Working together to tackle biofilms and wound infection

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Working together to manage biofilms and wound infection

Learning objectives

1. NHS Long Term Plan, implications for infection management.
2. National Wound Care Strategy Programme- how we can do our bit?
3. What wound infection is and how it can develop.
4. Biofilms and their impact on wound infection and healing.
5. Holistic management of wound infection and biofilm-based wound care (BBWC).

NHS Long Term Plan

The NHS marked its 70th anniversary with a national debate on three big truths:

1. There is pride in our health service.
2. But there is also concern about funding, staging, increased inequalities and pressures from a growing and ageing population.
3. Finally, there is optimism about possibilities for continuing medical advance and better outcomes of care.

NHS Long Term Plan

Looking ahead to the NHS' 80th birthday, the *NHS Long Term Plan* takes all three realities as its starting point and sets out a new service model for the 21st century, including:

- More NHS action on prevention and health inequalities (e.g. smoking, obesity, alcohol, antimicrobial resistance)
- Further progress on care quality
- NHS staff to get the backing they need
- Digitally enabled care will go mainstream across the NHS
- Taxpayers investment to be used to maximum effect.

NHS Long Term Plan

Antimicrobial resistance- Government Five Year Plan

- Number of antibiotic prescriptions dispensed reduced 13.2% in five years (2013-2017), but further progress is required
- Continue to reduce need for, and unintentional exposure to antibiotics
- Support the development for **new antimicrobial agents**
- Continue to support system-wide improvement, infection prevention, control practice and antimicrobial stewardship

National Wound Care Strategy Programme (NWCSP)

The National Wound Care Strategy Programme (NWCSP) has been established to improve the care of patients with:

- Pressure ulcers
- Leg ulcers
- Surgical wounds

It will also make recommendations about education and information needs, workforce, supply and distribution of wound care products, and data and information requirements.

National Wound Care Strategy Programme (NWCSP)

The NWCSP are keen to hear the views of those involved in wound care and want to encourage people (in particular, patients and carers) to register their interest by email; stakeholdercouncil@supplychain.nhs.uk, putting 'National Wound Care Strategy Programme' in the subject heading.

Or, sign up to one of their Stakeholder Forums: http://bit.ly/2RB72yL and have your say

Wound infection

All wounds, whether acute or chronic, are contaminated with microorganisms from the environment or patient (Schultz et al, 2003), e.g:

- Dressings
- Bodily fluids
- Hands of patient/healthcare provider (Vowden and Cooper, 2006).

