

SPORE-FORMING...GRAM POSITIVE BACILLI CLOSTRIDIUM SPECIES

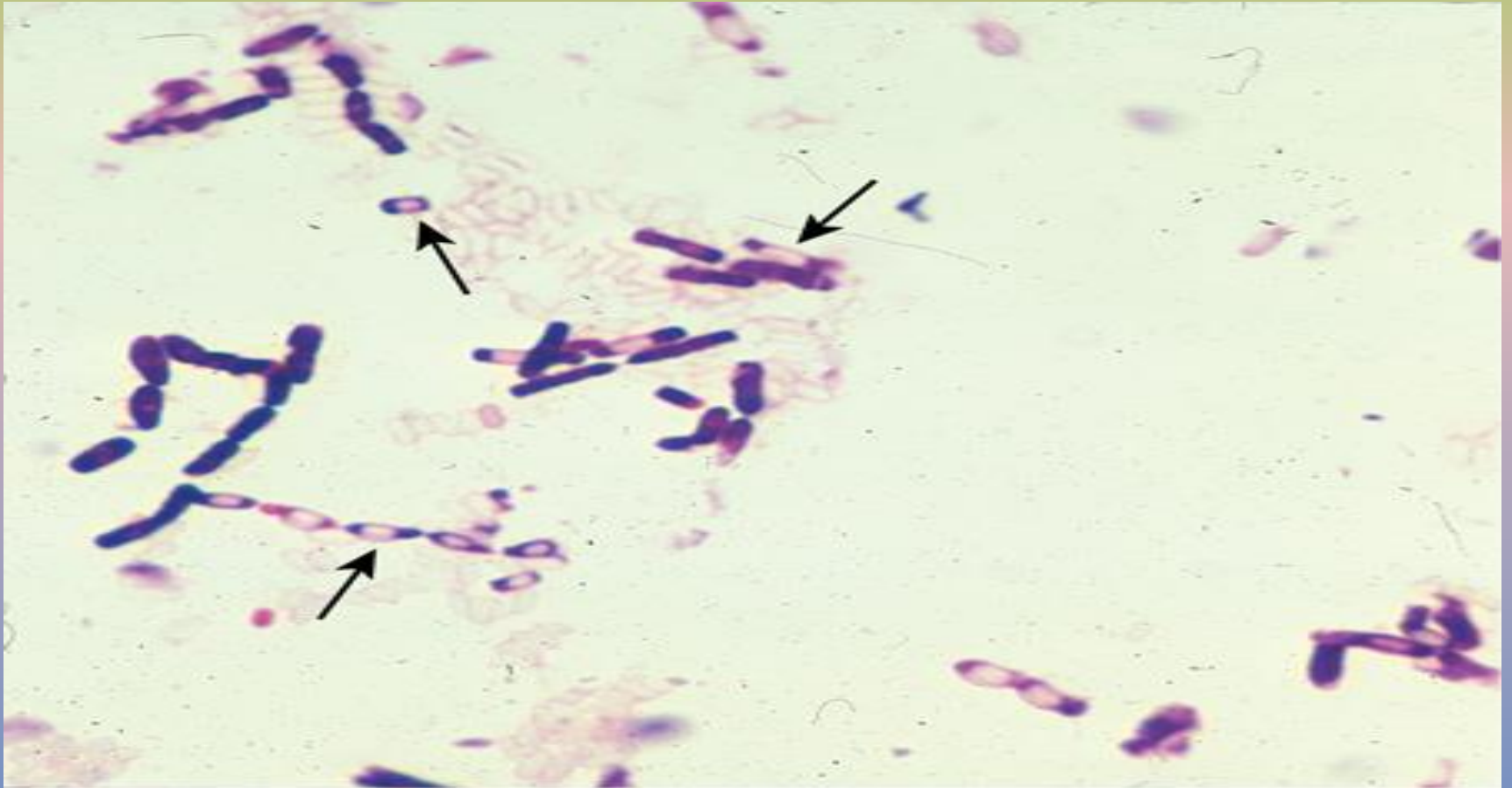
*Zainab Kh. Abbas
Anbar University*

*B.Sc., M.Sc. Med. Microbiology
College of Medicine- Dep. of
Microbiology*

Clostridium Species

The clostridia are large anaerobic, gram-positive, most species are motile rods. Many decompose proteins or form toxins, and some do both. Their natural habitat is the soil or the intestinal tract of animals and humans, where they live as saprophytes. Among the pathogens are the organisms causing botulism, tetanus, gas gangrene, and pseudomembranous colitis

