

The Wound Infection Evidence Matrix

Our rating system is focussed towards the levels of evidence as follows:

1. Meta analysis and systematic reviews
2. Randomised controlled trials
3. Non randomised controlled trials, case control trials, prospective cohort studies, animal studies, evidence summaries or evidence guidelines
4. Case reports, case series
5. Expert opinion, other literature reviews

Newer Antiseptic Use And the Evidence

The search included Google Scholar, Ovid, Medline, MBASE and companies websites



Wound cleansing is an important process in the management of all wounds but in particular chronic wounds.

The presence of contaminants, bacteria, dressing residue, non-viable tissue is common in chronic wounds and it is important to attempt to remove as much as possible.

The major question is what is the most appropriate solution or product To be used to remove these contaminants.



Introduction

Products continue to be introduced into the market for use both directly as an antiseptic or have secondary properties of reducing bacterial growth

Antiseptics

Antiseptics generally have a broad spectrum of antibacterial activity. Their action at multiple sites within microbial cells reduces the likelihood of bacteria developing mechanisms to avoid their effects and so may explain their relatively low levels of bacterial resistance. Antiseptics are applied topically and are non-selective agents that inhibit multiplication of or kill micro-organisms. They may also have toxic effects on human cells.

Antiseptics

Indications for antiseptics

- To prevent wound infection or recurrence of infection in patients at greatly increased risk – eg in sacral wounds in patients with diarrhoea, in partial- or full-thickness burns, in immunocompromised patients, or in wounds that are unlikely to heal because of unalterable patient or systemic factors
- To treat:
 - wound infection accompanied by systemic symptoms
 - localised wound infection
 - spreading wound infection] **in combination with systemic antibiotics**
 -

Wound infection in clinical practice
An international consensus

Comparison of commonly used antimicrobials

	Gram +ve	Gram -ve	Fungi	Endospores	Viruses	Resistance
Chlorhexidine	+++	++	+	0	+	+
Honey	+++	+++	+++	0	+	0
Iodine	+++	+++	+++	+++	++	0
Maggots	+++	++	ND	ND	ND	0
Silver	+++	+++	+	ND	+	+

Wound Cleansing

Cleansing infected wounds

Infected wounds should be cleansed at each dressing change. Cleansing by irrigation should use sufficient pressure to effectively remove debris and micro-organisms without damaging the wound or driving micro-organisms into wound tissues.

Wound infection in clinical practice
An international consensus



Newer Antiseptics Prontosan

Prontosan is a solution containing Polyhexanide a Biguanid antiseptic related to Chlorhexidine and Undecylenamidopropyl Betaine a surfactant



Chlorhexidine

Chlorhexidine has since been widely deployed in surgical handwashes, as an antiseptic and in various topical treatments for wound sepsis.

Chlorhexidine has also been marketed extensively. There have been few if any reports of chlorhexidine resistance at use concentrations, in spite of its widespread use for almost fifty years in clinical settings, but small changes (c. 5-fold) in MIC have been noted



Polyhexamethylene biguanide (PHMB)

Polyhexamethylene biguanide (PHMB) is a polymeric cationic antimicrobial agent that has been deployed in consumer applications for over 40 years. Whilst it shares many attributes with the simpler cationic agents it has additional action mechanisms that render it unique amongst this generic class of antimicrobials.



Polyhexamethylene biguanide (PHMB)

PHMB was recognised as possessing superior antimicrobial effect to other cationic biocides, but it could only be poorly defined chemically. Early attempts to rationalize the PHMB mixtures were unsuccessful and precluded their use in pharmaceutical products. Nevertheless, PHMB was marketed as a broad-spectrum antimicrobial agent in a number of diverse applications.

Polyhexamethylene biguanide (PHMB)

As with the bisbiguanides, PHMB was shown to bind rapidly to the envelope of both Gram-positive and Gram-negative bacteria and in doing so displaces the otherwise stabilising presence of Ca^{2+} . This binding is to the cytoplasmic membrane itself, and also to lipopolysaccharide and peptidoglycan components of the cells wall.

