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Please read this bit first

The HPCSA and the Med Tech Society have confirmed that this clinical case study, plus your routine review of your EQA reports from Thistle QA, should be documented as a "Journal Club" activity. This means that you must record those attending for CEU purposes. Thistle will **not** issue a certificate to cover these activities, nor send out "correct" answers to the CEU questions at the end of this case study.

The Thistle QA CEU No is: **MT00025.**

Each attendee should claim **THREE** CEU points for completing this Quality Control Journal Club exercise, and retain a copy of the relevant Thistle QA Participation Certificate as proof of registration on a Thistle QA EQA.

Cycle 24 - Organism 6:

Clostridium perfringens

Clostridia are gram-positive, anaerobic, spore-forming bacilli commonly found throughout nature (with the exception of the North African desert). Cultivated rich soil has the highest density of organisms. In addition, clostridia have been isolated from normal human colonic flora, skin, and the vagina. More than 150 *Clostridium* species have been identified, but only 6 have been demonstrated to be capable of producing the fulminant condition known as clostridial gas gangrene. Usually, more than 1 species is isolated from clinical specimens.

Clostridium perfringens, previously known as *Clostridium welchii,* is the most common cause of clostridial gas gangrene (80-90% of cases). Other clostridia species responsible for the condition include *Clostridium novyi* (40%), *Clostridium septicum* (20%), *Clostridium histolyticum* (10%), *Clostridium bifermentans* (10%), and *Clostridium fallax* (5%).

Infections are characterized by a very low level of host inflammation in response to organism-associated exotoxins. In fact, it is more of a response to the exotoxins than a classic immune response to invading organisms. Purulence is often absent. The process of myonecrosis can spread as fast as 2 cm/h. This results in systemic toxicity and shock that can be fatal within 12 hours. Overwhelming shock with accompanying renal failure usually leads to death.

Infection requires 2 conditions to coexist. First, organisms must be inoculated into the tissues. Second, oxygen tension must be low enough for the organisms to proliferate. These organisms are not strict anaerobes; 30% oxygen tension in the tissues allows for free growth of these bacteria, but 70% oxygen tension restricts their growth. Inoculation of organisms into low oxygen tension tissues is followed by an incubation period that usually ranges from 12-24 hours. However, this period can be as brief as 1 hour or as long as several weeks. The organisms then multiply and produce exotoxins that result in myonecrosis.

Although not very well understood, exotoxins appear to be tissue-destructive soluble antigens produced by clostridia. They include lecithinase, collagenase, hyaluronidase, fibrinolysin, hemagglutinin, and hemolysin toxins. *C perfringens* produces at least 17 identifiable exotoxins that are used for species typing (eg, type A, type B, type C).

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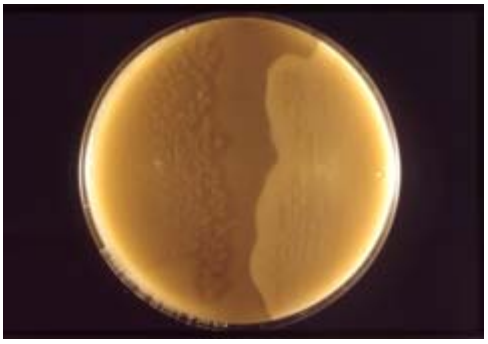
Theta toxin causes direct vascular injury, cytolysis, hemolysis, leukocyte degeneration, and polymorphonuclear cell destruction. These effects on leukocytes may explain the relatively minor host inflammatory response that is observed in tissues of patients with clostridial myonecrosis.

Kappa toxin, also produced by *C perfringens,* is a collagenase that facilitates the rapid spread of necrosis through tissue planes by destroying connective tissue.

Alpha toxin is produced by most clostridia and has phospholipase C activity. This potent lecithinase causes lysis of red blood cells, myocytes, fibroblasts, platelets, and leukocytes. It also may decrease cardiac inotropy and trigger histamine release, platelet aggregation, and thrombus formation.

Photomicrograph of gram-positive Clostridium prumpfringens bacilli.



C. perfringens colonies on an egg yolk agar plate showing a white precipitate

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CPD Questions:

1. How many Clostridium species are capable of producing the condition known as “clostridial gas gangrene”?
2. Is *Cl perfringens a strict anaerobe? How much oxygen tension in the tissues will allow it to grow?*
