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| Wound Culture (Surgical or Deep) |
| **Purpose** | This procedure provides instruction for Wound Culture (surgical or deep) for the Microbiology laboratory. |
| **Principal and Clinical Significance** | Wound infections can occur as complications of surgery, trauma and bites or diseases that interrupt mucosal or skin surfaces. The patient’s own flora or organisms in the hospital environment can be sources of surgical wound infections. Human and dog bite infections are often polymicrobic and grow the normal oral flora from the source. *S. aureus,* group Astreptococci, anaerobic cocci, *Clostridium* sp., members of the *Enterobacteriaceae, Bacteroides* sp., and *Fusobacterium* sp. are commonly associated with wound infections. Infections can range from simple postoperative infections to complicated, severe, and rapidly progressive infections such as necrotizing fasciitis.  Interpretation of the culture results should be based on the Gram stain criteria and laboratory testing. |
| **Policy Statements** | This procedure applies to Microbiologists who perform culture set-up and plate reading. |
| **Test Code** | WDC |
| **Materials** |  |  |  |  |
|  | **Reagents** | **Supplies** | **Equipment** | **Media** |
|  | * Gram Stain reagents
* Oxidase reagent
* Staphaurex™
* Other supplies as necessary for the identification of common agents
 | * Glass slide (GMST)
* Anaerobic Gas pack
* Sterile dispo pipette
* Sterile tube
 | * Ambient air incubator
* Anaerobic jar
* CO2 incubator
* Incinerator
* Inoculating loop
* Microscope
* Vortex mixer
 | Refer to the Sunquest specimen label for media information. Appropriate media is determined by the specimen site.* Chocolate agar (CHOC)
* Sheep Blood agar (SB)
* CNA agar (CNA)
* MacConkey agar (MAC)
* Thioglycollate (THIO)
* Saline, Normal 1 mL (SLNE)
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| **Specimen** | 1. Acceptable specimens
* Aspirated material or swab
* Aspirated material is superior to a swab specimen. If a swab must be used, collect two, one for culture and one for Gram stain.
1. SDES codes/Specimen type
* State specific site of specimen.
* The code Sunquest code WND cannot be used as a SDES code. It is considered a source code and will error in Cerner Power Chart.

For additional information, refer to [Lab Test Directory - Deep wound/surgical culture](http://www.childrensmn.org/Manuals/Lab/MicroBioViral/033676.asp). |
| **Special Safety Precautions** | Microbiologists are subject to occupational risks associated with specimen handling. Refer to the safety policies located in the safety section of the *Microbiology Procedure Manual***.**1. [*Biohazard Containment*](file:///G%3A%5CLab%20Procedures%5CMicrobiology%5C1NEW%20Micro%20Procedure%20Manual.%20%28same%20as%20in%20Starnet%29%5CMCVI%203%20Safety%5CMCVI%203.1%20Biohazard%20Containment.docx)
2. [*Biohazardous Spills*](file:///G%3A%5CLab%20Procedures%5CMicrobiology%5C1NEW%20Micro%20Procedure%20Manual.%20%28same%20as%20in%20Starnet%29%5CMCVI%203%20Safety%5CMCVI%203.4%20Biohazardous%20Spills.docx)
3. [*Safety in the Microbiology Laboratory*](file:///G%3A%5CLab%20Procedures%5CMicrobiology%5C1NEW%20Micro%20Procedure%20Manual.%20%28same%20as%20in%20Starnet%29%5CMCVI%203%20Safety%5CMCVI%203.2%20Safety%20in%20the%20Microbiology%20Lab.docx)
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| **Procedure** | InoculationWarm all media before inoculation. Label all plates, tubes and slides properly with the patients name, accession number and date. 1. 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.
2. Always inoculate the culture media first before preparing the slide when using the same pipette.

Specimen processingAspirates and exudatesIf specimen is received in a syringe, transfer the entire amount into a sterile tube and mix well (vortex)If the specimen is received in a syringe and the volume is small, rinse syringe with a small amount of THIO or SLNE to remove the specimen from the syringe. Mix well.Place 1-2 drops directly on each plate, into the THIO and onto a slide.Spread the specimen on the slide to make a thin film. Poor Gram stain results will occur if the smear is too thick.Specimens received on swabs1. Emulsify swab in 1.0 ml of sterile saline and vortex.
2. Squeeze the swab against the side of the tube to express remaining fluid and then discard.
3. Place 1-2 drops of the suspension directly on each plate, into a THIO. Place one drop of specimen on a slide for Gram stain.
4. Streak plates semi-quantitatively for primary isolation.
5. Sterilize the inoculating loop in the incinerator for 5 s to 10 s. Allow the loop to cool.
6. Pass the loop back and forth through the inoculum in the first quadrant several times.
7. 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.
8. ~AUT0029Flame 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 4-5 times.
9. **Incubation**
10. Incubate CHOC, SB, and CNA in 4-10% CO2 at 35ºC.
11. Incubate MAC and THIO in ambient air incubator at 35ºC.
12. **Gram stain examination**