Polyhexamethylene biguanide (PHMB)

The toxicity profile of both the biguanides and the polymeric biguanides is excellent. Neither molecule is a primary skin irritant nor a hypersensitising agent. With respect to the deployment of PHMB as part of a wound care system there is little or no evidence to suggest that this would lead to the emergence of PHMB resistant.

Use of the agent within a barrier wound dressing such as Kerlix AMD would impair the growth and penetration through the dressing of adventitious pathogens both from the environment to the dressed wound



Undecylenamidopropyl Betaine

A very mild, active surfactant with a dual water and oil solubility.

A highly pure betaine based on undecylenic acid, developed for special demands of the personal care industry. This betaine is exceptionally mild. The action is to reduce surface tension and allow wound contaminants to lift.



Undecylenamidopropyl Betaine

Surfactants are wetting agents that lower the surface tension of a liquid, allowing easier spreading, and lower the interfacial tension between two liquids. The action of a surfactant on a wound is to assist in the separation of Loose non-viable material on the surface of a wound.

Wikipedia



Surfactants

A surfactant can be classified by the presence of formally charged groups in its head. A non-ionic surfactant has no charge groups in its head. The head of an ionic surfactant carries a net charge. If the charge is negative, the surfactant is more specifically called anionic; if the charge is positive, it is called cationic.

Wikipedia



Undecylenamidopropyl Betaine

Claims is made for this product on the website include

Betaine is a surface active solution that penetrates difficult coatings and removes debris, bacteria and biofilm, powerfully yet gently

In respect to its action on Biofilm this is based on one in-vitro study by H.-M. Seipp Efficacy of Various Wound Irrigants against Biofilms. This lab study Examined the effect of Saline, Ringers solution and Prontosan on Biofilm on the surface of silicone tubes



Prontosan Evidence

Author	Study Type	Patient No.	Duration	Publication Type
JOY BELL,	Case Report	1	14days	Poster
VIOLET BUTTERS	Case Report	1	12 days	Poster
KUMAL RAJPAUL	Case Report	2	6mth/4weeks	Poster
NICOLA HUGHES	Case Report	1	6 weeks	Poster
Gary Bain	Case Report	3	2-3 weeks	Paper
Nicoll	Case Report	1	6weeks+	Poster
C Williams	Case Report	1	3 weeks+	Poster
Cairns SA,Minhas U, Riddell AD, Leaper DJ, Harding KG.	Case Series	15	N/S	Poster
Rodriguez Cancio et al	Case Study	1	58 days	Paper
Horrocks A	Case Series	10	N/S	Paper



Prontosan Evidence

Prof. Marco Romanelli	Active v control study	20/20	4 weeks	Poster
DENISE WOOD	Case Series	8	4 weeks	Poster
Andriessen	Comparison Retrospective Study	59/53	N/S	Paper

Prontosan Evidence

There are a number of case studies listed on the company website as the European Case studies All are one patient cases from various clinicians and some hospitals some with multiple cases and some with only one patient.

13 individual clinicians and 3 hospitals covering 29 patients.

The information is basic and not clear as to length of treatment

Prontosan Evidence

There are some published studies on the use of Prontosan Gel

Valenzuela and Perucho published in Revista de enfermeria (Spain)

A series of patients studied to evaluate reduction in wound bacterial culture growth, improved healing, tissue quality, exudate level, erythema, heat in the peri-skin.

The outcome was improvement in most areas evaluated.



Flaminal

Flaminal is available as two hydrogels with a high alginate content which are promoted for the reduction of bacterial growth in wounds



Flaminal Evidence

White published in Wounds UK in 2006 a overview of Flaminal
Titled “ Flaminal : a novel approach to wound bioburden control. This paper compares some hydrogels and their impact on a range of bacteria, Viruses, yeasts



Flaminal

Flaminal® hydrogels are based upon gelled alginate and not on other polymers
Flaminal® hydrogels use the enzymes glucose oxidase and lactoperoxidase to control the bioburden in a similar way to honey.

