

## TREATMENT GUIDELINE FOR ADULT PATIENTS WITH BACTEREMIA

### Purpose:

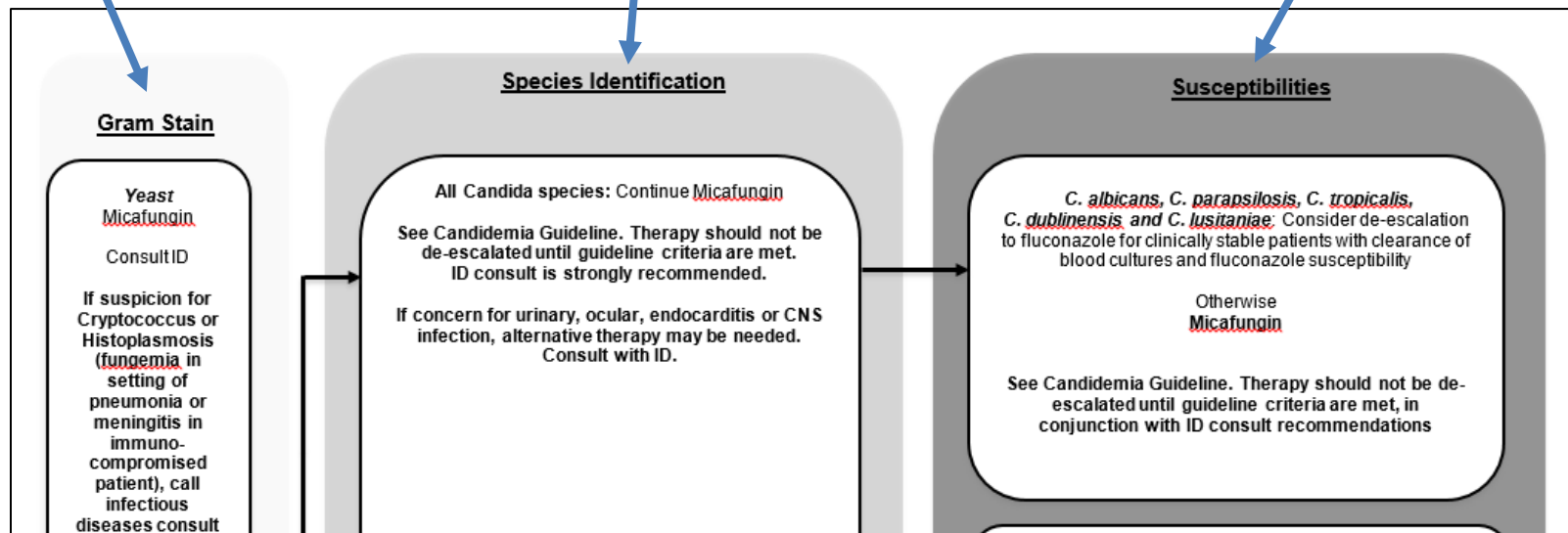
This guideline is intended to help guide antimicrobial therapy for adult patients (defined as patients admitted to adult service lines) following the results of Gram Stain, Organism identification (with or without Biofire™ molecular resistance results) and antimicrobial susceptibilities. Deviation from the recommendations in this guideline may be required for patients with concomitant infections, history of resistant pathogens, or with antimicrobial allergies or intolerance.

### How to use this guideline:

For patients with ONLY Gram stain results available, refer to the left column (labeled ***Gram Stain***) for treatment recommendations

For patients with organism identification results available, refer to the middle column (labeled ***Species Identification***) for treatment recommendations

For patients with antimicrobial susceptibility results available, refer to the right column (labeled ***Susceptibilities***) for treatment recommendations



## Gram Stain

**Yeast**  
Micafungin

Consult ID

If suspicion for **Cryptococcus** or **Histoplasmosis** (fungemia in setting of pneumonia or meningitis in immunocompromised patient), call infectious diseases consult service

## Species Identification

**All Candida species:** Continue Micafungin

**See Candidemia Guideline. Therapy should not be de-escalated until guideline criteria are met. ID consult is strongly recommended.**

If concern for urinary, ocular, endocarditis or CNS infection, alternative therapy may be needed. Immediately consult ID for treatment recommendations

If *Candida auris* identified immediately consult ID for treatment recommendations.

