Managing Infected Wounds and Biofilms: What have we learned in the past year?

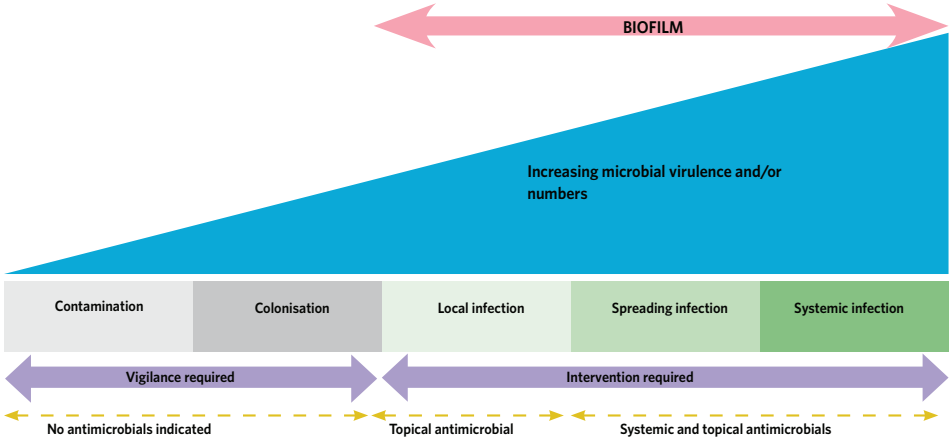
This is a brief summary of a presentation given at the fall conference of Wounds Canada, in Mississauga, Ontario, on November 18, 2017. It has been produced with the financial support of Hollister. The presenter was Kevin Woo, RN PhD FAPWCA, an Associate Professor at Queen's University, School of Nursing and School of Rehabilitation in Kingston, Ontario. He has served on expert panels to develop Best Practice Guidelines and Recommendations in collaboration with the Registered Nurses' Association of Ontario and Wounds Canada, and is Web Editor for the Advances in Skin and Wound Care *website.*

Updated Terminology Related to the Infection Continuum

The International Wound Infection Institute's 2016 consensus document[1] has suggested a new definition for chronic wounds: "While acute wounds heal in a timely manner, chronic wounds have a slow progression through the healing phases or show delayed, interrupted or stalled healing due to intrinsic and extrinsic factors that impact the individual and their wound. A chronic, non-healing wound can be an indicator of the presence of a biofilm when holistic assessment and treatment have corrected the underlying cause(s) of the wound."

The wound infection continuum (see Figure 1) illustrates the potential numbers and virulence of microorganisms in a wound. All wounds have bacteria in them, but they become problematic when the host's defence systems become overwhelmed by the quantity and/or virulence of the bacteria.

Figure 1. The Wound Infection Continuum[1]



An Update on Wound Biofilms

Biofilm formation is the dispersion of planktonic bacteria and biofilm fragments from mature biofilm. According to IWII[1] and Schultz et al.,[2] wound biofilms:

- Cannot be visualized on the wound
- May reappear within 72 hours after debridement (based on *in vivo* studies)
- Are found both on the wound surface and in deeper layers of tissue
- Are found in slough (devitalized tissue)

Duration and Use of Topical Antimicrobials and Antibacterials

Current research recommends the use of topical antimicrobials and antibacterials for 2–4 weeks, after which time the patient should be reassessed. Topical antimicrobials may be used following debridement to prevent biofilms reformation.[1,2] Health-care professionals should consider using a topical antimicrobial or antibacterial dressing that is minimally or non-cytotoxic and that addresses form and function.

Clinical Diagnosis of Infection

One clinical challenge in wound care is determining whether or not an infection is affecting the wound's healing progress. Many wounds do not produce the signs that are traditionally considered diagnostic of an infection (pain, exudate, odour, temperature). In these cases, checklists may be used to gather more information about the wound and to determine whether or not an infection is present.

To give health-care professionals additional direction and memory aids for assessing a complex wound for signs of infection, the following UPPER and LOWER checklists have been created (Figures 2 and 3).

Methylene Blue and Gentian Violet Dressings: A Prospective Evaluation

A recent prospective study[3] examined the use of the methylene blue and gentian violet dressing (Hydrofera Blue Classic Antibacterial Foam Dressing) for the management of chronic

Figure 2.
Wound Infection Checklist (UPPER)
Local/Superficial Infection – Treat with Topical Antimicrobials

Unhealthy tissue	Surface area on wound bed covered by devitalized tissue and unhealthy granulation tissue (thin and friable, bleeds easily, dark red, dull or dusky discoloration, overgranulation, pocketing, and bridging)
Poor healing	Stalled wound healing with no significant change in wound size or volume (approximately 10% in last 7 days)
Pain	New or increased pain
Exudate	Increased volume of exudate Change of consistency: viscous and thick exudate
Reek	Presence of foul odour

Local infection/increased bacterial burden should be suspected in the presence of 3 or more signs and symptoms.

Figure 3.
Wound Infection Checklist (LOWER)
Deep Infection – Treat Systemically ± Topical Antimicrobials

Larger in size	Sudden or unexplained increase in wound size or new areas of satellite breakdown
Osseous tissue and/or deep structure	Wound that probes to bone or deep structures; crepitus may be present
Warmth	Increased periwound temperature of more than 3° F compared to areas distant from the wound
Edema	Increased edema or induration around the wound
Redness	Redness of >2 cm beyond wound margin

Deep infection/increased bacterial burden should be suspected in the presence of 3 or more signs and symptoms.

References
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2. Murphy, CA. Evaluation and Treatment of Lower Extremity Wounds in a Vascular Surgery Patient Population. Electronic Thesis and Dissertation Repository. Paper 3351. http://ir.lib.uwo.ca/etd/3351/.

wounds with local infection in 29 patients. All patients completed the four-week study, and the following wound improvements occurred:

- Baseline mean wound surface area was significantly reduced by 42.5%, from 21.4 to 12.3 cm^2 at week 4 (P=0.005).
- Baseline mean wound coverage by devitalized tissue (%) was significantly reduced from 52.6% to 11.4% at week 4 (P<0.001).
- Mean UPPER and LOWER wound infection scores were reduced from 3.6 at baseline to 0.9 at week 4 (75%; P<0.001).

These results indicate that the Hydrofera Blue Classic dressing was effective at managing these chronic wounds and helped them progress onto a healing trajectory.

These findings are supported by four recent studies[3,4,5,6] that demonstrated that foam dressings containing methylene blue and gentian violet manage exudating wounds and may aid in the removal of devitalized tissue from the wound bed. As this action occurs, the dressing helps disrupt biofilm that is associated with slough and devitalized tissue.

In Summary

Three takaways from recent advances in wound infection and biofilms:

- Assess the wound using an infection checklist to differentiate between local and deep infection.
- Biofilm management: select antibacterial/antimicrobial dressings.
- Clear away devitalized tissue and slough through debridement.

References

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6. Prest D. Managing challenging chronic wounds in the community setting using an antibacterial PVA foam dressing containing methylene blue and gentian violet. Poster presented at the Canadian Association of Wound Care conference; October 29–November 1, 2015; Toronto, ON.

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