Richard White Wounds UK, 2006, Vol 2, No 3



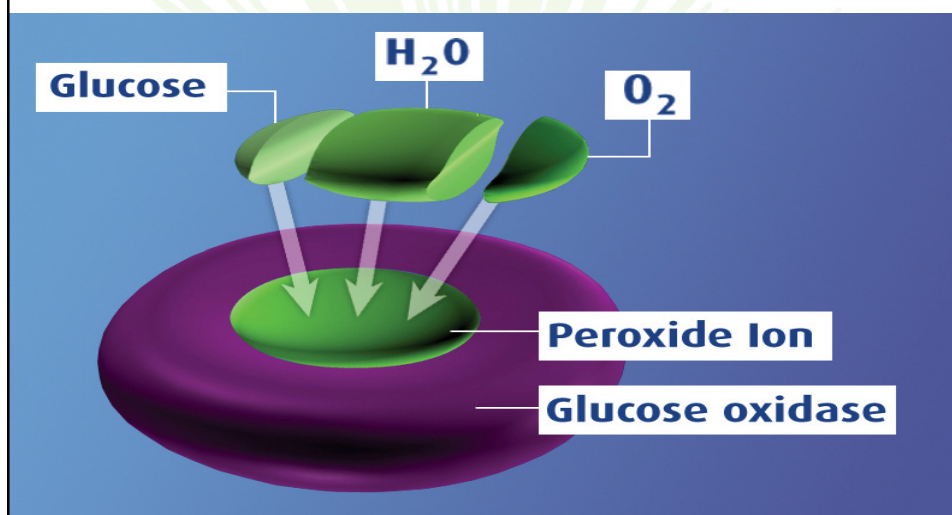
Flaminal

Flaminal® contains lactoperoxidase which is an enzyme extracted from milk and acts as an important natural antimicrobial (Banks et al, 1986). It has been shown to be bacteriostatic against Gram-positive organisms and exhibits pH-dependent bactericidal action against Gram-negative organisms in the presence of hydrogen peroxide and thiocyanate.

