Introduction

Blood should be obtained for culture from any patient sufficiently ill to be hospitalized where there is fever, hypothermia, leukocytosis or granulocytopenia. Specific conditions where bacteremia may be suspected include endocarditis, pyelonephritis, pneumonia, meningitis, pyogenic arthritis, osteomyelitis, deep seated abscesses, pelvic inflammatory disease and cellulitis. It is also appropriate to collect blood cultures in neonates, children and the elderly who have nondescript findings or complaints. The issue of anaerobic blood cultures is controversial given that there has been a recent decline in anaerobic bloodstream infections and that most anaerobes are facultative and will grow from the standard aerobic blood culture. Specific clinical situations warrant investigation for anaerobic bacteremia and include necrotizing infections of the head and neck, necrotizing skin and soft tissue infections, necrotizing pneumonia, brain abscess, gynecologic infections and infections following colorectal surgery. Patients in septic shock with no obvious focus should also receive an anaerobic blood culture to rule out septic thrombophlebitis. In immunocompromised patients, patients with complicated postoperative courses or burn patients, fungemia may be suspected and fungal blood cultures may be requested. In the primary investigation of fungemia, the aerobic bottles (Bactec Peds Plus/F/ Bactec Plus+ Aerobic /F) are adequate for the recovery of yeasts. However, these broth media may not be optimal when investigating for dimorphic/filamentous fungi in high risk severely immunocompromised patients. In these clinical scenarios the laboratory should be contacted to obtain Lysis Centrifugation tubes.

General Recommendations

The rate of recovery of microorganisms from blood is directly related to the volume of blood cultured. For specific recommended blood volumes per patient weight, refer to Recommended Blood Volume Chart.

Neonates (up to one month of age)

Site 1: Aseptically collect 0.5 – 1.0 mL into a single Bactec Peds Plus/F vial.

Children < 25kg

A lesser volume of blood is adequate in pediatric patients because the concentration of microorganisms during bacteremia is higher than in adults. A blood culture consists of a total of 3-6 mL of blood collected from a single venipuncture site:

Site 1: Aseptically collect 3 - 6 mL. If collecting < 3 mL use only a single Bactec Peds Plus/F vial. If collecting > 3 mL, place 3 mL in one Bactec Peds Plus/F vial and the rest of the volume in another Bactec Peds Plus/F vial

Note: If anaerobic cultures are requested an additional 3 - 5 mL should be collected in Bactec Lytic/10 Anaerobic/F vial.

For children and adults ≥ 25 kg

A blood culture set consists of a total of 20 - 30 mL collected from two separate venipuncture sites:

Site 1: Aseptically collect 16 - 20 mL into two Bactec Plus+ Aerobic/F vials
Site 2: Aseptically collect a further 8 -10 mL into a second Bactec Plus+ Aerobic/F vial.

Note: If anaerobic cultures are requested collect 20 mls from one of the above venipuncture sites and place 8-10mL in a Bactec Lytic/10 Anaerobic/F vial.

October 15, 2007

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BC Children’s Hospital
Blood Culture Collection Protocol

Timing and Number of Blood Cultures

Collecting blood cultures with a febrile spike is an acceptable practice, but is not without controversy. The maximum yield for positive blood culture is obtained in patients whose blood is drawn between 2 hours to ½ hour prior to the febrile spike. It is of greater importance that the blood cultures be collected prior to the institution of antimicrobial therapy after which the yield is significantly compromised. A delay in collection of blood cultures does not justify a delay in the institution of appropriate empiric antimicrobial therapy in seriously ill patients.

Only in rare circumstances should more than two blood culture sets be collected in one 24 hour period. Microbiologist approval will be required prior to collection of a third set or any deviation from this protocol. A single blood culture set collected daily for three days is considered adequate, even for endocarditis and fever of unknown origin.

For certain less commonly encountered pathogens, such as Brucella, Leptospira, Mycobacterium, Bartonella or dimorphic/filamentous fungi, special culturing techniques are required to isolate these microorganisms from blood. In clinical settings where such organisms are suspected, the clinician must consult with the laboratory to ensure appropriate culturing.

Procedure for Blood Culture Collection

Blood for culture must be collected with special care because microorganisms present on the skin may contaminate the culture.

Please observe the following guidelines:

1. Equipment
   - Obtain blood culture media from the laboratory. Check expiry dates
   - Blood culture tray
   - Sterile gloves (latex or non-latex)
   - 1, 2, 5, and 10cc syringes
   - Alcohol swabs (to disinfect blood culture bottle tops)
   - Tourniquet
     Note: for patients in isolation rooms, leave tourniquet in room
   - Needles/butterfly needles (appropriate size, depending on patient)
   - Vacutainers
   - 2% chlorhexidine gluconate with 70% isopropyl alcohol

2. All staff collecting blood cultures must first perform appropriate handwashing and wear either sterile gloves or use “no touch” technique.

3. Site of collection:
   - All initial sites should be peripheral, if possible.
   - Second site may be a central line if line sepsis is suspected, or peripheral access sites are few.
   - Cultures drawn through peripheral venous or arterial lines are not appropriate unless drawn at the time of insertion.
   - Take peripheral cultures distally of any venous lines in the same limb.

