

Research Compact

Tags	wound care, therapeutic index, hypochlorous acid, PHMB, octenidine
Title	Therapeutic Indices of Topical Antiseptics in Wound Care: A Systemic Review
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Source	2024, Clinical Management Extra, https://pubmed.ncbi.nlm.nih.gov/39355996/
Aim of the study	The systemic review aims to evaluate therapeutic index (TI) values of common topical antiseptics against bacterial species prevalent in chronic wound environments. A higher therapeutic index corresponds to increased safety and clinical efficacy.

$$\text{Therapeutic index} = \frac{\text{Mean cytotoxic concentration in mammalian cells}}{\text{Mean MBC of bacterial species}}$$

The analysis of 37 studies provides comparative insights into antiseptic efficacy and cellular toxicity, aiming to guide evidence-based selection of antiseptics used to assess the clinical utility of topical antiseptics in wound care while considering antibiotic stewardship principles and emerging resistance patterns.

Results

Therapeutic indices of selected antiseptics, as derived from the systematic review, are comprehensively summarized in Table 1, providing a critical overview of their efficacy and safety profiles. Hypochlorous acid showed the highest TIs against the key pathogens, while Polyhexamethylene biguanide (PHMB) achieved the highest TI for MRSA (12.1). Octenidine demonstrated moderate antimicrobial efficacy against key pathogens, particularly MRSA, outperforming Chlorhexidine, for which resistance mechanisms have been documented.

Table 1: Therapeutic indices of selected antiseptics

Antiseptic	Bacteria	Mean Therapeutic Index
Hypochlorous acid	<i>E. coli</i>	5.49 (1.47-833)
	<i>P. aeruginosa</i>	8.81 (5.45-71.4)
	<i>S. aureus</i>	6.31 (2.73-147)
Octenidine	<i>E. coli</i>	1.33 (0.022-19.5)
	MRSA	3.33 (0.064-25.3)
	<i>P. aeruginosa</i>	0.95 (0.0185-9.74)
	<i>S. aureus</i>	1.15 (0.029-50.7)
Chlorhexidine	<i>E. coli</i>	1.15 (0.034-33.88)
	MRSA	2.55 (0.045-41.5)
	<i>P. aeruginosa</i>	0.70 (0.022-33.88)
	<i>S. aureus</i>	0.068 (0.0007-21.2)
PHMB	<i>E. coli</i>	0.66 (0.04-136)
	MRSA	12.1 (1-136)
	<i>P. aeruginosa</i>	1.14 (0.08-68)
	<i>S. aureus</i>	0.60 (0.04-136)

Aspect	Therapeutic Index	Biocompatibility Index (BI) *
Primary Focus	Safety margin between toxicity and efficacy	Balance between cytotoxicity and efficacy
Calculation Basis	$\frac{\text{Mean cytotoxic concentration in mammalian cells}}{\text{Mean MBC of bacterial species}}$	$\frac{IC_{50} \text{ (Half maximal inhibitory concentration)}}{\text{Concentration producing } \geq 3 \log_{10} \text{ microbial reduction}}$
Advantages	<ul style="list-style-type: none"> Includes extensive data due to its systematic review design 	<ul style="list-style-type: none"> Comparability through standardisation Reproducible in vitro tests
Limitations	<ul style="list-style-type: none"> Values are drawn from studies with varying conditions and exposure times minimum bactericidal concentration (MBC) is based on planktonic bacteria and may not reflect biofilms in chronic wounds 	<ul style="list-style-type: none"> Limited to analysis of only two bacterial species: <i>E. coli</i> and <i>S. aureus</i>

Conclusion

The Therapeutic Index and the Biocompatibility Index both serve as meaningful metrics for evaluating antiseptics. Nevertheless, it is important to consider that the BI is derived from standardized experimental conditions, which makes its values reproducible and directly comparable. In contrast, the TI is based on a systematic review of diverse primary studies, incorporating data obtained under varying methodologies and experimental settings, which may limit its comparability.