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| Tissue Culture |
| **Purpose** | This procedure provides instructions for performing tissue cultures. Organisms that reside on the skin and mucous membranes as well as organisms in the environment can cause infections if they enter normally sterile tissue through breaks in the skin or normally intact mucous membranes. Because virulence factors are not always necessary, virtually any species can be involved. Tissue specimens are obtained during surgical procedures at significant risk and expense to the patient. Therefore, it is important that pathology review these tissues. Tissues obtained at autopsy are valuable in determining the cause of death. Since they are obtained by Pathology, review is not necessary.  |
| **Scope** | This procedure is performed when Tissue Cultures are ordered from Surgery and from Pathology surgery cases or post mortem exam. This procedure applies to all Microbiology staff performing Tissue Cultures. |
| **Policy Statements** | This procedure is performed 24/7 and includes Gram stain and culture for aerobes and less fastidious anaerobes. All aerobic organisms will be identified. Anaerobic organisms will be characterized or identified depending on the nature of the culture. The day shift microbiologists will interpret gram stains, unless the site is a joint or there is a special request, in which case the technical staff on-duty will stain and read the gram and enter a preliminary result in the computer. |
| **Test Code** | **TISC** |
| **Materials** | **Reagents** | **Supplies** | **Equipment** | **Media** |
|  | * Gram Stain reagents
 | * Sterile Forceps
* Sterile Scalpel
* Anaerobic Gas Pack
* Glass Slide (GMST)
* Petri dish, Sterile
* Sterile disposable pipette
* Tissue grinding kit or sterile stomacher bag
 | * Ambient air incubator
* Anaerobic jar
* CO2 incubator
* Incinerator
* Inoculating loop
* Microscope
* Stomacher
* Tissue Grinders are available for Bone specimens
 | Refer to the Sunquest specimen label for media information.* Chocolate agar (CHOC)
* Sheep Blood agar (SB)
* Anaerobic Sheep Blood agar (ASB2)
* Anaerobic Kanamycin-Vancomycin agar (AKV)
* CNA agar (CNA)
* MacConkey agar (MAC)
* Normal Saline, 1 mL (SLNE)
* Thioglycollate (THIO)
* Trypticase soy broth (TSB)
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| Sample | 1. Acceptable specimens
* Tissue
1. SDES codes/Specimen type
* The code Sunquest code TIS cannot be used as a SDES code. It is considered a source code and will error in Cerner PowerChart.
* State specific site of specimen. If the SDES CODE is unknown, do a keyword look-up at the SDES prompt by clicking **Result code lookup**. Type in text and do a search by description. Highlight code and click **Add to list**. Select the highlighted code to enter in SDES.
* If the tissue is from an autopsy, add the code AUT after the site code.

Text: ABDSearch option ○ Code ◙ DescriptionABD ABDOMENABDF ABDOMINAL FLUIDClick **Add to List*** Free text may be added to the specimen description code by clicking **Free Text**. Type free text in the box and click **OK**. This will automatically append the free text on to the SDES code. Click **Select** to save.
1. Specimen Collection and Transport
* Refer to Lab Test Directory – Tissue Culture and Gram Stain
1. Specimen assessment
* Refer to the Sample Rejection section of Lab Test Directory – Tissue Culture and Gram Stain

.1. Special instructions
2. All surgery tissues need to be reviewed and documented by pathology before processing in microbiology, if surgery did not also submit to Pathology.
3. Process immediately. Do not allow drying out.
4. Aliquot the appropriate amount of specimen for other requests such as [AFB Culture](http://www.childrensmn.org/Manuals/Lab/MicroBioViral/033039.asp) or [Fungal culture](http://www.childrensmn.org/Manuals/Lab/MicroBioViral/033252.asp).
5. **If there is a small amount** of specimen, call the physician to prioritize the tests.
6. **If there is** **extra** tissue, save a sterile aliquot in a small amount of THIO or SLNE at 4ºC for 1 week in case further studies may be requested.
 |  **Related document**[Lab Test Directory – Tissue culture and gram stain](http://www.childrensmn.org/Manuals/Lab/MicroBioViral/033629.asp) |
| **Special Safety Precautions** | Microbiologists/virologists are subject to occupational risks associated with specimen handling. Refer to the safety policies**:**1. Biohazard Containment
2. Safety in the Microbiology/Virology Laboratory
* Biohazardous Spills
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| **Procedure** | Follow the procedure below to process Tissue cultures. |
|  | InoculationWarm all media before inoculation. Label all plates, tubes and slides properly with the patients name, accession number and date. Inoculate the media in the order of the least selective first to prevent carryover of inhibitory substances to another medium. Refer to the Sunquest specimen label for the order of inoculation.1. Always inoculate the culture media first before preparing the slide when using the same pipette.

