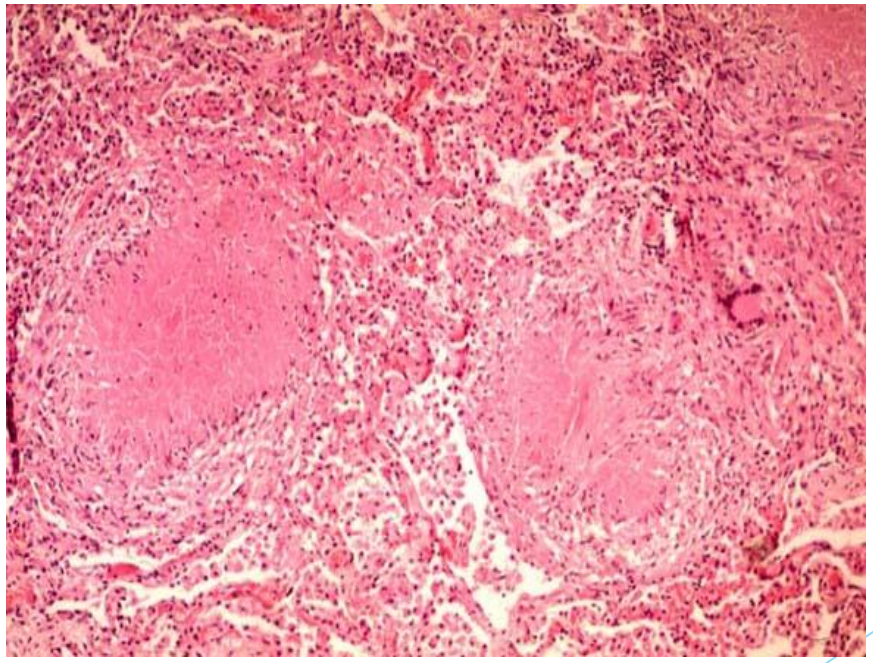
M.J.F. COLLEGE OF VETERINARY AND ANIMAL SCIENCE, CHOMU, JAIPUR

DEPARTMENT OF VETERINARY PATHOLOGY



Gangrene - Greek word ***gangraina***, which means

"Putrefaction of tissues"

- It is the invasion and putrefaction of necrotic tissue by saprophytic bacteria.

- **Prime cause**- Reduced blood supply to the affected tissues, which results in cell death.
- **Most often seen in:** Lungs, Intestine, Mammary gland, Large muscles of the thigh and shoulder, extremities.

Types of gangrene

- 1. Dry Gangrene
- 2. Moist Gangrene
- 3. Gas Gangrene

Dry Gangrene

Extremities- Gangrene of the leg, ear, tail, wattle, or comb is associated with

1.Freezing.-Freezing temperatures cause coagulative necrosis of tissue. Invaded with saprophytic bacteria

2.Certain drugs or plants- (ergot and mould on fescue grass) contain active principles which cause arterial spasms and restrict the blood flow & leads to necrosis of the extremities. The tissues are invaded with bacteria and gangrene results

- *Thromboangitis obliterans* in man is the cause for the gangrene of extremities since blood supply is arrested due to occlusion of the arterioles.

- Senile gangrene may occur in humans in old age from arteriosclerosis which causes ischaemia.

- Diabetic gangrene also occurs from narrowing of arteries. Bacteria grow well in the tissue due to their high sugar content.

Dry Gangrene

- Usually observed in the extremities.
- Determining factors: Moisture and Temperature
- When necrosis occurs

- Circulation is no longer maintained

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- Necrotic tissue gets dehydrated by evaporation and becomes dry

- Since bacteria require moisture for growth, invasion & spread of bact in an area is slow

- When the tissue is dead and circulation absent, the part becomes cool

- The growth of bacteria is suppressed

- Invasion and spread of bacteria through the necrotic tissue are therefore slow

Grossly:

- Area is dry, shriveled and appears mummified due to dehydration.
- It is reddish brown, green, grey or black in colour
- The colour depends on the amount of iron sulphide formed.
- The disintegrating erythrocytes liberate haemoglobin.
- Bacterial putrefaction of the dead tissue produces hydrogen sulphide.
- When hydrogen sulphide comes in contact with iron of haemoglobin, iron sulphide (a black pigment) is produced.

- It produces black discoloration of false melanin, the change is called pseudomelanosis
- The area also has a very putrid odour due to hydrogen sulfide
- The gangrene extends in the direction of the body until a point is reached where sufficient circulation is present to keep the part alive
- The dead tissue is demarcated sharply from the living by a line of severe inflammatory reaction

- This is an attempt by the body's defences to prevent the bacteria from spreading

- In addition, the defense line also tries to prevent the entrance of toxins formed in the dead tissue from being absorbed by the living tissue.

