PURPOSE: To determine the presence or absence of bacterial pathogens in catheter tip specimens.

SAMPLE INFORMATION:

Type	Sterile container
Source	Intravascular catheters including: central, CVC, Hickman, Broviac, peripheral, arterial, jugular, femoral, subclavian, umbilical, hyperalimentation, hemodialysis, port-a-cath and swan-Ganz catheters.
Stability	If the sample is received in the laboratory and processed greater than 48 hours from collection: • Add specimen quality comment "Delayed transport may have compromised the recovery of organism"
Storage Requirements	Refrigerated
Criteria for rejection	1. Unlabeled/mislabeled specimen. 2. Specimen container label does not match patient identification on requisition. 3. Foley catheter tips are not acceptable for culture – request a urine specimen. 4. Chest tube tips. 5. Abdominal drain tips. 6. Catheter tips should not be placed in saline or transport medium.

NOTE:

- **Tips from total parenteral nutrition (TPN) lines or hyperalimentation lines: After processing, send to DynaLIFE for *Malassezia furfur* (Fungus culture).**

REAGENTS and/or MEDIA:

- Blood agar (BA) and MacConkey agar (MAC)
- Identification reagents: catalase, oxidase, Staph latex test, Strep latex test, etc.

SUPPLIES:

- Disposable inoculation needles
- Biosafety cabinet
- 35° ambient air and 37° CO_2 incubators
- Wooden sticks
- Vitek 2 and supplies

SPECIAL SAFETY PRECAUTIONS:

Containment Level 2 facilities, equipment, and operational practices for work involving infectious or potential infectious materials or cultures.

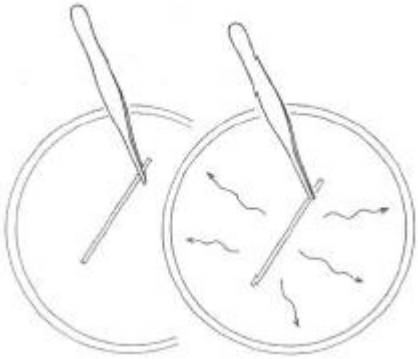
- Lab gown must be worn when performing activities with potential pathogens.
- Gloves must be worn when direct skin contact with infected materials is unavoidable.
- Eye protection must be used when there is a known or potential risk of exposure of splashes.
- All procedures that may produce aerosols, or involve high concentrations or large volumes should be conducted in a biological safety cabinet (BSC).
- The use of needles, syringes and other sharp objects should be strictly limited.

All patient specimens are assumed to be potentially infectious. Universal precautions must be followed. Since viable micro-organisms are used, all cultures must be handled with appropriate precautions. All equipment in contact with cultures should be decontaminated by appropriate methods.

QUALITY CONTROL:

- Refer to Test Manual for reagent quality control procedures.

PROCEDURE INSTRUCTIONS:

Step	Action
Processing specimens for catheter tip culture	
1	In the biosafety cabinet, roll the catheter tip back and forth across the entire surface of Blood agar using a sterile needle, exerting slight downward pressure. Repeat with MacConkey agar. **NOTE:** If the tip is too long, cut the end closest to the top of the tube (proximal end) with sterile scissors prior to rolling on the plate: 
2	If the specimen is from a patient on total parenteral nutrition or is the catheter tip from a hyperalimentation line, culture for *Malassezia furfur* should also be performed. Refer specimen to DynaLIFE for fungus culture after C&S processing has been completed.
3	Place MAC plate in the O_2 incubator. Place BA plate in the CO_2 incubator.
4	Examine plates after 24 hour incubation. Record observations in the LIS.
5	Re-incubate CO_2 plate for an additional 72 hours. Discard O_2 plate.
6	At 48 hours, examine plates and record observations in the LIS.
7	At 72 hours, examine plates and record observations in the LIS.
8	At 96 hours, examine plates and record observations in the LIS..

