I. GENERAL PRINCIPLE

The purpose of a blood culture is isolation and identification of bacteria circulating in the vascular system. Bacteria enter the blood from extra-vascular sites via the lymphatic vessels, when the bacteria multiply at a rate exceeding the capacity of the reticuloendothelial system to remove them. Bacterial sepsis is one of the most serious infectious diseases, with rapid detection and identification of blood-borne pathogens a most important function of the microbiology lab.

II. SPECIMEN COLLECTION

A. Timing

1. Orders for multiple blood cultures will be drawn at one time, performing a separate venipuncture for each set ordered.

2. A maximum of four sets of blood cultures per patient per day is accepted. Request for more than six sets of blood cultures per patient per hospitalization requires consultation with the pathologist.

3. Blood cultures should be collected prior to starting antimicrobial therapy.

B. Blood Culture Order

CULTBLD - refers to blood culture by the broth method. A volume of blood is placed into a larger volume of liquid media formulated with nutrients to enhance the growth and recover the largest array of organisms possible. The term "blood culture" usually refers to this method of testing, which requires 2 bottles of media per 1 blood culture. This is known as a "set," one bottle with media formulated for aerobic bacteria, and one bottle with media formulated for anaerobic bacteria.

Example: If the order reads "BC x 2",

- Order CULTBLD as procedure #1
- Order CULTBLD again as procedure #2
- File each order to obtain separate accession #’s per set
- Draw blood for 4 bottles, performing a separate venipuncture per set

C. Volume

1. The volume of the draw is critical because the concentration of organisms in most bacteremias is low, especially if the patient is on antimicrobial therapy. However, in infants and children, the number of bacteria in the blood is higher so less blood is required.

2. BACTEC blood culture bottle options and recommended volumes are:

- Aerobic Standard: 8 - 10 ml of blood
- Anaerobic Standard: 5 - 7 ml blood
- Peds Plus: 1 - 3 ml blood. This bottle serves as the aerobic bottle of the set for pediatric patients due to the smaller volume requirements. This bottle may also be used in place of the aerobic bottle if the patient is known to currently be on antibiotic therapy, as the peds plus bottle contains an antibiotic-binding resin.

3. A blood culture set is defined as an aerobic and an anaerobic bottle. However, if the collection is difficult or yields less than the optimum volumes per bottle as defined above, the following inoculation requirements should be implemented.
a. Less than three ml volume – inject total volume into a single Peds Plus bottle
b. 4 ml volume – inject 1 ml into Peds Plus, 3 ml into Anaerobic Standard bottle
c. 5 ml volume – inject 2 ml into Peds Plus, 3 ml into Anaerobic Standard bottle
d. > 5 ml volume – split volume evenly between Aerobic and Anaerobic bottles
e. The maximum amount for either the aerobic or anaerobic bottle is 10 ml of blood. **Do not overfill any bottle type.**

D. **Collection Method**

1. All blood cultures will be collected by venipuncture by the laboratory staff, according to the following guidelines. If blood cultures are ordered for a newborn in the nursery, a patient outside the scope of the hospital, or in a laboratory-staffed clinic, these guidelines must be strictly followed by the person responsible for obtaining the specimen. Any deviation could result in contamination of the culture and confusion for the physician in making a diagnosis and selecting treatment for the patient.

2. Blood cultures must always be collected first, prior to any other blood order.

3. Bottles MUST remain upright or on a slight slant only to ensure no fluid is in the neck of the bottle during the venipuncture process. Bottle labels are graduated in 5 ml increments to allow for estimation of blood volume introduced.

4. Selection of collection method

   a. BACTEC bottles are NOT evacuated. Blood flow into the bottle is strictly gravitational, so keep this in mind when assessing the patient and selecting phlebotomy method.

   b. Butterfly / vacutainer holder setup may be used if patient has sufficient blood pressure and/or blood flow. This option is also useful for patients with both blood cultures and additional blood work orders.

   c. Butterfly / syringe setup is an option for low blood low and additional blood work orders. Unscrew the vacutainer holder from the end of the butterfly tubing and replace it with a syringe. After obtaining sufficient volume for blood cultures, remove the syringe, replace the vacutainer holder and proceed with additional blood collection. Place a clean needle on the syringe and inject blood into bottles.

   d. Needle and syringe setup is best used for difficult draws, where obtaining adequate volumes could be most problematic. After collection, replace phlebotomy needle with a clean needle before injecting blood into bottles.
E. **Antisepsis and Venipuncture**

1. Select venipuncture site, then release tourniquet.

2. Cleanse the selected venipuncture site.
   a. Rub vigorously with an alcohol prep pad. Let dry 1 minute.
   b. Apply a 10% povidone-iodine solution over the same area, beginning at the proposed entry site and circling outward to a diameter of approximately 5-cm. Let dry 1 minute.
   c. Cleanse the site a second time with an alcohol prep pad to remove the iodine by wiping down the center of the prep area, then down each side. This step is helpful in the event the site must be palpated during the phlebotomy procedure.
   d. Prepare palpitation fingers in the same manner.
   e. If the iodine solution is unavailable, substitute chlorhexidine, except in the case of an infant less than 2 months old. For those pediatric patients, substitute a 3 alcohol pad prep with 1 minute dry time between each application.

3. Clean rubber caps of blood culture containers with alcohol. Let caps dry. Do not prep rubber stoppers with any other agent, per manufacturer’s instructions.

4. Retie tourniquet without touching the prepped area, insert needle into vein, and withdraw blood.

5. After bleeding stops, if any iodine remains on the skin, reclean venipuncture site with alcohol to remove.

6. Repeat the procedure for each blood culture set ordered, selecting a different site for each venipuncture, if possible.

E. **Labeling**

1. All bottles must be labeled in the presence of the patient.

2. **Orient the patient labels vertically**, to correspond with the bottle bar code. **Do not cover the bottle bar code.**

3. Label the aerobic/anaerobic bottle of each set with the same accession #.

III. **TRANSPORT**

A. Blood cultures are transported at room temperature.

B. **Do not refrigerate blood cultures if there is a delay in transporting to laboratory.**
See original policy in the Laboratory for all documented biennial reviews.

REFERENCES:

Clinical Microbiology Procedures Handbook; 1992; Isenberg; American Society for Microbiology.

Manual of Clinical Microbiology; 1991; 5th edition; Balows, Hausler; American Society for Microbiology.

BD Bactec™ Standard/10 Aerobic/F Culture Vials package insert: 2/2010

BD Bactec™ Standard Anaerobic/F Culture Vials package insert: 2/2010

BD Bactec™ Peds Plus™ / F Culture Vials package insert: 6/2012