LITHOLIFE®

Marine Algae Calcium for Next-Generation Plant-Based Beverages

Nutritional fortification, clean-label differentiation, sustainability and formulation guidance

A USDA Organic-certified, marine algae-derived calcium and magnesium matrix designed to elevate the nutrition and ingredient story of plant-based beverages.

Technical knowledge article for the food and beverage industry
August 2026

Executive overview

Calcium fortification has become nearly indispensable for plant-based beverages intended to compete nutritionally with dairy. Yet “contains calcium” does not answer the questions that increasingly matter to consumers and formulators: Where did the calcium come from? Is it a single isolated mineral or a broader food-derived matrix? Does it fit the plant-based and organic proposition? Will it remain uniformly dispersed? And what evidence supports its nutritional value?

Litholife is 100% Lithothamnion calcareum, a calcified coralline red alga containing 30–36% elemental calcium and 2–4% magnesium, with iron and other naturally occurring trace constituents. It is neutral in odor and taste, available in fine particle sizes, tested lot by lot, and certified to the USDA National Organic Program. In plant-based beverages, it can supply calcium while preserving a coherent algae-derived, organic and multimineral ingredient story.

The strongest comparison is evidence-led. Conventional calcium carbonate is commonly produced from quarried limestone and tricalcium phosphate from mineral phosphate value chains; both are nonrenewable geological resources and isolated salts. Their production can involve quarrying, land disturbance, habitat change, dust, waste and energy use. This does not mean every conventional supplier has the same footprint, nor that calcium carbonate is always poorly absorbed. In a human soy-beverage trial, calcium carbonate absorption was similar to cow’s milk, whereas tricalcium phosphate was lower. Lithothamnion research provides promising evidence, but no published clinical trial has yet measured absorption from a Litholife-fortified beverage.

Decision factor	Litholife algae calcium	Conventional carbonate / TCP
Origin	Calcified marine red alga; algae-derived matrix.	Usually geological limestone or phosphate-rock value chains; verify each supplier.
Composition	30–36% Ca, 2–4% Mg and naturally occurring trace constituents.	Primarily a defined single calcium salt; other minerals require separate addition.
Certification	Litholife ingredient is USDA Organic certified; Kosher and Vegan certifications documented.	Conventional mineral salts are generally not agricultural organic ingredients; status is supplier-specific.
Nutrition evidence	Pilot human data on another Lithothamnion ingredient show favorable calcium-metabolism markers; product-specific beverage evidence remains to be generated.	Carbonate: absorption equivalent to milk in one soy trial. TCP: significantly lower in the same trial.
Brand story	Supports marine algae-derived, organic, multimineral and clean-label positioning.	Functional fortification but usually a commodity mineral narrative.
Formulation	Fine insoluble particles require a designed suspension system and process validation.	Carbonate and TCP are also sparingly soluble and can sediment; supplier grade and process matter.

U.S. COMMERCIAL QUICK REFERENCE

Plant-Based Beverages | Prepared for Unichem's U.S. market development team

This section consolidates the six information categories requested by Unichem. It should be read together with the full technical article, current specification, lot Certificate of Analysis and current certificates.