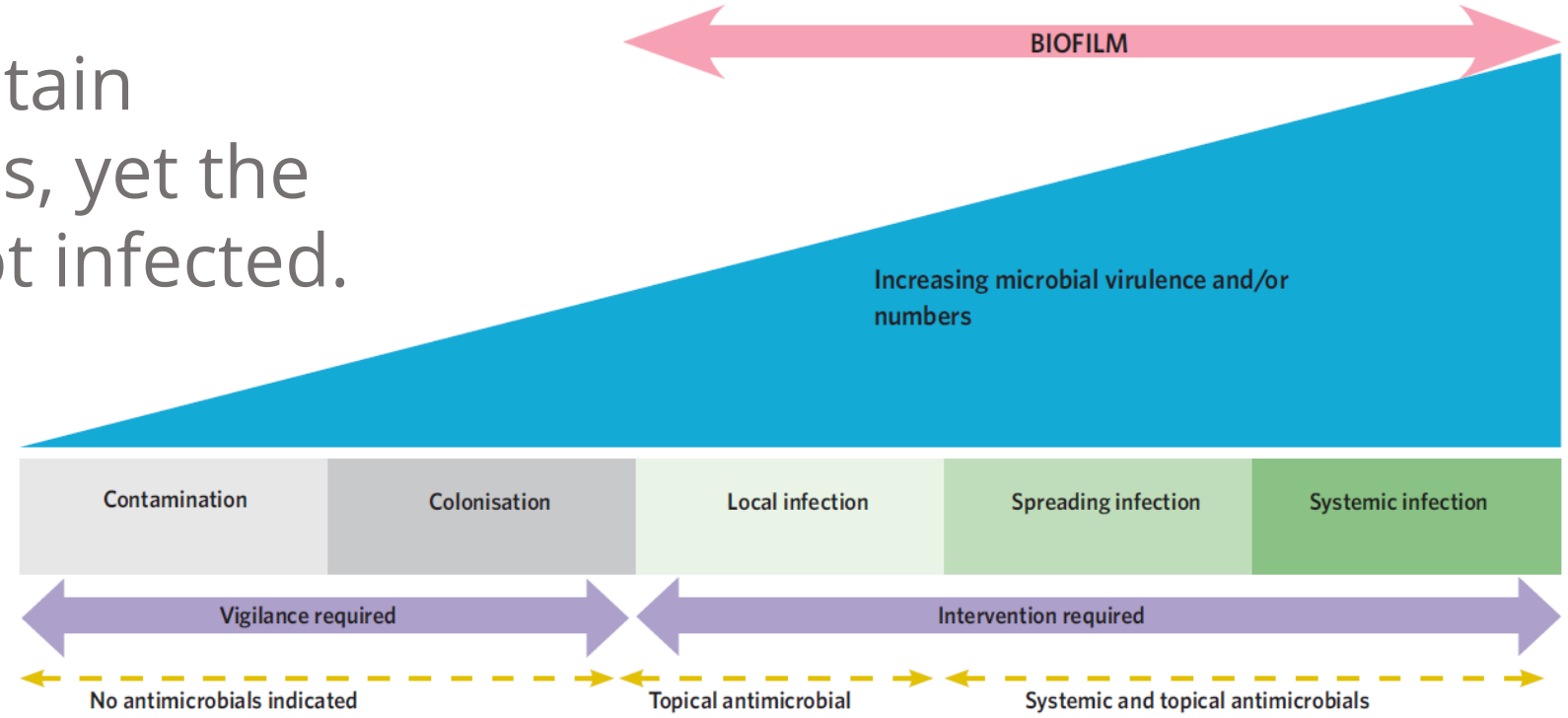
Impact of wound infection

To patients:

- Increased patient morbidity – risk of sepsis
- Pain and suffering
- Increased exudate and malodour
- Anxiety and distress
- Impaired mobility
- Social isolation
- Delayed healing
- Increased patient morbidity/mortality

Bioburden levels- stages in the wound infection continuum

All wounds contain microorganisms, yet the majority are not infected.



Complications of untreated wound infection

Cellulitis:

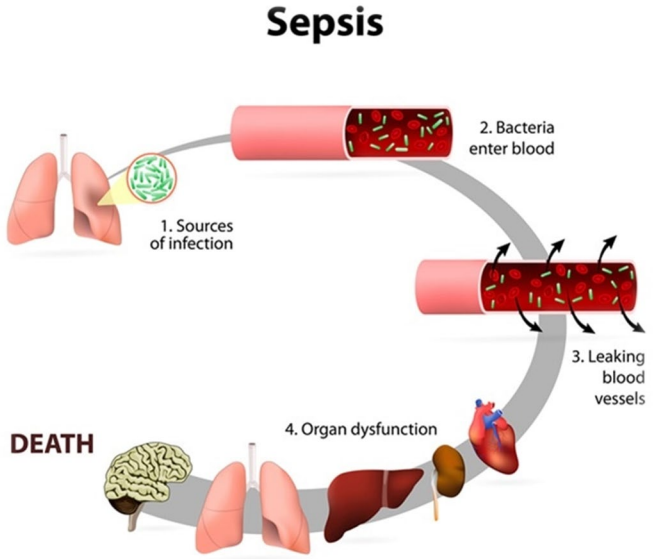
- Painful and oedematous spreading infection
- Can be confused with inflammation
- Commonly caused by *Staphylococcus aureus.*

