

Interpretation of Positive Blood Cultures When PCR Blood Culture Identification (BCID) Results are “Not Detected”

Nebraska Medicine currently uses a multi-plex PCR-based blood culture identification (BCID) system that is able to identify 19 potential pathogens growing in blood culture. BCID generally detects over 90% of the most common causative agents in bloodstream infections; however, when microbes not included on the panel are present in a blood culture, it returns a result of “Not Detected.” This document aims to provide guidance in these scenarios supported by data collected at Nebraska Medicine from January 2018 to August 2019.

Table 1: Recommendations for treatment of patients with blood cultures growing organisms not detected on BCID

Gram Stain/Preliminary Culture Result	Likely Organism (% total BCID negative)*	Recommended Treatment
Gram-positive:		
Aerobe (most can also grow in anaerobic bottles)	<i>Micrococcus sp.</i> (18.1%) <i>Coagulase-negative Staphylococcus</i> (9.3%) <i>Diphtheroids</i> (7%)	None
Anaerobe bottle only	<i>Peptostreptococcus sp.</i> (4.4%) <i>Lactobacillus sp.</i> (2.6%) <i>Clostridium sp.</i> (2.6%)	None If therapy is desired: Metronidazole 500 mg PO q8h OR Penicillin G 4 million units IV q4h
Gram-negative:		
Aerobe (most can also grow in anaerobic bottles)	<i>Acinetobacter sp.</i> (1.8%) <i>Stenotrophomonas maltophilia</i> (1.6%) <i>Pseudomonas fluorescens-putida group</i> (1%)	Levofloxacin 750 mg IV/PO q24h
Anaerobe bottle only	<i>Bacteroides fragilis group</i> (9.3%) <i>Fusobacterium sp.</i> (4.7%)	Metronidazole 500 mg IV/PO q8h

*A full list of isolated organisms can be found below in Table 2

Orange text = Cocci, Blue text = Bacilli (rods)

Gram-Positives

When BCID results as “Not Detected” but there is microbial growth, the organism is most frequently gram-positive (71%). Of the gram-positive results, the most common species isolated were *Micrococcus sp.*, coagulase-negative *Staphylococcus*, and *Diphtheroids* (combined 48.5%). These organisms can grow in either aerobic or anaerobic bottles. They are usually considered contaminants and do not require treatment, but clinical judgment should be used. Instances in which these cultures may warrant treatment are when there are 2 out of 2 blood cultures positive or when the patient has a documented history of infection with the organism. Typically when multiple cultures are positive with these organisms, the cause is device-related and the primary treatment is removal of the device, when possible.

Anaerobic gram-positive organisms are more rarely isolated, with the most common being *Peptostreptococcus* sp., *Lactobacillus* sp., and *Clostridium* sp. These organisms will grow in an anaerobic bottle only. They are typically considered contaminants and require no treatment, but clinical judgment should be used. If therapy is desired, the recommended antibiotics are metronidazole 500 mg po q8h OR penicillin G 4 million units IV q4h. Either of these options should have activity against common gram-positive anaerobic species.

Gram-Negatives

When BCID results as “Not Detected” and the gram stain characteristics are negative, the organisms are more commonly anaerobes. Of these, *Bacteroides fragilis* group and *Fusobacterium* sp. are the most common. Although these organisms are not commonly seen in the blood, they are typically indicative of an underlying infection and are associated with high mortality rates, increasing the importance of appropriate therapy. Metronidazole is the preferred agent for these organisms because of its potent activity and lack of resistance. Penicillins with beta-lactamase inhibitors and carbapenems are also usually active.

Aerobic gram-negative rods that are “Not Detected” are rarer and typically include *Acinetobacter* sp., *Stenotrophomonas maltophilia*, and *Pseudomonas fluorescens-putida* group. These organisms are often associated with true infection and should be treated with an appropriate agent. Levofloxacin has reliable activity against all 3 of these as well as other aerobic gram-negatives, making it an appropriate empiric choice until identification. Of note, an updated BCID panel that detects *Acinetobacter* and *Stenotrophomonas maltophilia* is in development and will be coming to Nebraska Medicine when available.

