Biofire® FilmArray® Blood Culture Identification Panel Clinician Guidance for Empiric Therapy

NM Antimicrobial and Diagnostic Stewardship Program

The BioFire® FilmArray® Blood Culture Identification 2 (BCID2) Panel is an FDA-approved multiplex PCR assay that rapidly detects a limited number of commonly-identified bloodstream pathogens. While detection of organisms and resistance markers can serve as a guide for empiric antimicrobial selection, culture-based identification and susceptibility testing is required for directed antimicrobial therapy.

Note: All management decisions should be made with consideration of the patient's clinical status, medication allergies, and prior recent culture/susceptibility results.

- **Considerations to warrant broader or alternative therapy recommendations:**
  - **Critical illness and/or recent history of multi-drug resistant organisms**
  - **Source of infection that may include other pathogens**
  - **Discordant BCID2 and Gram stain results – await final culture and susceptibility data**
  - **Suspected bloodstream infection based on clinical presentation, but negative BCID2**
- **^ For cases with suspected or confirmed intra-abdominal infections (IAI), consider addition of Gram-negative or anaerobic coverage (add metronidazole, piperacillin-tazobactam)**
- Please contact ADSP/ID pharmacist or consider ID consultation for other questions related to interpretation and management. For non-urgent questions email nmhaspconsult@nm.org.
- See Appendix A for additional clinical considerations & *pharmacist interpretation workflow*

Gram-positive Bacteria:

- *Enterococcus faecalis*
- *Enterococcus faecium*
- *Listeria monocytogenes*
- *Staphylococcus aureus*
- *Staphylococcus epidermidis*
- *Staphylococcus lugdunensis*
- *Staphylococcus* species
- *Streptococcus agalactiae*
- *Streptococcus pneumoniae*
- *Streptococcus pyogenes*
- *Streptococcus* species

Gram-negative Bacteria:

- *Acinetobacter calcoaeceticus-baumannii complex*
- *Bacteroides fragilis*
- Enterobacterales species
- *Enterobacter cloacae complex*
- *Escherichia coli*
- *Haemophilus influenza*
- *Klebsiella aerogenes*
- *Klebsiella oxytoca*
- *Klebsiella pneumoniae* group
- *Neisseria meningitidis*
- *Proteus* species
- *Pseudomonas aeruginosa*
- *Salmonella*
- *Serratia marcescens*
- *Stenotrophomonas maltophilia*

Gram-negative Resistance Genes: CTX-M, KPC, IMP, OXA-48-like, NDM, VIM, *mcr*-1

Yeast:

- *Candida albicans*
- *Candida auris*
- *Candida glabrata*
- *Candida krusei*
- *Candida parapsilosis*
- *Candida tropicalis*
- *Cryptococcus neoformans/gattii*

Table 1. Gram-positive Bacteria

Organism	Resistance Gene	Antibiotic Recommendation	Comments
Enterococcus faecalis	---	Ampicillin ^	Severe PCN allergy: Vancomycin ^Consider piperacillin-tazobactam if concern for intra-abdominal source of infection caused by other GNRs
Enterococcus faecium	---	Vancomycin ^	
	*van*A/B	Linezolid or Daptomycin ^	Daptomycin 8-12 mg/kg IV q24h
Listeria monocytogenes	---	Ampicillin	Severe PCN allergy: TMP/SMX. If dual allergy of PCN and TMP/SMX, consult ID or ADSP/ID pharmacist.
Staphylococcus aureus	---	Cefazolin	CNS infections: Use Oxacillin *ID consult recommended*
	*mec*A/C and MREJ or *mec*A/C	Vancomycin	*ID consult recommended*
Staphylococcus epidermidis	---	Vancomycin*	*Consider discontinuing antibiotics if only 1 of 2 cultures are positive, the patient lacks systemic signs/symptoms of infection (fever, hypotension, leukocytosis), & the patient does not have an implanted device such as hemodialysis line, PICC line, cardiac devices or prosthetic valves. This suggests contamination.
Staphylococcus species	---	Vancomycin	
Staphylococcus lugdunensis	---	Cefazolin	
	*mec*A/C	Vancomycin	
Streptococcus agalactiae	---	Ceftriaxone	
Streptococcus pneumoniae	---	Ceftriaxone	Consider addition of Azithromycin or Levofloxacin CNS infection: add Vancomycin & increase Ceftriaxone dosing to 2 g IV q12h
Streptococcus pyogenes	---	Ceftriaxone	Toxic shock syndrome: add Linezolid or Clindamycin IV 900 mg q8h for anti-toxin effects
Streptococcus species	---	Ceftriaxone	For patients with febrile neutropenia, Cefepime first line

