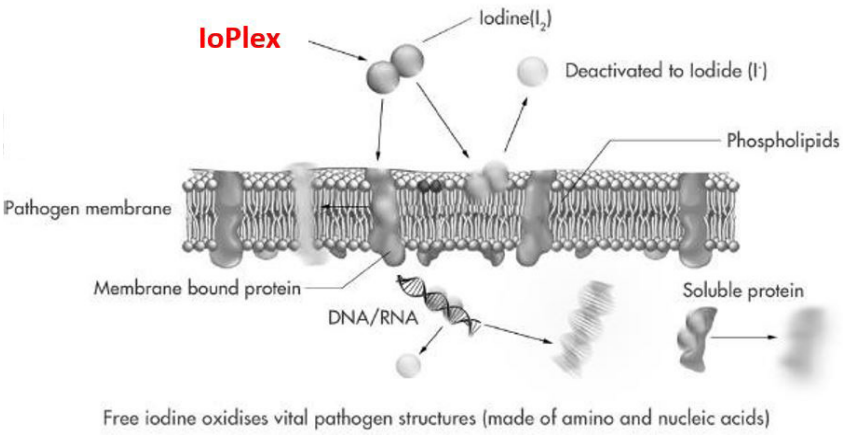
Medline Sponsored Learning:

Two New Technologies to Manage Chronic Wound Biofilms and Skin Folds

Presenter: Dr. Gregory Schultz PhD*

The Burden Of Biofilm In Chronic Wounds

Biofilm is the preferred form of bacterial life. Biofilms have a complex physical architecture consisting of proteins, extracellular DNA, polysaccharides, and lipopolysaccharides. When the wound bioburden is high, the aggregate of planktonic (free-floating) bacteria goes through a process known as *quorum sensing* to change the bacteria phenotype and develop into a biofilm. These colonies of bacteria will subsequently secrete extrapolymeric substances (EPS) that serve as a protective barrier. This barrier renders the biofilm resistant to antimicrobials and inflammatory cells. Biofilms are prevalent in chronic, hard-to-heal wounds. In a study by Malone et al., biofilm was identified in >80% of chronic wound biopsies.[1] Biofilms delay wound healing and can cause infections. It has also been found that biofilm can penetrate deeper into the tissue under the wound bed. This allows biofilm to further evade the effects of topical antimicrobials. Proper wound hygiene is crucial to the management of biofilm. This includes proper wound cleansing, adequate wound debridement (appropriate for the patient), and the use of an antimicrobial that can disrupt biofilm and target planktonic bacteria.

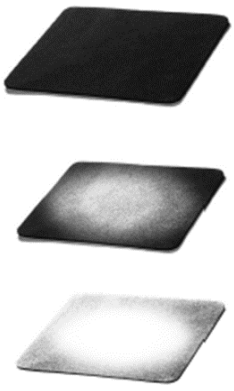


Bigliardi, P. L., Alsagoff, S. A. L., El-Kafrawi, H. Y., Pyon, J. K., Wa, C. T. C., & Villa, M. A. (2017). Povidone iodine in wound healing: A review of current concepts and practices. *International Journal of Surgery* (London, England), 44: 260–268.

