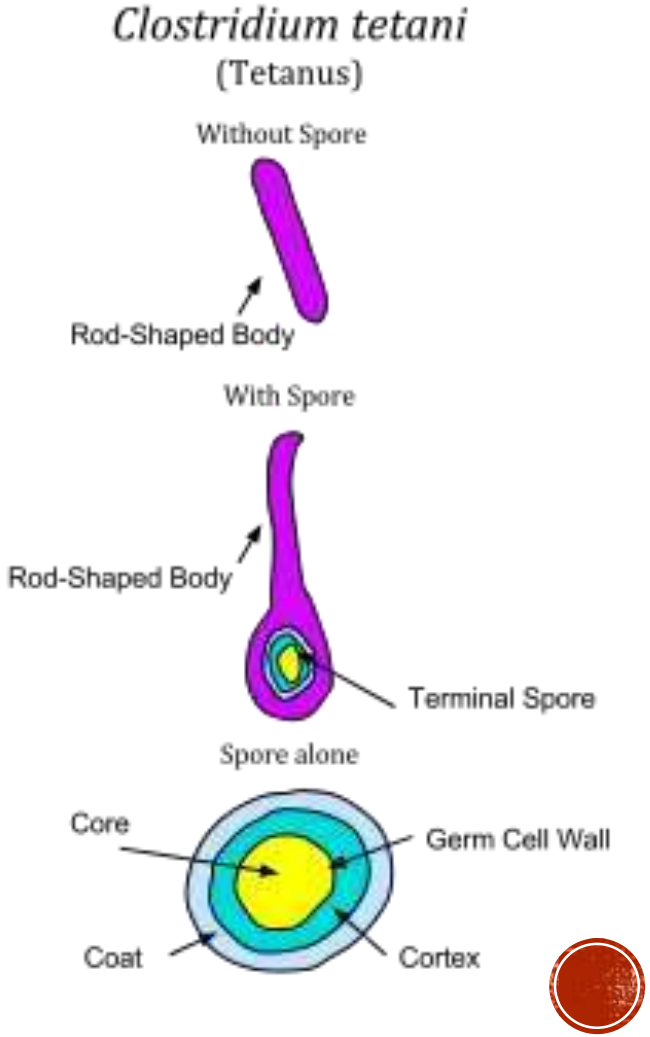
**Medically important species are**

- *Clostridium tetani*
- *Clostridium botulinum*
- *Clostridium erfingen*
- *Clostridium difficile*