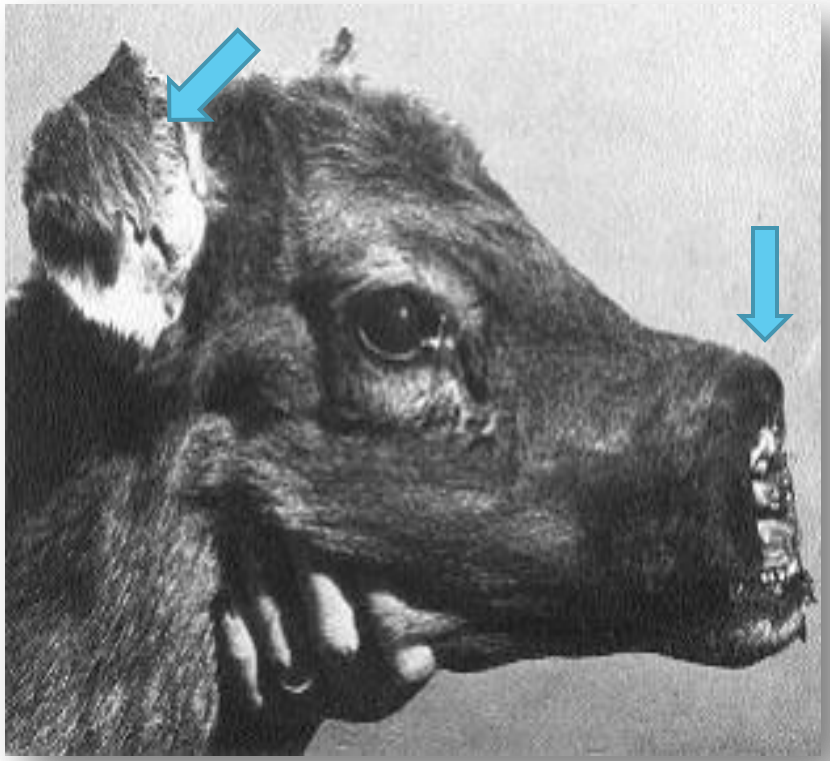
- The neutrophils and macrophages in the inflammatory zone digest the necrotic tissue by their hydrolytic enzymes.

- The gap is then repaired by granulation tissue formation.

MICROSCOPICALLY

- A structure less necrotic area, stained pink with numerous bacteria.
- A few gas bubbles are evident by clear spaces.
- An acute inflammatory reaction is present at the junction of the living and dead tissue.

DRY GANGRENE



Dry gangrene of an amputated hand due to infarction from septic emboli

Central dry gangrene and toward the edges, moist gangrene with some ascending cellulitis

Dry gangrene with dead toes and visible bone

Moist gangrene

- Occurs in the internal organs where there is an abundance of moisture and the temperature is higher.

- With optimum conditions of moisture and warmth, the growth and spread of saprophytic bacteria are very rapid.

Moist gangrene: Occurs in internal organs

In Lungs - it occurs due to

1. Faulty drenching of medicine-
2. Improper insertion of stomach tube where feed & medicines are poured in lungs
3. Paralysis and infectious diseases of the throat where food may pass into the trachea & lung .

The feed and medicines act as irritant and cause necrosis of lung tissue-invasion of saprophytes cause Gangrene.

In Intestine- In Horses infarction due to Verminous thrombus in the anterior mesenteric artery (due to *Strongylus vulgaris*.

-Acute passive local hyperemia associated with a malposition of the viscera (torsion, volvulus or intussusception)

--vascular disturbances cause necrosis of intestinal wall-invasion of saprophytes cause gangrene.

MAMMARY GLAND

In mastitis, caused by *Staphylococcus*

Necrosis

Toxins

Thrombosis of the mammary vessels (infection spreading to the vessel walls)

Subsequent infection by saprophytes

Gangrene

When moist gangrene involves Intestinal tract

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Invasion of numerous bacteria contained in intestinal contents on intestinal wall

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When Intestinal wall gets necrotic, rupture occurs

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Faecal contents are discharged into the peritoneal cavity

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Spreading microorganisms throughout the viscera

