**PHMB: Does it have a role in wound care?**

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**ABSTRACT**

Polyhexamethylene biguanide (PHMB) is a broad spectrum antimicrobial agent. Used widely within Europe and the US in a myriad of applications from swimming pools to contact lens solutions. However its use as a topical application for wound care has not been widely adopted – especially within the UK. A literature clinical evaluation was conducted in accordance with the Medical Device Directive and database results were screened and abridged based on GHTF quality criteria. The resulting clinical information was extracted and reviewed.

The evidence demonstrates PHMB to have excellent bacteriocidal properties whilst offering very low toxicity in humans, does not cause skin sensitivity in normal concentrations. Furthermore there is no evidence of bacterial resistance, and is highly biocompatible. It was clear that PHMB offers an excellent tool to clinicians in both preventing and treating infected wounds.

**Background**

Chronic wounds

- Cost the NHS around £3bn every year,
- Affect 200,000 individuals at any one time,
- Bacterial colonisation are both complex and controversial,
- Once bacterial colonisation is established, wound healing is significantly reduced, or halted exacerbating the pain, discomfort and reduced quality of life for patients.

Polyhexamethylene biguanide (PHMB) is a cationic biocide which binds to negatively charged phosphate groups of bacterial phospholipid walls. This in turn disrupts the membrane, causing cytoplasmic shedding and cell death. However due to this selection and similarity to our own Antimicrobial Peptides (AMPs) means it leaves mammalian cells intact.

Used extensively for over 60 years, PHMB is used in:

- contact lens solutions,
- swimming pools,
- wound irrigation solutions,
- eye washes in the treatment of acanthamoeba keratitis.

PHMB offers an opportunity to incorporate an innovative wound care design and manufacturing company.

**Methods**

A literature clinical evaluation was conducted in accordance with EU Directive 93/42/EEC (medical device directive), and guidelines from MEDDEV and Global Harmonisation Task Force (GHTF).

A literature search review plan was created detailing:

- Database selection
- Search terms (for each database)
- Characteristics
  - must contain PHMB,
  - delivery vehicle (e.g. foam, cellulose or gauze)
  - used in wound care (any aetiology)

An exclusion criterion was then defined to shortlist potential literature. Using three phases below:

- **Phase 1** • Review title only
- **Phase 2** • Review abstract
- **Phase 3** • Review full text • Extract data

Papers undergoing phase 3 were scored based on the quality and relevance using the GHTF scoring system. An example of the data extraction form is shown below (table1).

**Results**

The largest search results came from Google Scholar with 3290 articles from the initial search, and 78 from EBSCOhost (which included PubMed, CINHAL etc.).

Table 2 shows the proportion of search results making it to phase 3.

Table 3 shows the results of the phase reviews shown as a 100% stacked bar chart.

**Conclusion**

A number of key conclusions can be drawn from the systematic review of current literature, as it relates to PHMB in wound care.

- PHMB has been in use for 60 years within Europe & US
- Similarity with antimicrobial peptides means it kills bacteria leaving mammalian cells intact
- Effective on bacteria, viruses, fungi, yeasts.
- No evidence of bacterial resistance
- Very low toxicity
- Non-sensitising
- Highly biocompatible (outperforms chlorhexidine, iodine, triclosan, silver)

Based on all the information in the current literature, and the absence of any adverse events reported, it would be sensible to conclude that PHMB offers a safe alternative to current topical therapies.

- PHMB offers an opportunity to incorporate a new method of bacterial control which has been proven to be safe, efficient and cost effective.
- Useful in both the treatment and prevention of wound colonisation.
- The use of PHMB in wound dressings provides huge benefits to patients, and provides clinicians with an effective tool.

**Table 2: Proportion of articles making it to phase 3 review.**

<table>
<thead>
<tr>
<th>Database</th>
<th>Phase 3</th>
<th>Actual</th>
</tr>
</thead>
<tbody>
<tr>
<td>EBSCOhost</td>
<td>46%</td>
<td>n=36/78</td>
</tr>
<tr>
<td>Google Scholar</td>
<td>3%</td>
<td>n=86/3290</td>
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<td>NHS CRN/CT</td>
<td>6%</td>
<td>n=12/18</td>
</tr>
<tr>
<td>BSI</td>
<td>0%</td>
<td>n=0/20</td>
</tr>
</tbody>
</table>

Table 2: Percent of documents found making it to phase 3 review.

**Declaration of interest:**

The author is employed by Brightwave Ltd, Head of Quality & Regulatory Affairs. Brightwave Ltd is part of Advancis Medical, an innovative wound care design and manufacturing company.