Anaerobic Gram Positive Spore-forming Bacilli including Clostridium spp. (LTR57856)

Edit Approved By: Dragan, Tatiana (09/15/2021) **Revision: 4.00**

Organism

Anaerobic Gram Positive Spore-forming Bacilli

- *Clostridium spp.*
- *Clostridiodes difficile* (formerly *Clostridium difficile*)
- *Hathewaya histolytica* (formerly *Clostridium histolyticum*)
- *Hathewaya limosa* (formerly *Clostridium limosum*)
- *Paeniclostridium sordellii* (formerly *Clostridium sordellii*)
- *Paraclostridium bifermentans* (formerly *Clostridium bifermentans*)
- *Terrisporobacter glycolicus* (formerly *Clostridium glycolicum*)

Clinical

These organisms are found in the environment (soil) and in the gastrointestinal tract. *Clostridium spp.* and other anaerobic gram-positive spore-forming bacilli, are encountered in a wide variety of clinical settings ranging from contamination of wounds to cellulitis, bacteremia, abscesses, intra-abdominal sepsis, gangrene, myonecrosis, and septicaemia. Gas gangrene is toxin mediated and caused most frequently by *C. perfringens*, but also by *C. novyi, C. septicum, C. haemolyticum*, *P. sordellii, H. histolytica* and *P. bifermentans.* Other toxin-mediated Clostridial infections include botulism (*C. botulinum*), food poisoning (*C. perfringens*), tetanus (*C. tetani*), and colitis (*C. difficile*). These organisms are usually involved in polymicrobial infections including intra-abdominal, pelvic, pleuropulmonary, central nervous system, and skin/soft tissue infections. *C. septicum*, *C. perfringens* and *C. tertium* bacteremia may be a marker of underlying gastrointestinal tract or hematologic malignancies.

Usual susceptibility pattern

Although many strains are susceptible to penicillin, resistance has been described due to beta-lactamase production or decreased affinity to penicillin binding proteins. *Clostridium spp.* other than *C. perfringens* (*C. clostridioforme, C. ramosum, C. butyricum*) appear to have more penicillin resistance. In these organisms, penicillin resistance may be mediated by an inducible beta-lactamase. Clindamycin resistance has been documented in *C. perfringens, C. ramosum, C. difficile, C. tertium, C. subterminale, C. butyricum, C. sporogenes* and *C. innocuum.* Cephalosporins (including cefoxitin), and quinolones do not have reliable activity against *Clostridium spp.* These organisms are usually susceptible to carbapenems, piperacillin/tazobactam and metronidazole.

Note: *C. tertium* is aerotolerant and is often resistant to beta lactam antibiotics, clindamycin and metronidazole. It is often susceptible to vancomycin.

Anaerobic Gram Positive Spore-forming Bacilli including Clostridium spp., Continued

Susceptibility method

Etest method using Laked Blood Agar incubated anaerobically at 35°C for 48-72 hours, depending on growth characteristics. (Clindamycin - read at 48 hours).

Note: Use 1.0 McFarland suspension in pre-reduced, enriched thioglycollate broth.

Susceptibility reporting

	CSF/ Brain	Blood	Sterile Body Site/ Deep Wound	Comments
β-lactamase	*	*	*	Test but do not report
Clindamycin			✓	
Meropenem	✓	2	2	2nd line if pen I/R If meropenem I/R **see Special Considerations**
Metronidazole	✓	✓	✓	For *C. tertium* report as R If metronidazole I/R **see Special Considerations**
Penicillin	✓	✓	✓	If β-lactamase positive –report pen R If pen I/R and β-lactamase negative **see Special Considerations**
Piperacillin/ tazobactam		2	2	2nd line if pen I/R

Note:	Consult microbiologist regarding the need for susceptibility testing. Susceptibility testing is recommended if organism is sole isolate from sterile body site. For other sites, or if isolated with other organisms, clinical correlation and correlation with Gram stain is required. Generally, susceptibility testing is not recommended if multiple organisms isolated.

Special considerations

<table>
<tr><td>Penicillin:</td><td>
<table>
<tr><th>IF…</th><th>THEN…</th></tr>
<tr><td>Penicillin I/R
and
β-lactamase negative</td><td>• This may indicate an altered penicillin binding protein mechanism of resistance.
• Repeat β-lactamase testing
• Consult microbiologist
• If penicillin I/R and β-lactamase negative report pip/tazo as R.</td></tr>
</table>
</td></tr>
<tr><td>Meropenem:</td><td>These organisms should be susceptible to meropenem.
Consult microbiologist if I/R.</td></tr>
<tr><td rowspan="3">Metronidazole:</td><td>Efficient anaerobiasis must be achieved within 1-2 hours of incubation.
Failure to do so may result in false resistance result.</td></tr>
<tr><td>Consult microbiologist if metronidazole I/R (exception C. tertium).</td></tr>
<tr><td>C. tertium – report Metronidazole as resistant.</td></tr>
</table>

Interpretation

For Etest, report actual MIC result. For interpretation (S, I, or R) report according to the nearest higher doubling dilution **(Appendix 1)**.

Use **CLSI** interpretive document for **Anaerobes**.