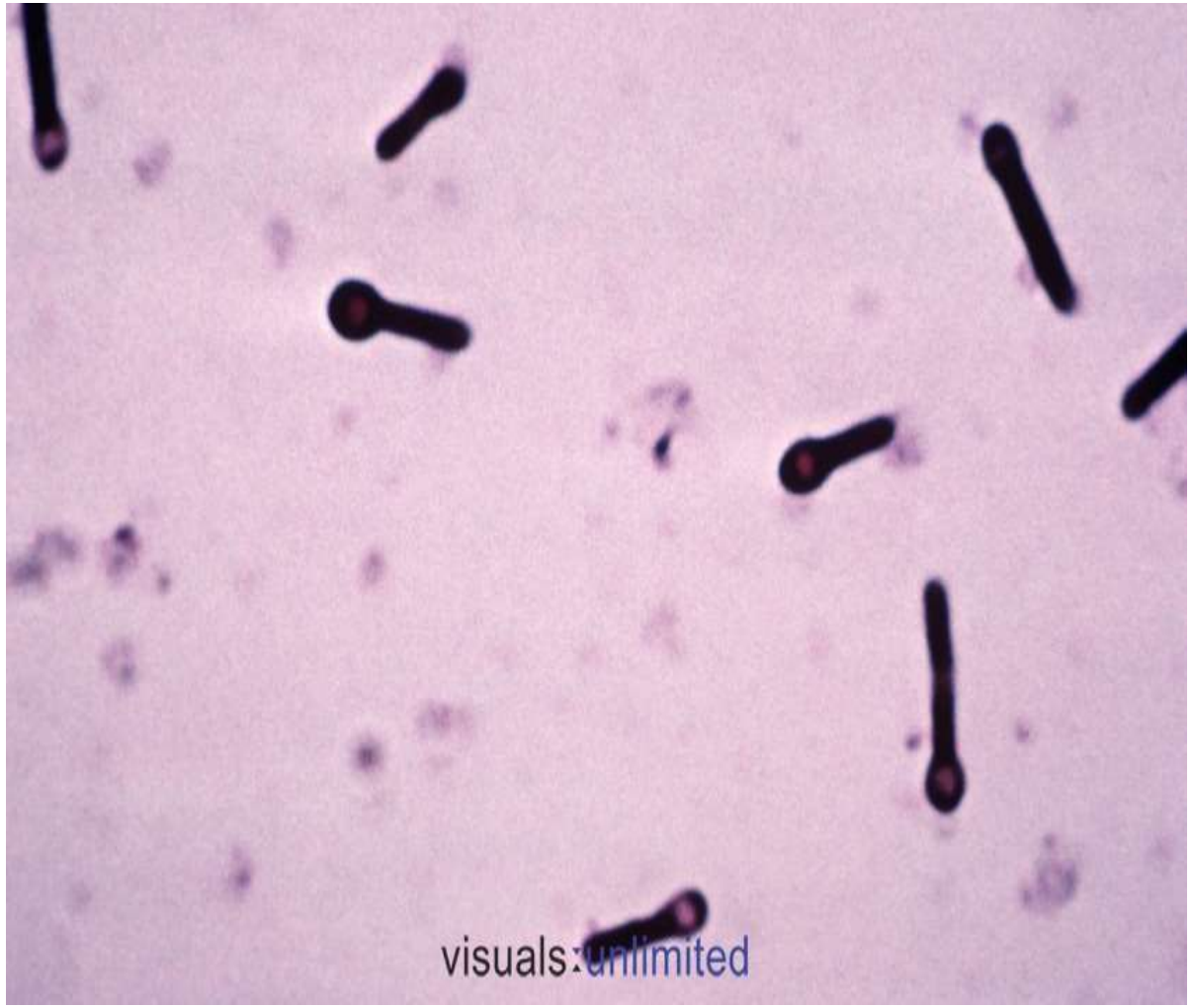
# CLOSTRIDIUM TETANI

# MORPHOLOGY

- Large, motile, spore forming rod
- It produce round terminal spore (drumstick appearance)
- Spores are widespread in soil

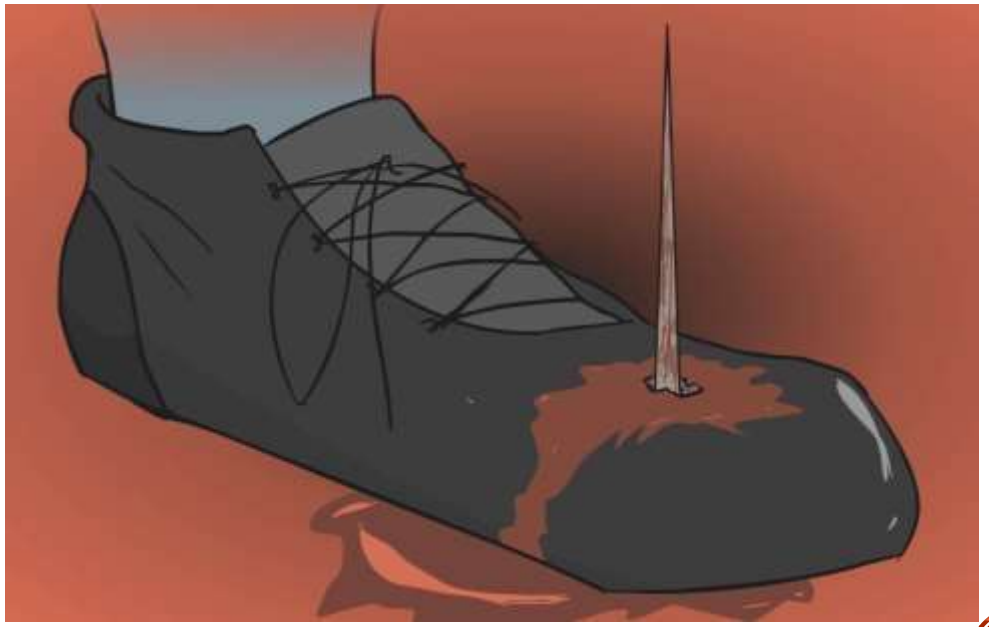


# CLOSTRIDIUM TETANI GRAM STAIN



# TRANSMISSION

- Portal of entry is wound site
- In neonatal tetanus, it may enter through contaminated umbilicusor circumcision wound.



