

PHMB FAQs

Attracts. Disrupts. Exterminates.

What is PHMB?

PHMB is Polyhexamethylene biguanide, a broad spectrum antimicrobial effective against drug resistant organisms such as MRSA and VRE¹. It was introduced into medicine in the 1990s by Swiss surgeon Dr. Willenegger as a local antiseptic treatment and usage steadily increased to include:

- Wound care management
- Treatment of burns
- Antiseptic treatment for cataract surgery
- Substitute for antibiotics in local anti-infective treatment^{3, 4}.

PHMB has been used for nearly 40 years in non-medical consumer products such as, contact lens cleaning solutions and swimming pool cleaners^{1, 2}.

PHMB has excellent antimicrobial efficacy, low cytotoxicity and exceptional tissue compatibility, proven by independent researchers in:

- *In vitro* testing
- Animal testing
- Case reports
- Controlled clinical trials⁵

PHMB Mode of Action?

The cell wall of many microorganisms is negatively charged. PHMB, which is positively charged, has a natural affinity for the envelopes of Gram-negative and Gram-positive bacteria³. It rapidly binds to bacteria's phospholipid (outer) membrane, altering the integrity of bacterial cell wall and reorganizing the membrane

structure¹. This action causes protective layer disintegration, cytoplasm leaks and collapse and death of the bacterial cell^{1, 6}.

Maximal activity of PHMB occurs between pH 5-6² and concentrations of PHMB effects the manner in which the target cell dies⁷. At low concentrations, part of the intracellular contents are released, while at high concentrations, the bactericidal effect is very rapid due to coagulation of the cytoplasm. PHMB does not interact with animal cells in the same way it interacts with bacterial cells⁴

Is bacteria resistant to PHMB?

PHMB has been in medical consumer use since the early 1990s with no evidence of bacteria resistance, most likely due to its rapid and non-specific bactericidal activity^{1, 3, 6, 7}. Bacteria is unable to protect itself by removing PHMB from within, so intracellular bactericidal concentrations are maintained^{1, 6}. Further, there is evidence that PHMB binds to DNA and other nucleic acids, suggesting it may also inactivate bacterial DNA. As a result, nothing that is capable of replicating remains⁶.

Are there other commercially available medical products utilizing PHMB?

Yes, there are various wound dressings sold into the healthcare market which contain PHMB.

Will PHMB cause skin irritation?

PHMB is well tolerated when used topically on skin, eyes, nose, ciliated epithelium and wounds. No uptake from intact skin and wounds was proven⁵.

PHMB kills bacteria, however, it does not interfere with the proteins that make up animal cell membranes⁹.

- The specific antimicrobial action does not affect animal cell integrity
- Has low toxicity against human cells^{6,7}
- Has not demonstrated systemic absorption

Skin sensitivity to PHMB is low (approximately 0.5%), even when the tested concentrations (2.5% and 5%) were 5–10 times more than normally used in wound applications^{4,9}.

What are the allergic risks associated with PHMB?

In animal tests, PHMB did not show any sensitizing or photosensitizing effects. Its carries only a slight allergic risk and remains an uncommon contact allergen⁵.

Overview of the efficacy and tolerability of PHMB¹⁰

Efficacy	Tolerability
Broad antimicrobial effect	Good clinical tolerability
Very low minimum blood/protein error	Selective, specific mechanism of action
After-effect, post antiseptic effect	Biocompatibility index >1
Concentration-dependent promotion of wound healing	No known toxic risks
Anti-inflammatory properties	No known resorption risks
No known development of resistance	Sustainability of the active ingredient
Reduction of biofilm and fibrin formation	Low risk of contact sensitization

References

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