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Process is extremely rapid

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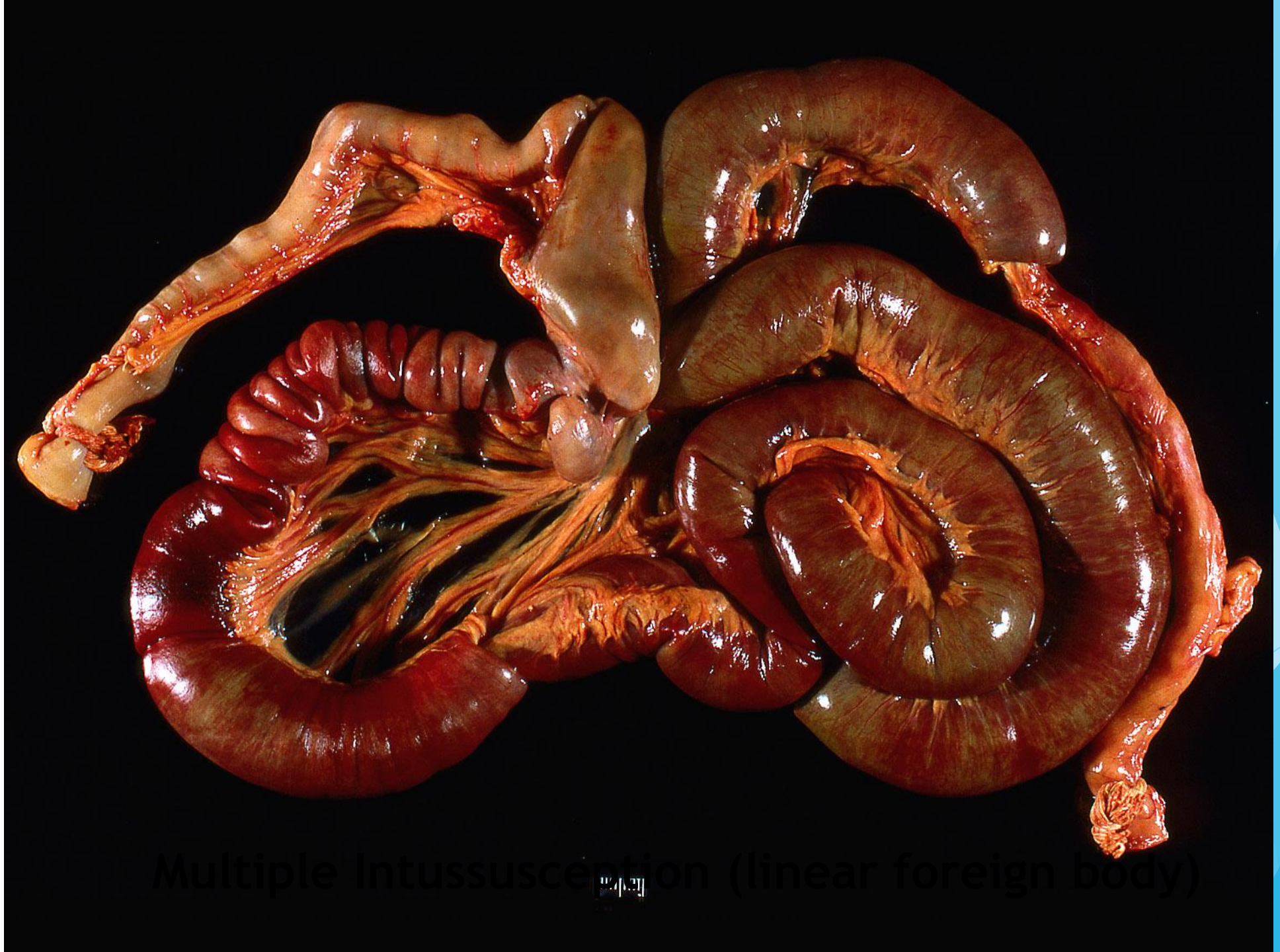
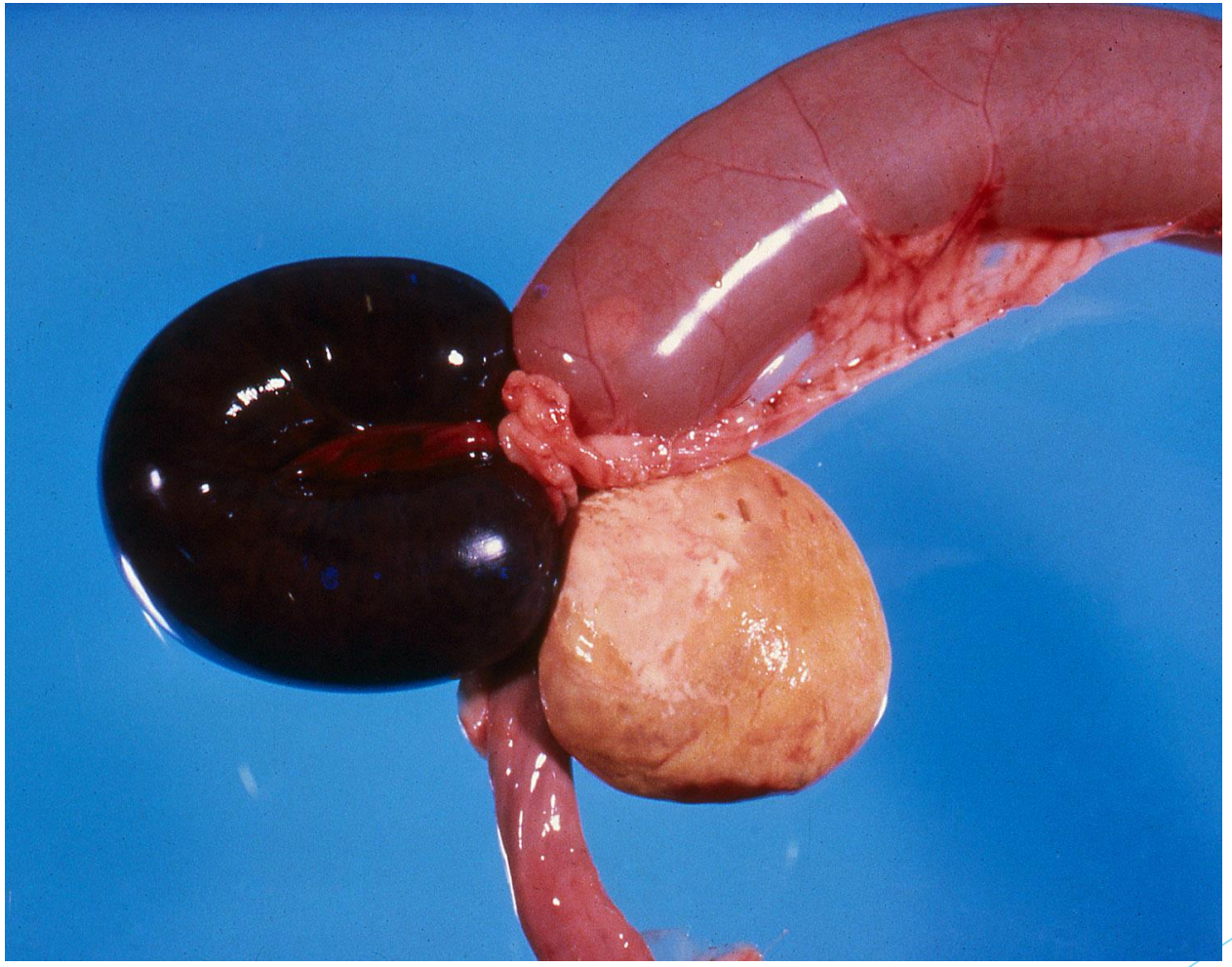
Death due to septicaemia, Sepremia and shock