Osteomyelitis:

- Acute or chronic infection of the bone

Septicaemia/death:

- Infection of the blood which can be caused by wound infection



Holistic assessment of wound infection

It is essential to readjust the interaction between the individual and the infecting pathogen in favour of the individual by:

- Optimising the host response
- Reducing the number or virulence of microorganisms
- Optimising the wound healing environment

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Implement local infection control policies and procedures

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Diagnosis of wound infection

Healthcare professionals should understand the risk factors and signs and symptoms of wound infection.

Diagnosis of wound infection is based on the clinician's assessment of the patient (host), wound and periwound tissue, as well as the patient's responses, such as systemic inflammatory response or sepsis.

Management of wound infection

- Prompt diagnosis and treatment of infection promotes wound healing and minimises the impact on the individual, carer/family and healthcare systems
- Treatment of an infected wound should follow a clear and decisive treatment plan
- Optimise the patient's immune response, e.g. by treating underlying conditions, such as diabetes, and improve nutrition and hydration
- Requires a multidisciplinary team approach
- Assess and manage other anatomical sites of infection (e.g. urinary tract, chest)

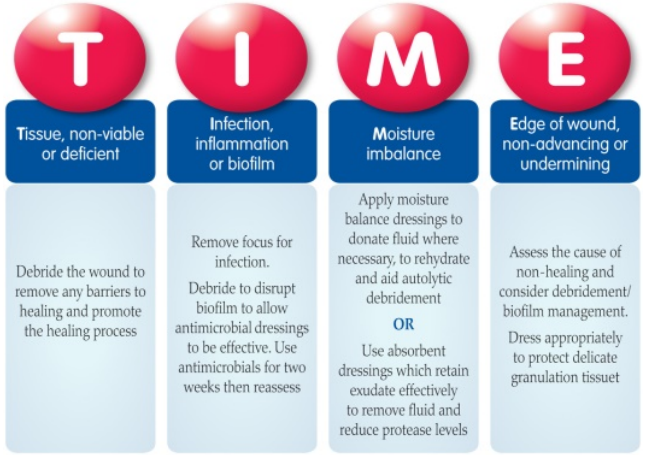
Management of wound infection

- Treat systemic symptoms (e.g. pain, pyrexia)
- Promote psychosocial support
- Ensure the individual is engaged in the development of a personalised management plan
- Eliminate local factors that may contribute to wound infection (local moisture management, pressure offloading and oedema control/contaminated footwear).

Management of wound infection

Wound bed preparation

The principles of wound bed preparation are entrenched concepts- a framework that promotes a healthy wound bed through:



- Therapeutic wound cleansing
- Disruption of biofilm
- Removal of necrotic, non-viable tissue through wound debridement
- Reducing the risk of reinfection or further infections, e.g. through use of an aseptic technique as appropriate and patient/caregiver education (IWII, 2016)

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Management of wound infection

- In the absence of systemic signs of wound infection, local treatment with antiseptics, surfactants (in gel or solution form) and antimicrobial dressings may be sufficient

- Post-debridement, topical antimicrobials have been recommended to prevent (or at least delay) attachment of planktonic microbes and kill any disrupted or dispersed biofilm.

Antimicrobial agents

Topical antimicrobial agents are compounds often contained within dressings.

The majority of agents are described as broad spectrum, which means that they have the ability to either kill or control the growth of organisms commonly found within an open wound bed.

Antimicrobial agents

Selection of an antimicrobial dressing should be based upon comprehensive holistic assessment, with a primary objective of optimising the wound bed (Wounds UK, 2011)

Duration of use should always be based on regular wound assessment. Remember, the **two-week challenge** with a topical antiseptic, as this allows sufficient time for the topical agent to exert a beneficial activity.