Unichem request	Litholife response
1. Key technical differentiators and benefits	30–36% calcium with 2–4% naturally accompanying magnesium in a marine algae-derived matrix; USDA Organic-certified ingredient; neutral odor and taste; fine grades for dispersion; lot-level safety controls. The origin aligns naturally with plant-forward, vegan and premium sourcing narratives.
2. Clinical, scientific or application data	A human pilot study using another Lithothamnion-derived ingredient showed favorable acute calcium-metabolism markers, but it is not direct Litholife beverage evidence. Research shows calcium carbonate can achieve milk-comparable absorption in a soy beverage when properly formulated, while tricalcium phosphate performed lower in the cited study. Litholife-specific beverage absorption, stability and sensory claims require finished-product testing.
3. Competitive positioning	Compared with conventional quarried calcium carbonate or phosphate-rock-derived TCP, Litholife offers differentiated algae provenance, magnesium co-delivery and an organic ingredient platform. Conventional salts remain standardized, economical fortificants. Litholife's value is strongest when nutrition, sourcing and brand story are considered together; quantified sustainability superiority requires a comparative LCA.
4. U.S. regulatory status	Confirm the lawful U.S. food ingredient name/pathway, intended conditions of use, Nutrition Facts declaration and finished-beverage labeling. USDA Organic certification of Litholife does not automatically qualify the finished beverage for the USDA seal; formulation, handling and label must be reviewed by the finished-product certifier. Structure/function or disease-risk claims require separate regulatory review.
5. Applications and suggested use	Company development starting range: 0.35–0.70%, usually screening 550 or 1,250 mesh according to process and package. At 35% Ca and beverage density near 1 g/mL, 0.35% contributes about 122.5 mg Ca/100 mL and 0.70% about 245 mg/100 mL before native calcium and process variation. Validate wetting, suspension, homogenization, heat treatment, sedimentation/redispersibility, sensory profile and shelf-life calcium uniformity.
6. Supported marketing claims	Recommended: "calcium from marine algae," "algae-derived calcium," "calcium with naturally occurring magnesium," "made with USDA Organic-certified Litholife algae calcium," subject to certifier approval, and "alternative to conventional quarried calcium sources." Avoid "more bioavailable," "complete mineral nutrition," "carbon neutral," "regenerative" or finished-product organic claims without direct substantiation/approval.

Claim-use discipline

Claims should match the evidence level of the exact ingredient and finished product. Category-level Lithothamnion research supports technical plausibility but is not automatically Litholife-specific clinical proof. Disease-treatment claims are outside the recommended territory.

Documents to accompany customer discussions

Current technical specification for the proposed grade

Representative and shipment-specific Certificate of Analysis

Current USDA Organic, Kosher, Vegan, Halal and GMP documentation, as applicable

Safety, allergen, non-GMO, contaminant and microbiological documentation

Full segment technical article and cited scientific references

1. Why the source of calcium matters

A plant-based beverage is not differentiated only by the source of its protein or carbohydrate base. Fortificants can either reinforce or weaken the product concept. A beverage made from oats, almonds, soy, rice, peas or coconut may still rely on a calcium source derived from mined rock. That is legally and nutritionally possible, but it creates a disconnect for brands promising plant-forward sourcing, organic integrity and recognizable ingredients.

Litholife offers a more coherent option: the ingredient originates from a calcified marine alga rather than a conventional geological deposit. “Algae-derived” is scientifically more precise than calling the material a living plant, but it is compatible with plant-based positioning and certified Vegan according to Litholife documentation.

2. What Litholife delivers

Attribute	Current specification	Value in beverages
Identity	100% Lithothamnion calcareum	Single-source algae ingredient with differentiated provenance.
Calcium	30.0–36.0%	Concentrated fortification; calculate from the actual lot CoA.
Magnesium	2.0–4.0% depending on grade	Meaningful co-delivery not provided by pure calcium salts.
Iron	Minimum 400 mg/kg in current specifications	A natural contribution; do not use as a guaranteed claim without finished-product data.
Sensory	Fine beige powder; neutral odor and taste	Designed for flavor-sensitive bases, subject to sensory testing.
Solubility	Insoluble in water; soluble in weak acids	Functions as a dispersed mineral phase; suspension engineering is essential.
Safety program	Lot testing for composition, microbiology, arsenic, cadmium, lead and mercury	Supports supplier qualification and beverage hazard-control programs.
Shelf life	48 months under specified dry storage	Operational flexibility for industrial users.

3. A more complete mineral proposition

Calcium carbonate and tricalcium phosphate are useful standardized fortificants, but they are principally single-salt solutions. Litholife is different because calcium is naturally accompanied by magnesium and a spectrum of trace constituents. This does not mean that every trace element is present at a nutritionally significant level, nor that a beverage can claim them without analysis. It means the formulator begins with a naturally assembled multimineral matrix rather than rebuilding the mineral story exclusively from isolated salts.

Magnesium is the most commercially relevant co-mineral because its specification is 2–4%. At a 0.35% inclusion and 3.2% lot magnesium, Litholife contributes approximately 11.2 mg Mg per 100 mL, assuming beverage density near 1 g/mL. Finished-product values, serving claims and nutrition labeling must be confirmed analytically and under the applicable jurisdiction.

