Product Information

LaraCare™ A200 – Galactoarabinan

A Natural Enhancer for Skin Actives

Extracted from the Larch tree harvested in North America, LaraCare™ A200 (INCI: Galactoarabinan) is a highly functional polysaccharide. This natural polysaccharide, galactoarabinan (GA), is a natural polymer linked with sugar units consisting of galactose and arabinose in the ratio of 6:1, respectively. Unlike many other natural products, LaraCare™ A200 displays a synthetic-like consistency, characterized, in part, by its narrowly-peaked molecular weight distribution and high intrinsic purity. It has many unique properties and benefits in personal care applications. It imparts multi-functionality to water-based systems.

LaraCare™ A200 is a natural, mild, non-irritating and water dispersible polymer which can enhance emulsion stability, reduce transepidermal water loss (TEWL), and provide moisture benefits in formulations. LaraCare™ A200 may help to improve appearance of skin’s superficial fine lines, impart film forming properties, and helps improve formulation uniformity which may ultimately enable SPF enhancement. Approved by ECOCERT in ecological and organic certified cosmetics.

1. Active Matter

INCI Name: Galactoarabinan
Chemical Name: Arabinogalactan
Botanic Name: Genus Larix
Empirical Formula: \([((C_5H_8O_4)(C_6H_{10}O_5)x]_x\)
Molecular Weight: ~20,000 Daltons
TSCA – CAS No: 9036-66-2 D-Galacto-L-Arabinan
ENEICS No: 232-910-0 Galactoarabinan

2. Physical and Chemical Properties

2.1 Appearance: Granular, off white to tan free flowing powder

2.2 Solvent Compatibility

Galactoarabinan is soluble in water and proportionally soluble in many solvents:

<table>
<thead>
<tr>
<th>Solvent</th>
<th>%Solvent in H₂O</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethanol</td>
<td>30%</td>
</tr>
<tr>
<td>Methanol</td>
<td>30%</td>
</tr>
<tr>
<td>Isopropanol</td>
<td>30%</td>
</tr>
<tr>
<td>Acetone</td>
<td>30%</td>
</tr>
<tr>
<td>DMSO</td>
<td>50%</td>
</tr>
</tbody>
</table>
2.3 Rheology Property and Electrolyte Stability

Galactoarabinan has minimal contribution to the formulation viscosity. It also is unaffected by formulation pH, salt contents, ionic species, or shear.

![Figure 1. Viscosity Profile at Various pH](image1)
![Figure 2. Electrolyte Effect](image2)

3. Specifications

Assay: >95% Galactoarabinan

Physical State:
- Texture: Free Flowing Powder
- Foreign Matter: None
- Odor: Slightly Aromatic
- Color*: Off-White to Tan*

Particle Size: < 20% +40M

Moisture: 2.0 – 6.0 %

Viscosity (5% solution): max 5.0 cps

Brookfield LVT Dial Viscometer Spindle SC4-18 / 25°C.

*Due to the nature of the product and its drying process an occasional particle may become discolored.

Microbiological:
- A.P.C.: max 100 CFU/g
- Yeast: max 10 CFU/g
- Mold: max 100 CFU/g

Heavy Metals
- Arsenic: max 0.4 ppm
- Lead: max 0.1 ppm
- Cadmium: max 0.25 ppm
- Mercury: max 0.1 ppm
- Total: max 5 ppm

pH (1% solution): 4.5 – 9.2
4. Efficacy / Suggested Applications

4.1 Moisture Control and Humectancy

LaraCare™ A200 acts as an excellent moisture-enhancing additive by holding the moisture within the molecular matrix under dry conditions. It has been clinically tested by an independent laboratory to measure its effectiveness for reducing TEWL and thus offers moisturization benefits to skin care formulations. As indicated in Figure 3, the lotion without LaraCare™ A200 or galactoarabinan (GA) imparted statistically significant reduction in TEWL only at the measurement made 1 hour after application. In contrast, a statistically significant reduction in TEWL was observed at 1, 2, and 4 hours after a single application of the lotion containing LaraCare™ A200.

![Figure 3. Transepidermal Water Loss (TEWL) Study](image)

Clinical Testing Protocol:
- 22 Subjects
- Product applied to lower leg with a single application (2.0mg/cm²) with and without the incorporation of LaraCare™ 2%W/W
- Measurements taken at 1, 2, 4 Hours after a single application

Test Formulations and Controls:
- Control (without GA)
- Test formulation with 2% GA

4.2 Film-forming Potential on Skin

As a fairly large polysaccharide, galactoarabinan is likely to remain on the skin surface where it may help enable skin barrier function. FT-IR spectra of skin treated with a solution of 2% LaraCare™ A200 shows that galactoarabinan does remain on the skin’s surface; the appearance of peaks at 1600 and 750 cm⁻¹ on treated skin, in Figure 4, can only be attributed to the galactoarabinan. Also, the galactorabinan peaks are still evident two hours post-application.

