Exploring the Therapeutic Potential of Algae-Based Sheet Masks in Skincare: A Comprehensive Study of Cosmetological Benefits and Microbiome Balanced Interactions

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Key take aways

- The Algae Mask led to a significant decrease in skin pH levels, pointing to improved skin health and an enhanced acidic barrier, crucial for skin balance and defense.
- The mask maintained skin barrier function, enhancing skin moisture retention and reduces wrinkles
- While maintaining skin microbiome diversity, the Algae Mask successfully decreased the relative abundance of the genus Corynebacterium, potentially correlating with an improvement in skin pH and overall skin health.
- Scanning Electron Microscopy (SEM) imaging revealed a sponge-like resemblance, indicating an effective reservoir for essential minerals, such as calcium, crucial for skin health.
- The biomatrix structure of the Algae Mask facilitated the release of calcium ions over time, aiding in skin hydration and smoothness by promoting moisture penetration into the deeper layers of the skin.
- Treatment with the Algae Mask showed a reduction in skin gaps, improved moisture content, and enhanced skin plumpness, which are benefits for skin health and hydration.

Background

- Skin issues like dryness, environmental damage, and aging are common worldwide
- Scientists are exploring new skincare treatments using bio-compatible materials
- Alginate and calcium are innovative materials for facial sheet masks
- Sheet masks deliver hydration and nutrients to the skin conveniently
- Alginates from seaweeds promote wound healing, reduce inflammation, and have antioxidants
- Alginate forms strong hydrogels with calcium, which benefits skin hydration
- Calcium plays a key role in the skin's physiology, aiding in cellular processes and barrier function, maintaining hydration and protecting against external elements
- Calcium sulphate has potential in skin health enhancement
- Sheet masks with alginate and calcium sulphate could improve skincare product effectiveness

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Clinical Summary Sheet

Study Goal

- Evaluate the effectiveness and dermatological benefits of an Algae Mask composed of alginate and calcium sulphate
- Assess the structure, soothing properties, and skin penetration capabilities of the Algae Mask
- Determine the release of calcium ions from the mask and their ability to penetrate the skin
- Investigate the fibroblast cell-activating effect of the Algae Mask extract
- Clinical evaluations were conducted to assess the safety, skin hydration, barrier function, and anti-aging effects of the Algae Mask
- Microbiome evaluations aimed to compare the diversity of skin microbiota before and after using the Algae Mask, as well as changes in skin pH and water loss

Methods

- The structure of the Algae Mask was analyzed using scanning electron microscopy
- In-vitro tests were conducted to measure calcium ion release, penetration, and concentration
- The release of ionic constituents was measured using a Franz diffusion cell with a skin substitute
- The concentration of released calcium ions was determined using UV/VIS spectrometry
- The fibroblast cell-activating effect was assessed using the XTT assay
- Clinical evaluations were performed following ethical guidelines, including skin hydration measurements and wrinkle analysis
- Microbiome evaluations compared skin microbiota diversity, pH, and water loss before and after 28 days of mask application. Samples were collected using swabs and analyzed using Metagenomics NGS to assess skin microbiome changes, species diversity, and pH variations