# TOXIN

Two toxins

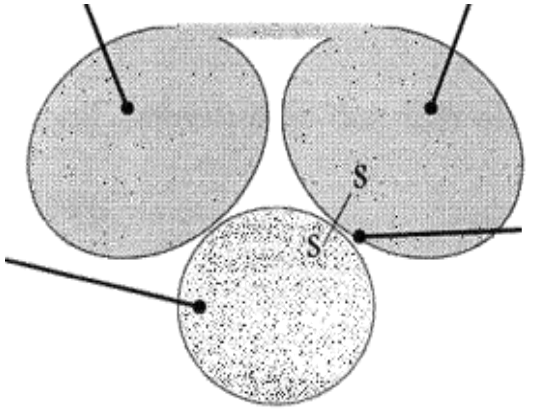
- Oxygen-labile hemolysin (tetanolysin)
- Heat-labile neurotoxin (tetanospasmin), Plasmid encoded

# TETANOLYSIN

- Clinical significance is unknown
- Inhibited by oxygen and serum cholesterol.
- serologically related to streptolysin O and the hemolysins.

# TETANOSPASMIN

- Released during stationary phase of growth.
- Responsible for clinical manifestations of tetanus.
- Two part (A-B)

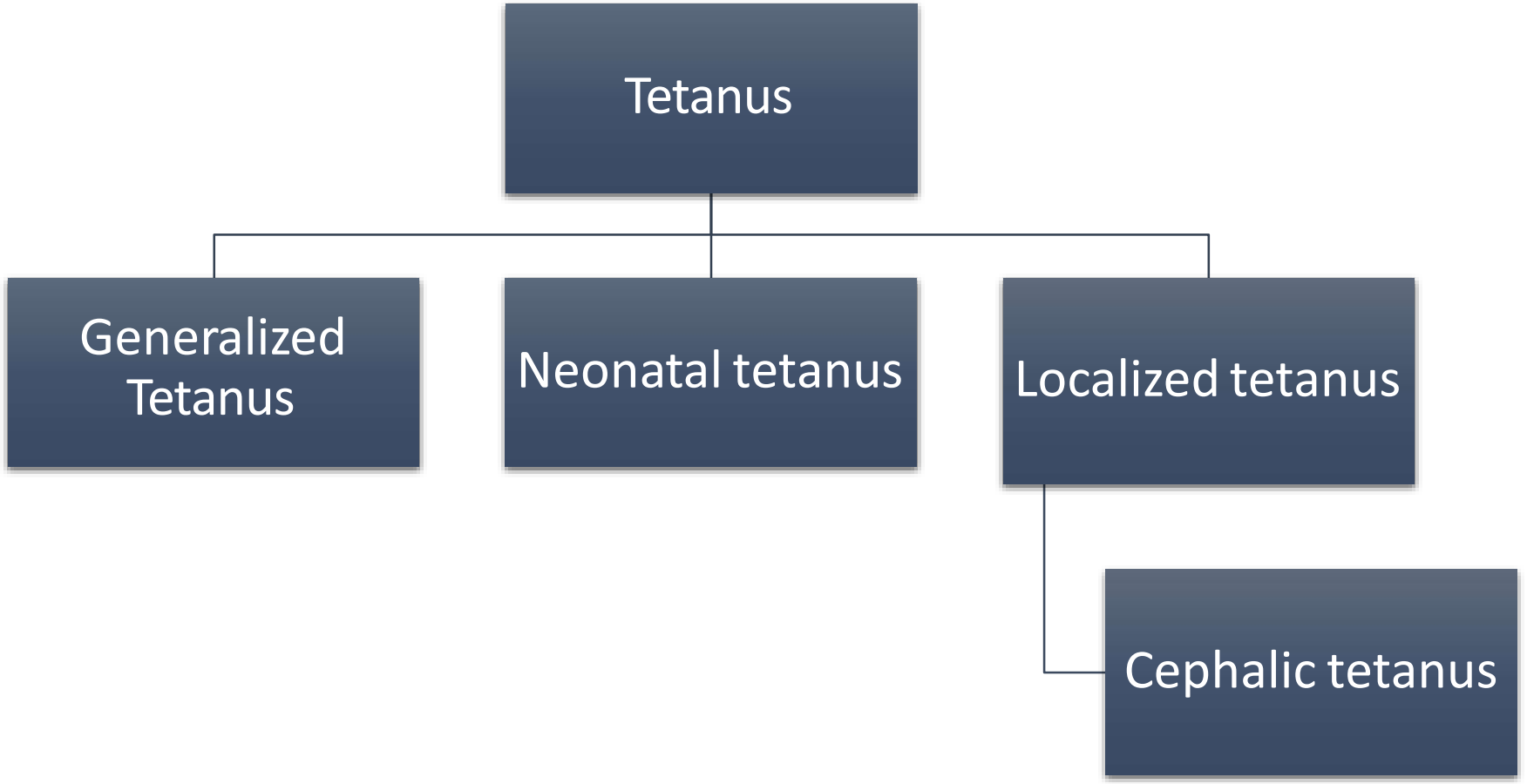


# CLINICAL DISEASE

**Incubation period**

- varies from a few days to weeks.
- The duration of the incubation period is directly related to the distance of the primary wound infection from the central nervous system.