Table 2. Gram-negative Bacteria

Organism	Resistance Gene	Antibiotic Recommendation	Comments
Acinetobacter calcoaeceticus-baumannii complex	---	Ampicillin-sulbactam + Minocycline	Ampicillin-sulbactam 9 g IV q8h Minocycline 200 mg IV BID Severe PCN allergy: Meropenem 2 g IV q8h + Minocycline 200 mg IV BID If critically ill: *ID or ASP/ID pharmacist consultation is strongly recommended.* Consider adding Meropenem, Cefiderocol, or Polymyxin B
Bacteroides fragilis	---	Piperacillin-tazobactam	Alternative for low-risk, hemodynamically-stable patients: Metronidazole ^
Enterobacterales species	---*	Cefepime ^ (Please read comments to prevent misinterpretation)	This is a broad target for all bacteria within the Enterobacterales (formerly Enterobacteriaceae) group. **If another target within the group is also positive (*E. cloacae, E. coli, Klebsiella* spp., *Proteus* spp., or *Salmonella),* follow the antibiotic recommendation for that specific organism instead as this likely represents a monomicrobial bacteremia** *See below if resistance genes detected
Enterobacter cloacae complex	---*	Cefepime ^	*See below if resistance genes detected
Escherichia coli	---*	Ceftriaxone ^	*See below if resistance genes detected
Haemophilus influenzae	---	Ceftriaxone	CNS infection: dose Ceftriaxone 2 g IV q12h
Klebsiella aerogenes	---*	Cefepime ^	*See below if resistance genes detected
Klebsiella oxytoca	---*	Ceftriaxone ^	*See below if resistance genes detected
Klebsiella pneumoniae group	---*	Ceftriaxone ^	*See below if resistance genes detected
Neisseria meningitidis	---	Ceftriaxone	CNS infection: dose Ceftriaxone 2 g IV q12h
Proteus	---*	Ceftriaxone ^	*See below if resistance genes detected
Pseudomonas aeruginosa	---*	NMH: Cefepime Sites other than NMH: Piperacillin-tazobactam	Alternatives: Piperacillin-tazobactam, Ceftazidime, Meropenem If concern for MDR *P. aeruginosa* based on culture history, consider

			Ceftolozane-tazobactam with ID consultation Septic shock: Add Tobramycin 7-10 mg/kg x 1 *See below if resistance genes detected
Salmonella	---*	Ceftriaxone	*See below if resistance genes detected
Serratia marcescens	---*	Ceftriaxone^	*See below if resistance genes detected
Stenotrophomonas maltophilia	---	TMP/SMX	TMP/SMX 8-12 mg/kg/day based on AdjBW Allergy: Levofloxacin
*Resistance Genes			
Any	CTX-M	Meropenem	
Any	IMP	Ceftazidime-avibactam + Aztreonam	*ID consult required*
Any	KPC	Meropenem-vaborbactam OR Ceftazidime-avibactam	
Any	OXA-48-like	Ceftazidime-avibactam	
Any	NDM	Ceftazidime-avibactam + Aztreonam	
Any	VIM	Ceftazidime-avibactam + Aztreonam	
Any	*mcr-1*	Avoid Colistin/Polymyxin B	Marker for Colistin resistance

Table 3. Yeast

Organism	Resistance Gene	Antifungal Recommendation	Comments
Candida albicans	---	Fluconazole	*ID consult recommended* Consider Micafungin if previous azole exposure or critically ill
Candida auris	---	Micafungin	*ID consult recommended* Micafungin 200 mg IV daily
Candida glabrata	---	Micafungin	*ID consult recommended*
Candida krusei	---	Micafungin	*ID consult recommended*
Candida parapsilosis	---	Fluconazole	*ID consult recommended* Consider Micafungin if previous azole exposure or critically ill
Candida tropicalis	---	Fluconazole	*ID consult recommended* Consider Micafungin if previous azole exposure or critically ill
Cryptococcus neoformans/gattii	---	Liposomal Amphotericin B + Flucytosine	*ID consult recommended* Liposomal Amphotericin B IV 3-4 mg/kg/day Flucytosine 25 mg/kg PO q6h

Appendix A. Pharmacist Interpretation Workflow for BCID2 Results

Purpose of this section: interpretation and management for results that occur in off-peak hours (8am – 4pm) and clinical pharmacist outreach, when appropriate, to primary teams.

Note: All management decisions should be made conjunctively with primary teams and should be guided by the patient's clinical status, medication allergies, and prior recent culture/susceptibility results.

Please complete the following steps while covering Blood Biofire Results:

1. Review Biofire Result inbox 3 times per shift (every 2-3 hours).
2. Assess new results and follow the below actions based the diagram below (Traffic light).
3. Contact the primary team as indicated.
4. Complete the Antimicrobial Stewardship Navigator: under intervention, choose "Rapid diagnostic" → Blood Biofire → Choose active abx → Indication→ Overall recommendations
5. Mark the inbox message as "read" but do not delete the message.

Actions Based on Biofire Result

Must reach out to provider:

- Uncovered pathogen/Drug Bug mismatch
- Complex patient or restricted agent requiring ID consult
- Unnecessary antimicrobial causing increased risk of adverse event

High priority pathogens to review carefully and likely intervene:

- *Staphylococcus aureus*
  - Discontinue vancomycin in setting of *Staph aureus* when no resistance is detected (i.e. MSSA)
- *Pseudomonas*
- *Candida*
- *Enterococcus*
- Gram-negative resistance genes

Consider reaching out to provider:

- De-escalation opportunity
- IV to PO recommendation

Straightforward, high-value stewardship interventions:

- D/c vancomycin for single positive for species outlined above with high suspicion for contamination in patients without guidance listed risk factors
- Cefepime or pip-tazo de-escalation to ceftriaxone for urinary source Gram-negatives as recommended in interpretation tables above

No need to reach out to provider:

- Receiving recommended therapy
- Complex patient actively followed by ID Consult

Examples:

- De-escalation opportunity: E. coli bacteremia from an intra-abdominal source on pip-tazo
- MRSA bacteremia on vancomycin
- Gram-negative resistance gene detected and receiving appropriate empiric coverage per ID consult