Antibiotic therapy

Antibiotics alone **should not be used routinely for the promotion of wound healing.** Their use should be reserved for wound infections confirmed by clinical signs and symptoms and/or confirmation by microbiological inquiry.

Antibiotics must be used in combination with prudent wound management strategies, such as wound bed preparation (i.e. debridement and therapeutic cleansing).

To be effective in destroying infective agents, antibiotics must be able to reach the anatomical site of infection in adequate concentrations.

Antibiotic therapy *continued*

Remember

Systemic antibiotics should be reserved for use only when the degree of infection is unable to be controlled with local intervention alone (i.e. topical antiseptic and debridement at every dressing change).

Regular and consistent reassessment

Evaluate interventions based on resolving signs and symptoms of wound infection and the patient's general condition.

Consider:

- Has the patient's pain decreased?
- Has exudate volume lessened?
- Has malodour resolved?
- Has erythema and oedema decreased?
- Is there a reduction in non-viable tissue?
- Is the wound reducing in size and/or depth?
- If there is limited or no improvement in signs and symptoms of wound infection, reassess the individual and their wound and adjust the management plan accordingly

Biofilm - fact or fiction

For some time, the presence of biofilm has been implicated in a wide range of diseases, e.g. chronic tonsillitis, chronic sinus problems, urinary tract infections and dental decay (Costerton et al, 1999)

However, it is only relatively recently that biofilm in wounds has been recognised as being potentially pathogenic (Percival et al, 2015)

Despite significant advances, emerging science from the laboratory has yet to provide a full understanding of wound biofilm in the clinical context.

Biofilm - fact or fiction?

It is thought that nearly all chronic wounds contain biofilm (78.2%) (Malone et al, 2017)

Biofilms are communities of bacteria encased in self-producing matrix of polysaccharides, protein and DNA that provides high levels of tolerance to antibodies, antibiotics and antiseptics/antimicrobial agents and the host's defence system

Biofilm - fact or fiction

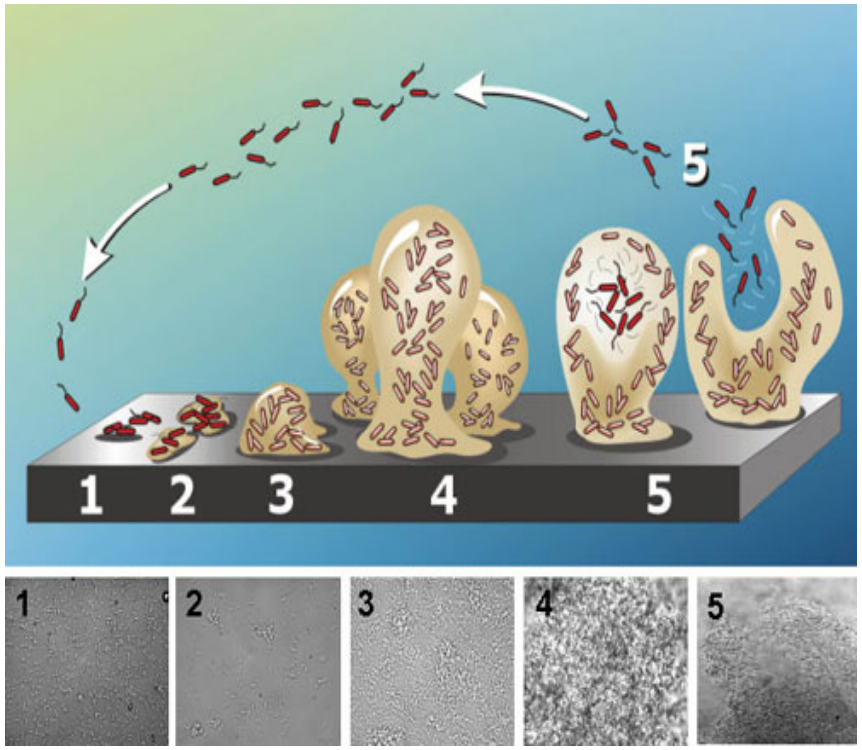
The microbes in biofilm are protected from the patient's immune system and antimicrobial agents, such as antiseptics and antibiotics, in two ways:

- By the barrier formed by the protective coating
- By becoming inactive or 'going to sleep'

Five stages of biofilm formation

How quickly do biofilms form?

