Interior Health
Laboratory Service

Best Practices for Blood Cultures

This document provides guidance for best practices for blood cultures in diagnoses of bloodstream infection due to bacterial, mycobacterial and fungal infection.

Section 1. Blood Culture for Bacteremia and Candidemia

Blood cultures are the critical specimens for diagnosing bloodstream infection. Ninety percent of blood cultures are negative. In Interior Health, 1-3% of positive blood cultures are contamination. Unrestricted repeating of blood cultures increases the risk of contamination, leading to false-positive results, additional cultures and imaging, and unnecessary antibiotic use. This document provides guidance on the indications for INITIAL and FOLLOW-UP blood cultures, and when the FOLLOW-UP blood culture is not required.
NOTE: Discuss with a Medical Microbiologist or Infectious Diseases if any questions about a specific scenario.

Indications for INITIAL Blood cultures in adult patients:

- **Blood cultures are INDICATED in the following scenarios:**
  - Sepsis/septic shock
  - Systemic signs of infection AND asplenia
  - Fever with signs of infection in severely immunosuppressed patients (e.g., neutropenia, hematopoietic stem cell or solid organ transplant)
  - Syndromes with high risk of bacteremia (>50%):
    - Endovascular infection
      - Infective endocarditis
      - Septic thrombophlebitis
      - Infected cardiac/vascular devices
    - Central nervous system (CNS) infections
      - Meningitis
      - Epidural abscess
    - Musculoskeletal infections
      - Native joint septic arthritis
      - Vertebral discitis/osteomyelitis
    - Catheter-related bloodstream infection
  - Syndromes with intermediate risk of bacteremia (>10%, <50%):
    - Cholangitis
    - Pyelonephritis
    - Severe pneumonia
    - Severe cellulitis/skin soft tissue infection (SSTI) (e.g., necrotizing soft tissue infection)
    - Non-severe cellulitis/SSTI with significant comorbidities (e.g., severely immunocompromised, end-stage renal or liver disease)

- **Blood cultures are NOT indicated in the following scenarios:**
    - Syndromes with low risk of bacteremia (<10%)
        - Non-severe cellulitis/SSTI
        - Lower urinary tract infection (e.g. cystitis, prostatitis)
        - Non-severe community-acquired pneumonia (CAP)
        - Non-severe diabetes related foot infection
        - Colitis (including *C. difficile*)
        - Aspiration pneumonitis
        - Uncomplicated cholecystitis, diverticulitis, or pancreatitis
    - Fever or leukocytosis explained by a non-infectious cause (e.g., drug withdrawal, trauma, pulmonary embolism, etc.)
    - Isolated fever or leukocytosis without symptoms and signs of systemic infection
    - Post-operative fever within 48 hours
    - Persistent fever or leukocytosis in patient with negative blood culture in past 48-72 hours with out new localizing signs of infection
        - Other cultures or imaging to look for a source control issue would be more appropriate than blood cultures
        - Consider Infectious Diseases consultation
    - Surveillance blood cultures in patients without suspicion of bacteremia (e.g., from central line prior to TPN initiation, prior to central line replacement)

Indications for FOLLOW-UP Blood Culture to Document Clearance of Bloodstream Infections:

NOTE: Follow-up blood culture should be collected at least 48 hours from the initial positive blood culture, AND after effective antibiotics have been started, AND after source control has been achieved.

- Bacteremia caused by the following organisms:
    - Carbapenemase producing *Enterobacterales*
    - *Enterococcus spp.*
    - *Pseudomonas aeruginosa*
    - *Salmonella spp.*
    - *Staphylococcus aureus:* repeat blood culture every 72 hours until blood cultures are negative on two separate days
    - *Staphylococcus lugdunensis*
    - Yeast

- Suspected/proven intravascular infection, regardless of which microorganism was detected on initial blood culture
    - Endocarditis
    - Previous history of endocarditis
    - Cardiac comorbidities
        - Heart transplant-associated valvulopathy
        - Unrepaired congenital heart disease, repaired congenital heart disease with residual shunt or valvular regurgitation, or repaired congenital heart disease within the first six months post-repair)
    - Intra-cardiac medical device(ICD)/pacemaker
    - Vascular graft
    - Septic thrombophlebitis/septic emboli

- Other clinical indications, regardless of which microorganism was detected on initial blood culture
    - Epidural abscess
    - Persistent symptoms and lack of clinical improvement
    - Febrile neutropenia patient
    - Catheter-related bloodstream infection when attempting catheter retention

The Following Conditions DO NOT Require FOLLOW-UP Blood Culture:

- Single positive blood culture (i.e. 1 bottle positive or 2/4 from the same venipuncture) with skin flora, AND no clinically suspicious/ proven intravascular infection or other clinical indications for follow-up blood culture
    - *Actinomyces spp.*
    - *Bacillus spp.*
    - Coagulase-negative staphylococci
    - *Corynebacterium spp.*
    - *Cutibacterium acnes*
    - *Kocuria spp.*
    - *Micrococcus spp.*
    - Viridans group streptococci

