

When and how to culture a chronic wound

A culture is a valuable tool in wound care if used correctly.

By Marcia Spear, DNP, ACNP-BC, CWS, CPSN

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. For wound care providers, the goal is to eliminate the infection before these consequences arise.

Most chronic wounds are colonized by polymicrobial aerobic-anaerobic microflora. However, practitioners continue to debate whether wound cultures are relevant. Typically, chronic wounds aren't cultured unless the patient has signs and symptoms of infection, which vary depending on whether the wound is acute or chronic. (See *Differentiating acute and chronic wounds*.)

With chronic wounds, many clinicians find it more practical to treat local signs and symptoms, such as increased pain and drainage, erythema, friable granulation tissue, and edema. If these are present, a culture is indicated. For a patient with a suspected wound infection, cultures are important in diagnosing the infection, identifying the specific organism, and determining the number of organisms present. This information guides appropriate antibiotic treatment and is crucial in preventing antibiotic-resistant infections.

Techniques for obtaining a wound culture

When a wound culture is deemed necessary, what's the best technique for obtain-



ing it? The current literature on laboratory methods for diagnosing wound infections doesn't recommend a universal sampling technique or protocol. Three techniques can be used:

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

Differentiating acute and chronic wounds

In *acute wounds*, classic signs and symptoms are those of inflammation—erythema, pain, increased exudate, and warmth. These tend to persist beyond the 3 to 4 days of the initial inflammatory response. They can be masked or diminished by a compromised immune system, posing a challenge even for the most experienced clinicians. If you suspect an infection, consider obtaining a wound culture.

Chronic wounds, in contrast,

rarely cause classic signs and symptoms of inflammation or infection, so wound care providers must be especially vigilant. Be sure to obtain a thorough history and assessment, checking for:

- increased wound drainage amount and odor
- thick purulent or murky drainage
- epithelial bridging at the wound base
- discoloration and friability of granulation tissue

- increased tenderness or sudden pain.

These findings suggest the need to obtain a wound culture. Also, suspect a subclinical infection and consider obtaining a culture if a chronic wound doesn't improve after 2 weeks of treatment unless an explanation exists, such as a change in nutritional status or exacerbation of an underlying medical condition.

Deep-tissue biopsy

A deep-tissue or punch biopsy for a quantitative culture (which determines the colony counts per gram of tissue) 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.

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. Data from needle aspirations are reported in terms of colony-forming units per volume of fluid. Although less invasive than tissue biopsy, needle aspiration can be painful and results may underestimate bacterial isolates. Also, exudate must be present in the wound so that aspirate can be collected. 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. If done properly, it usually identifies the bacterial species of the infection and helps guide antibiotic therapy. 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-cm² area of the wound bed with

A deep-tissue or punch biopsy for quantitative culture is the gold standard for identifying wound bioburden and diagnosing clinical infection.

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. A 2001 prospective study of 38 patients with chronic wounds from various causes evaluated the correlation between quantitative wound biopsies and swab cultures; 27 (74%) of the biopsies indicated infection. Simultaneous swab cultures of these showed infection in 22 cases. The researchers concluded that a quantitative swab culture is a valuable adjunct in managing chronic wounds.

Basic principles for obtaining a wound culture

Although guidelines exist for obtaining a wound culture, no single guideline is used universally. Nonetheless, no matter what technique you use, certain basic principles apply:

- 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, as recommended by the Wound Ostomy and Continence Nursing Society guideline. Don't culture avascular tissue.

Follow these basic steps:

1. Irrigate the tissue with normal saline solution.
2. Moisten a swab with normal saline solution.
3. Swab a 1-cm² area of viable tissue for 5 minutes with enough force to produce exudate.

Wanted: A clinical practice guideline

The technique used to obtain a wound culture usually depends on the provider and clinical setting. If a clinical practice guideline existed, its use could yield more accurate and complete diagnostic information for true wound infections. The need for a universal evidence-based guideline is apparent. ■

Selected references

American Society of Plastic Surgeons. Evidence-based clinical practice guideline: chronic wounds of the lower extremity. May 2007. www.docstoc.com/docs/120588469/Evidence-based-Clinical-Practice-Guideline-Chronic-Wounds-of-the-Lower-Extremity. Accessed December 4, 2013.

Bonham PA. Swab cultures for diagnosing wound infections: a literature review and clinical guideline. *J Wound, Ostomy Continence Nurs*. 2009;36(4):389-95.

Gardner SE, Frantz RA, Saltzman CL, et al. Diagnostic validity of three swab techniques for identifying chronic wound infection. *Wound Repair Regen*. 2006;14(5):548-57.

Kingsley A, Winfield-Davies S. Audit of wound swab sampling: why protocols could improve practice. *Prof Nurse*. 2003;18(6):338-43.

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.

Wound, Ostomy, and Continence Nurses Society (WOCN). Guideline for prevention and management of pressure ulcers. Mount Laurel, New Jersey: Wound, Ostomy, and Continence Nurses Society (WOCN); 2010 Jun 1. www.guideline.gov/content.aspx?id=23868. Accessed December 4, 2013.

Serena T, Robson MC, Cooper DM, Ignatius J. Lack of reliability of clinical/visual assessment of chronic wound infection: the incidence of biopsy-proven infection in venous leg ulcers. *Wounds*. 2006;18(7):197-202.

Spear M. Best technique for obtaining wound cultures. *Plast Surg Nurs*. 2012;32(1):34-6.

Marcia Spear is a nurse practitioner and certified wound specialist in the Department of Plastic Surgery at Vanderbilt University Medical Center in Nashville, Tennessee. She has written numerous articles on wounds and wound care and has lectured to a wide variety of audiences both nationally and internationally.