1. Planktonic attachment
2. Irreversible attachment
3. Cell proliferation
4. Growth and maturation
5. Dispersal

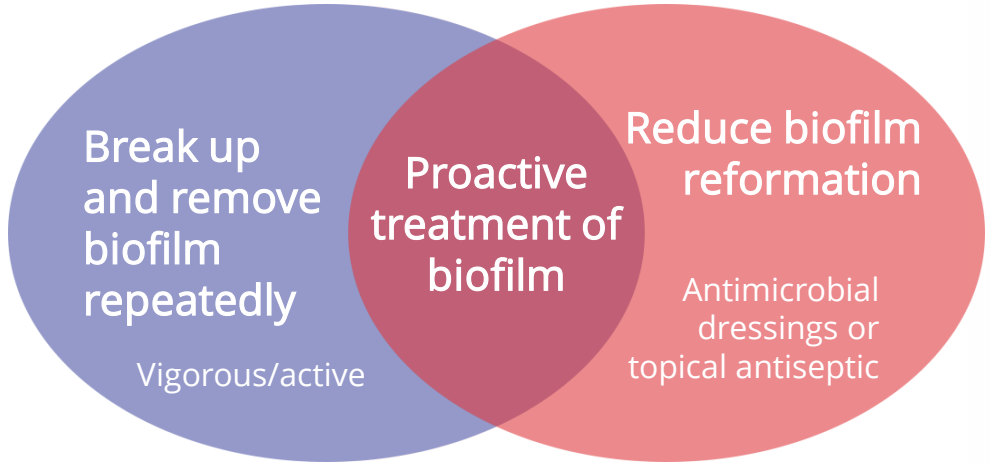


Planktonic bacteria typically:

- Attach within minutes
- Form attached microcolonies within 2-4 hours
- Develop initial extracellular polymeric substance tolerant to biocides within 6-12 hours
- Evolve into mature biofilm colonies within 2-4 days
- Rapidly recover from mechanical disruption and reform mature biofilm within 24 hours.

Clinical impact of biofilm

- Increased imbalance of protease inhibitors, which destroy essential proteins
- Decrease in growth factor receptors
- Reduction in cell proliferation
- Reduction in cell migration
- Acute wounds progress to being chronic



Delayed healing
Inflammation
Increased exudate volume

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Can you see biofilm in a wound? Is it invisible?

Biofilm-based wound care (BBWC)

The aim is to prevent attachment, interrupt quorum sensing and prevent or delay biofilms from re-forming.

BBWC is a term used to maximise strategies to manage non-healing wounds by addressing factors that can delay healing and target biofilm, i.e:

- Frequent wound bed debridement to break up biofilm, disrupt the extracellular matrix (ECM) and inhibit microbial cell-to-cell communication

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Biofilm-based wound care (BBWC)

- Suppressing microbial growth. Effective antimicrobial dressing post-debridement to prevent biofilm re-formation and to prevent emergence of dominant bacteria
- Alternate topical treatments to prevent emergence of dominant bacteria
- Effective biofilm clinical pathway to manage/disrupt and maintain the disruption of biofilms