- Uncomplicated gram-negative bacteremia
    - Clinically improving after 48 hours effective antibiotic treatment and source controlled

For ordering information and collection instructions, refer to the Interior Health Microbiology Laboratory Test Directory ("Blood Culture"): microbiology-guide-to-specimen-ordering-collection-and-transport-information.pdf

Section 2. Blood Culture for Disseminated Mycobacterial Infection

The Facts:

- Routine Blood culture bottles are NOT useful for detecting mycobacterial bloodstream infection (disseminated infection). Myco/F lytic blood culture bottles are designed for mycobacterial bloodstream infection (disseminated infection) including disseminated tuberculosis (TB) and non-TB mycobacterial (NTM) infection such as BCG infection from urinary tract cancer treatment, disseminated diseases due to Mycobacterium avium complex (MAC) and slow grower infections.
- The major predisposing conditions for disseminated tuberculosis include Immunodeficiency/suppression, hematologic disorders, severe diabetes and alcoholism.
- Mycobacterial blood culture doesn't add to the diagnostic yield of conventional tests used routinely for tuberculosis and NTM infection, namely sputum microscopy and culture, or biopsy specimens. Furthermore, tissue biopsy has better yield for diagnosing mycobacterial infection compared to mycobacterial blood culture. When no localized infection site is identified and the clinical presentation suspected disseminated mycobacterial infection, blood culture is helpful.

Indications for Mycobacterial Blood Culture:

- Suspected disseminated mycobacterial infection in patients with clinical risk factor (*e.g.* immunosuppression* or certain chronic illnesses) and relevant exposure history (for TB)
- History of bladder cancer with prior BCG irrigation therapy with subsequent clinical presentation compatible with suspected disseminated BCG infection

Mycobacterial Blood Culture Is NOT Indicated for the Following:

- Localized Mycobacterial Infection: targeted specimens (*e.g.* sputum or biopsy) preferred and provide much higher diagnostic yield.

For ordering information and collection instructions, refer to the Interior Health Microbiology Laboratory Test Directory ("TB/Mycobacteria"): microbiology-guide-to-specimen-ordering-collection-and-transport-information.pdf

Section 3. Blood Culture for Disseminated Mold Infection

The Facts:

- Routine blood culture bottles are excellent for yeast detection but not good for detecting mold. Myco/F lytic blood culture bottles are designed for detecting fungemia caused by disseminated mold infection.
- Since mold blood culture yield is extremely low and turn around time is long, most positive mold blood cultures result in no immediate clinical impact due to other microbiological tests available sooner, such as targeted culture specimens from biopsy or respiratory sources, serology, antigen tests, and PCR. Furthermore, most of the positive mold blood culture isolates are deemed to be false positive results, if clinical suspicion is low.

Indications for Fungal Blood Culture:

- Clinical suspicion of disseminated mold infection in Immunocompromised* patients when other faster targeted tests (*e.g.* bronchoscopy or biopsy cultures, serology, antigen tests) are not possible
- Clinical suspicion of disseminated dimorphic mold infection (*e*.g.: *Histoplasma, Blastomyces*) in patients with relevant travel history, if other faster directed tests (*e.g.* respiratory or biopsy cultures, serology, antigen tests) are not possible

Mold Blood Culture Is NOT Indicated for the Following:

- Detection of yeast (*e.g. Candida* or *Cryptococcus* species) since these can be detected in routine blood cultures
- Diagnosis of disseminated mold infection in patients for whom other more rapid targeted tests are available (*e.g.* bronchoscopy or biopsy culture, serology, antigen tests)

For ordering information and collection instructions, refer to the Interior Health Microbiology Laboratory Test Directory ("Fungal Culture, Deep"): microbiology-guide-to-specimen-ordering-collection-and-transport-information.pdf

***Immunocompromised/immunosuppressive Conditions**

healthbc.sharepoint.com/sites/IPCPortalIH/SharedDocuments/Forms/All.aspx?id=%2Fsites%2FIPCPortalIH%2FShared Documents%2FDefinition %26 Management of Immunocompromised Patients%2Epdf&parent=%2Fsites%2FIPCPortalIH%2FShared Documents:

- Hematopoietic stem cell transplant patients in the first 24 months after transplant
- Patients with neutrophil count < 0.5 x 10^9/ L for duration ≥ 48 hours
- Patients receiving corticosteroid therapy equivalent to prednisone ≥ 20mg/day for duration of ≥ two weeks
- HIV positive patients with CD4 < 200 x 10^6/ L
- Patients with inflammatory bowel disease, rheumatologic conditions, multiple sclerosis, or solid organ recipients receiving immunosuppressive therapy, such as, infliximab, etanercept, and methotrexate
- Oncology patients receiving chemotherapy
- Patients with extensive loss of skin/mucous membrane barrier defenses e.g., graft versus host disease, Steven-Johnson syndrome, scalded skin syndrome, major burns
- Patients with congenital or acquired hypogammaglobinemia or agammaglobulinemia, severe combined immunodeficiency or other congenital immune deficiency syndrome

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