![Figure 4. FT-IR Analysis Showing Galactoarabinan on Skin Surface](image)

- 2% LaraCare™ A200 in water was applied to a 4 in² section of the inner forearm and allowed to dry. FT-IR scans of the test area.
- Scan also taken at 2 hours post-application.

Test Formulations and Equipment:
- Test formulation is 2% GA in water.
- Perkin Elmer Spectrum One FT-IR with a single bounce ATR with a ZnSe crystal.
- Diffuse Reflectance Infrared Fourier Transform Spectroscopy (DRIFTS) for the neat LaraCare® A200.
- Range = 4,000 to 650 cm⁻¹; Resolution = 4 cm⁻¹; Scans = 4.
By nature of its chemistry, the galactoarabinan polysaccharide can impart some film-forming potential in a typical personal care formulation. In an aqueous system, LaraCare™ A200 shows definite film-forming ability, as seen below in Figure 5.

**Figure 5.** LaraCare™ A200 Film-forming

![Dried Film of 5% LaraCare® A200 / 0.5% Glycerin (In water)](image)

### 4.3 Skin Treatment Efficacy Evaluation

A clinical study was conducted by an independent research institute to evaluate the efficacy of a test product containing galactoarabinan (GA) in improving the skin texture and in treating the skin’s superficial fine lines. Fifteen (15) subjects completed an eight (8) week full face study. Panelists were evaluated at baseline and after eight weeks of product application. Results of silicon replicas analysis showed an improvement of 19% in superficial fine lines around the eye area after eight weeks of product use (Figure 6).

**Clinical Testing Protocol:**

- 15 Subjects between age 35-60
- An eight (8) week, full face study
- Product performance was assessed using silicon replicas with subsequent image analysis for measuring fine lines/wrinkles

**Test Formulations and Controls:**

- Test Formula: 5% GA

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**In-vitro Film-forming Test:**

- 5% LaraCare™ A200 was mixed with glycerine and water and placed in a foil weighing dish.
- Product was dried overnight at 40 °C.
- Film was peeled out of the weigh dish at room temperature.

**Test Formulation:**

- 5% LaraCare™ / 0.5% glycerin / 94.5% water.

**Figure 6.** Reduction of Superficial Fine Lines

![Skin Replica Image Analysis](image)

Note: T² represents the degree of superficial lines using silicon replicas with subsequent image analysis.
4.4 Sunscreen Formulation SPF Enhancement

The reduction of droplet/particle size in the emulsion and the improvement of pigment dispersibility and uniformity in the formulation assist galactoarabinan (GA) to exhibit SPF enhancement for sunscreen formulations. As demonstrated in the following Figure 7, the dispersion of titanium dioxide in the emulsion with GA is more even, much more fine, less whitening and without agglomerates.

**Figure 7. Emulsion Incorporating with Titanium Dioxide with and without GA**

![Figure 7](image)

An *in-vitro* instrumental study was conducted. In this study, common organic sunscreens and inorganic sunscreens with various surface treatments at moderate concentration levels were incorporated in the testing formulations. The composition of the base emulsion is shown in Table 2. The SPF values of the test formulas, based on this base emulsion plus different sunscreen actives, were measured.

**Table 2. SPF Emulsion Base**

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>W/W %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>qs</td>
</tr>
<tr>
<td>Ethyhexyl palmitate</td>
<td>6.0</td>
</tr>
<tr>
<td>Glyceryl Stearate (and) Cetearyl Alcohol (and) Stearoyl Lactylate</td>
<td>5.0</td>
</tr>
<tr>
<td>Glycerin</td>
<td>3.0</td>
</tr>
<tr>
<td>Polysorbate 20</td>
<td>1.0</td>
</tr>
<tr>
<td>Xanthan Gum</td>
<td>0.5</td>
</tr>
<tr>
<td>Preservative</td>
<td>qs</td>
</tr>
</tbody>
</table>

**SPF In-vitro Testing Protocol:**

- SPF-290 SPF Analyzer was used for this study
- Vitro-Skin™ was used as the substrates (by Innovative Measurement Solution)
- Test product was applied to Vitro-Skin™ at the rate of 2µl/cm²
- SPF was determined instrumentally in duplicate runs per product with 12 reading points for each run

**Test Formulations and Controls:**

- Control: 0% GA emulsion base
- Test Formula: Different sunscreen combinations with different levels of GA: 0%, 2% and 5%

From the in-vitro SPF testing results (see Table 3), GA displayed the ability to enhance the SPF. The magnitude of improvement ranged from as little as 5% to as much as 60%. In general, the higher the GA level, the better the enhancement. Two grades of titanium dioxide used for this study were treated with a hydrophilic coating, such as aluminium hydroxide (and) hydrated silica and aluminium hydroxide (and) hydrated silica (and) alginic acid. The hydrophobic coating titanium dioxide was aluminium hydroxide (and) stearic acid.
As indicated in Table 3, GA boosts the SPF of the products containing physical sunscreens of titanium dioxide with both hydrophilic and hydrophobic coatings. The results of SPF boosting effect are due to the GA acting as a dispersing aid to achieve much smaller, even and uniform distribution of particulates with minimal agglomeration.

