

Recommendations for *Bacillus cereus* biovar *anthracis* Identification

(Adapted from ASM Bacillus Identification Guideline 08/31/2017: <https://asm.org/Guideline/Identification-of-Bacillus-cereus-biovar-anthraxis>)

Background

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

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. The organism has since been recovered from an elephant and goats in other countries of Africa. The CDC has determined that *B. cereus* biovar *anthracis* has all of the virulence determinants and the biothreat potential of *B. anthracis*. *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:

Characteristic	<i>B. anthracis</i>	<i>B. cereus</i>	<i>B. cereus</i> biovar <i>anthracis</i> CI ¹	<i>B. cereus</i> biovar <i>anthracis</i> CA ²
Hemolysis ³	-	+	-	-
Motility ⁴	-	+	+/-	+/-
Gamma phage susceptibility ⁵	+	-	-	-
Penicillin G ⁶	S	R	S	R
Capsule	+	Absent in vitro	+	+

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.

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*.

Reporting

Clinicians and laboratories should report any illness consistent with *B. anthracis* or *B. cereus* biovar *anthracis* where an anthrax test has been ordered or there is epidemiologic evidence relating it to anthrax. **All suspect anthrax cases are immediately notifiable to the Local Health Department or UDHHS (1-888-EPI-UTAH) per the Utah Communicable Disease Rule (<https://epi.health.utah.gov/rules-regulations/>)**

Recommendations

For routine cultures, sentinel laboratories should continue using the existing ASM Sentinel Laboratory Clinical Guidelines for Suspected Agents of Bioterrorism and Emerging Infectious Diseases, *Bacillus anthracis* (<https://asm.org/ASM/media/Policy-and-Advocacy/LRN/Sentinel%20Files/AnthraxLRN-Aug2017.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 should be tested for motility. Isolates can appear weakly hemolytic upon extended 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 and should be investigated further by contacting the patient's attending physician to determine if the patient has an anthrax-like illness or if the patient has an infection caused by this organism. If the sentinel laboratory is unable or unwilling to contact the patient's physician, notify the Utah Department of Health Epidemiology and provide the physician's contact information and laboratory testing results. Appropriate travel history should be obtained as well.
3. If the isolate is deemed significant, please contact the Utah Public Health Laboratory or the Utah Department of Health and Human Services Epidemiology for consultation and instruction on forwarding the isolate to the Utah Public Health Laboratory.

Utah Public Health Laboratory

Biothreat Response Team

801.965.2561 – office

801.560.6586 – after hours

Kim Christensen kchriste@utah.gov

Epidemiology

DREAM Program

801.538.6191 – office

888.374.8824 – after hours

Jade Murray-Thompson jademurray@utah.gov