Perform Gram stain and interpret.1. Quantitate PMNS, epithelial cells, histiocytes, bacterial and fungal morphotypes.
2. Blot excess oil from slide. Hold slide for one week.
3. If a Gram stain QA failure should occur, review slide and culture. Hold culture plates an additional day if necessary.
4. **Culture examination**
5. Day 1:
6. Examine aerobic plates and THIO.
7. Plated media
8. Gram stain each colony type and perform initial identification procedures, i.e., catalase, oxidase, etc.
9. Correlate colony types with the direct Gram stain.
10. 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. Squamous epithelial cells represent contamination
11. Set up definitive biochemical or identification procedures on significant organisms if well isolated.
12. Perform antimicrobial susceptibility testing on significant organisms if well isolated.
13. Subculture organisms that are not well isolated to appropriate media for further work-up.
14. Re-incubate primary plates and subcultures for an additional day.
15. Report preliminary results.
16. THIO broth
17. Visually inspect THIO.
18. If growth is observed, perform gram stain on THIO.
19. 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.
20. If there appears to be additional organisms in the THIO that are not on the plates, determine if Anaerobic Culture has been ordered. If Anaerobic Culture has been ordered, subculture to appropriate aerobic media. Identify appropriate organisms. If organism in THIO appears to be an anaerobe, hold THIO for 5 days. After 4-5 days, confirm isolation of organism in Anaerobic Culture before finalizing culture. If Anaerobic Culture has not been ordered, subculture to appropriate aerobic and anaerobic media. Identify appropriate organisms. Add bill code ANAID.
21. Day 2
22. Examine primary plates from the previous day for additional microorganisms.
23. Read and record identification tests and susceptibilities from the previous day.
24. Set up additional tests as needed.
25. Visually inspect THIO. If growth is observed, perform gram stain on THIO. Refer to section ‘c’ above for further instructions.
26. Ensure THIO with growth was gram stained for 2 consecutive days.
27. Send updated or final report.
28. MRSA isolation requires a “Called to” if not from E.D. (disch.), or a repeat isolate. Freeze for future reference.
29. If there is no growth on the plates, discard after 2 days. Culture is held open while THIO is incubating.
30. Hold the THIO for 5 days. If no growth in THIO, final the report as “No Growth, 5 days”.
31. 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.
32. Save a representative primary plate for anaerobes in an anaerobic jar or bag, whether a complete work-up was performed or not, at room temperature for 7 days in case a physician calls for further studies.
33. Additional Days
34. Complete identification and susceptibility testing procedures until all significant isolates are finished.
35. Send updated report and finalize.
36. **Send invasive pathogens cultured from sterile sites to MDH for the EIP program.** Refer to [MCVI 4.1 Infection Prevention Notification](file:///G%3A%5CLab%20Procedures%5CMicrobiology%5C1NEW%20Micro%20Procedure%20Manual.%20%28same%20as%20in%20Starnet%29%5CMCVI%204%20Result%20Notification%5CMCVI%204.1%20Infection%20Prevention%20Notification%20and%20MDH%20Submission.docx) for further information.
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| **Limitations** | 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 their isolation. Cultures for these organisms should be specifically requested. |
| **Method Performance Specifications** | 1. Perform definitive identification and susceptibility testing on the following:
	* 1. Organisms isolated in **pure culture** and observed in the specimen Gram stain.
		2. Organisms isolated from **patients with catheter-related infections**
		3. Any quantity of a **probable pathogen**, i.e., *S. aureus, Ps. aeruginosa,* etc.
		4. Predominate to moderate numbers of **potential pathogens** with unpredictable susceptibility patterns such as the *Enterobacteriaceae.*
		5. If only one or two species are present or predominant and WBCs are seen on the smear, identify and perform AST.
		6. If >2 species with no predominant strain, perform ID only, no AST.
		7. Perform AST on multiple GNRs only on special request.
	1. If **yeast** is predominant or numerous or from a sterile site, identify to the species level.
	2. Identify organisms that are **always considered pathogenic**, i.e., *Brucella, Haemophilus, Pasteurella,* and *Francisella.* These organisms do not grow on MAC. *Francisella* and *Brucella* can be found in lymph node biopsies and are extremely infectious. *Francisella* is a tiny coccobacillus that grows slowly and is catalase positive and oxidase negative. *Brucella* is also a tiny slow growingcoccobacillus that is catalase, oxidase positive and urease positive. Refer to MCVI 3.60 [Bioterrorism](file:///G%3A%5CLab%20Procedures%5CMicrobiology%5C1NEW%20Micro%20Procedure%20Manual.%20%28same%20as%20in%20Starnet%29%5CMCVI%203%20Safety%5CMCVI%203.60%20BioTerrorism%20Protocol.docx) Protocol for identification procedures.
	3. ***Viridans group streptococci* or *Enterococci***

a. Identify at least to the genus level from surgically, invasive specimens.b. The anginosis group (“S. milleri”) is often associated with brain and liver abscesses. Identify to the species level.*c. S. bovis* is associated with gastrointestinal malignancies.* 1. Perform limited identification and no susceptibility testing on the following:
		1. **Probable skin contaminants**, which include:

