Blood Culture Collection

PRINCIPLE:

The detection of microorganisms in a patient’s blood has diagnostic and prognostic importance. Blood cultures are essential in the diagnosis and treatment of the etiologic agents of sepsis. Bacterial sepsis constitutes one of the most serious infectious diseases and, therefore, the expeditious detection and identification of bloodborne bacterial pathogens is an important function of the diagnostic microbiology laboratory. Blood cultures are performed to detect living microorganisms in a patient’s blood. Blood cultures can easily be contaminated with microorganisms found on the skin resulting in false positive results generated to the patient’s physician. This could result in great patient harm. Strict adherence to site cleansing technique and drawing technique will result in optimal specimen for testing.

REAGENTS / EQUIPMENT / SUPPLIES:

A. Media
1. BACTEC PLUS Aerobic/F Culture Vial, store at 2°C to 25°C. Optimum blood volume for each vial is 8 to 10 mL; 3 to 10 mL of blood is acceptable.
2. BACTEC Lytic/10 Anaerobic/F, store at 2°C to 25°C. Optimum blood volume for each vial is 8 to 10 mL; 3 to 10 mL of blood is acceptable.
3. BACTEC PEDS PLUS/F Culture Vial, store at 2°C to 25°C. Optimum blood volume for each vial is 1 to 3 mL; 0.5 to 5 mL of blood is acceptable.
5. ChloroPrep, 1.75 ml - 2% chlorhexidine gluconate and 70% isopropyl alcohol skin prep to be used on patients 2 Months of age and older.
6. Povidone-Iodine Swabstick Antiseptic/Germicide to be used on patients < 2 Months old. Store at room temperature, avoid excess heat.
7. Alcohol prep pad.
8. Phlebotomy supplies.
QUALITY CONTROL:

Each case of media has a Quality Control certificate indicating the organisms tested and the acceptability of those tests. Place each Quality Control certificate in the Microbiology Reagent/Media logbook found in the Microbiology department.

LIMITATIONS OF PROCEDURE:

1. Use Chloraprep with care in premature infants or infants under 2 months of age. This product may cause irritation or chemical burns.
2. Care must be taken to prevent contamination of the sample during collection and inoculation into the BACTEC vial. A contaminated sample will give a positive reading, but will not indicate a relevant clinical result.
3. Because blood can neutralize the toxicity of SPS toward organisms sensitive to SPS (such as P. aerobius), the presence of optimum volumes of blood (5-10 mL) is a benefit in the recovery of these organisms. Some fastidious organisms, such as certain Haemophilus species, require growth factors, such as NAD, or factor V, which are provided by the blood specimen. If the blood specimen volume is 3.0 mL or less, an appropriate supplement may be required for recovery of these organisms.
4. Optimum recovery of isolates for adults will be achieved by adding 8-10 mL of blood. Use of lower or higher volumes may adversely affect recovery and/or detection times.

PROCEDURE NOTES:

1. Blood cultures will be drawn as to specific physician's orders (blood culture x 1, x 2 or x 3). If no specific timed draws are written, the laboratory will obtain the cultures at scheduled intervals. If the patient is to be placed on antibiotics or if the condition of the patient warrants, the laboratory will draw the designated number of blood cultures from different sites (if possible) within 5-20 minute intervals of each other. If the conditions allow, the cultures will be obtained in intervals of 20 minutes or longer as to the laboratory schedule. The number of multiple blood cultures requested per patient should be limited to 2-3/24 hour period. The total blood cultures per patient acceptable without consultation will be three. Most cases of bacteremia are detected using two to three sets of separately collected blood cultures. More than three sets of blood cultures yield little additional information. Conversely, a single blood culture may miss intermittently occurring bacteremia and make it difficult to interpret the clinical significance of certain isolated organisms.
2. Blood Cultures ordered when a patient is “spiking a temperature” are considered STAT and the first culture should be obtained within 10 minutes of the time ordered.
3. Blood culture bottles should be drawn prior to any other tubes of blood being drawn for additional lab work.
4. Do not use culture vials past their expiration date.
5. Do not use culture vials that exhibit any cracks, defects, contamination, cloudiness or bulging or indented stoppers.
6. Due to a poor seal or crack the vial may leak. Do not use a leaky bottle. If the vial has
already been inoculated, treat the leak or spill with caution, as pathogenic organisms/agents may be present.

7. A contaminated vial could contain positive pressure and could be refluxed into the patient’s vein. Carefully observe the direction of blood flow when performing a draw with a butterfly to ensure that the blood is flowing into the bottle and not refluxing back into the patient’s vein. Contaminated bottles may not be readily apparent.

