Bacillus cereus group (LTR79358)

Edit Approved By: Dragan, Tatiana (07/25/2023) **Revision: 4.00**

Organism

Bacillus cereus group

- *B. anthracis*
- *B. cereus*
- *B. mycoides*
- *B. pseudomycoides*
- *B. thuringiensis*
- *B. weihenstephanensis*

Clinical

These organisms are widely distributed in nature, especially in soil environments. Their spores may contaminate dried foods (spices, tea, flour, powders).

B. anthracis - is an obligate pathogen of animals and humans and is the cause of anthrax which may cause infections in different forms (cutaneous, intestinal and inhalational).
Any request for isolation of this organism must be referred to a Level III Laboratory.

B. cereus is an opportunistic pathogen in immunocompromised patients (cancer, alcoholism, preterm neonates, intravenous drug users) and has been associated with bacteremia, septicemia, meningitis, brain abscess, endocarditis, pneumonia, lung abscess, and osteomyelitis. It may also cause wound or ocular infections in otherwise healthy patients, especially following burns, surgery or trauma (usually following soil exposure). Neonates are prone to infection with this organism, especially umbilical stump and ventilator associated respiratory tract infections.

B. cereus is also associated with food-borne illnesses (two enterotoxigenic food poisoning syndromes associated with B. cereus: a diarrheal type and a vomiting type).

B. thuringiensis - has been associated with wound, burn and ocular infections.

Bacillus cereus group, Continued

Usual susceptibility pattern

B. cereus and *B. thuringiensis* produce various chromosomal beta-lactamases including two penicillinases and a broad spectrum inducible metallo beta-lactamase resulting in resistance to penicillins, cephalosporins (especially 3rd generation cephalosporins) and beta-lactamase inhibitor combinations. Recent in vitro data from clinical isolates suggest that 98.5% of *B. cereus* are imipenem susceptible. Induction of the metalloenzyme may result in elevated MICs to carbapenems. Expression of the beta-lactamases is slow and not well detected by nitrocefin. These organisms are usually susceptible to vancomycin, quinolones, aminoglycosides, tetracyclines, chloramphenicol, and rifampin (the latter should not be used alone). They have variable susceptibility to macrolides and clindamycin and are usually resistant to TMP-SMX. Rare resistance to vancomycin has been reported.

Clindamycin plus gentamicin may be best therapy for ocular infections (antibiotic penetration).

B. anthracis is usually susceptible to penicillin, ciprofloxacin and doxycycline. It is resistant to cephalosporins. Susceptibility testing for *B. anthracis* must be performed in a Level III laboratory. Refer to **CLSI** guidelines for **Potential Agents of Bioterrorism.**

Susceptibility method

Etest method using Mueller-Hinton agar with 5% sheep blood incubated in 5% CO_2 at 35°C for 20-24 hours.

Use 1.0 McFarland suspension in broth.

Susceptibility reporting

	CSF/ Brain	Blood (See note)	Sterile Body Site (See note)	Eyes (See note)	Other	Comments
Ciprofloxacin		✓*	✓*	✓	✓*	* Do not report in patients < 18 y
Clindamycin		*	✓	✓	✓	***See Special Considerations**
Gentamicin				*		***See Special Considerations**
Imipenem	*	✓	✓	2		2nd line if cipro I/R *Test and consult microbiologist prior to reporting **See Special Considerations**
Meropenem	*	✓	✓	2		2nd line if cipro I/R * Test and consult microbiologist prior to reporting **See Special Considerations**
Penicillin	R	R	R	R	R	Report all isolates as R
Tetracycline					✓	Do not report in patients < 8 y
Vancomycin	✓	✓	✓	✓	✓	**See Special Considerations**

Note

<table>
<tr><td>Deep eye specimens:</td><td>Perform susceptibility testing according to report chart if:
<table>
<tr><td>• vitreous fluid</td><td>• canaliculitis</td><td>• corneal ulcer / scrapings</td></tr>
<tr><td>• chamber aspirate</td><td>• endophthalmitis</td><td>• contact lens related infections</td></tr>
<tr><td>• intraocular fluid</td><td>• donor sclera</td><td>• ophthalmology clinic/ward</td></tr>
<tr><td>• keratitis</td><td>• chorioretinitis</td><td>• history of failure of therapy</td></tr>
<tr><td>• injury/surgery</td><td>• cornea</td><td>• preseptal/orbital cellulitis</td></tr>
</table>
Add comment:
“In serious infections, combination therapy with gentamicin should be considered.” &2116</td></tr>
<tr><td rowspan="2">Superficial eye specimens:</td><td>Susceptibility testing of superficial eye specimens not routinely performed.
Add comment:
“Susceptibility testing of topical antibiotics is not standardized and is not routinely performed on superficial eye specimens.” &A89</td></tr>
<tr><td>Susceptibility testing may be selectively performed on superficial eye specimens based on Gram stain and clinical history, after consultation with microbiologist.</td></tr>
<tr><td>Blood or Sterile body site</td><td>If reporting susceptibility results add comment:
“In serious infections, combination therapy with gentamicin should be considered.” &2116</td></tr>
</table>

Special considerations

Clindamycin:	Clindamycin may be reported on blood culture isolates on physician request. It is **NOT** recommended for treatment of endocarditis.
Gentamicin:	Consult microbiologist regarding the need for gentamicin susceptibility testing. If requested by microbiologist send to reference lab for gentamicin MIC testing.
Imipenem/ Meropenem:	If reporting carbapenems (imipenem or meropenem) as susceptible, add comment: “Penicillin and cephalosporin resistance in this organism is mediated by an inducible beta lactamase that can also affect carbapenems. Carbapenems should be used with caution” **(23448)**
Vancomycin:	These organisms should be susceptible to vancomycin. Consult MOC if I/R. Confirmation with broth microdilution and molecular testing for *van* genes may be needed.

Interpretation

Use **CLSI** interpretive document for **Bacillus species (Not B. anthracis) and Related Genera.**