CODIF
R & N

PHYCOSACCHARIDE AC

Get it over with acne!
PHYCOSACCHARIDE AC

OVERALL ANTI-ACNE TREATMENT

Phycosaccharide AC is a biotechnological product that treats all of the cutaneous disorders associated with acne: excess sebum production, bacterial spots, acneic lesions, inflammation, and scarring.

This complete treatment and reparative action is provided by a specific oligoalginate whose design is inspired by an original defence system developed between a brown alga and its symbiotic micro-organism. The chelation of the oligoalginate with zinc results in an active compound with antimicrobial, soothing, and reparative virtues to treat all types of acneic skins.

AT THE ORIGIN...

The development of this active ingredient began with a surprising discovery.

Certain brown algae with very high polysaccharide content have a sugar composition that is very beneficial for skin health. Whilst working on the composition of the cell walls of Laminaria, which are rich in mucilage, Codif Recherche et Nature laboratories discovered a marine micro-organism living in symbiosis with the brown alga. The role of the micro-organism in this mutually beneficial relationship is crucial. On its own, the alga is incapable of controlling the accumulation and degradation of the polysaccharides that compose its mucilage. The micro-organism intervenes in their digestion by secreting an enzyme called alginate lyase.

This symbiotic lifestyle becomes even more interesting when the brown alga is attacked. Under such circumstances, the micro-organism synthesises a high quantity of alginate lyase to release small fragments of oligosaccharides capable of activating the defence systems of the alga.

In an effort to combat acneic infections, our laboratories have developed a production method for Phycosaccharide AC in accordance with this symbiotic life. An alginate lyase of marine origin is produced and purified via the culture of the marine micro-organism. Polysaccharides of Laminaria harvested in the natural habitat are then digested by the marine enzyme to obtain an oligoalginate. The latter is finally chelated with zinc to obtain our active ingredient Phycosaccharide AC.
At puberty, under the effect of hormones, the sebaceous glands secrete large quantities of sebum that make the skin oily and shiny. When this overproduction of sebum is accompanied by bacterial development and thus an infectious state, acneic lesions develop.

There are two types of acneic lesions according to the stage of infection of the follicle.

Retentional lesions: these are the first to appear. As their name indicates, they are due to the retention of the sebum under the surface of the skin. This retention creates white spots called microcysts, or comedones and blackheads, when the phenomenon is accompanied by an accumulation of keratin.

Inflammatory lesions: these appear secondarily and are due to inflammation of the hair follicle under the effect of a bacterial infection. They are characterised by the development of red spots: papules, often accompanied by a white spot called a pustule.

PHYCOSACCHARIDE AC reduces the production of sebum as well as the growth of Propionobacterium acnes (P. acnes) and Staphylococcus aureus (S. aureus) bacteria to limit acneic tendencies. It also reduces inflammation of the lesions and accelerates healing.
IN-VITRO TEST
TREATING ACTION

PHYCOSACCHARIDE AC REDUCES THE PRODUCTION OF SEBUM BY -26%.

PHYCOSACCHARIDE AC inhibits the synthesis and accumulation of lipids in the sebocytes thus regulating the production of sebum.

Protocol: human sebocytes stimulated with testosterone and treated with 0.025% Phycosaccharide AC. Visualisation and measurement of the quantity of lipids by fluorescence (green).

Visualisation of the accumulation of lipids (green fluorescence) in the sebocytes.
IN-VITRO TEST
TREATING ACTION

PHYCOSACCHARIDE AC (PAC) INHIBITS THE GROWTH OF P. ACNES BY -70%.

Phycosaccharide AC inhibits the growth of *P. acnes* by up to -70%. This action reduces infection.

*Protocol:* culture of *P. acnes* in liquid medium with or without Phycosaccharide AC (PAC). Evaluation of bacterial growth by turbidity at 750 nm after 48 hours of culture.


PHYCOSACCHARIDE AC INHIBITS THE GROWTH OF S. AUREUS BY -36%.

Phycosaccharide AC inhibits the growth of *S. aureus* by -36% compared to the placebo.

*Protocol:* 12 volunteers with acne applied a gel containing 5% PAC twice daily for 28 days. Bacterial sample on two zones of the face and culture for 48 hours. The results were expressed as the variation of the number of colonies per millimetre between D0 and D28.
**IN-VITRO TEST**

**REPARATIVE ACTION**

**PHYCOSACCHARIDE AC STIMULATES THE PROCESSES OF RE-EPITHELISATION**

Kawada and al (1) demonstrated that oligoalginites with a similar composition to Phycosaccharide AC act as cofactors of EGF (Epidermal Growth Factor), in the recruitment and activation of keratinocytes during re-epithelisation of the skin. The rate of division and recruitment of keratinocytes can be determined by the size of the colonies that they form to heal the tissues.

RESULT: +136% increase in the size of the colonies.

Phycosaccharide AC, by promoting the recruitment and mobilisation of keratinocytes, increases the size of the colonies by +136%. This promotes the healing of acneic lesions.