Table 2: Organism Groups Identified by Culture and Not Detected by BCID

Organism Group Stratified by Gram Stain			
	n	% of Gram Stain	% of Total BCID Negative
Gram Positive	274	100.0%	70.8%
<i>Micrococcus</i> sp.	70	25.5%	18.1%
Coagulase-negative <i>Staphylococcus</i>	36	13.1%	9.3%
Diphtheroids	27	9.9%	7.0%
<i>Peptostreptococcus</i> sp.	17	6.2%	4.4%
<i>Bacillus</i> species, not <i>anthracis</i>	12	4.4%	3.1%
<i>Rothia</i> sp.	10	3.6%	2.6%
<i>Clostridium</i> sp.	10	3.6%	2.6%
<i>Lactobacillus</i> sp.	10	3.6%	2.6%
Viridans group <i>Streptococcus</i>	8	2.9%	2.1%
<i>Corynebacterium striatum</i> group	7	2.6%	1.8%
<i>Abiotrophia/Granulicatella</i> sp.	7	2.6%	1.8%
Unable to identify	7	2.6%	1.8%
<i>Gemella</i> sp.	7	2.6%	1.8%
<i>Enterococcus</i> sp.	6	2.2%	1.6%
<i>Actinomyces</i> sp.	5	1.8%	1.3%
<i>Aerococcus</i> sp.	5	1.8%	1.3%
<i>Propionibacterium</i> sp.	5	1.8%	1.3%
<i>Leuconostoc</i> sp.	4	1.5%	1.0%
<i>Peptoniphilus</i> sp.	3	1.1%	0.8%
<i>Parvimonas micra</i>	3	1.1%	0.8%
<i>Eggerthella lenta</i>	3	1.1%	0.8%
<i>Fingoldia magna</i>	3	1.1%	0.8%
<i>Atopobium parvulum</i>	1	0.4%	0.3%

<i>Dermabacter hominis</i>	1	0.4%	0.3%
<i>Staphylococcus aureus</i>	1	0.4%	0.3%
<i>Pediococcus</i> sp.	1	0.4%	0.3%
<i>Blautia producta</i>	1	0.4%	0.3%
<i>Cutibacterium acnes</i>	1	0.4%	0.3%
Group C <i>Streptococcus</i>	1	0.4%	0.3%
<i>Eubacterium limosum</i>	1	0.4%	0.3%
<i>Facklamia hominis</i>	1	0.4%	0.3%
Gram Negative	113	100%	29.2%
<i>Bacteroides fragilis</i> group	36	31.9%	9.3%
<i>Fusobacterium</i> sp.	18	15.9%	4.7%
<i>Acinetobacter</i> sp.	7	6.2%	1.8%
<i>Prevotella</i> sp.	6	5.3%	1.6%
<i>Stenotrophomonas maltophilia</i>	6	5.3%	1.6%
Unable to identify	5	4.4%	1.3%
<i>Pseudomonas fluorescens-putida</i> group	4	3.5%	1.0%
<i>Pasteurella multocida</i>	4	3.5%	1.0%
<i>Sphingomonas paucimobilis</i>	3	2.7%	0.8%
<i>Morganella morganii</i>	3	2.7%	0.8%
<i>Veillonella</i> sp.	2	1.8%	0.5%
<i>Moraxella</i> sp.	2	1.8%	0.5%
<i>Roseomonas</i> sp.	2	1.8%	0.5%
<i>Capnocytophaga sputigena</i>	2	1.8%	0.5%
<i>Leptotrichia</i> sp.	2	1.8%	0.5%
<i>Achromobacter xylosoxidans</i>	1	0.9%	0.3%
<i>Neisseria sicca</i> group	1	0.9%	0.3%
<i>Anaerobiospirillum succiniciproducens</i>	1	0.9%	0.3%
<i>Cardiobacterium hominis</i>	1	0.9%	0.3%
<i>Alistipes</i> sp.	1	0.9%	0.3%
<i>Chryseobacterium indologenes</i>	1	0.9%	0.3%
<i>Brevundimonas vesicularis</i>	1	0.9%	0.3%
<i>Proteus vulgaris</i>	1	0.9%	0.3%
<i>Wautersiella falseni</i>	1	0.9%	0.3%
<i>Eikenella corrodens</i>	1	0.9%	0.3%
<i>Flavobacterium odoratum</i>	1	0.9%	0.3%
Grand Total	387	100.0%	100.0%

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