Specimen processing1. **PREFERRED METHOD—**Stomacher;

**DO NOT USE FOR HARD TISSUES that would puncture the stomacher bag.**1. Place tissue in sterile petri dish and cut into small portions using sterile forceps and scissors.
2. Using a sterile swab or forceps, transfer the tissue into a sterile Stomacher bag and add 1.0 ml of SLNE to moisten the tissue for homogenizing.
3. Insert Stomacher bag between the door and paddles in the blender, allowing 4 cm of the bag to project above the top of the door.
4. Pull handle forward to firmly close the door and switch machine on for 1-2 min.
5. Switch machine off, hold bag, open door by lifting the handle, and remove the bag.
6. Remove the all of the saline eluted specimen by using a sterile pipette.

Place 1-2 drops directly on each plate, into the THIO and onto a slide. Also, place a piece of the tissue into the THIO.1. Spread the specimen on the slide to make a thin film. Poor Gram stain results will occur if the smear is too thick.

Note: Do not stomach or grind tissues for fungal culture. This will break up the fungal elements and prevent growth1. **FOR BONE:** Tissue grinding method
2. Place tissue in sterile petri dish and cut into small portions using sterile forceps and scissors.
3. Using a sterile swab or forceps, transfer the tissue into the tube and add 1.0 ml of SLNE to moisten the tissue for grinding/homogenizing.
4. Using a circular motion, homogenize the specimen.
5. Remove all of the saline eluted specimen by using a sterile pipette.

Place 1-2 drops directly on each plate, into the THIO and onto a slide. Also, place a piece of the tissue into the THIO.1. Spread the specimen on the slide to make a thin film. Poor Gram stain results will occur if the smear is too thick.

**PRION PRECAUTION: FOR BRAIN and SPINAL CORD TISSUE:** Cover hood work surface with a disposable plastic backed pad, use disposable items for processing and discard all items into red trash for incineration. Immediately clean hood surface with 1:10 dilution of bleach. **Rinse well with water.**1. Streak plates semi-quantitatively for primary isolation.
2. Sterilize the inoculating loop in the incinerator for 5 s to 10 s. Allow the loop to cool.
3. Pass the loop back and forth through the inoculum in the first quadrant several times, covering approximately ¼ of the plate.
4. Flame the loop, turn the plate a quarter turn and pass the loop through the edge of the first quadrant approximately 4 times while streaking into the second quadrant. Continue streaking in the second quadrant without going back into the first quadrant 3-4 times.
5. Flame loop again, turn the plate another quarter of a turn, and pass the loop through the edge of the second quadrant approximately four times while streaking into the third quadrant. Continue streaking in the third quadrant without going back into the second quadrant 3-4 times.

1. Incubation
2. Incubate CHOC, SB, and CNA in 4-10% CO2 at 35ºC
3. Mpls: Place ASB2 and AKV in anaerobic holding chamber to be closed in an AnaeroPack™ System. Close for 2 days. St Paul should use the BD GasPak™ EZ Pouch anaerobic system.
4. Place MAC and THIO in ambient air incubator at 35ºC. Hold THIO for 5 days.
5. Gram stain examination

Perform Gram stain and interpret.1. Quantitate PMNS, epithelial cells, histiocytes, bacterial and fungal morphotypes.
2. Blot excess oil. Hold slide for one week. Hold autopsy slides for possible review in autopsy slide box.
3. If a Gram stain QA failure should occur, review slide and culture. Hold culture plates an additional day if necessary.
4. Culture examination: Read plates daily for 3 days.