Richard White Wounds UK, 2006, Vol 2, No 3

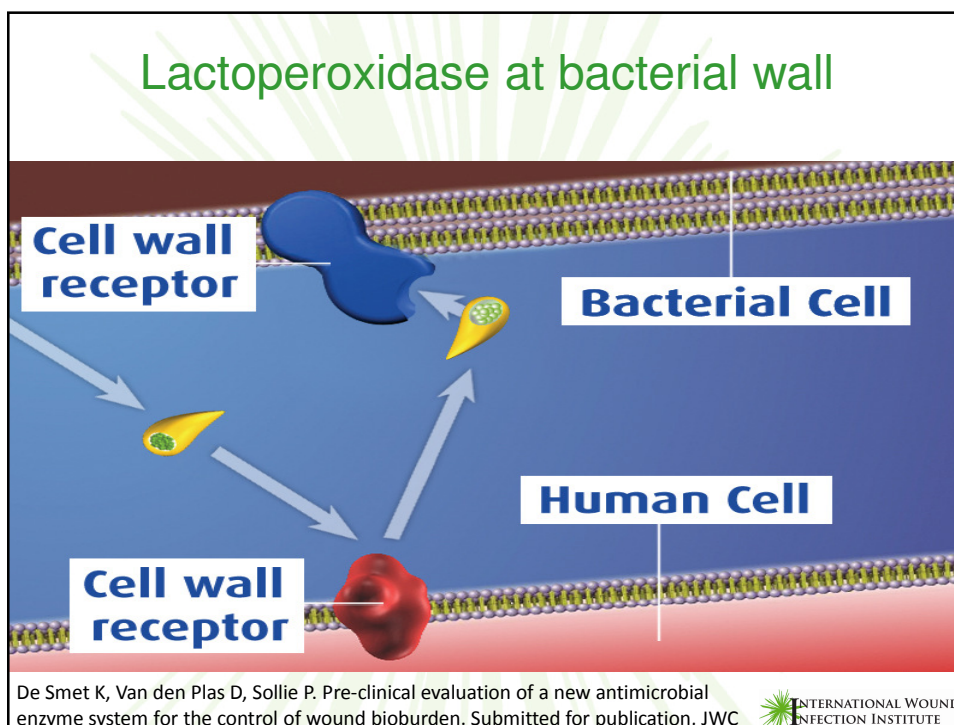
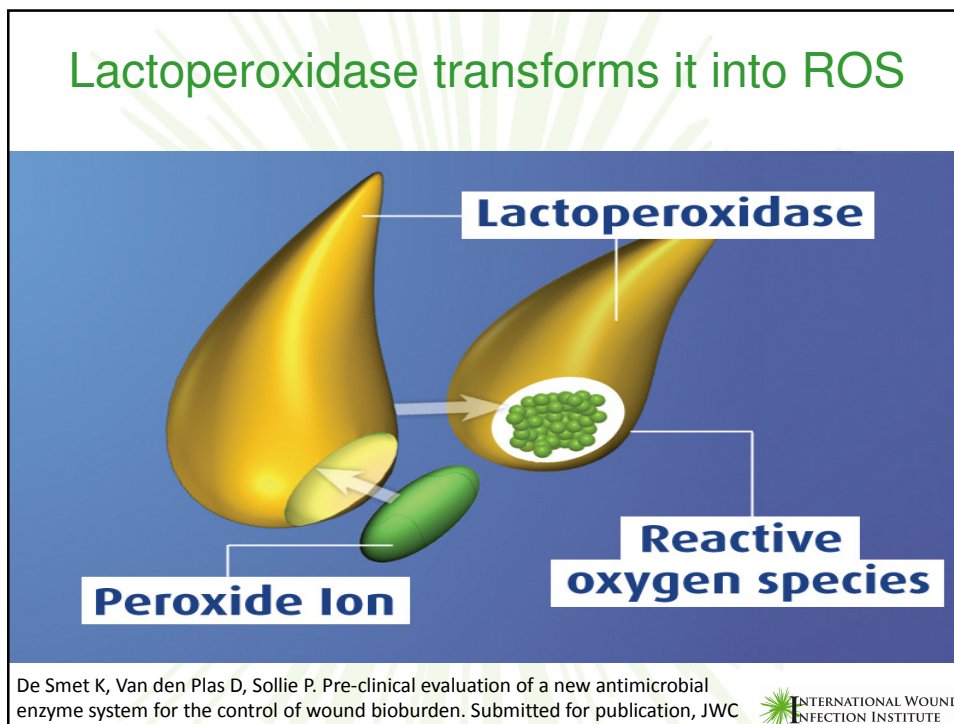


Glucose oxidase forms peroxide

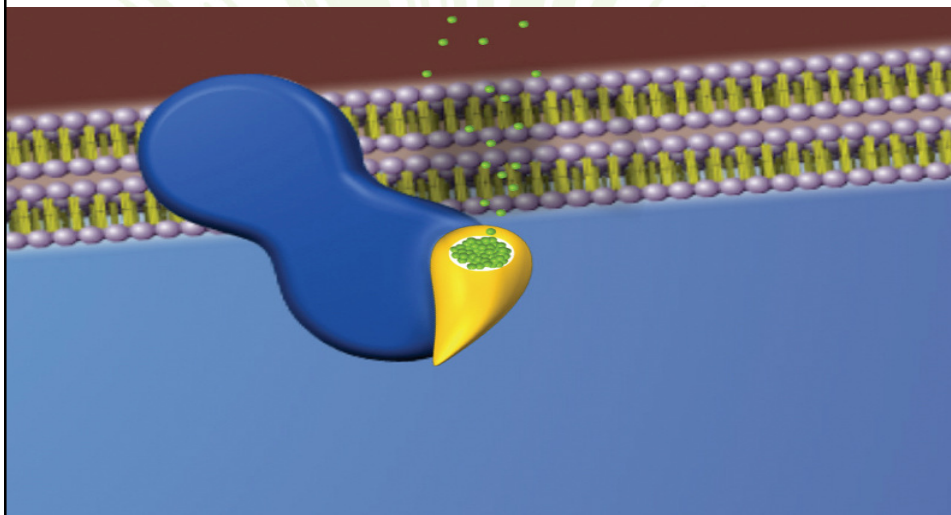


De Smet K, Van den Plas D, Sollie P. Pre-clinical evaluation of a new antimicrobial enzyme system for the control of wound bioburden. Submitted for publication, JWC