MACROSCOPICALLY

- Area is moist and red, green, grey or black in colour as a result of iron sulphide formation.
- The odour is extremely offensive because of the abundance of hydrogen sulphide.
- The intestine is distended with large quantities of gas
- There is no sharp line of demarcation betn dead & living tissue



Multiple Intussusception (linear foreign body)



Gangrenous Mastitis

Gangrenous mastitis in Goat

Mastitis cause by coagulase-positive Staphylococcus aureus. S. aureus can produce alpha toxin, a potent vasoconstrictor that is probably involved in the pathogenesis of gangrene mastitis.

GAS GANGRENE

- It is specific type of moist gangrene frequently observed in humans and animals.
- This is due to invasion of the tissue by various *Clostridial* organisms (*Clostridium perfringens*, *C. welchi*, *C. chauvoei*, *C. septicum* and *C. novyi*). The organisms of clostridial groups are pathogenic & saprophytic. They cause necrosis & gangrene of the tissue.
- These organisms are inhabitants of the soil and the digestive tract.
- They enter into the wounds of various types, e.g., shearing, castration, docking and ear notching, needles for inj.

Necrosis due to injury

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In necrotic tissue these organisms grow and multiply and produce Toxins

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Kill the surrounding tissues

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Invade the necrotic tissue

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Spread throughout the body and bring about the death

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The organisms produce gas, accumulated in the tissues

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Gives a characteristic **crackling noise** when pressed

- The reason for the thigh and shoulder muscles to be more often affected is that these are more prone to trauma.

- The same series of events occurs in black quarter and malignant oedema in cattle and sheep.

- Cattle and sheep are injured by other animals by kicks, horn thrusts or bunts (head thrusts).

- **Grossly**-The affected muscles are black in colour, emit a foul odour and show evidence of gas.
- On section a serosanguineous, foul smelling fluid is found to exude
- **Microscopically-**
- The muscle cells appear ruptured.
- The sarcolemma is separated from the fibre, which dies as it is deprived of blood supply.
- The necrotic tissues are edematous, with non-specific inflammatory reaction.
- The edema fluids as well as the necrotic tissues show numerous rod-shaped, gram-positive spore containing organisms.