BioFire® Blood Culture Identification 2 Panel (BCID2) ®

What is it?

A multiplex PCR test that detects 33 pathogens and 10 genetic resistance markers directly from positive blood culture bottles. Results are available an hour after test initiated. This technology allows moving from empiric to targeted antimicrobial therapy earlier in treatment.

What does it identify?

<table>
<tr><th>Gram Positive (+) Bacteria</th><th colspan="2">Gram Negative (-) Bacteria</th></tr>
<tr><td>Enterococcus faecalis
Enterococcus faecium
Listeria monocytogenes
Staphylococcus
• Staphylococcus aureus
• Staphylococcus epidermidis
• Staphylococcus lugdunensis
Streptococcus
• Streptococcus agalactiae
• Streptococcus pyogenes
• Streptococcus pneumoniae</td><td>Enterobacterales
• Enterobacter cloacae complex
• Escherichia coli
• Klebsiella aerogenes
• Klebsiella oxytoca
• Klebsiella pneumoniae group
• Proteus
• Salmonella
• Serratia marcescens</td><td>Acinetobacter calcoaceticus-baumannii complex
Bacteroides fragilis
Haemophilus influenzae
Neisseria meningitidis
Pseudomonas aeruginosa
Stenotrophomonas maltophilia</td></tr>
<tr><th>Gram Positive (+) Resistance Genes</th><th colspan="2">Gram Negative (-) Resistance Genes</th></tr>
<tr><td><u>Methicillin Resistance:</u>
mecA/C
mecA/C and MREJ (MRSA)

<u>Vancomycin Resistance:</u>
vanA/B</td><td colspan="2" rowspan="3"><u>Carbapenemases:</u>
IMP
KPC
OXA-48-like
NDM
VIM

<u>Colistin Resistance:</u>
mcr-1

<u>Extended Spectrum Beta-Lactamases (ESBL):</u>
CTX-M</td></tr>
<tr><th>Yeast</th></tr>
<tr><td>Candida albicans
Candida auris
Candida glabrata
Candida krusei
Candida parapsilosis
Candida tropicalis
Cryptococcus neoformans/gattii</td></tr>
</table>

<u>Note:</u> The BCID2 panel is only capable of detecting organisms and resistance genes included in the list above. In polymicrobial infections the capacity to correctly identify all present organisms is significantly decreased; interpret results with caution in light of clinical scenario.

How is it ordered/run?

The test is not ordered. It is run <u>automatically</u> on **positive** blood samples meeting one of the following criteria:

- All positive blood cultures for patients admitted to an oncology or ICU service
- All positive blood cultures with a gram negative or fungal organism seen on gram stain

<u>Note</u>: The BCID2 panel will be performed on the first blood sample meeting testing criteria and will not be repeated on samples collected in the subsequent 72 hours. <u>All samples will receive standard culture testing as well.</u>

How will results be reported?

Results will appear within the blood culture report indicating the genus or species identified by multiplex PCR. When a resistance gene is detected, it will be reported as a comment below the genus or species identified. When the

organism identification and susceptibilities from the standard blood culture are available, the culture report will be updated with this new information below the BCID2 result as shown below:

Culture, Blood

Escherichia coli ESBL !
DETECTION BY MULTIPLEX PCR

ESBL-producing organism. BlaCTX-M gene detected by rapid PCR.

What decisions can be made based on the BCID2 panel results?

As with all diagnostic tests, results from the BCID2 panel need to be evaluated in view of the patient's unique scenario, clinical condition, and source of infection. Here are potential antimicrobial optimizations based on panel results that would be reasonable in most situations:

- If only *E. coli* or *Klebsiella spp*. identified without detection of ESBL production (CTX-M gene) in uncomplicated patients on antipseudomonal coverage: change antipseudomonal agent to ceftriaxone (See Appendix I for internal data)
    - Complicated patients in whom de-escalation may not be appropriate: lack of source control, suspected polymicrobial infection, ANC ≤500, other infection caused by non-susceptible gram negative organisms, hemodynamic instability, or metastatic infection
- If on anti-MRSA agents and only gram-negative organism(s) identified: discontinue anti-MRSA agents
- If *S. aureus* susceptible to oxacillin (no *mecA/C* & MREJ) identified: change to targeted β-lactam therapy
- If organism identified is not covered by current therapy: modify therapy to treat pathogen(s)

Whom do I contact for questions about the BCID2 panel?

- Microbiology lab (6-2658) or CAUSE pager (6494)
- Occasionally discrepancies between the molecular method and the antimicrobial susceptibility testing results may occur (eg. mecA/C gene not detected, but oxacillin resistant by MIC). These instances are rare and in these cases, the CAUSE team should be consulted for further recommendations.

Appendix I: Internal microbiology data for *E. coli* and *Klebsiella spp.* isolates:

- When 60 *E. coli* isolates and 45 *Klebsiella spp.* isolates at Atrium Health Wake Forest Baptist were reviewed for detection of CTX-M by BCID2 and correlating ceftriaxone susceptibility by standard culture and susceptibility report, the positive predictive value (PPV) was 100% for *E. coli* and *Klebsiella spp.* and the negative predictive value (NPV) was 94% for *E. coli* and 100% for *Klebsiella spp.*