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Please read this section 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: **MT- 18/063.**

Each attendee should claim **ONE** 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.

MICROBIOLOGY LEGEND

CYCLE 44 ORGANISM 6

ENTEROCOCCUS FAECALIS

Enterococcus faecalis – formerly classified as part of the group D *Streptococcus* system – is a Gram-positive, commensal bacterium inhabiting the gastrointestinal tracts of humans and other mammals. Like other species in the genus *Enterococcus*, *E. faecalis* is found in healthy humans, but can cause life-threatening infections in humans, especially in the nosocomial (hospital) environment, where the naturally high levels of antibiotic resistance found in *E. faecalis* contribute to its pathogenicity. *E. faecalis* has been frequently found in re-infected root canal-treated teeth in prevalence values ranging from 30% to 90% of the cases. Re-infected root canal-treated teeth are about nine times more likely to harbor *E. faecalis* than cases of primary infections

Physiology

E. faecalis is a nonmotile microbe; it ferments glucose without gas production, and does not produce a catalase reaction with hydrogen peroxide. It can produce a pseudo-catalase reaction if grown on blood agar. The reaction
is usually weak. It produces a reduction of litmus milk, but does not liquefy gelatin. It shows consistent growth throughout nutrient broth which is consistent with being an aerotolerant anaerobe. They catabolize a variety of energy sources including glycerol, lactate, malate, citrate, arginine, agmatine, and many keto acids. Enterococci survive very harsh environments including extremely alkaline pH (9.6) and salt concentrations. They resist bile salts, detergents, heavy metals, ethanol, azide, and desiccation. They can grow in the range of 10 to 45°C and survive at temperatures of 60°C for 30 min.

Enterococcus faecalis basic characteristics

- Gram-positive cocci
- Non-motile
- Non-spore-forming
- Catalase: negative (a pseudo catalase is sometimes produced and a weak effervescence is observed in the catalase test)
- Oxidase: Negative
- Facultative anaerobic bacteria

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Laboratory identification

- Grows in broth containing 6.5% NACL
- Hydrolyse esculin in the presence of bile salts (bile-esculin medium) and turns more than half the medium dark brown.
- Hydrolyse pyrrolidonyl-β-naphthylamide (PYR test - The PYR test determines the activity of pyrrolidonyl aminopeptidase, an enzyme produced by Enterococcus faecalis and many other Enterococcus species. L-pyrrolidonyl-β-naphthylamide impregnated into the strip serves as the substrate for the pyrrolidonyl arylamidase. Catabolism of the substrate produces β-naphthylamide which reacts with the PYR reagent (0.01% cinnamaldehyde reagent) to form a bright red color).
- Produce a cell-wall associated glycerol teichoic acid antigen that is identified as the streptococcal group D antigen

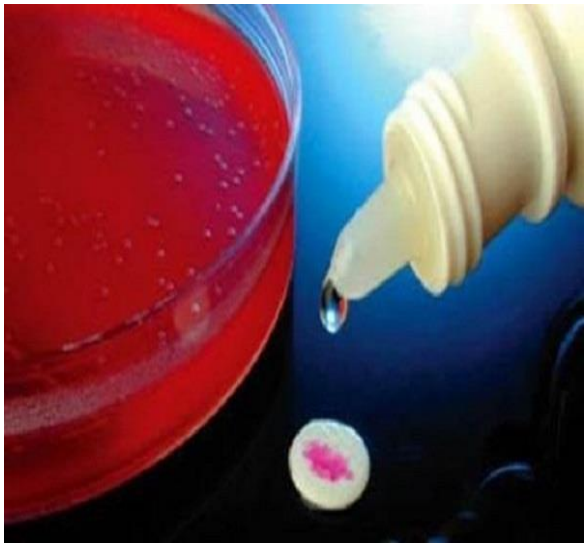

Figure 1: Enterococcus faecalis PYR positive test

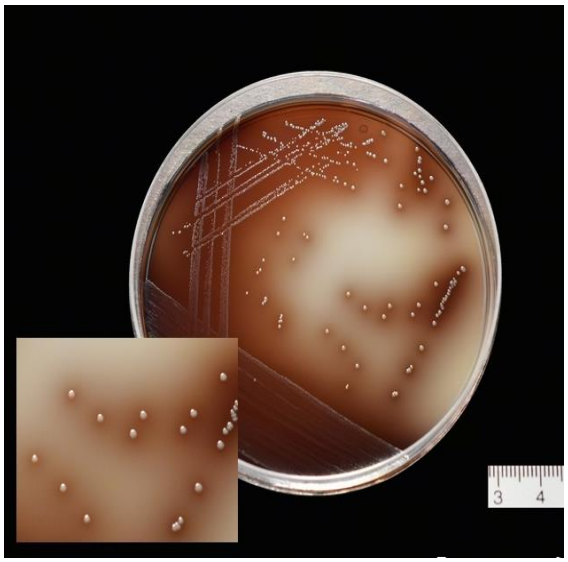

Figure 2: Enterococcus faecalis on bile esculin agar

Pathogenesis

E. faecalis can cause endocarditis and septicaemia, urinary tract infections, meningitis, and other infections in humans. Several virulence factors are thought to contribute to E. faecalis infections. A plasmid-encoded hemolysin, called the cytolysin, is important for pathogenesis in animal models of infection, and the cytolysin in combination with high-level gentamicin resistance is associated with a five-fold increase in risk of death in human bacteraemia patients. A plasmid-encoded factor called "aggregation substance" is also important for virulence in animal models of infection.

Treatment and Antibacterial resistance

E. faecalis is resistant to many commonly used antimicrobial agents (aminoglycosides, aztreonam, cephalosporins, clindamycin, the semisynthetic penicillins (nafcillin and oxacillin) and trimethoprim-sulfamethoxazole). Resistance to vancomycin in E. faecalis is becoming more common. Treatment options for vancomycin-resistant E. faecalis include nitrofurantoin (in the case of uncomplicated UTIs), linezolid, and daptomycin, although ampicillin is preferred if the bacteria are susceptible. Quinupristin/dalfopristin can be used to treat Enterococcus faecium but not E. faecalis. In root canal treatments, NaOCl and chlorhexidine (CHX) are used to fight E. faecalis before isolating the canal. However, recent studies determined that NaOCl or CHX showed low ability to eliminate E. faecalis.

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References

1. https://www.microbiologyinpictures.com/.../enterococcus-faecalis...
2. https://en.wikipedia.org/wiki/Enterococcus_faecalis
3. http://www.microbiologyinpictures.com/bacteria-photos/enterococcus-faecalis-images.html

Questions

1. Discuss the Laboratory identification of E. faecalis.
2. Discuss the pathogenesis of E. faecalis.
3. How can E. faecalis be treated?