The History Of Iodine As An Antimicrobial Agent

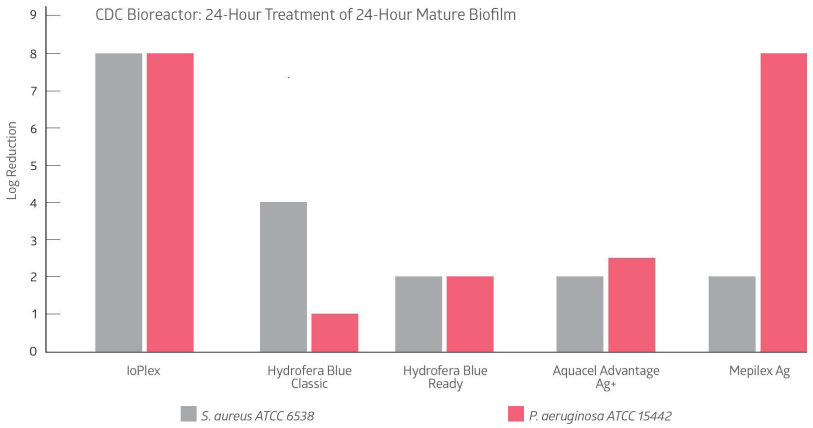
Iodine has long been used as an antimicrobial agent. It is an oxidizing agent (i.e., takes electrons away from other molecules) that can oxidate/iodinate multiple bacterial components, including genetic material (RNA and DNA), soluble proteins, and phospholipids. It can also disrupt biofilm scaffolding. The multiple mechanisms of antimicrobial action makes it near impossible for bacteria to adapt and develop resistance against iodine. Caution must be taken when using aqueous iodine, as iodine at high concentrations is cytotoxic and can cause further damage to the wound bed.

The Next Generation Of Anti-Biofilm Strategy: The IoPlex® Iodophor Foam Dressing

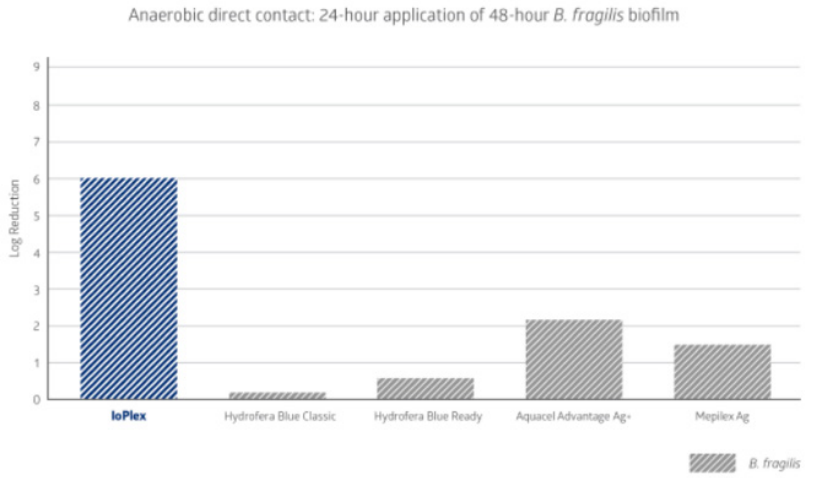


The IoPlex® Iodophor Foam (IoPlex) dressing provides a controlled release of iodine into the wound bed. Unlike aqueous iodine, the release of iodine by the IoPlex dressing does not exceed the cytotoxicity index. IoPlex is made of polyvinyl alcohol (PVA) foam.

It has a high absorption capacity and can manage a large amount of



CDC Bioreactor: 24-Hour Treatment of 24-Hour Mature Biofilm[2]



Anaerobic Direct Contact: 24-Hour Application of 48-Hour B.fragilis Biofilm[2]