October 15, 2007

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Blood Culture Collection (cont’d)

4. Site preparation:

Skin:
Vigorously cleanse the skin over the venipuncture site in a circle approximately 5 cm in
diameter with 2% chlorhexidine gluconate with 70% isopropyl alcohol.

   Note: In NICU use 2% chlorhexidine with 4% isopropyl alcohol.
   • Scrubbing should optimally continue for 30-60 seconds
   • Allow the venipuncture site to dry for up to 60 seconds (to allow for organism killing)
   • Do not touch the venipuncture site after cleansing prior to phlebotomy.

Intravascular Catheters:
• Vigorously cleanse the hub of the catheter with 2% chlorhexidine gluconate with 70%
isopropyl alcohol for 30- 60 seconds.
• Allow to dry for up to 60 seconds (to allow for organism killing).
  Note: For drawing blood from central venous catheter - refer to Nursing Policy and Procedure PT 009 and PT 010.

5. Disinfect the blood culture vial by removing the tab from the cap and swabbing the septum with
either alcohol or chlorhexidene gluconate with 70% isopropyl alcohol.

   Note: In rare circumstances of skin sensitivity/allergy to chlorhexidene gluconate, povidone iodine may be substituted as a skin cleanser. Do not use iodine to
disinfect the blood culture bottles because it may damage the septum.

6. Collection protocol:

   Butterfly needle procedure:
   For detailed procedure please refer to Accessioning Department Medical Laboratory
   Assistant Procedures manual, Binder 2 of 2, Sub section: Phlebotomy, Winged Set with
   Syringe.

   Alternative syringe draw procedure (adults, certain children and neonates):
   • Perform venipuncture with syringe and draw proper amounts of blood.
     Note: A vacutainer may be used for this procedure.
     For central line draws, only single use vacutainers should be used.
   • Blood is then inoculated into the appropriate blood culture vial. Do not change needles
     before injecting the blood into the culture via. Be sure to inoculate the correct volume
     into each vial. Do not recap needles.
     Note: If using safety needle with syringe, use adaptor to transfer blood to vials.

7. Label vials with patient’s full legal name (last and first) and other pertinent information (eg. right
arm, peripheral/central line etc.), making certain the labels go around the vials, but do not
obscure the barcodes and adjacent sequence numbers on the original Bactec vial labels. If
collecting from an intravascular device, also ensure that the correct lumen is identified (eg.
red/white lumen)

8. Immediately transport the specimen to the laboratory.

   Note: If there is a delay in transport, vials can be kept at room temperature. Do
not refrigerate

October 15, 2007
**Recommended Optimal Blood Volumes**

<table>
<thead>
<tr>
<th>Patient Weight</th>
<th>Recommended Volume/Blood Culture Set</th>
<th>Blood Culture Bottle</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Aerobic Culture</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 1 kg</td>
<td>0.4 – 1.0 mL</td>
<td>Bactec Peds Plus/F – pink top</td>
</tr>
<tr>
<td>1-3 kg</td>
<td>0.5 - 1.0 mL</td>
<td><strong>Note</strong>: 3.0 mL optimum/bottle</td>
</tr>
<tr>
<td>3.0 kg - &lt; 10 kg</td>
<td>1.0 - 3.0 mL</td>
<td></td>
</tr>
<tr>
<td>10 - 20 kg</td>
<td>3.0 - 6.0 mL</td>
<td>Bactec Peds Plus/F – pink top <strong>Note</strong>: 3.0 mL optimum/bottle</td>
</tr>
<tr>
<td>20 - 35 kg</td>
<td>10 - 20 mL*</td>
<td>Bactec Plus + Aerobic/F – grey top <strong>Note</strong>: 8-10 mL optimum/bottle</td>
</tr>
<tr>
<td>&gt; 35 kg</td>
<td>20 -30 mL*</td>
<td>Bactec Plus+ Aerobic/F – grey top <strong>Note</strong>: 8-10 mL optimum/bottle</td>
</tr>
<tr>
<td><strong>Anaerobic Culture</strong></td>
<td></td>
<td>Bactec Lytic/10 Anaerobic/F purple top</td>
</tr>
<tr>
<td><strong>Fungal Culture</strong>**</td>
<td>Refer to Aerobic Culture for Volume per Weight</td>
<td>Bactec Peds Plus/F – pink top or Bactec Plus + Aerobic/F - grey top <strong>Note</strong>: If dimorphic/filamentous fungi requested add: 1.5 mL or 10 mL Isolator tube (depending on size of patient)</td>
</tr>
<tr>
<td><strong>Mycobacterium Culture</strong></td>
<td>1 - 3 mL</td>
<td>SPS Vacutainer tube</td>
</tr>
</tbody>
</table>

*In older children, if unable to collect > 3 mL (total), use Bactec Peds Plus/Fvial –pink top

** Fungal cultures can be collected in same bottle as for aerobic culture

October 15, 2007
References