- MORPHOLOGY & IDENTIFICATION
- TYPICAL ORGANISMS
- Spores of clostridia are usually wider than the diameter of the rods in which they are formed. In the various species, the spore is placed centrally, subterminally, or terminally. Most species of clostridia are motile and possess peritrichous flagella.



Source: Brooks GF, Carroll KC, Butel JS, Morse SA, Mietzner TA: *Jawetz, Melnick, & Adelberg's Medical Microbiology*, 25th Edition: <http://www.accessmedicine.com>
Copyright © The McGraw-Hill Companies, Inc. All rights reserved.

- Culture

- Clostridia are anaerobes and grow under anaerobic conditions; a few species are aerotolerant and will also grow in ambient air. In general, the clostridia grow well on the blood-enriched media used to grow anaerobes and on other media used to culture anaerobes as well.

- Colony Forms

- Some clostridia produce large raised colonies (eg, *C perfringens*).
- others produce smaller colonies (eg, *C tetani*).
- Some clostridia form colonies that spread on the agar surface.
- Many clostridia produce a zone of hemolysis on blood agar. *C perfringens* characteristically produces a double zone of hemolysis around colonies

- GROWTH CHARACTERISTICS

- Clostridia can ferment a variety of sugars; many can digest proteins. Milk is turned acid by some and digested by others and undergoes "stormy fermentation" (ie, clot turn by gas) with a third group (eg, *C perfringens*).

CLOSTRIDIUM BOTULINUM

- *C botulinum*, which causes **botulism**, is worldwide in distribution; it is found in soil and occasionally in animal feces.
- Types of *C botulinum* are distinguished by the antigenic type of toxin they produce. Spores of the organism are highly resistant to heat, withstanding 100C for several hours. Heat resistance is diminished at acid pH or high salt concentration.

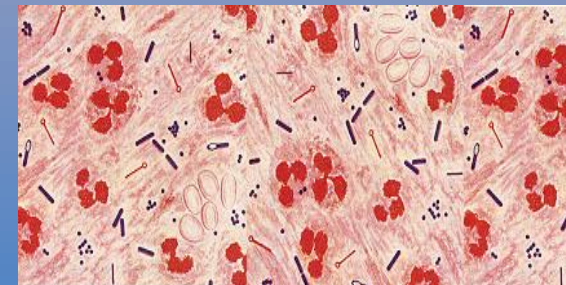
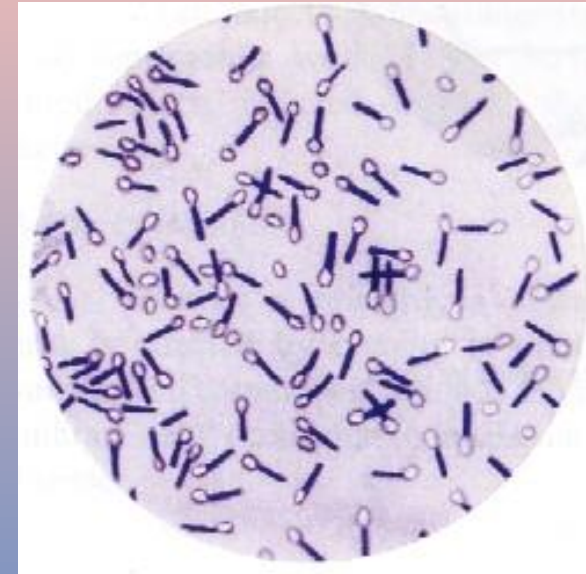
CLOSTRIDIUM CAUSING TETANUS

CL. TETANI

- *INTRODUCTION:*
- *C tetani*, which causes **tetanus**, is worldwide in distribution in the soil and in the feces of horses and other animals. Several types of *C tetani* can be distinguished by specific flagellar antigens. All share a common O (somatic) antigen, which may be masked, and all produce the same antigenic type of neurotoxin, tetanospasmin.

