

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-11/00142**.

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.

MICROBIOLOGY LEGEND

CYCLE 33 ORGANISM 1

Proteus spp.

Proteus spp. are found in the human GI tract, soil, water, and sewage. They are associated with UTI's, pneumonia, wound infections, septicemia, and meningitis. *P. mirabilis* is the most commonly isolated species.

The species comprising the genus *Proteus* are distinguished biochemically from *Morganella* and *Providencia* spp. by their production of hydrogen sulphide and lipase, hydrolysis of gelatin and a lack of acid production from mannose. Optimum growth conditions for these bacterial species are obtained at 37°C, which reflects the intestinal niche occupied by many of these bacteria. When grown in liquid media, *Proteus* spp. appears as short rods with six to ten peritrichous flagella.

Colonial morphology

P. mirabilis and *P. vulgaris* (sometimes) swarm in waves on blood agar and chocolate agar, covering the entire surface of the plate. They produce colourless (NLF), flat, 2- to-3-mm-diameter colonies on MAC; sometimes slightly swarming; having a foul smell. Colonies on Hektoen enteric agar are colorless. Colonies on XLD are yellow or colorless, with or without black centers.

Laboratory tests

CLSI Document M35-A states that an isolate can be identified as a *Proteus* sp. (with more than 95% likelihood) if it meets the following criteria:

- Gram-negative bacillus
- Swarming growth
- Indole positive = *Proteus vulgaris*
- Indole negative = *Proteus mirabilis* if ampicillin sensitive (ampicillin-resistant isolates can be reported as indole-negative *Proteus*, or isolates can be further tested; *P. mirabilis* is indole negative, maltose negative, and ornithine positive; *P. penneri* is indole negative, maltose positive, and ornithine negative)

Proteus, *Morganella*, and *Providencia* spp. are the only members of the Enterobacteriaceae family that produce phenylalanine deaminase. Many commercial minisystems are available for identifying *Proteus* spp.

Phenylalanine deaminase (PAD) test. Phenylalanine is an amino acid. The enzyme phenylalanine deaminase causes the deamination of phenylalanine to phenylpyruvic acid. The PAD test detects the formation of phenylpyruvic acid. After the organism is grown on a phenylalanine agar slant, 4 or 5 drops of ferric chloride reagent are added to the agar slant, with rotation of the tube to dislodge the surface colonies. The immediate appearance of an intense green color indicates the presence of phenylpyruvic acid, which is interpreted as a positive test result.



The tube in the left show negative (light yellow) and the tube on the right show positive (dark green) PAD test results.

Treatment

Treatment of *P. mirabilis* infection is frequently successful with penicillins. Although aminoglycosides and cephalosporins are usually effective against the other organisms in this group, resistance is becoming increasingly common (especially aminoglycoside resistance in *P. rettgerii* and other indole positive isolates). Treatment with amikacin, newer β -lactam antibiotics, and newer quinolones is often required when aminoglycoside resistant mutants are involved.

References

1. The Prokaryotes: Vol. 6, Stanley Falkow.
2. Laboratory Diagnosis of Infectious Diseases, Paul G. Engelkirk, Janet Deben-Engelkirk

Questions

1. Discuss the morphological characteristics of *Proteus* spp.
 2. Discuss the biochemical Identification of *Proteus* spp.
 3. Discuss the treatment of *Proteus* spp.
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