



# Wound culture

(Sampling methods)

**M. Rostami**

**MSn.ICP**

**Rajaei Heart Center**



Infection is a major impairment in delayed and nonhealing chronic wounds. Cultures of chronic wounds are not routinely performed unless there is a clinical suspicion of infection. However, controversy persists among practitioners as to the relevancy of doing cultures and the technique to use. This article will explore the various techniques used in clinical practice to obtain cultures for diagnosing wound infections.



Chronic wound infections are a significant healthcare burden, contributing to increased morbidity and mortality, prolonged hospitalization, limb loss, and higher medical costs. What's more, they pose a potential sepsis risk for patients.

Most chronic wounds are colonized by polymicrobial aerobic-anaerobic micro flora. However, practitioners continue to debate whether wound cultures are relevant.



## Indication of chronic wound culture

### Local Signs and Symptoms of Wound Infection

- Erythema, warm to touch
- Edema, Indurations
- Increased pain, tenderness
- Increased exudates
- Friable granulation tissue
- Odor "after" wound cleansing



## Techniques for obtaining a wound culture

When a wound culture is deemed necessary, what's the best technique for obtaining it? The current literature on laboratory methods Three techniques can be used:

- deep-tissue or punch biopsy
- needle aspiration
- swab culture



## Deep-tissue biopsy

A deep-tissue or punch biopsy for a quantitative culture is the gold standard for identifying wound bioburden and diagnosing clinical infection. A deep-tissue biopsy after initial debridement and cleaning of superficial debris with normal saline solution is the most useful way to detect invasive organisms.





But quantitative biopsies are hard to perform, **invasive**, **painful**, **expensive**, and **not available** in all settings. Also, they must be done by qualified and trained providers, who aren't always available.

- . Punch biopsies are done using sterile technique. Injectable, local anesthesia is administered to numb the area, which is then cleansed with sterile normal saline. Using a 3 mm curette and sterile scissors, the physician removes a tissue sample from the wound bed, which is then placed in a sterile container and transported to the laboratory.

# Needle aspiration



- Needle aspiration of wound fluid is a good alternative when there's little loss of skin, as in puncture wounds or postsurgical wounds with suspected abscess. Although less invasive than tissue biopsy, needle aspiration can be painful and results may underestimate bacterial isolates.
- Before needle puncture, the area must be cleaned thoroughly with normal saline solution.







## Swab culture

In clinical settings, a swab culture is the most common technique used because **it's practical, noninvasive, and cost effective**

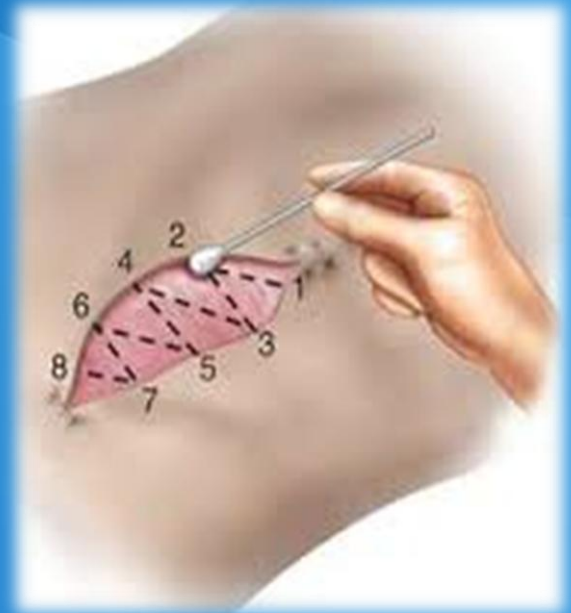
- . The swab-culture technique for quantifying bacterial burden in burn patients, called *Levine's technique*, requires the clinician to twirl the end of the cotton-tipped applicator on a 1-cm<sup>2</sup> area of the wound bed with enough pressure to cause minimal bleeding



- The most commonly used alternative to Levine technique is the *z-track* or *10-point swab culture*. This semi-quantitative culture is quick and most useful in a clinical setting. It's also **inexpensive and reproducible**. However, it may yield false-positive results, especially if wound-bed cleaning and preparation are inadequate or when only a culture of surface bacteria is obtained.



***Levine's technique***



***z-track swab culture***



## Basic principles for obtaining a wound culture

Always obtain the culture from properly cleaned and prepared tissue to avoid obtaining only a culture of surface contamination.

- Collect the culture **before** topical or systemic antibiotics are initiated.
- Obtain a swab culture from a viable **wound bed**,  
Don't culture avascular tissue.