CLOST. TETANI: GENERAL FEATURES

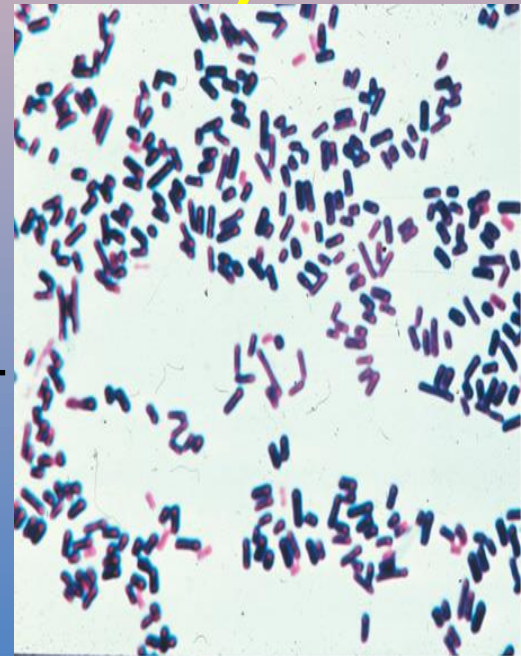
- Gram positive, straight, slender rod with rounded ends
- All species form endospore (drumstick with a large round end)
- Obligate anaerobe
- Motile by peritrichous flagella
- Grows well in cooked meat broth and produces a thin spreading film when grown on enriched blood agar
- Spores are highly resistant to adverse conditions
- Iodine (1%) in water is able to kill the spores within a few hours



CLOSTRIDIA THAT PRODUCE INVASIVE INFECTIONS

CLOSTRIDIUM PERFRINGENS

- Large Gram-positive bacilli with stubby ends
- Capsulated
- Non motile (while others of *C/* are motile)
- Anaerobic
- Grown quickly on selective media
- Can be identified by Nagler reaction



CLOSTRIDIUM PERFRINGENS

- Many different toxin-producing clostridia (*C perfringens* and related clostridia). can produce invasive infection (including **myonecrosis** and **gas gangrene**) if introduced into damaged tissue. About 30 species of clostridia may produce such an effect, but the most common in invasive disease is *C perfringens* (90%). An enterotoxin of *C perfringens* is a common cause of food poisoning.

LABORATORY DIAGNOSIS

➤ Specimen: Histological specimen or wound exudates

- Histological specimen transferred aseptically into a sterile screw-capped bottle & used immediately for microscopical examination & culture
- Specimens of exudates should be taken from the deeper areas of the wound where the infection seems to be most pronounced

➤ Microscopical examination (Gram, Spore stain etc)

- Gram-positive bacilli, non motile, capsulated & sporulated
- The spore is oval, sub-terminal & non bulging
- Spores are rarely observed

➤ Culture: Anaerobically at 37C

- On **Robertson's cooked meat medium** → blackening of meat will observed with the production of H₂S and NH₃
- On blood agar → β-hemolytic colonies



Prerduced, anaerobically sterilized (PRAS) plated media

BIOCHEMICAL TESTS

- *Cl. perfringens* characterized by:
 - It ferments many carbohydrates with acid & gas
 - It acidified litmus milk with stormy clot production
 - Nagler reaction is positive

- *CLOSTRIDIUM DIFFICILE* & DIARRHEAL DISEASE
- PSEUDOMEMBRANOUS COLITIS

- Pseudomembranous colitis is diagnosed by detection of one or both *C difficile* toxins in stool and by endoscopic observation of pseudomembranes or microabscesses in patients who have diarrhea and have been given antibiotics. Plaques and microabscesses may be localized to one area of the bowel. The diarrhea may be watery or bloody, and the patient frequently has associated abdominal cramps, leukocytosis, and fever.

Thank
you

For Your Attention