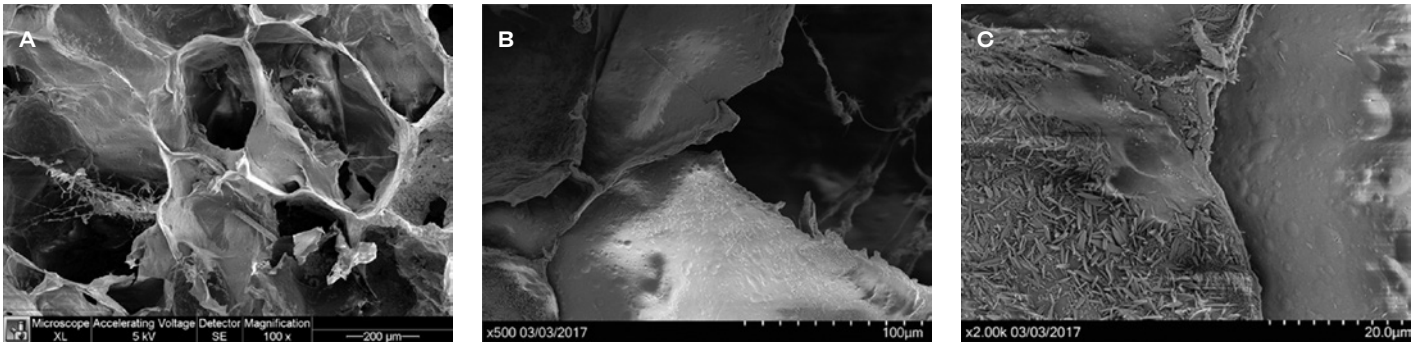
Results

Mask Structure

The Algae Mask has a biomatrix-ionic structure derived from algae and calcium

The mask acts as a reservoir for essential minerals due to lyophilization and stabilization

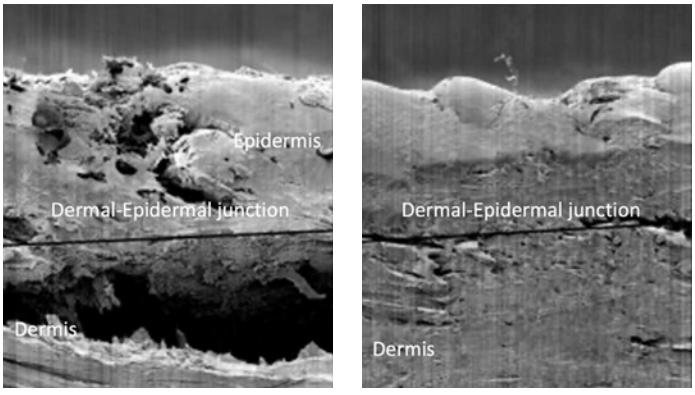
SEM imaging shows that the mask resembles a natural sponge with stable locations for ion adsorption



SEM images of Algae Mask at 100x magnification (a), 500x (b), 2000x (c), demonstrating the porous structure of the biomatrixconsisting of crosslinked marine polysaccharides and calcium crystallites

Reduced skin distress

- Skin irritation specimens treated with the mask showed reduced open spaces and a smoother skin surface with a decrease in the dermal-epidermal junction gap, indicating potential skin health enhancement
- The mask alleviates skin distress and increasing moisture content



Side view SEM images of irritated human skin biopsies at 500x magnification, before and after mask application

Before mask application

After mask application

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Results

Release and penetration of calcium ions and deep absorption into the skin

- Conductivity increased significantly during the 20-minute mask application, showing calcium ion release that may help hydrate skin and smooth wrinkles.
- The heightened calcium ion concentration could effectively influence the epidermal calcium gradient, mimicking conditions of young skin

Increased fibroblast activity

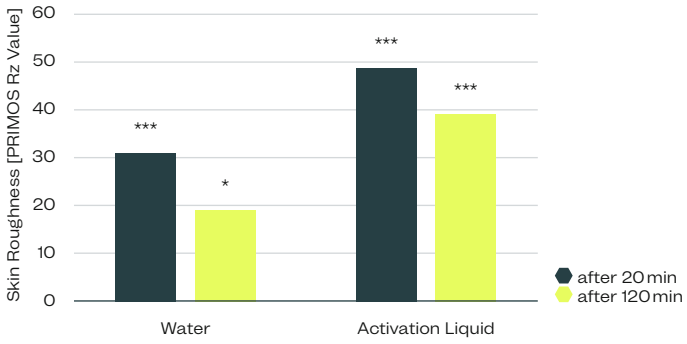
- The Algae Mask significantly increased fibroblast cellular activity by 7%, indicating its potential to enhance fibroblast activity