# CLINICAL DISEASE



# GENERALIZED TETANUS

- Most common form.
- Involvement of the masseter muscles (trismus or lockjaw) is the presenting sign in most patients.
- characteristic sardonic smile that results from the sustained contraction of the facial muscles is known as risus sardonicus
- Other early signs are drooling, sweating, irritability, and persistent back spasms (opisthotonos)

# GENERALIZED TETANUS

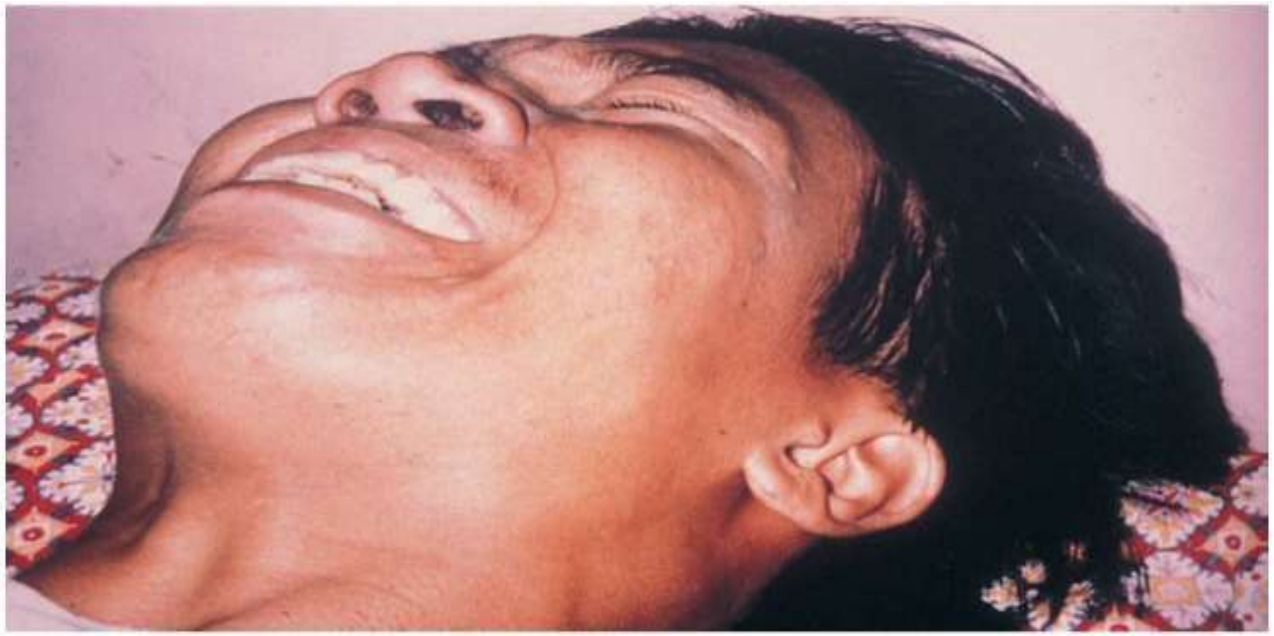


**FIGURE 30-6** Facial spasm and risus sardonicus in a patient with tetanus. (From Cohen J, Powderly WG, Opal SM: *Infectious diseases,* ed 3, Philadelphia, 2010, Mosby.)