*Protocol: keratinocytes from human epidermis cultured with or without 0.5% Phycosaccharide AC for 16 days. The surface area of the colonies was determined after staining with Rhodamine.*

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**IN-VITRO TEST**

**SOOTHING ACTION**

**PHYCOSACCHAIDE AC REDUCES THE MEDIATORS OF INFLAMMATION: -81% IL1A AND -46% PGE2**

Phycosaccharide AC reduces the release of inflammatory mediators, thus promoting a soothing action.

*Protocol: IL1a: human skin explants. Topical application of 1% Phycosaccharide AC followed by exposure to UVBs. Quantification of IL1a in the culture medium, 24h after application. PGE2: human keratinocytes cultured in the presence of a Phorbol ester (PMA) with or without 0.1% Phycosaccharide AC for 24 hours. Quantification of PGE2 in the culture medium.*
**CLINICAL TEST**

**PROTOCOL**
20 volunteers aged between 14 and 30 years with acneic skins.
Two applications per day of a cream containing 1% Phycosaccharide ACP for 28 days.

**SOOTHING AND REPARATIVE ACTION AFTER 4 DAYS**

-6%*** INFLAMMATION
The inflammation of the acneic lesions was reduced by 6%*** on average and up to -22%.
***p<0.001 Student test

-5 mm² IN THE SURFACE OF THE LESIONS
The surface of the acneic lesions is reduced by 5 mm²*** on average and up to -13 mm².
***p<0.001 Student test

**TREATING ACTION AFTER 28 DAYS**

-15%* OF SEBUM ON THE SURFACE OF THE SKIN
The quantity of sebum on the surface of the skin was reduced by 15%* on average and up to -57%. The speed with which the skin becomes oily again was also reduced by 9%*** on average.
*p<0.05 ; ***p<0.001 Student test
TREATING ACTION AT 28 DAYS

-6%*** OF RETENTIONAL LESIONS

Retentional lesions: -6%*** on average and up to -44%
Comedones: -3%*** on average and up to -18%
Microcysts: -3%* on average and up to -26%.

-5%*** OF INFLAMMATORY LESIONS

Inflammatory lesions: -5%*** on average and up to -14%
Nodules: -4%*** on average and up to -12%.

*p<0.05 ; ***p<0.001 Student test

GLOBAL EFFICACY ON THE FOREHEAD AND CHEEKS
# Formulation Guide

## Emulsified Cream for Greasy Skin

**Protocol:**
Prepare A. Disperse B while stirring. Then, add C.
Add the matters D one by one while stirring then E (warmed). Finally, add F while stirring.

<table>
<thead>
<tr>
<th>Phase</th>
<th>Commercial name</th>
<th>INCI</th>
<th>Percentage</th>
</tr>
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<tbody>
<tr>
<td>A</td>
<td>Water</td>
<td>Water Sq 100</td>
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</tr>
<tr>
<td>A</td>
<td>Glycerin</td>
<td>glycerin</td>
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</tr>
<tr>
<td>B</td>
<td>Micropear M100</td>
<td>Polymethyl methacrylate</td>
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<tr>
<td>B</td>
<td>Velvetveil ZC</td>
<td>Silica and mica</td>
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<tr>
<td>C</td>
<td>Cosmedia SP</td>
<td>Sodium polyacrylate</td>
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<tr>
<td>D</td>
<td>Cegermil</td>
<td><strong>Zea Mays and glycine soja and helianthus annuus</strong></td>
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<tr>
<td>D</td>
<td>Silicone DC 345</td>
<td>cyclomethicone</td>
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<tr>
<td>D</td>
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<tr>
<td>D</td>
<td>Preservative</td>
<td></td>
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<tr>
<td>E</td>
<td>Aroleat Samphira</td>
<td><strong>Caprylic/Capric Triglyceride and hydrogenated vegetable oil and Crithmum maritimum</strong></td>
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<tr>
<td>F</td>
<td>Phycosaccharide ACP</td>
<td><strong>Aqua and hydrolyzed algin and zinc sulfate</strong></td>
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<tr>
<td>F</td>
<td>Parfum</td>
<td>/</td>
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</table>
BIBLIOGRAPHIC REFERENCES

PHYCOSACCHARIDE AC: OVERALL ANTI-ACNE TREATMENT

COSMETIC ACTIVITY

Regulates the production of sebum
Inhibits the growth of *P. acnes* and *S. aureus*
Reduces the mediators of inflammation
Improves the healing processes
Reduces the inflammation of acneic lesions
Reduces the size of acneic lesions
Reduces the number of retentional and inflammatory lesions

INCI NAME

Phycosaccharide ACP: Water (and) Hydrolyzed algin (and) Zinc sulfate (and) Phenoxyethanol
Phycosaccharide ACG: Glycerin (and) Water (and) Hydrolyzed algin (and) Zinc sulfate

RECOMMENDED % OF USE: 1% PHYCOSACCHARIDE ACP
                          2% PHYCOSACCHARIDE ACG

CHARACTERISTICS: hydrosoluble active ingredient from plant origin - 100 % natural

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