### **Cryptococcus spp.:**

Liposomal amphotericin B (Ambisome™) + flucytosine.  
Consult ID

### **Histoplasma:**

Liposomal amphotericin B (Ambisome™)  
Consult ID

## Susceptibilities

***C. albicans, C. parapsilosis, C. tropicalis, C. dublinensis and C. lusitanae:*** Consider de-escalation to fluconazole for clinically stable patients with clearance of blood cultures and fluconazole susceptibility

Otherwise  
**Micafungin**

**See Candidemia Guideline. Therapy should not be de-escalated until guideline criteria are met, in conjunction with ID consult recommendations**

***C. glabrata* with fluconazole MIC  $\leq$  8 (SDD):** Consider de-escalation to fluconazole for clinically stable patients with clearance of blood cultures

Otherwise  
**Micafungin**

### **Cryptococcus spp.:**

Fluconazole may be appropriate for step down therapy when criteria is met in conjunction with ID consult recommendations

### **Histoplasma**

Step down therapy may be appropriate when clinical stable in conjunction with ID consult recommendations

## Gram Stain

**Gram-positive cocci in clusters:**  
Vancomycin

## Species Identification

***S. aureus* or *S. lugdunensis* and *MecA/C* + MREJ negative:**

Cefazolin if no suspicion for endocarditis, CNS infection  
Oxacillin if endocarditis or CNS infection is suspected

***S. aureus* or *S. lugdunensis* and *MecA/C* + MREJ positive or *MecA/C* + MREJ not performed:**  
Vancomycin OR Daptomycin (if no pulmonary involvement)

**Consult ID**

Consider discontinuing adjunctive gram-negative therapy between 48-72 hours if cultures are negative for gram-negative pathogens, except for patients with intra-

***Single positive culture for Coagulase-negative Staphylococcus* or *S. epidermidis* in suspected infection of prosthetic material, neutropenia, or in hemodynamically unstable patients:**

***S. epidermidis* and *mecA/C* Negative:**  
Cefazolin

***S. epidermidis* and *mecA* Positive OR coagulase negative *Staphylococcus*:**  
Vancomycin

For patients who do not meet the above criteria, a single positive culture for Coagulase-negative *Staphylococcus* or *S. epidermidis* may represent contamination, assess for possible source of infection and hold antibiotics if clinically stable

## Susceptibilities

***S. aureus* or *S. lugdunensis* sensitive to methicillin:**  
Cefazolin OR oxacillin

***S. aureus* or *S. lugdunensis* CNS infection sensitive to methicillin:**  
Oxacillin

***S. aureus* or *S. lugdunensis* intermediate or resistant to methicillin:**  
Vancomycin OR Daptomycin (if no pulmonary involvement )

Antibiotic susceptibilities are only performed when *Coag-negative Staph* or *S. epidermidis* grow from 2 or more bottles.

If growth from 1 blood culture bottle, assess for possible source of infection, repeat blood cultures, and hold antibiotics if clinically stable

***Coagulase-negative Staph* or *Staph epidermidis* sensitive to methicillin:**  
Cefazolin

***Coagulase-negative Staph* or *Staph epidermidis* meningitis sensitive to methicillin:**  
Oxacillin

***Coagulase-negative Staph* or *Staph epidermidis* intermediate or resistant to methicillin:**  
Vancomycin

**Gram-positive cocci in chains or pairs:**

Vancomycin

**Hem-onc, SICU, Solid organ transplant:**

Linezolid

**BMT with ANC>1,000:**

Linezolid

**BMT with ANC<1,000:**

Daptomycin

***E. faecalis* and *VanA/VanB* Negative:**

Ampicillin

(consider piperacillin/tazobactam as alternative for intra-abdominal infections)