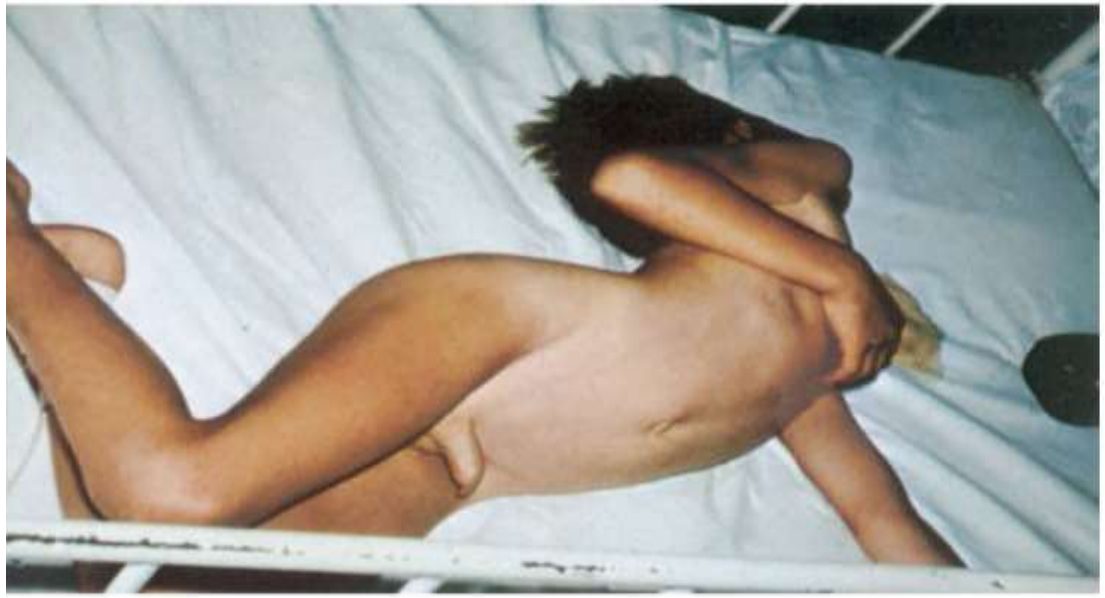


**FIGURE 30-7** A child with tetanus and opisthotonos resulting from persistent spasms of the back muscles. (From Emond RT, Rowland HAK, Welsby P: *Colour atlas of infectious diseases,* ed 3, London, 1995, Wolfe.)

# LOCALIZED TETANUS

- Disease remains confined to the musculature at the **site of primary infection.**

**Cephalic tetanus**

- A variant in which which the primary site of infection is the head
- The prognosis for patients with cephalic tetanus is very poor.

# NEONATAL TETANUS

**Neonatal tetanus (tetanus neonatorum)**

- Typically associated with an initial infection of the umbilical stump
- progresses to become generalized.
- The mortality in infants exceeds 90%
- developmental defects are present in survivors.
- This is almost exclusively a disease in developing countries.

# NEONATAL TETANUS

# TREATMENT

- Debridement of the primary wound
- Use of penicillin or metronidazole to kill the bacteria and reduce toxin production

**Prevention:**

- **Vaccination with tetanus toxoid**

# CLOSTRIDIUM BOTULINUM

# CLOSTRIDIUM BOTULINUM

- large, spore forming, anaerobic rods.
- Spores are widespread in soil, contaminate vegetables and meat.
- If foods are canned without sterilization, spore will survive and germinate under anaerobic condition and bacteria will produce toxin

# TOXIN

- Similar to tetanus toxin, C. botulinum toxin a protein (A-B toxin) consisting of a small subunit (light, or A chain)

# CLINICAL USE OF TOXIN

Botox is a commercial preparation of exotoxin A used to remove wrinkles on the face

**Effective in minute amount in certain muscle disorders**

# CLINICAL DISEASE

- Descending weakness and paralysis
- Diplopia
- Dysphagia
- Respiratory muscle failure
- No fever

## Botulism

### Wound botulism

Spores contaminate wound, germinate and produce toxin at site

### Infant botulism

Organism grow in gut and produce toxin.
Ingestion of honey contaiinng the organism is the cause

# TREATMENT

**Patients with botulism require the following treatment measures:**

- Adequate ventilatory support
- Elimination of the organism from the GI tract through the judicious use of gastric lavage and metronidazole or penicillin therapy,
- Use of trivalent botulinum antitoxin to inactivate unbound toxin circulating in the bloodstream.