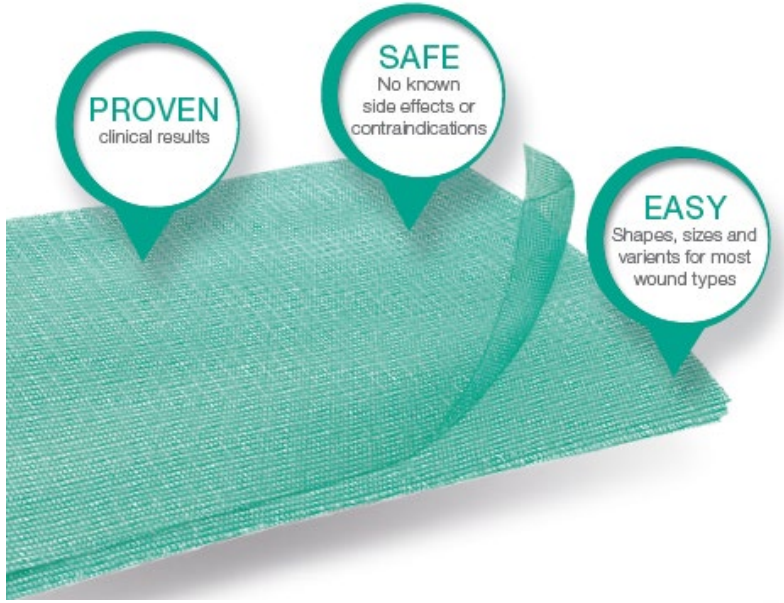
Biofilm-based wound care (BBWC)

- If after two weeks, the wound has improved but continues to show signs of infection, use the current microbial dressing or topical antiseptic preparation may be justifiable.
- If the wound has not improved, it should be reassessed and an antimicrobial dressing or topical antiseptic preparation containing a different antiseptic agent considered.

It’s time to go green

Cutimed® Sorbact® Range

- A range of wound dressings for safe infection prevention and management
- Sorbact® technology binds and removes bacteria and fungi via a simple physical principle
- A broad range of evidence demonstrates its safety and efficiency.



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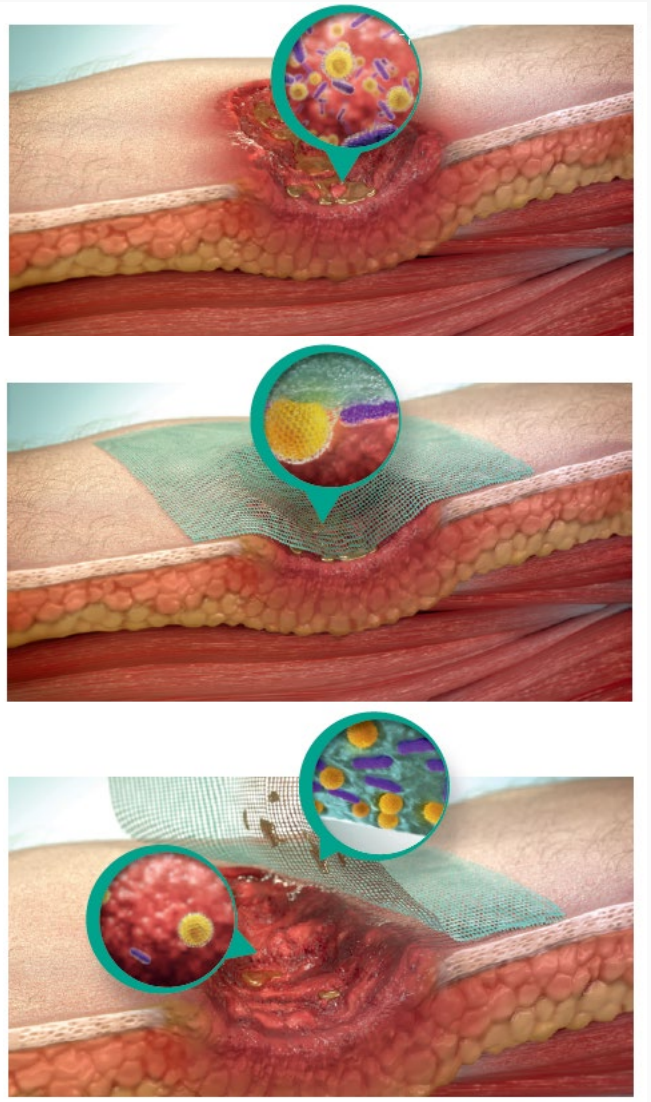
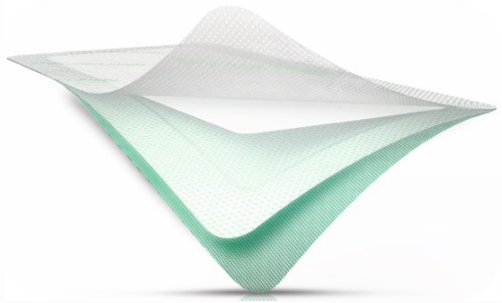
Sorbact® Technology