Caution: For cultures of lymph nodes, work up slow growing organisms in BSC, since pathogens such as *Francisella, Brucella, and Mycobacterium* can be found in these specimens. See MC 210 for LRN procedures for testing flowcharts of possible Bioterrorism organisms.1. Day 1
2. Examine aerobic plates and THIO.
3. Plated media
4. Gram stain each colony type and perform initial identification procedures, i.e., catalase, oxidase.
5. Correlate colony types with the direct Gram stain.
6. Use the initial Gram stain to help determine the extent of work-up required on the culture. The presence of many WBCs indicates an infectious process.
7. Set up definitive biochemical or identification procedures on significant organisms if well isolated.
8. Perform antimicrobial susceptibility testing on significant organisms if well isolated.
9. Subculture organisms that are not well isolated to appropriate media for further work-up.
10. Reincubate primary plates and subcultures for an additional day.
11. Report preliminary results.
12. Culture plates that are no growth after 1 day should be taped closed and labeled as ’NG1-work up in hood’. These cultures may be a slow growing highly infectious organism and should be worked up in the BSC for our own safety. Please refer to the LRN Level Bioterrorism Laboratory Protocols Procedure, in the Safety folder for more specific information.
13. THIO broth
14. Visually inspect THIO.
15. If positive, smear THIO for 2 consecutive days.
16. Correlate the culture result with the Gram stain of the THIO. Do not subculture the THIO if the smear correlates with the growth on the plates. Discard after 2 days.
17. If there appears to be additional organisms in the THIO that are not on the plates, subculture to appropriate media.
18. Day 2
19. Examine primary plates from the previous day for additional microorganisms.
20. Examine anaerobic plates, compare to aerobic plates, and do appropriate subcultures and identifications.
21. Read and record identification tests and susceptibilities from the previous day.
22. Set up additional tests as needed.
23. Send updated report.
24. Call MRSA results to the patient’s caregiver, if not previously positive. Freeze isolate for future reference.
25. Additional Days
26. Complete identification and susceptibility testing procedures until all significant isolates are finished.
27. If there is no growth on the plates, discard after 3 days. Culture is held open while THIO continues to incubate.
28. Hold the THIO for 5 days. If no growth in THIO, final the report as “No Growth, 5 days”.
29. Send updated report and finalize
30. Save a representative primary plate, whether a complete work-up was performed or not, at room temperature for 7 days in case a physician calls for further studies.
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| **Limitations** | Specimens are routinely screened for rapid growing anaerobes (e.g., *Bacteroides fragilis* group, *Clostridium perfringens*, *Fusobacterium*, and anaerobic gram-positive cocci). Slow-growing *Mycobacterium* sp. or *Nocardia* sp. that may cause abscesses will **not** be recovered in routine bacterial cultures even if present, since extended incubation periods or special media are necessary for isolation. Cultures for these organisms should be specifically requested. |
| **Critical/****Significant results** | * 1. *Francisella* can be found in lymph node biopsy specimens and is extremely infectious. It is a tiny coccobacillus that grows slowly and is catalase positive and oxidase negative. Work in BSC if suspected. Do not use automated ID systems. Refer to MC 210 for LRN Bioterrorism guidelines and flowcharts.
	2. Notify physician of the isolation of *S. pyogenes* which can cause life threatening necrotizing fasciitis.
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| **Result Reporting** | 1. CULTURE RESULTS: Record culture results and culture work-ups in Sunquest MRE *Culture Entry* tab in Observations or Workups by using customized keyboards or by entering a code in the result box. Report results semiquantitatively, i.e., 1+, 2+, 3+ or 4+.

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| Quantity | 1st quadrant# colonies | 2nd quadrant# colonies | 3rd quadrant# colonies |
| 1+ | <10 |  |  |
| 2+ | >10 | <5 |  |
| 3+ | >10 | >5 | <5 |
| 4+ | >10 | >5 | >5 |

1. No Growth Cultures: Update culture status in the Observation result box (Culture Entry tab), by using the “No Growth” update key (‘). Report as “No growth 5 days".
2. Positive cultures:

Observations: 1. 4+ STAPHYLOCOCCUS AUREUS Further identification to followWorkups: Wkup # 1 Workup Components Med : SB GMS : STPH Desc : BH SC : SB Id : SAUR SLC : POS TUC : VMIC : 1 FOXS : 25-SS DTEST : POSIf growth is only in the THIO, report as:Observations: 1. SCANT GRAM NEGATIVE RODS ISOLATED FROM BROTH ONLY Further identification to follow. (**SCAN-GNR-BO-FID**)Workups: Wkup # 10 Workup Components Med : THIO SC : SB MAC (Add Wkld: 2) Desc : CLDY GMS : GMNR ID : GNR1. Call MRSA results to patient’s caregiver, if not previously called. Document date and time called in computer.