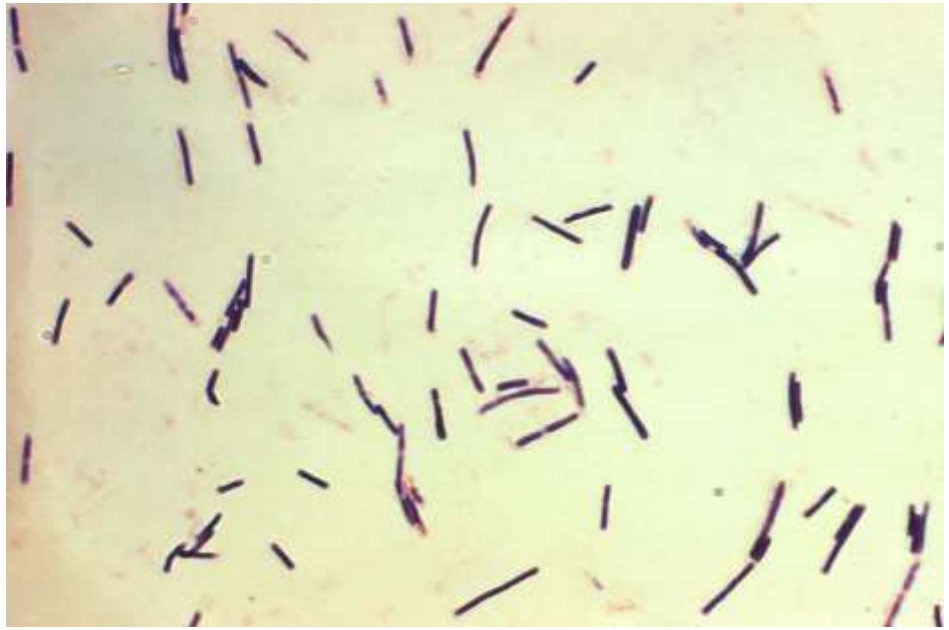
# PREVENTION

- Disease is prevented by
  - Destroying the spores in food (virtually impossible for practical reasons)
  - Preventing spore germination (by maintaining the food in an acid pH or storage at 4° C or colder)
  - Destroying the preformed toxin (Toxins are inactivated by heating at 60° C to 100° C for 10 minutes).
  - Infant botulism has been associated with consumption of honey contaminated with C. botulinum spores, so children younger than 1 year should not eat honey.

# CLOSTRIDIUM PERFINGENS

# CLOSTRIDIUM PERFINGENS

- Most frequent clinical isolate of clostridium
- Inhabits in soil and in intestine of animals and humans.
- Rapidly grows in tissues and in culture
- Large, rectangular, gram positive bacilli
- Capsulated, non motile with subterminal spore



# TOXINS AND ENZYMES

**Epsilon toxin**

- Increase vascular permeability of gastrointestinal wall

**Iota toxin**

- necrotizing activity
- increase vascular permeability

**Entero toxin**

- Produced primarily by type A strain
- Disrupts ion transport in ileum and jejunum by inserting into the cell membrane and altering membrane permeability.

# CLINICAL DISEASE

**Clostridial myonecrosis (gas gangrene)**

- Military settings- Gutshot injuries
- Civilian cases - accidental injuries, surgical complication, injection of medication such as epinephrine.

# TREATMENT

- **Simple wound contamination**
  - Care of wound
  - removal of necrotic tissue
  - cleansing
  - Antibiotics - rarely required

**Anaerobic cellulitis:**

- Opening the involved area
- removing all necrotic tissue
- cleansing thoroughly
- Antibiotics

# TREATMENT

**Clostridial myonecrosis**

- Care of wound : surgical removal of all infected and necrotic tissue
- Amputation- rapidly progressive infection involving limb
- Antibiotics - Penicillin G/ Clindamycin or Metronidazole, Gentamicin or Tobramycin (for facultative Gram negative organisms)

# CLOSTRIDIUM DIFFICLE

# GENERAL CRITERIA

- Part of normal microbial flora of GIT (3 – 5% adult, 40 – 50% healthy neonates)

**Morphology:**

- large gram positive rod.
- having oval subterminal spore.

# VIRULENCE FACTORS

**Enterotoxin (Toxin A)**

- produce chemotaxis; induce cytokine production, with hypersecretion of fluid;
- produces haemorrhagic necrosis.

**Cytotoxin (Toxin B)**

- induces depolymerization of actin with loss of cellular cytoskeleton.

**Adhesin factor**

- binding to colonic cells.

# TRANSMISSION

- Exogenous - Person to person in hospital.
- Endogenous -Over growth of toxin producing strains after Rx of Antibiotics.

**Antibiotics implicated in Cl.difficele Associated Diarrhoea and Colitis:**

- Cephalosporin
- Ampicillin and amoxicillin
- Clindamycin.
- Other Penicillins, Macrolides, Tetracyclines.