OPTIMIZATION OF PAPAIN-BASED WOUND CLEANSER

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WHY PAPAIN-BASED WOUND CLEANSER?

• To incorporate the **cleansing effect** + the **debriding activity** into a single product.
Wound cleansing effect

**Why?**
- To clean the surface of the wound by removing bacteria, mold, fungus, necrotic debris, blood clots, dirt and eschar.

**Purpose:**
- To prevent infection
- Promote healing of injured tissue.
Wound debridement

**What?**
- removal of necrotic or nonviable tissue from the wound surface.

**How?**
- the use of proteolytic enzyme formulations
- Or known as enzymatic debridement
PAPAIN as a proteolytic enzyme

- Proven clinically and laboratory that it does not harm viable tissue surrounding wound.
- Potent activity against denatured protein
- Range: 3.0 to 12.0 (wider range compared to bromelain)
Consequently,

- action of papain-based wound cleanser in proper cleansing and hastening the closure of excisional skin wounds is to be enhanced.
Objective:

- to optimize the desirable characteristics in papain-based wound cleanser that not only will clean the wound but also promote the healing of the wound.
Scopes

- Formulating a non-toxic and physiologically compatible papain-based wound cleanser in aqueous form.

- Macroscopic analysis to measure the wound closure and rate of wound recovery.
WOUND?

✓ a break in the epithelial integrity of the skin.
✓ However, the disruption could be deeper: extending to the dermis, subcutaneous fat, fascia, muscle or even the bone.
Methodology

1. Formulating wound cleanser
2. Experimental procedure
3. Raw area measurement + macroscopic assessment.
## Wound cleanser formulation

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) GLYGERIN</td>
<td>Emollient</td>
</tr>
<tr>
<td>2) MANNITOL</td>
<td>Humectant</td>
</tr>
<tr>
<td>3) COCO - BETAIN</td>
<td>Surfactant</td>
</tr>
<tr>
<td>4) ALPHA-TOCOPHEROL</td>
<td>Vitamin-E</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>5) SORBITIC ACID</td>
<td>preservative</td>
</tr>
<tr>
<td>6) DEIONIZED WATER</td>
<td>High purity water</td>
</tr>
<tr>
<td>7) PAPAIN</td>
<td>Debriding agent</td>
</tr>
<tr>
<td>8) ALOE-VERA GEL</td>
<td>Reduce swelling</td>
</tr>
<tr>
<td>9) 8-HYDROXYQUINOLINE</td>
<td>Cosmetic biocide</td>
</tr>
<tr>
<td>Group</td>
<td>Function</td>
</tr>
<tr>
<td>--------------------</td>
<td>--------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>Surfactant</strong></td>
<td>Assist cleaning the wound</td>
</tr>
<tr>
<td><strong>Humectant</strong></td>
<td>Stabilize moisture at the wound site</td>
</tr>
<tr>
<td><strong>Emollient</strong></td>
<td>Soften or soothes dry skin</td>
</tr>
<tr>
<td><strong>Cosmetic biocide</strong></td>
<td>Reduce microbial action at the wound site</td>
</tr>
<tr>
<td><strong>Vitamin E</strong></td>
<td>Promotes tissue re-growth, reduce scar</td>
</tr>
</tbody>
</table>
**Vitamin C** = increase collagen synthesis-aid in wound healing + neutralize free radicals

**Papain** = digest protein at wound site

**Aloe-VERA** = Soothe skin, ease pain, reduce inflammation
2. Experimental procedure

1. Anaesthetization

2. Preparing the rat
3. Creating a wound

Pattern = 3 x 1.5 cm

4. Apply medication based on groups

5. Reapply medications daily


How to apply cleanser

How to apply gel
<table>
<thead>
<tr>
<th>1. Control group (CG)</th>
<th>2. Cleanser group (G1)</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Control group (CG)" /></td>
<td><img src="image2" alt="Cleanser group (G1)" /></td>
</tr>
<tr>
<td>3. Gel group (G2)</td>
<td>4. Cleanser+gel group (G3)</td>
</tr>
<tr>
<td><img src="image3" alt="Gel group (G2)" /></td>
<td><img src="image4" alt="Cleanser+gel group (G3)" /></td>
</tr>
</tbody>
</table>
Raw Area Measurement:

1. Wound tracing
2. Planimetric

Macroscopic Observation:

1. Scabs.
2. Contraction.
3. Secretions.
## Results + Discussion

<table>
<thead>
<tr>
<th>Group</th>
<th>Wound Healing Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. CG</td>
<td>++++</td>
</tr>
<tr>
<td>2. G1</td>
<td>+++++</td>
</tr>
<tr>
<td>3. G2</td>
<td>++</td>
</tr>
<tr>
<td>4. G3</td>
<td>+++</td>
</tr>
</tbody>
</table>

+ = Minimum
+++++ = Maximum
MEAN VALUE OF RAW AREA VS EXPERIMENTAL PERIOD

EXPERIMENTAL PERIOD (DAY)

control(CG)
cleanser(G1)
gel (G2)
cleanser+gel(G3)
# Macroscopic analysis

<table>
<thead>
<tr>
<th>GROUP</th>
<th>SCABS</th>
<th>SECRETIONS</th>
<th>CONTRACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Control (CG)</td>
<td>++</td>
<td>+/+++</td>
<td>+++</td>
</tr>
<tr>
<td>2. Cleanser (G1)</td>
<td>++++</td>
<td>++/+++++</td>
<td>++++</td>
</tr>
<tr>
<td>3. Gel (G2)</td>
<td>+/+++</td>
<td>++</td>
<td>++</td>
</tr>
<tr>
<td>4. Cleanser+gel (G3)</td>
<td>++</td>
<td>++/+++++</td>
<td>+++</td>
</tr>
</tbody>
</table>

+ = MIN, ++++= MAX
1. Control (CG)

Wound at day 1

Wound at day 5

Wound at day 10

Wound at day 15

Wound at day 20
2. Cleanser (G1)

Wound at day 1

Wound at day 5  Wound at day 10  Wound at day 15
3. Gel (G2)

Wound at day 1

Wound at day 5

Wound at day 10

Wound at day 15

Wound at day 20
4. Cleanser + gel (G3)

Wound at day 1

Wound at day 5

Wound at day 10

Wound at day 15

Wound at day 20
Conclusion...

1. Cleanser is proved to be efficient in promoting wound healing compared to others.

2. Cleanser works best on its own :-
   [Excess treatment modalities may increase damage to tissue injury thus delay wound healing]
Recommendations

- Use larger wound size to observe the healing rate
- Different type of wound to observe debriding action:
  - full thickness excisions
  - partial thickness bum
  - partial thickness excisions with chemical ablations
- Microscopic assessment.
• THANK YOU