Vancomycin if penicillin allergy

***E. faecalis* and *VanA/VanB* Positive:**

Ampicillin (consider piperacillin/tazobactam as alternative for intra-abdominal infections)

Linezolid if penicillin allergy

(Daptomycin for BMT patients with ANC<1,000)

***E. faecium*, and *VanA/VanB* negative:**

Vancomycin

***E. faecium*, and *VanA/VanB* Positive:**

Linezolid

(Daptomycin for BMT patients with ANC<1,000)

***E. casseliflavus*, *E. gallinarium*:**

Linezolid

(Daptomycin for BMT patients with ANC<1,000)

**Other Enterococcus Species:**

Vancomycin

***Strep. pneumoniae*, *Strep. anginosus* or *Strep. species*:**

Non-meningitis: Ceftriaxone

Meningitis: Ceftriaxone and Vancomycin

Endocarditis, CNS infection or febrile neutropenia:

Vancomycin

***Strep. agalactiae* or *Strep. pyogenes*:**

Penicillin or Ampicillin

**Penicillin-based antibiotics should be first line therapy for all Enterococcus species if sensitive:**

Ampicillin

(Consider ampicillin/sulbactam or piperacillin/tazobactam for intra-abdominal infections)

**Patients with penicillin allergy or ampicillin-resistant Enterococcus:**

Vancomycin

**Patients with vancomycin allergy or vancomycin-resistant Enterococcus:**

Linezolid

(Daptomycin for BMT patients with ANC<1,000)

Patients with suspected endocarditis will likely require combination therapy and ID consult is strongly recommended

**Penicillin-based antibiotics should be first line therapy for all Streptococcus species infections, except meningitis or brain abscess, if sensitive:**

Penicillin or Ampicillin

**\*Gram-negative bacilli:**

Piperacillin-tazobactam or Cefepime (add metronidazole for intra-abdominal infections)

\*Evaluate if patient has history of resistance to piperacillin-tazobactam or cefepime with prior year, and modify therapy accordingly

*E. coli, Klebsiella pneumoniae, K. oxytoca, Proteus, Serratia, Morganella, Salmonella, Enterobacteriales:*

**No CTX-M, KPC, IMP, VIM, NDM, OXA detected:**

Cefepime or Piperacillin-tazobactam

**CTX-M positive:**

Meropenem

**KPC positive:**

Meropenem/Vaborbactam

**IMP, VIM or NDM positive:**

Ceftazidime/avibactam plus Aztreonam

**OXA positive:**

Ceftazidime/avibactam

*Enterobacter cloacae complex, Citrobacter freundii, Klebsiella aerogenes*

**No CTX-M, KPC, IMP, VIM, NDM, OXA detected:**

Cefepime

**CTX-M positive:**

High-dose meropenem

**KPC positive:**

Meropenem/Vaborbactam

**IMP, VIM or NDM positive:**

Ceftazidime/avibactam plus Aztreonam \ OR cefiderocol

**OXA positive:**

Ceftazidime/avibactam

**Narrow antibiotic selection based on susceptibility results, clinical status, concomitant infections.**

- Narrow-spectrum antibiotics are preferred if no resistance or allergies. These include ampicillin, penicillin, ampicillin/sulbactam, ceftazolin and cefuroxime.
- ID consult is strongly encouraged for patients with infections from organisms with *KPC, IMP, VIM, NDM, or OXA* resistance genes

**Narrow antibiotic selection based on susceptibility results, clinical status, concomitant infections.**

- ID consult is strongly encouraged for patients with infections from organisms with *KPC, IMP, VIM, NDM, or OXA* resistance genes
- *Enterobacter cloacae, Citrobacter freundii, and Klebsiella aerogenes* frequently have an inducible beta-lactamase resistance gene (*AmpC*), which can confer resistance to penicillin, ampicillin, ampicillin/sulbactam, and 1st-3<sup>rd</sup> generation cephalosporins. Cefepime should be first-line therapy if susceptible.
- *Citrobacter koseri* is not associated with having *AmpC* gene, and narrow spectrum antibiotics should be prescribed if susceptible