Significant decrease in skin pH with stable skin barrier function

91% of subjects had pH decrease

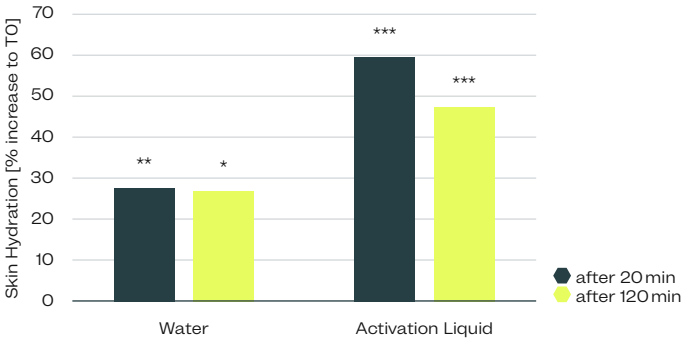
maximum pH decrease: **7%**

Significant immediate and prolonged reduction in skin roughness



The Rz-DIN values in the test area are compared before and after in the relative change (with negative values indicating an improvement).
*p ≤ 0.05 **p ≤ 0.01 ***p ≤ 0.001.

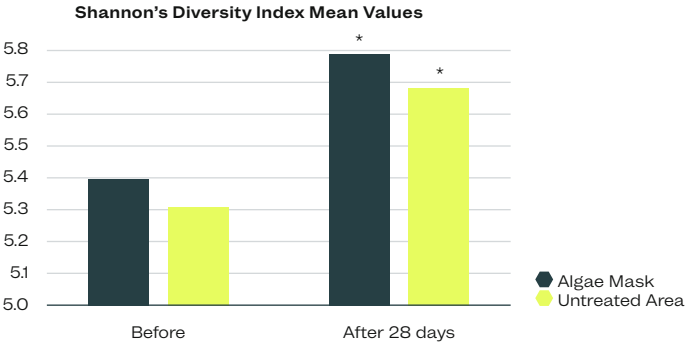
Significant immediate increase in skin hydration and prolonged moisturization effect

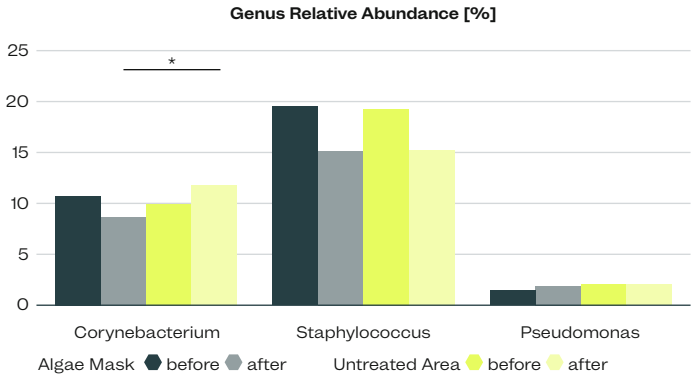


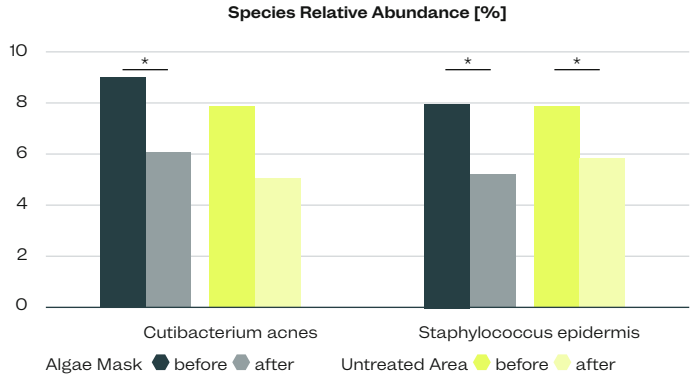
Average increase in moisture after 15 - 20 minutes (T1) and two hours (T2 after mask removal). *p ≤ 0.05 **p ≤ 0.01 ***p ≤ 0.001.

Maintains a healthy skin microbiome diversity and reduces the Corynebacterium genus

Corynebacterium bacteria is an opportunistic bacteria and have been implicated as the cause of significant skin infections.







*statistically significant

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