Coagulase-negative staphylococci diphtheroidsViridans streptococci *Bacillus* sp. with many epithelial cells/no PMNS* + 1. Isolates from sources such as **decubitis ulcer**, **perianal abscess** or **fistula** and **intestinal drainage.**
		2. **Mixed cultures, more than 3 organisms generally represent contamination or colonization**. If the culture grows more than 3 organisms, none that is predominant, report as “MIXED FLORA, no further identification” (**MF**) or “MIXED ANAEROBIC FLORA, No further identification” (**MIXA**).
		3. Hold the plates for further testing if requested.
		4. EXCEPTION: **If one organism is clearly predominant**, perform susceptibility testing.
	1. **Consult with physician on questionable cultures** regarding work-ups.
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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 semi-quantitatively, 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 “*x*” days". Final ( / ) culture at 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 VMIC : 1  1. If growth is only in the THIO, report as:

Observations: 1. GRAM NEGATIVE RODS ISOLATED FROM BROTH ONLY Further identification to follow (**GNR-BO-FID**)Workups: Wkup # 10 Workup Components Med : THIO SC : SB MAC  Desc : CLDY GMS : GMNR ID : GNR1. **Gram stains**: Report Gram stain results by selecting the *Direct Exam* tab. Follow [MC 2.0 Gram stain](file:///G%3A%5CLab%20Procedures%5CMicrobiology%5C1NEW%20Micro%20Procedure%20Manual.%20%28same%20as%20in%20Starnet%29%5CMC%202%20Staining%5CMC%202.0%20Gram%20stain.docx) procedure for interpretation and resulting.

Observations: 1. 2+ GRAM POSITIVE COCCI 2. 4+ WBC'S1. MRSA isolation requires a “Called to” if not from E.D. (disch.), or a repeat isolate. Document date and time called in computer.

1. 3+ METHICILLIN-RESISTANT STAPH AUREUS \*\*\*MDRO\*\*\*2. MULTIPLE DRUG RESISTANT ORGANSIM (MDRO): This organism requires SPECIAL CONTACT PRECAUTIONS. Please call Infection Control.3. \*\*Called to Linda S., RN L8 @ 1300 7/7/031. Review **Culture Summary** for accuracy before filing report.
2. Continued reports: If there are more isolates to report, than lines in Sunquest MRE, it will be necessary to create a continued report. In Order Entry, order WDCC (Wound Culture Continued Report), using the same date/time. Add “SEEC” to the original accession and “RCON” to the new accession. It will be necessary to free text the new and old accessions after the SEEC and RCON comments. Refer to [MCVI 5.0 Micro Computer Training](file:///G%3A%5CLab%20Procedures%5CMicrobiology%5C1NEW%20Micro%20Procedure%20Manual.%20%28same%20as%20in%20Starnet%29%5CMCVI%205%20Computer%5CMCVI%205.0%20Micro%20Computer%20Training.docx) for complete details.
3. 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 [MCVI 5.1 LabelingErrors -Specimen Mix-up](file:///G%3A%5CLab%20Procedures%5CMicrobiology%5C1NEW%20Micro%20Procedure%20Manual.%20%28same%20as%20in%20Starnet%29%5CMCVI%205%20Computer%5CMCVI%205.1%20Labeling%20Errors-Specimen%20Mix-up.docx) for Sunquest report entry information.
4. If 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.
* Re-final the culture when identifications and/or testing are complete.
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| **References** | 1. Leber, Amy. 4th edition, Clinical Microbiology Procedures Handbook, 2016. American Society for Microbiology, Washington D.C., 20036. Vol. 1-3. Section 3.13.1, section 3.3.2.
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| **Training Plan/ Competency Assessment** | **Training Plan** | **Initial 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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| **Appendices** | BATTERY: WDCSPEC MEDIA0 SLNE, CHOC, SB, CNA, MAC, THIO, GMST |
| **Historical Record** |  |  |  |  |
|  | **Version** | **Written/Revised by:** | **Effective Date:** | **Summary of Revisions** |
| 1.0 | Pat Ackerman | 1981 | Initial Version |
| 1.1 | Pat Ackerman | 12/27/1995 |  |
| 1.2 | Pat Ackerman | 08/14/2003 |  |
|  | 1.3 | Pat Ackerman | 09/05/2005 |  |  |  |
| 1.4 | Pat Ackerman | 01/18/2008 | Updated Sunquest 6.2 reporting information. Revised SRPT and CORR statements. |
| 1.5 | Pat Ackerman | 11/14/2008 | Added EIP information |
|  | 1.6 | Tina Gronquist | 06/19/2014 | Updated into online format. |
|  | 2 | Becky Carlson | 4/18/2015 | Re- numbered from MC 435 for CMS load. |
|  | 3 | Susan DeMeyere | 9/7/2017 | Changed reporting to keep culture open while THIO incubates.  |
|  | 4 | Susan DeMeyere | 10/30/2018 | Removed culturing for anaerobes on initial set up. Added instructions for THIO processing |
|  | 5 | Susan DeMeyere | 10/9/2020 | Removed use of Scant when growth only from THIO.  |
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