PHMB - Mode of Action and the Performance Characteristics of a Silicone PHMB Foam Dressing

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Introduction

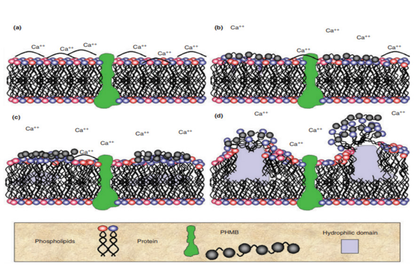
Antimicrobial agents within wound care provide topical alternatives to manage infection. **PHMB** (polyhexamethylene biguanide) is a **broad-spectrum** antimicrobial substance used in contact lens cleaning solutions and peri-operative cleansing products[4] and, more recently, wound care dressings. It is important to understand the **mode of action** of PHMB and a commonly accepted model is **cell membrane disruption[6].** Recently, an alternative mechanism has been suggested where PHMB selectively binds and **condenses chromosomes.** This poster reviews the literature on the modes of action and antimicrobial testing performance of PHMB foam wound dressing.

Method

Perform a literature review to understand the mode of action of PHMB

PHMB Foam Dressing was tested following AATCC TM100. The dressing was inoculated at T=0, and re-challenge of the product was administered during the 7 day test period

PHMB MODE OF ACTION [1,2]

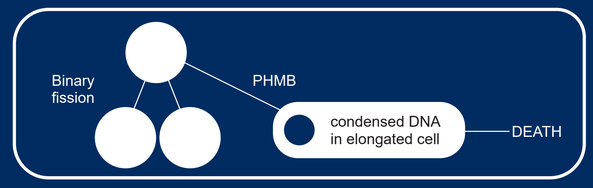


Positively charged PHMB rapidly connects to the negatively charged cell walls/membranes of microorganisms

This disrupts the cell wall/membrane and stops the microorganisms from growing & multiplying

The connection also causes reorganization of the membrane in a manner that prevents removal of the PHMB – resistance to PHMB is not achieved.

PHMB MODE OF ACTION – NEW Alternative proposal [2,3]



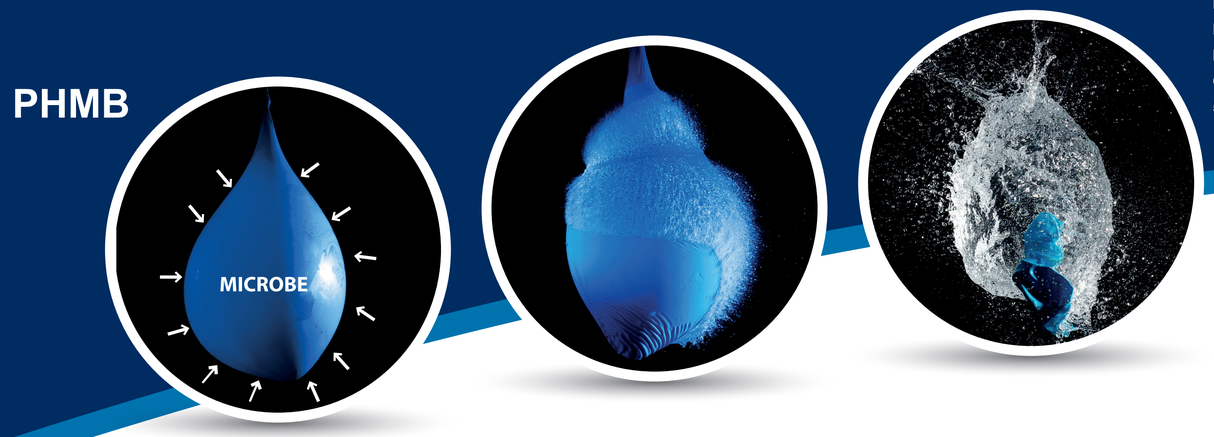
- PHMB is able to enter bacterial cells through the cell walls/membrane.
- PHMB binds to the chromosomes of the bacteria and condense chromosomes, resulting in intracellular foci of DNA; resulting in lysis and cell death.
- PHMB is revealed as the first example that binds and condenses bacterial chromosomes.

IN VITRO ANTIMICROBIAL TEST[5]

Micro-organism	6hr		24hr		48hr		168hr	
	Log Redn	&redn	Log Redn	&redn	Log Redn	&redn	Log Redn	&redn
Serratia marcescens (G-ve)	>6.3	>99.99%	>6.3	>99.99%	4.8	>99.99%	>6.3	>99.99%
MRSA (G+ve)	>6.6	>99.99%	>6.6	>99.99%	>6.6	>99.99%	>6.6	>99.99%
VRE (G-ve)	>6.9	>99.99%	>6.9	>99.99%	>6.9	>99.99%	>6.9	>99.99%
Candida albicans (Yeast)	3.6	>99.97%	4.6%	>99.99%	>6.1	>99.99%	>6.1	>99.99%

Conclusion

The use of PHMB as a antimicrobial agent has been widely documented[4]. The common accepted model for PHMB antimicrobial activity is cell membrane disruption model. However, in more recent years studies have suggested an alternative mechanism where PHMB selectively binds and condenses chromosomes. In mammalian cells (human cells), PHMB uptake is partitioned within endosomes and excluded from the nuclei[2]. Therefore, has a **low toxicity on mammalian cells (human cells)**. There has been no reported PHMB acquired resistance and selective chromosome condensation offer a unexpected model for antimicrobial action that may not succumb to resistance[2]. The results from the *in vitro* antimicrobial testing indicate that PHMB acts quickly and eradicates 99.99% of gram negative, gram positive, and yeast within 24 hours whilst sustaining this for up to 7 days.



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