8. Wear gloves while handling inoculated vials and perform all processing in a biological safety cabinet.

9. In some cases, the bottle may be cracked or break. If the bottle is already inoculated, treat the spill with caution. Use personal protective equipment and treat as a biohazard.

10. Properly dispose of all contaminated materials properly. **Pathogenic microorganisms, including Hepatitis B Virus and Human Immunodeficiency Virus, may be present in specimens. “Universal Precautions” and institutional guidelines should be followed in handling all items that are contaminated or contain blood or other body fluids.**

PROCEDURE:

A. **Adult Blood Culture Collection**

A single adult blood culture consists of 1 Aerobic BACTEC bottle and 1 Anaerobic BACTEC bottle. Optimum blood volume for each vial is 8 to 10 mL.

If it is impossible to draw the required amount, aliquot as follows:

<table>
<thead>
<tr>
<th>Amount in Venipuncture</th>
<th>Amount in BACTEC Plus Aerobic Vial</th>
<th>Amount in BACTEC Plus Anaerobic Vial</th>
</tr>
</thead>
<tbody>
<tr>
<td>16-20 mL</td>
<td>Split equally between aerobic and anaerobic vials</td>
<td></td>
</tr>
<tr>
<td>13-16 mL</td>
<td>8 mL</td>
<td>5 - 8 mL</td>
</tr>
<tr>
<td>10-12 mL</td>
<td>5 - 7 mL</td>
<td>5 mL</td>
</tr>
<tr>
<td>5-9 mL</td>
<td>entire blood amount</td>
<td>0</td>
</tr>
</tbody>
</table>

1. Cleanse the site for venipuncture using ChloraPrep by applying to the center of site and moving outward in concentric circles. Allow to dry for 30 seconds.

2. The site for venipuncture should not be touched after cleansing.

3. Before inoculating the bottle, remove the flip-off cap and observe bottle for any defects or contamination. Swab the bottle septum with an alcohol wipe, do not allow the bottle top to touch bedding, patient, etc after removing the top.

4. The draw may be performed with either a needle and syringe or with a butterfly and hub.
a. When using a butterfly, the correct order of draw is:
   **Aerobic bottle first, Anaerobic bottle second, followed by additional tubes.** (The aerobic bottle is first in order to allow the air from the tubing to enter the aerobic bottle and not the anaerobic bottle.)
   Watch markings on side of bottle carefully to ensure that no more than the optimum volume is drawn. The vacuum in the vial may exceed 10 mL and more than the optimum volume could mistakenly be drawn. Overfilled bottles can cause false positive results.

b. When using a needle and syringe, the correct order of draw is:
   **Anaerobic bottle first, Aerobic bottle second, followed by additional tubes.** (The anaerobic bottle is first so that bubbles that collect in the syringe will not be put into the anaerobic bottle.)
   After enabling the safety device on the needle, remove the needle and attach a transfer device. Place the aerobic bottle on the transfer device and let the correct amount of blood enter the bottle. Remove the transfer device and syringe. Repeat for aerobic bottle.

5. Invert the bottles 10 times to mix. Label the bottle correctly being careful not to obscure bar code on the blood culture bottle.

B. Pediatric Blood Culture Collection

A single pediatric blood culture consists of 1 Peds Plus/F bottle. Optimum blood volume for each vial is 1 to 3 mL; 0.5 to 5 mL of blood is acceptable. **In order to ensure the correct volume, a direct draw butterfly is not acceptable to use for collection of pediatric blood cultures.** The vacuum in the vial will exceed 5 mL and more than the optimum volume could mistakenly be drawn. Instead, a syringe should be used with a butterfly or needle attached.

1. Cleanse the site for venipuncture. Povidone-Iodine Swabstick should be used for patients under 2 Months of age. Apply to the center of site and moving outward in concentric circles. Allow to dry.
2. The site for venipuncture should not be touched after cleansing.
3. Before inoculating the bottle, remove the flip-off cap and observe bottle for any defects or contamination. Swab the bottle septum with an alcohol wipe, do not allow the bottle top to touch bedding, patient, etc after removing the top.
4. After enabling the safety device on the needle, remove the needle and attach a transfer device. Place the pediatric bottle on the transfer device and let the correct amount of blood enter the bottle. Remove the transfer device and syringe.
5. Invert the bottles 10 times to mix. Label the bottle correctly being careful not to obscure bar code on the blood culture bottle.

C. Any adult blood culture bottle noted to have less than 5 mL of blood after drawing is documented on the corrective action log on the front of the Bactec instrument. A low volume of blood in pediatric bottles is also noted.
REFERENCES:

8. www.pdipdi.com