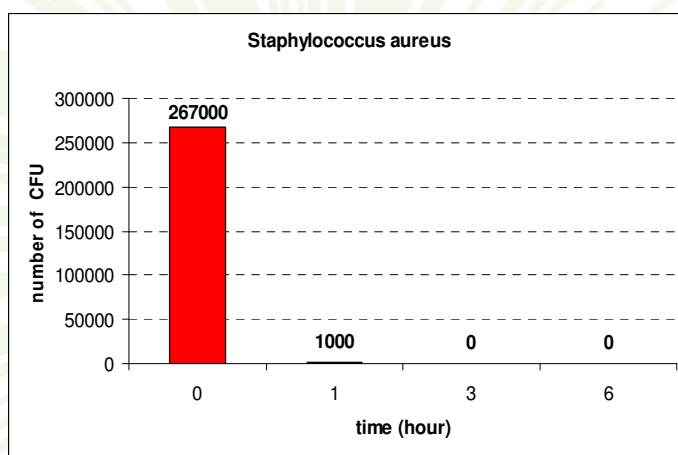
ROS destroy bacterial cell wall



De Smet K, Van den Plas D, Sollie P. Pre-clinical evaluation of a new antimicrobial enzyme system for the control of wound bioburden. Submitted for publication, JWC



Challenge test with Staph. aureus



Sollie P. Evaluation of alginate gels with antimicrobial enzyme system technology for leg ulcer healing. Wounds UK Glasgow 2007



Flaminal

Peroxidases are enzymes that belong to the natural non-immune defence systems (Tafazoli and O'Brien, 2005) found in milk and in the secretions of exocrine glands such as saliva, tears, intestinal secretions, cervical mucus and the thyroid.

Richard White Wounds UK, 2006, Vol 2, No 3



Flaminal

From the available laboratory and clinical evidence it is clear that the Flaminal® products are safe and effective both clinically and microbiologically though some studies have shown MRSA is not always cleared.

Richard White Wounds UK, 2006, Vol 2, No 3



Flaminal

The major difficulty is that there is little published evidence other than case studies and very little in the way of studies in the major wound or medical literature

Flaminal Evidence

Author	Study Type	Patient No.	Duration	Publication
M de la Brassinnet*, L Thirion†, L-IL Horvat‡	Comparative study	10/10	28 days	J.European Academy of Dermatology and Venereology 20(2);2006
Marini, L., Bragadin, G., Bares, M.	Open study	34	10	Journal of the European Academy of Dermatology & Venereology Supplement. 17 (Supplement 3):151, November 2003.
14 non-english citations found On Google scholar				
Tudor	Case Study	1	8weeks	Poster
De Smet, van den Plas, Lens, Sollie,	Pre-clinical Evaluation of a New Antimicrobial Enzyme for the Control of Wound Bioburden			Wounds 21(3) March 2009
Van den Plas, Lambrecht, Jacobs, Liekens, Van Hoey,	Case Study	4		Wounds21(9)2009

Flaminal

The combination of glucose oxidase with lactoperoxidase serves to provide a sustained source of safe and effective broad-spectrum antimicrobial action in a manner similar to our own natural white cell defences.

Richard White Wounds UK, 2006, Vol 2, No 3



Flaminal Evidence

De la Brassinne et al published in JEADV 2006 titled
“a novel method of comparing the healing properties of two hydrogels in chronic leg ulcers with 10 patients in each group both groups showed significant healing with the Flaminal group showing greater levels of reduction in wound size.



Flaminal Evidence

Vandenbulcke et al published in Lower Extremity Wounds in 2006 a study titled "Evaluation of the Antibacterial Activity and Toxicity of 2 new Hydrogels: a pilot study.

This was an in-vitro study with an in-vivo component. This study was small with only seven wounds included.



Conclusion

Despite the use of many other antiseptics in a wide range of situations evidence supporting their efficacy in the treatment of wound infection is more limited. Clinicians will use newer products however it is important that further good clinical research to be undertaken and published to validate their use in wound management

