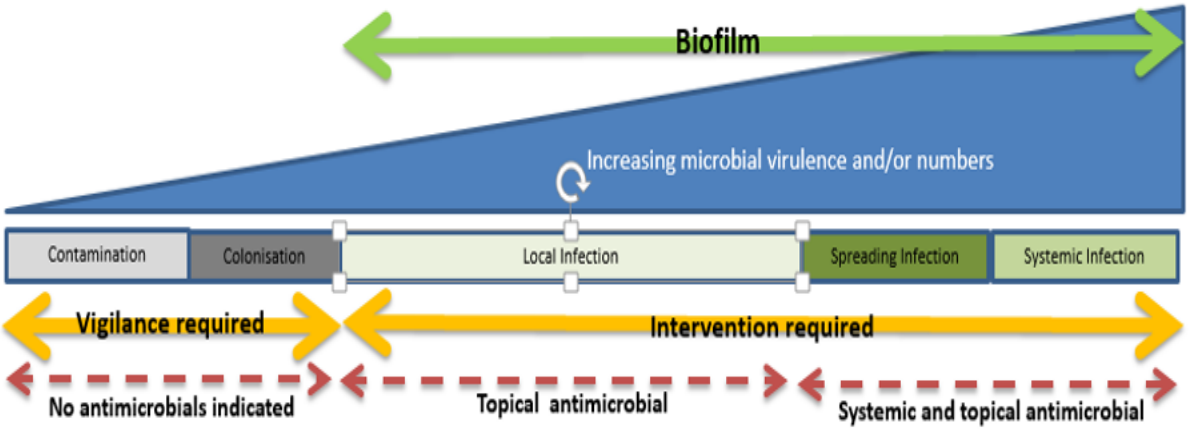
Wound Infection

Wound infection is the invasion of a wound by proliferating microorganisms to a level that invokes a local and/or systemic response in the patient (host). The presence of microorganisms within the wound causes local tissue damage and impedes wound healing. In most cases, development of wound infection is multifactorial and occurs when cumulative risk factors overwhelm the host's defence system. The 3 main factors associated with increased risk of wound infection are:

- The Individual
- The wound
- The environment.

The diagnosis of wound infection is based on the clinician's assessment of the patient (host), the wound and peri-wound tissue, and patient's (host) responses such as systemic inflammatory response or sepsis. Comprehensive assessment for wound infection aids early detection and timely treatment.

The Wound Infection Continuum



Contamination	Colonisation	Local infection		Spreading Infection	Systemic infection
All wounds may acquire micro-organisms . If suitable nutritive and physical conditions are not available for each microbial species, or they are not able to successfully evade host defences, they will not multiply or persist; their presence is therefore only transient and wound healing is not delayed.	Microbial species successfully grow and divide, but do not cause damage to the host or initiate wound infection .	Covert (subtle) signs of local infection • Hypergranulation (excessive 'vascular' tissue) • Bleeding, friable granulation • Epithelial bridging and pocketing infection • Wound breakdown and enlargement • Delayed wound healing beyond expectations • New or increased pain • Increasing malodour	Overt (classic) signs of local infection • Erythema • Local warmth • Swelling • Purulent discharge • Delayed wound healing beyond expectations • New or increasing pain • Increasing malodour	• Extending in duration +/- erythema • Lymphangitis • Crepitus • Wound breakdown/dehiscence with or without satellite lesions • Malaise/lethargy or non specific general deterioration • Loss of appetite • Inflammation	• Severe sepsis • Septic shock • Organ failure • Death

International Consensus Update (2016) Wound Infection in Clinical Practice.

CREST (2005) Guidelines on the management of cellulitis in adults. CREST, Belfast. International Wound Infection Institute. (2016) Wound Infection in Clinical Practice: Principles of best practice. *International Conesus Document*

Local Infection Signs and Symptoms

- Erythema
- Local warmth
- Swelling
- Purulent discharge
- Delayed wound healing beyond expectations
- New or increasing pain
- Increasing malodour
- Hypergranulation (excessive vascular tissue)
- Bleeding friable granulation
- Epitelial bridging and pocketing infection
- Wound breakdown and enlargement
- Delayed healing beyond expectation
- New or increased pain
- Increasing malodour

Spreading Infection Signs and Symptoms

- Extending in duration +/- erythema
- Lymphangitis
- Crepitus
- Wound breakdown/ dehiscence
- Malaise/ lethargy
- Loss of appetite
- Inflammation