- **Cutimed Sorbact** dressings (in a moist wound bed) attract and bind bacteria/fungi through hydrophobic interaction:
  - Common microorganisms found in a wound bed environment are hydrophobic
  - Cutimed Sorbact displays hydrophobic properties, allowing the dressings to irreversibly bind bacteria and fungi in a moist wound bed



Sorbact® Technology *continued*

- Once bound, pathogens are removed with each dressing change, effectively and safely reducing the microbial load:
    - Unlike other antimicrobials which use various chemical agents and can cause side-effects through release of endotoxins.



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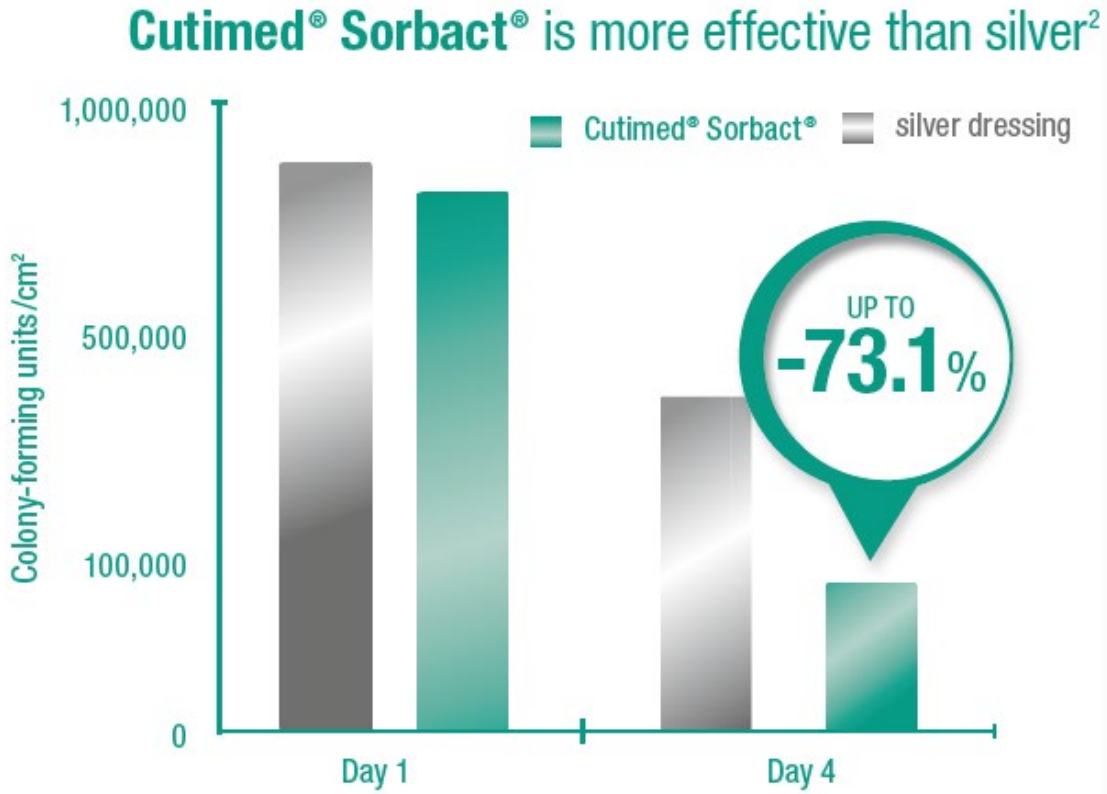
Sorbact® Technology

- Cutimed Sorbact reduced bacterial burden in critically colonised wounds up to 73% outperforming silver-based dressings (Mosti et al, 2015).