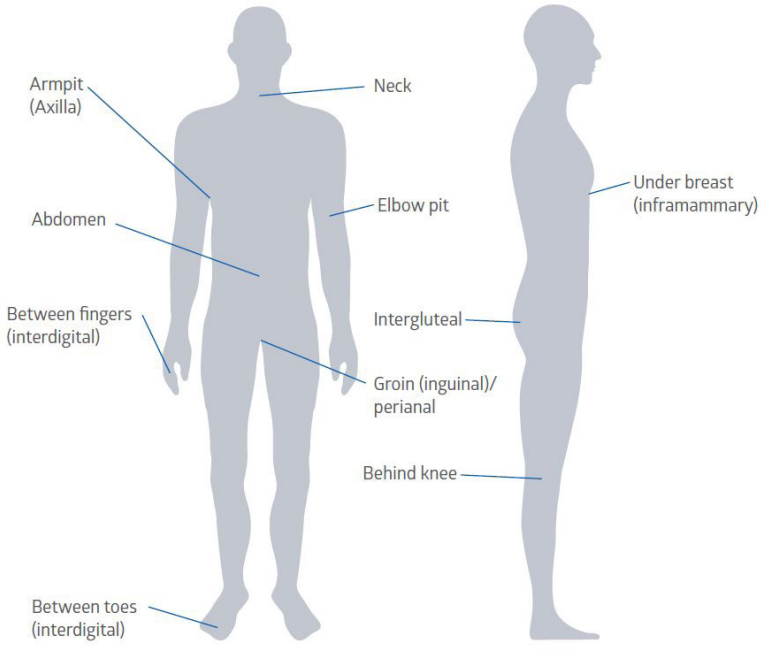
wound exudate. It can also wick moisture away from the wound. Moisture management is an important component to anti-biofilm strategy. The iodine is complexed with polymers in the PVA foam. This ensures a controlled release of iodine to prevent it from exceeding cytotoxic concentrations. Clinically, IoPlex® (which is black) will turn white (the colour of the native PVA foam) when all the iodine has been released. This is a useful visual tool to signal a dressing change is needed. IoPlex has been found to be superior in log reduction of in vitro biofilm, including anerobic bacterial biofilms.[1]

DriGo-HP™ Hydrogen Peroxide (H_2O_2): A Natural Antimicrobial Agent

Hydrogen peroxide (H_2O_2) is a major reactive oxygen species (ROS) that the body produces to combat bacteria. White blood cells, namely neutrophils and macrophages, produce H_2O_2 to inactivate and kill bacteria by oxidizing bacterial proteins (i.e., amino acid side chains) and cell membranes (i.e., phospholipids). The human body prevents tissue damage by H_2O_2 by producing endogenous enzymes (i.e., catalase) and reducing agents (i.e, glutathione) to neutralize it.

Medline offers a soft, smooth fabric with hydrogen peroxide (H_20_2) for the management of moisture in skin folds prone to maceration, odor and skin breakdown.The DriGo-HP™ Antibacterial Wicking Sheet contains 0.3% of H_2O_2, a naturally occurring antimicrobial agent in the human body, that is sequestered in the fabric. It has excellent moisture wicking rate, absorption capacity, and evaporation rate. It is non-cytotoxic, and non-irritating and non-sensitizing to intact skin. DriGo-HP™ can be used to reduce the risk of moisture-related intertriginous dermatitis (ITD) in areas such as under the armpits, under the breasts, groins and buttocks and between the toes.

Intertriginous Dermatitis



***Dr. Gregory Schultz PhD** is Professor Emeritus of Obstetrics and Gynecology at the University of Florida where he served as the Director of the Institute for Wound Research for 32 years. A major focus of Dr. Schultz's more recent research is on understanding the role that bacterial biofilms play in stimulating chronic inflammation that leads to highly elevated levels of proteases in wounds that impair healing in chronic wounds by destroying proteins including growth factors, receptors, and extracellular matrix proteins that are essential for healing.

To access the full presentation, click here: https://drive.google.com/file/d/1z_E8EVtf8epk8L-1TRDeLuuzABZXK60K/view?usp=share_link

References

1. Malone M, Bjarnsholt T, McBain AJ, James GA, Stoodley P, et al. The prevalence of biofilms in chronic wounds: a systematic review and meta-analysis of published data. J Wound Care [Internet]. 2017 Jan 2;26(1): 20-25. Available from: https://pubmed.ncbi.nlm.nih.gov/28103163/ DOI: 10.12968/jowc.2017.26.1.20
2. Roman M. Management of Biofilm: The efficacy of controlled release iodine. White paper, Medline Industries. Data on file. 2019.

MEDLINE Together Improving Care™ | Ensemble au cœur des soins℠

Presentation Digest is a production of Wounds Canada (www.woundscanada.ca).

The views expressed in this report are those of the presenters and do not necessarily reflect those of Wounds Canada, which has neither reviewed nor endorsed this report.