3+ METHICILLIN-RESISTANT STAPH AUREUS \*\*\*MDRO\*\*\*MULTIPLE DRUG RESISTANT ORGANSIM (MDRO): This organismrequires SPECIAL CONTACT PRECAUTIONS. Please call Infection Control.\*\*Called to Linda S., RN L8 @ 1300 7/7/03If growth should occur or additional testing should be requested after the culture has been finalized, remove the final status and send out a supplementary report. The code **SRPT** (supplementary report) must be used in SREQ or *Culture Observations* as follows:Updated or new culture information: In the *Culture Entry* tab, enter SRPT on an observation line followed by new results.Requests for additional testing: In the *Misc. Updates* tab, enter SRPT in SREQ followed by the request.Refinal the culture when identifications and/or testing are complete.1. If a culture requires a correction, the code **CORR** (corrected report) must be reported on an observation line in the *Direct Exam* or *Culture Entry* tab. Refer to policy MC 5.1 LABELING ERRORS/SPECIMEN MIX-UPfor Sunquest report entry information.
2. Gram stains: Report Gram stain results by selecting the *Direct Exam* tab. Follow Gram Stain procedure for interpretation and resulting.

Observations: 1. 2+ GRAM POSITIVE COCCI 2. 4+ WBC'S |
| **Continued Report** | 1. If there are more isolates to report than there are available lines in Sunquest it will be necessary to create a continued report.
2. In Order Entry, order MMCC (Miscellaneous Culture Continued Report using the same date/time of collection.
3. Add “SEEC” to the original accession in line 9 and “RCON” to the new accession in line 1.
4. It will be necessary to free text the new and old accessions after the SEEC and RCON comments.
5. Refer to MC 5.0 Micro/Viro Computer for complete details.
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| **References** | 1. Pezzlo, M., Section 2. Aerobic bacteriology, 2.1 and 2.10. *In* H.D. Isenberg (Ed) *Essential Procedures for Clinical Microbiology.* 1998, American Society for Microbiology, Washington, D.C., pg. 39-50, 102-110.
2. Forbes, B.A., et al., Bailey & Scott’s *Diagnostic Microbiology*, twelfth edition, 2007, Mosby, Inc., St. Louis, MO.
3. Pezzlo, M., Section 1, Aerobic bacteriology, 1.16, Garcia, Lynne (ed) *Clinical Microbiology Procedures Handbook*, 2010, American Society for Microbiology, Washington, D.C.
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| **Appendices** | WORKLABEL MEDIA-FORM DEFINITIONBATTERY: TISCSPEC MEDIA0 SLNE, GRIN, CHOC, SB, ASB2, CNA, AKV, MAC, THIO, GMSTPYL GRIN, CBAP, CHOC, T35, CHOC, SB, ASB2, CNA, MAC, UREB, THIO, GMST |
|  | **Training Plan** |  |  **Initial Competency Assessment** |
| **Training Plan/ Competency Assessment**  | 1. Employee must read the procedure
2. Employee will observe trainer performing the procedure.
3. Employee will demonstrate the ability to perform procedure, record results and document corrective action after instruction by the trainer.
 | 1. Direct observation
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| **Historical Record** | **Version** | **Written/Revised by:** | **Effective Date:** | **Summary of Revisions** |
| 1.0 | Pat Ackerman | 1978 | Initial Version |
| 1.1 | Pat Ackerman | 04/1979 |  |
| 1.2 | Pat Ackerman | 02/03/1992 |  |
|  | 1.3 | Pat Ackerman | 08/11/2003 |  |  |  |
| 1.4 | Pat Ackerman | 01/22/2006 |  |
| 1.5 | Pat Ackerman | 01/11/2008 | Updated Sunquest 6.2 reporting information. Revised SRPT and CORR statements. Revised MRSA reporting. Added procedure notes 1 and 2. |
| 1.6 | Jessica Craig / Becky Carlson | 10/26/2010 | Updated into online format |
| 2 | Becky Carlson  | 4/18/2015 | Re-numbered from MC 430 for CMS load. |
| 3 | Susan DeMeyere | 9/7/2017 | Changed reporting to keep culture open while THIO is incubating. Added to tape closed and label plates with no growth as NG1-work up in hood. |
| **Archived by:** |  |  |  |