Mosti et al, (2015) Comparative study of two antimicrobial dressings in infected leg ulcers: a pilot study. *J Wound Care* **24(3):** 121–2; 147–7

Case report one

- 55-year old lady with a history of venous leg ulceration of 10 months' duration
- Teacher in a secondary school
- Married with two children
- Experiencing high levels of pain and recurrent episodes of infection
- 'I just want my wound to stop ruling my life'.

Week one

Case report

- She presented with venous leg ulceration with lipodermatosclerosis
- At assessment, her ABPI measured 1.1mmHg, pain was level 10, there was evidence of granulation tissue in the wound bed, but it was non-healing and friable
- It was decided to continue effective limb cleansing with emollients and introduce a Cutimed® Sorbact® dressing pad
- The patient and her wound were to be evaluated at each dressing change.

Week six

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Case report two –
postoperative wound infection following toe amputation

- This 66-year-old male patient presented with a discoloured great toe, which rapidly deteriorated to necrotic, devitalised tissue
- He had a history of *polyarteritis nodosa* — external, IE: only affecting skin can be referred to as 'cutaneous vasculitis' and diabetes
- He was an independent person and reinforced the importance of resuming his work and promoting self-care
- Goals of treatment were to implement effective wound bed preparation, treat wound infection and promote healing

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Case report two *continued*

- On clinical examination, the toe was necrotic and there was evidence of infection and a high risk of systemic infection
- Vascular duplex showed no significant arterial disease
- It was agreed by the multidisciplinary team to admit him for amputation of the toe(s) under spinal anaesthesia
- Iloprost infusion was started for three days continuously to assist with healing due to small bore circulation, alongside intravenous (IV) antibiotic therapy

Case report two *continued*

- The surgical wound dehisced
- Following discharge home, it was agreed with the patient to cleanse the wound with an antimicrobial cleansing agent and then apply a dressing that would reduce the bacterial burden in and around the wound bed and effectively absorb exudate.
- This was Cutimed® Sorbact® swabs and Cutimed® Sorbact® pad
- The patient attended the tissue viability clinic

Case report two *continued*

- At the first and second reassessments there was considerable improvement. This was not visible, but also reported by the patient. Devitalised tissue was effectively resolved and granulation tissue was evident. The Sorbact® technology was able to bind and remove bacteria and fungi via a simple physical principle
- Malodour was no longer a problem and the patient's pain level was decreasing
- There was no need for antibiotic therapy
- Being able to self-care had a considerable impact on his quality of life
- The wound progressed in a timely manner and completed healed after 12 weeks

Summary

- Infection occurs when the multiplication of bacteria overwhelms the body's immune system causing damage/deterioration to the wound
- Infection can soon spread and lead to further complications.
- Identifying when chronicity is due to the presence of biofilm can also be overlooked and if suspected a BBWC pathway implemented
- Early diagnosis and management is vital if complications are to be avoided
- Clinicians should remain mindful of the signs and symptoms of infection, and those patients in whom the signs are more subtle and absent
- Cutimed® Sorbact® is a proven and safe dressing to actively prevent and manage wound infection.

Essity Academies

- Free education and training is available via Essity's academies

- 31 modules available including:
  - Anatomy and physiology of skin
  - Factors affecting wound healing
  - Infection management
  - Litigation and the law and the NHS
  - Leg ulcer management
  - Improving the assessment of wounds

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