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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 20 Organism 5:

Clostridium perfringens

Description of the pathogen

The *Clostridium* group contains more than 60 different species of bacteria. These bacteria are commonly found in soil everywhere in the world, and some species even live harmlessly in our intestines.

- *Clostridium* species are Gram-positive, rod-shaped, spore-formers. These generally obligate anaerobes are ubiquitous saprophytes or part of our normal flora.
- Clostridia employ butyric fermentation pathways to generate energy and, as a result, often produce a foul odour.
- *C. perfringens* produces large rectangular spores and is non-motile. This species is most often associated with wound infections but these are generally polymicrobic.
- *C. tetani* produces terminal spores, giving it the appearance of a squash racket. This species is motile and produces a single antigenic type of exotoxin.
- *C. botulinum* produces oval subterminal spores and is motile. Different strains within this species produce one of 8 exotoxin types (A, B, C1, C2, D, E, F, G). Types C and D are encoded by bacteriophage that infect the bacteria.
- *C. difficile* produces large oval subterminal spores and two different toxins; toxin A (an enterotoxin causing fluid accumulation in the intestine) and toxin B (a cytopathic agent). Ordinarily, this species can't compete with normal intestinal flora but, when antibiotics eliminate these normal flora, *C. difficile* can flourish, producing disease[1].

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Gas Gangrene

Gas gangrene is a serious wound infection that can follow a "dirty" wound (car accident, crush injury, farm accident, factory injury). *Clostridium* bacteria from the intestines or the soil contaminate the wound and produce toxins that destroy skin and muscles nearby. As the bacteria grow in the wound, they also manufacture "gas" as a by-product, and this gas can often be seen by doctors when they look at X-rays or scans of the wound area. Although at least seven different types of *Clostridium* bacteria may cause gas gangrene, about 80% of cases are due to *Clostridium perfringens*.

Signs and Symptoms

Gas gangrene is a severe but rare infection of the skin and muscles that can occur when a wound or injury is contaminated by *Clostridium* bacteria found in soil. The first symptom of gas gangrene is sudden, severe pain in the wound, with swelling that stretches the skin "tight" nearby. The skin in the area of the wound may be pale, bronze, or deep red, and it is tender to the touch. Large, bloody blisters may form in the area, and the wound itself may have a sweet smell and may leak a brown, bloody, or amber-colored fluid. As this serious infection continues, symptoms appear that involve the entire body, including fever, sweating, rapid pulse, and a sudden drop in blood pressure. Untreated gas gangrene may lead to severe kidney and blood problems, kidney failure, coma, and death[2].

Incubation

The incubation period for gas gangrene is usually 1 to 4 days after the "dirty" wound.

Duration

The duration of gas gangrene varies from patient to patient. It can be cured with antibiotics, combined with surgery to remove dead tissue around the wound.

Professional Treatment

Doctors can often make the diagnosis of gas gangrene by looking at the infected wound, noting its sweet odor, and evaluating the extent of injury.

Susceptibility to antimicrobial agents

Surgical measures are especially important in the treatment of gas gangrene and a number of other *Clostridium*-mediated diseases Penicillin G (10x 10^6 to 24 x 10^6 units per day) are still considered the drug of choice for gas gangrene. Beta-lactamase has not been demonstrated in *C. perfringens*. A combination of penicillin plus clindamycin may also be used[3].

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1. Allen SD, Emery CL, Lyerly DM. *Clostridium*. In Murray PR, ed. Manual of Clinical Microbiology. Washington, DC: ASM Press; 2003: 835-856.
2. Gorbach SL. *Clostridium perfringens*and other clostridia, p. 1925-1933. In SL Gorbach (ed.), Infectious Diseases, 2nd ed. W.B Saunders Company, Philadelphia, Pa.
3. Lorber B. 2000. Gas gangrene and other clostridium-associated diseases, p. 2549-2561. In G.L. Mandell (ed.), Mandell, Douglas and Benett's Principles and Practice of Infectious Diseases, 4th ed., vol. 2. Churchill Livingstone, Philadelphia, Pa.

Questions:

1. How would you differentiate between the genera *Clostridium* and *Bacillus?*
2. How would you isolate *Clostridium perfringens*?
3. What characteristics are used to identify *Clostridium perfringens*?
4. What infections are caused by *Clostridium perfringens*?