Follow these basic steps:

1. Irrigate twith normal saline solution.
2. Moisten a swab with normal saline solution.
3. Swab a 1-cm<sup>2</sup> area of viable tissue for 5 seconds.  
with enough force to produce exudates





## Choosing a sufficient pressure

The amount of pressure used in wound irrigation appears to be a determining factor in successful wound cleansing

American College of Surgeons:

usually performed using syringes and needles, is 35-70 pounds per square inch (psi), and low-pressure irrigation is 1-15 psi







- Original Agency for Health Care Policy and Research (AHCPR) guidelines describe safe and effective irrigation pressures as being **4-15 psi**, based on a series of different studies





recommended pressure for wound irrigation is 4 to 15 pounds per square inch as measured using a 19-gauge angiocatheter and a 35-ml syringe. This has been found to adequately clean the wound without harming healthy tissue and embedding debris into the wound base (Bryant & Nix, 2016).



Technique is as follows:

- Assess the patient's condition and identify any allergies, specifically to povidone-iodine or other topical solutions or medications.
- Assess the wound, including the amount and character of drainage and the size and condition of the wound and surrounding tissue.
- Irrigation should be performed using strict aseptic technique.
- Wash hands. If necessary, wear a protective gown. Put on clean gloves.
- If applicable, remove soiled dressing and discard with gloves.
- Put on goggles, if needed.



## Using sufficient volume

- Increased volume improves wound cleansing to a point, but optimal volume in wound irrigation remains largely understudied. Volumes of 50-100 mL per centimeter of laceration length or per square centimeter of a wound are commonly reported in the literature.



## Precautions and protection against splashback

- Irrigation, particularly high pressure, can splash and spread bacteria to surrounding areas and people. The use of a plastic shield at the end of the irrigating syringe reduces this hazard. Where needed, a face shield, mask, and protection over scrubs is advised. IV sites and other open areas should be protected from splashing.



- Prepare irrigation solution and irrigation delivery device in the patient's room. Using any solution that has been opened longer than 24 hours is not recommended. Place a waterproof trash bag near the patient's bed. Turn down the top of the trash bag, creating a cuff, to provide a wide opening and prevent instruments or gloves from touching the bag's edge.



# Conclusion

- Nearly all wounds are at risk for compromised healing owing to excessive exudation, edema, contaminants, and the presence of inflammatory mediators. Compromised wounds have the potential to develop complications, such as infection, which may lead to delayed wound healing, prolonged hospitalization, and more frequent readmissions.
- It is generally believed that the wound advances from contamination to colonization when the bacteria on the wound's surface begin to replicate and increase their metabolic activity. Heavy bacterial bioburden increases the metabolic requirements, stimulates a proinflammatory environment, and encourages the in-migration of monocytes, macrophages, and leukocytes—all of which can negatively impact wound healing. Bacteria also secrete harmful cytokines, which can lead to vasoconstriction and decreased blood flow.
- Thus, controlling or preventing infections is essential for the normal wound healing process to occur. Therefore, adequate management of these wounds with the help of negative pressure wound therapy irrigation can further enhance patient outcomes.<sup>[29]</sup>



## References:

- Agency for Healthcare Research and Quality AHRQ clinical practice guidelines, Pressure Ulcers in Adults: Prediction and Prevention and Treatment of Pressure Ulcers  
CMS: Guidance to Surveyors for Long Term Care: Regulation F272 (Comprehensive Assessment), F279 (Comprehensive Care Plans), F280 (Comprehensive Care Plan Revision), F281 (Services Provided Meet Professional Standards, F309 (Quality of Care), and F314 (Pressure Sores), and related requirements under F157 (Notification of Changes), F353 (Sufficient Staff), F385 (Physician Supervision), and F501 (Medical Director) (CMS, Guidance to Surveyors for Long Term Care Facilities. August 17, 2007)  
Levine NS, Lindberg RB, Mason AD, Pruitt BA Jr. The quantitative swab culture and smear: a quick, simple method for determining the number of viable aerobic bacteria in open wounds. J Trauma. 1976;16(2):89-94.  
Zuber TJ. Punch Biopsy of the Skin. Am Fam Physician. 2002 Mar 15;65(6):1155-
- BY Maryam Mamou, RN; Michael Jay Katz, MD, PhD MEDICAL
- EDUCATION, WILD IRIS INC. ALLRIGHTS RESERVED. 2016,

A top-down view of a group of people, likely medical professionals, wearing blue scrubs and white cuffs. They are holding hands in a circle, forming a ring around a central grey circular area. The word "Thanks" is written in a dark blue, serif font across the center of the image.

**Thanks**