Addition of *Bacillus cereus* biovar *anthracis* as a Tier 1 Select Agent (July 2017 update)

**Background:** Effective October 14, 2016, the Centers for Disease Control and Prevention (CDC) in the Department of Health and Human Services (HSS) added *Bacillus cereus* biovar *anthracis* as a Tier 1 select agent to the HSS list of select agents and toxins (1).

**Organism information:** *B. cereus* biovar *anthracis* was first described as an agent of anthrax-like disease in gorillas and chimpanzees in Cameroon and Côte d’Ivoire (2). The organism has since been recovered from an elephant and goats in other countries of Africa (3). The CDC has determined that *B. cereus* biovar *anthracis* has all of the virulence determinants and the biothreat potential of *B. anthracis* (1). No human infections caused by *B. cereus* biovar *anthracis* have been described at this time. *B. cereus* biovar *anthracis* isolates are non-hemolytic, like *B. anthracis*, and motile, like *B. cereus*. The characteristics of *B. cereus* biovar *anthracis* compared to *B. anthracis* and *B. cereus* are summarized in the following table (adapted from references 1-3):

<table>
<thead>
<tr>
<th>Characteristic</th>
<th><em>B. anthracis</em></th>
<th><em>B. cereus</em></th>
<th><em>B. cereus</em> biovar <em>anthracis</em> CI¹</th>
<th><em>B. cereus</em> biovar <em>anthracis</em> CA²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hemolysis³</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Motility⁴</td>
<td>-</td>
<td>+</td>
<td>+/-</td>
<td>+/-</td>
</tr>
<tr>
<td>Gamma phage susceptibility⁵</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Penicillin G⁶</td>
<td>S</td>
<td>R</td>
<td>S</td>
<td>R</td>
</tr>
<tr>
<td>Capsule</td>
<td>+</td>
<td>Absent in vitro</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>

1: CI = Côte d’Ivoire strains, from chimpanzees  
2: CA = Cameroon strains, from gorillas/chimpanzees  
3: Hemolysis: + = beta hemolytic on sheep blood agar; - = non-hemolytic  
4: Motility: + = motile; - = non-motile. +/- = *B. cereus* biovar *anthracis* strains are usually motile, including those recovered from gorillas, chimpanzees, and elephants; *B. cereus* biovar *anthracis* goat strains from Democratic Republic of the Congo were non-motile (3).  
5: Gamma phage susceptibility: + = susceptible; - = resistant.  
6: S= susceptible; R = resistant

**Challenges:** Based on the organism characteristics described above and the limited number of strains available for study, a sentinel laboratory protocol using rapid rule out or refer tests to differentiate *B. cereus* biovar *anthracis* from other *Bacillus* spp. is currently not available. Subject matter experts at the Centers for Disease Control and Prevention (CDC), the American Society for Microbiology (ASM), and the Association of Public Health Laboratories (APHL) are working to develop testing algorithms for *B. cereus* biovar *anthracis*.
**Recommendations:** Sentinel-level laboratories should continue using the existing ASM Sentinel Level Clinical Laboratory Guideline for *B. anthracis* ([http://www.asm.org/images/PSAB/LRN/Anthrax316.pdf](http://www.asm.org/images/PSAB/LRN/Anthrax316.pdf)) to rule out or refer isolates of *Bacillus* spp. that produce non-hemolytic colonies with a ground glass appearance and are non-motile. Until new guidelines are available, the following recommendations should be considered:

1) Suspect *Bacillus* spp. isolates that are large, catalase-positive Gram-positive rods and non-hemolytic at 24-hour incubation in ambient atmosphere or 5% CO₂ (personal communication, Alex Hoffmaster, Centers for Disease Control and Prevention) should be tested for motility. Isolates can appear weakly hemolytic upon extend incubation (48h) in ambient atmosphere and are more hemolytic in 5% CO₂ at 48h. Semi-solid medium is recommended for motility to ensure consistent results.

2) Suspect isolates should be investigated to determine if the isolate is significant regardless of motility. If the isolate was recovered from a sterile site or from a wound culture, follow the local public health guidelines to assess whether the public health lab or clinical lab should contact the patient’s attending physician to determine the likely clinical significance (e.g., does the patient have an anthrax-like clinical syndrome?). Appropriate travel history should be obtained as well. If the isolate is deemed significant, the local LRN reference laboratory should be contacted to obtain guidance regarding the need to refer the isolate for confirmatory testing.

**References:**