Probable Pathogens	Possible Pathogens
• *Staphylococcus aureus* • β-hemolytic *Streptococcus* • *Pseudomonas* spp. • Enterobacteriaceae • *Yeast* spp. • *Malassezia furfur*	• Coagulase negative *Staphylococcus* • Diphtheroids • viridans *Streptococcus* grp.

INTERPRETATION OF RESULTS:

Step	Action	
1	Examine BA plate after 24, 48, 72 and 96 hours incubation. Examine MAC plate after 24 hours incubation.	
2	Count each type of colony isolated. Only enumerate the growth on the BA as MAC is only used to provide separation of colony types.	
3	**IF**	**THEN**
	>15 CFU	• Identify to the genus level, including gram-positive rods.
	<15 CFU	• Identify only significant pathogens. • Susceptibility testing should be performed even when the same organism is identified from the patient's blood culture. Since catheter tip infections are due to the formation of a biofilm on the device, different morphotypes of the same organism may be recovered from the blood and the device. These morphotypes may have different antimicrobial susceptibility profiles and antimicrobial therapy should be directed against the most resistant isolate.

REPORTING RESULTS:

IF	REPORT
No growth after 4 days incubation	• Report: **"No growth after 4 days"**
Pathogen isolated **>15 CFU**	• Report organism identification under the isolates tab. • Report quantitation as actual number of colonies counted. If organism is too numerous to count, report as >100 colonies. • Report susceptibility results as per ASTM.
Gram-positive bacilli isolated **>15 CFU**	• Report as **"Corynebacterium spp."** if organism resembles diptheroids on gram stain and culture reactions are appropriate (catalase +) in the isolates tab. • Report quantitation as actual number of colonies counted. If organism is too numerous to count, report as >100 colonies. • Do not perform or report susceptibility testing.
Mixed skin flora isolated: (CNS, diptheroids) **>15 CFU**	• Report as **"Mixture of skin flora"** • Report quantitation as actual number of colonies counted. If organism is too numerous to count, report as >100 colonies. • Do not perform or report susceptibility testing.
Pure culture of skin flora isolated **> 15 CFU**	• Report minimal identification, (e.g., staphylococci spp., or Gram-positive bacilli) under the isolates tab. • Report quantitation as actual number of colonies counted. • Do not perform or report susceptibility testing.
Pathogen isolated: **< 15 CFU**	• Report organism identification under the isolates tab. • Report quantitation as actual number of colonies counted. • Report susceptibility results as per ASTM.
Mixed skin flora isolated: (CNS, diptheroids) **< 15 CFU**	• Report as **"Mixed skin flora, <15 colonies"**
Pure culture of skin flora isolated **< 15 CFU**	• Report minimal identification, (e.g., staphylococci spp., or Gram-positive bacilli) under the isolates tab. • Report quantitation as actual number of colonies counted. • Do not perform or report susceptibility testing.

NOTE:

- **If Gram-negative bacilli or *S.aureus* is isolated and NO blood culture was submitted, add isolate comment &TIP to state: "Please submit blood cultures to diagnose catheter-related sepsis"**

LIMITATIONS:

1. Sensitivity of semi-quantitative catheter tip cultures is estimated to be 85% in diagnosis of catheter-related bacteremia, but the specificity to diagnose catheter-related sepsis is low.
2. A negative tip culture does not eliminate the possibility of an infection. For example, infections of the catheter hub lumen may be missed by culture of only the tip.
3. Efforts to diagnose catheter-related sepsis using unpaired blood cultures drawn from the catheter are less sensitive than tip cultures.
4. Catheter tips impregnated with antiseptics may inhibit the ability of the organism to grow.

REFERENCES:

- Clinical Microbiology Procedures Handbook, 4th edition, ASM Press, 2016
- Jorgensen J.H., Pfaller M.A., Carroll K.C., Funke G., Landry M.L., Richter S.S., Warnock D.W. 2015. Manual of Clinical Microbiology, 11th edition, ASM Press, Washington, D.C.

REVISION HISTORY:

REVISION	DATE	Description of Change	REQUESTED BY
1.0		Initial Release	L. Steven