### Table 3. Effect of GA on Sunscreen SPF

<table>
<thead>
<tr>
<th>Sunscreen</th>
<th>%GA</th>
<th>SPF</th>
<th>% Increase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Octinoxate 5% (ethylhexyl methoxycinnamate) and Octisalate 5% (ethylhexyl salicylate)</td>
<td>0%</td>
<td>5.54</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td>2%</td>
<td>7.69</td>
<td>38.8</td>
</tr>
<tr>
<td></td>
<td>5%</td>
<td>8.60</td>
<td>55.2</td>
</tr>
<tr>
<td>Titanium dioxide (and) aluminum hydroxide (and) stearic acid 10%</td>
<td>0%</td>
<td>8.60</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td>2%</td>
<td>9.48</td>
<td>10.23</td>
</tr>
<tr>
<td></td>
<td>5%</td>
<td>12.13</td>
<td>41.05</td>
</tr>
<tr>
<td>Octinoxate 5%, titanium dioxide (and) aluminum hydroxide (and) hydrated silica (and) alginic acid 3%</td>
<td>0%</td>
<td>16.74</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td>2%</td>
<td>18.41</td>
<td>9.98</td>
</tr>
<tr>
<td></td>
<td>5%</td>
<td>27.00</td>
<td>61.29</td>
</tr>
<tr>
<td>Octinoxate 5%, Octisalate 5%, titanium dioxide (and) aluminum hydroxide (and) hydrated silica 3%</td>
<td>0%</td>
<td>12.95</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td>2%</td>
<td>13.76</td>
<td>6.25</td>
</tr>
<tr>
<td></td>
<td>5%</td>
<td>16.15</td>
<td>24.71</td>
</tr>
</tbody>
</table>

5. **Usage areas and recommendation to formulate**

LaraCare™ A200 is soluble in water and partially soluble in many solvents due to its surface activity. In typical emulsions or in surfactant systems, LaraCare™ should be introduced into the water phase. LaraCare™ A200 does not contribute to formula viscosity, can be tolerant with high level of electrolytes, works at wide pH range (2-12), and sustains high shear.

6. **Packaging / Storage**

The product is supplied in 25kg (55Lb) net weight fibre drums.

LaraCare™ A200 can be stored for at least four (4) years in the sealed original packaging under normal temperature conditions.
7. Regulatory Information

Galactoarabinan has a long history of use in the food industry (US-FDA 172.610), (EINECA 232-910-0). The global regulations of cosmetic applications are listed in Table 4 below.

<table>
<thead>
<tr>
<th>Country</th>
<th>Status</th>
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</thead>
<tbody>
<tr>
<td>USA</td>
<td>PC:1996 CTFA assigned INCI; General: TSCA-CAS #9036-66-2</td>
</tr>
<tr>
<td>Australia / New Zealand</td>
<td>General: NICNAS-AICS - #9036-66-2</td>
</tr>
<tr>
<td>Canada</td>
<td>General: CEPA-NDSL#9036-66-2</td>
</tr>
<tr>
<td>Europe</td>
<td>General: EINECS-232-910-0</td>
</tr>
<tr>
<td>Japan</td>
<td>PC: JCLD approved on positive list</td>
</tr>
<tr>
<td></td>
<td>MHW: Not restricted</td>
</tr>
<tr>
<td></td>
<td>Food: MITI-natural food additive list</td>
</tr>
<tr>
<td>South Korea</td>
<td>Natural food additive code #38</td>
</tr>
<tr>
<td>Taiwan</td>
<td>Food ingredient D-Galacto-L-Arabinan</td>
</tr>
<tr>
<td>Thailand</td>
<td>Food additive – Ministerial Notification</td>
</tr>
</tbody>
</table>

8. Toxicological Information

Refer to MSDS

Dermal Irritation: There have been no known irritation effects

- RIPT testing on 58 individuals showed no evidence of irritation or sensitization
- Neutral Red Uptake Bioassay found LaraCare™ A200 to be very mild to human epidermal keratinocytes (skin cell)

Ocular Irritation: Mattel Corporation EPI-Ocular™ in-vitro skin mode; classified LaraCare™ as a “non-irritant”.

Mutagenicity: Ames Test showed not mutagenic.

9. Ecological and Ecotoxicological information

Refer to MSDS

For questions or for further information, please email Technical Sales Support at contact.allendale@lonza.com or visit the Lonza web site at www.lonza.com. In North America, you can reach Lonza Technical Sales Support toll free at 800-365-8324.

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