**\*Gram-negative bacilli:**

Piperacillin-tazobactam  
or  
Cefepime (add metronidazole for intra-abdominal infections)

\*Evaluate if patient has history of resistance to piperacillin-tazobactam or cefepime, and modify therapy accordingly

***Pseudomonas aeruginosa***

**No IMP, VIM, NDM detected:**

Cefepime or Piperacillin-tazobactam. Consider empiric double coverage with tobramycin

**IMP, VIM or NDM positive:**

Cefiderocol plus tobramycin until susceptibilities result

**CTX-M, KPC, or OXA positive:**

Contact infectious diseases – unusual genotype

**Narrow antibiotic selection based on susceptibility results, clinical status, concomitant infections.**

- If *Pseudomonas* isolate is resistant to **cefepime, piperacillin-tazobactam, meropenem, imipenem, aztreonam, levofloxacin and ciprofloxacin**, request **ceftolozane-tazobactam, ceftazidime-avibactam and meropenem-vaborbactam** susceptibilities from microbiology lab (phone number 6-6831)
- Double coverage of *Pseudomonas* is not indicated after susceptibilities are available, unless isolate is resistant to all beta-lactam antibiotics, cystic fibrosis patient, or decompensating on susceptible antibiotics

***Acinetobacter baumannii***

**No IMP, VIM, NDM, OXA detected:**

High-dose meropenem plus minocycline until susceptibilities result

**IMP, VIM or NDM positive:**

Cefiderocol plus minocycline until susceptibilities result

**CTX-M, KPC positive:**

Contact infectious diseases – unusual genotype

**Narrow antibiotic selection based on susceptibility results, clinical status, concomitant infections.**

- There is no evidence double coverage of *Acinetobacter* improves outcomes. The decision to double cover should be made based on source of bacteremia, severity of infection, and patient's medical history
- Consider definitive combination therapy for carbapenem-resistant *A. baumannii* based on susceptibility information and infectious diseases consultation

**\*Gram-negative bacilli:**

Piperacillin-tazobactam  
or  
Cefepime

\*Evaluate if patient has history of resistance to piperacillin-tazobactam or cefepime, and modify therapy accordingly

**Gram-positive rod**

Most likely the result of skin flora contamination of blood culture

**Consider treatment in HD unstable, prosthetic material with suspected infection, BMT, Neutropenia:**  
Vancomycin

**If concern for Listeria:**  
Ampicillin

***Achromobacter:***

Piperacillin-tazobactam

PCN allergy: meropenem

(Avoid cefepime unless susceptibility is verified)

***Stenotrophomonas:***

Trimethoprim-sulfamethoxazole

Sulfa allergy: **Levofloxacin + minocycline** OR  
ceftazidime-avibactam PLUS aztreonam

*Bacillus*, *Lactobacillus* and *Corynebacterium spp.* are possible contaminants: consider treatment in hemodynamically unstable, prosthetic material with suspected infection, BMT, Neutropenia

***Bacillus* or *Corynebacterium spp.*:** Vancomycin

***Lactobacillus:*** Piperacillin/tazobactam

***Listeria:*** Ampicillin

Patients with multiple positive sets of blood cultures are more likely true infection. Consider ID consult.

**Narrow antibiotic selection based on susceptibility results, clinical status, concomitant infections.**

- *Achromobacter* is frequently multi-drug resistant, and ID consult is encouraged to guide appropriate management of these infections
- Trimethoprim-sulfamethoxazole should be dosed 10 mg/kg/day in 2-4 divided doses for patients with good renal function when treating *Stenotrophomonas* bacteremia
- Piperacillin-tazobactam and cefepime do not have activity against *Stenotrophomonas*

**Narrow antibiotic selection based on susceptibility results, clinical status, concomitant infections.**

- Susceptibilities will not be routinely performed by the microbiology lab. Please call to request susceptibilities if strong suspicion for infection