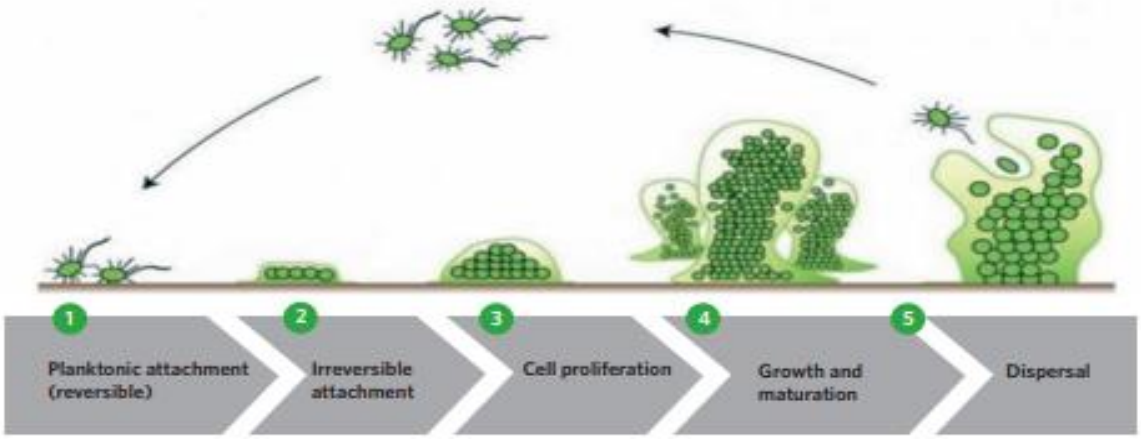
Systemic Infection Signs and Symptoms

- Severe sepsis
- Septic shock
- Organ failure
- Death

The role of Biofilms in wound infection

Biofilms are communities of complex microbes that attach to and grow on surfaces containing bacteria and fungi. Biofilm associated complications increase the risk of morbidity and mortality therefore wound bed preparation that incorporates the principles of biofilm-based wound care is essential. They are described as bacteria embedded in a thick, slimy barrier of sugars and proteins. A well-known example is tooth plaque. Biofilms have long been known to form on surfaces of medical devices, such as catheters, orthopaedic and breast implants, intrauterine devices**. I**t is becoming widely accepted that hard-to-heal wounds contain biofilm with the literature suggesting that 60% - 100% of chronic, hard-to heal wounds contain biofilm. Wounds often lack clinical signs of infection and often have low bacterial burden. Clinical microbiology tests do not adequately measure biofilm bacteria.

CREST (2005) Guidelines on the management of cellulitis in adults. CREST, Belfast. International Wound Infection Institute. (2016) Wound Infection in Clinical Practice: Principles of best practice. *International Conesus Document*



Biofilm Signs and Symptoms

Wound infection is the invasion of a wound by proliferating microorganisms to a level that invokes a local and/or systemic response in the patient (host). Wound infections may present with the following signs and symptoms:

- Failure of appropriate antibiotic treatment
- Recurrence of delayed healing on cessation of antibiotic treatment
- Delayed healing despite optimal wound management and health support
- Increased exudate/moisture
- Chronic inflammation
- Erythema
- Poor granulation/friable hyper-granulation
- Secondary signs of infection

Cellulitis

Cellulitis is defined as a spreading bacterial infections of the tissues under the skin (subcutaneous), which usually result from contamination of a break in the skin. (Clinical Research Efficiency Support Team [CREST], 2005, World Health Organization 2018). It is characterised by acute localised inflammation and oedema (World Health Organization 2018). It is important that clinicians are able to accurately differentiate cellulitis from the other conditions as urgent treatment is required to prevent it from worsening. Similarly, patients who are treated for cellulitis when they do not have the condition are in danger of receiving unnecessary antibiotic treatment while their true condition is neglected (Beldon and Burton, 2005).

Most cases of cellulitis arise from bacterial infection through a break in the skin, for example from trauma (due to a bite, burn, or laceration), leg ulceration, maceration or fungal infection between the toes, or a concomitant skin disorder (such as atopic eczema).Other risk factors for cellulitis include:

- Lymphoedema.
- Leg oedema.
- Venous insufficiency and history of venous surgery.
- Obesity.
- Pregnancy.

CREST (2005) Guidelines on the management of cellulitis in adults. CREST, Belfast. International Wound Infection Institute. (2016) Wound Infection in Clinical Practice: Principles of best practice. *International Conesus Document*