4. What absorption studies actually show

4.1 Tricalcium phosphate versus calcium carbonate in soy beverage

A randomized three-way crossover trial in 20 healthy young women used dual stable isotopes to compare 250 mg calcium from cow's milk, calcium-carbonate-fortified soy beverage and tricalcium-phosphate-fortified soy beverage. Fractional absorption was 0.217 from cow's milk, 0.211 from calcium-carbonate soy beverage and 0.181 from tricalcium-phosphate soy beverage. Carbonate did not differ from milk; both were significantly higher than tricalcium phosphate. The defensible conclusion is that fortificant choice matters and TCP performed worse in that formulation—not that every mineral carbonate is inherently poorly absorbed.

4.2 Evidence for Lithothamnion-derived calcium

In a double-blind crossover pilot trial, 12 premenopausal women received a single dose of a different commercial Lithothamnion-derived ingredient, conventional calcium carbonate or placebo. The algae-derived ingredient produced greater urinary calcium clearance versus placebo and a more prolonged suppression of parathyroid hormone after a meal; calcium carbonate showed an intermediate response. The authors stated that the algae ingredient may exert greater influence on these metabolism markers. This promising study was small, used another branded ingredient and did not test a beverage; it supports a research hypothesis, not a direct absorption claim for Litholife.

In-vitro work also shows that calcium and magnesium release from Lithothamnion is strongly pH-dependent. Food-matrix reviews emphasize that absorption depends on mineral form, dose, meal conditions, inhibitors such as phytate, particle behavior and the beverage matrix. A responsible article should therefore avoid a universal percentage such as "87% bioavailability" unless supported by a validated, product-specific protocol.

5. Sustainability: strong differentiation without overclaiming

Conventional calcium carbonate is typically linked to limestone quarrying, while calcium phosphates are connected to phosphate-rock extraction and processing. These are finite geological resources. Quarrying literature documents potential land-use change, vegetation and habitat loss, dust, noise, vibration, waste generation and changes to soil and water systems. Rehabilitation can reduce impacts, but it does not turn the extracted mineral deposit into a renewable resource.

Litholife's commercial documentation describes collection of naturally accumulated Lithothamnion deposits under Brazilian environmental licensing and extraction limits, with naturally renewing areas. This provides a differentiated sourcing narrative, but sustainability claims should remain tied to current licenses, monitoring data, traceability and, where possible, life-cycle assessment. "Lower environmental impact" is a comparative claim that should be supported by a like-for-like LCA before being quantified.

Recommended language	Why it is defensible	Avoid unless specifically substantiated
"Algae-derived alternative to conventional quarried calcium sources."	Accurately contrasts provenance without claiming zero impact.	"Mining calcium always destroys nature irreversibly."
"Sourced under environmental licenses and extraction limits."	Supported by current Litholife documentation; retain records.	"Impact-free," "regenerative" or "carbon neutral" without defined evidence.
"Uses a naturally occurring multimineral algae matrix."	Matches composition and identity.	"Every mineral is more bioavailable" or "complete mineral nutrition."
"USDA Organic-certified ingredient."	Certificate-backed ingredient fact.	Finished-beverage USDA Organic claim without certifier approval.

6. USDA Organic: more than a natural-positioning phrase

Litholife is certified under the USDA National Organic Program through IBD, with annual oversight documented by the company. For organic and premium plant-based beverages, this is a major differentiator from commodity mined calcium salts. It provides third-party verification of the ingredient and related handling controls rather than relying only on self-declared “natural” language.

Ingredient certification does not automatically authorize the finished beverage to display the USDA Organic seal. Formula composition, percentage of certified organic ingredients, processing aids, storage, segregation, recordkeeping, labeling category and finished-product certification must comply with the National Organic Program and be approved by the certifier.

7. Formulation and processing guidance

7.1 Starting inclusion calculation

Litholife company development guidance for plant-based beverages is typically 0.35–0.70%, with 550 or 1,250 mesh selected according to processing and packaging. These are development ranges, not universal specifications. At 35% calcium, 0.35% ingredient theoretically contributes about 122.5 mg calcium per 100 mL; 0.70% contributes about 245 mg/100 mL, assuming density near 1 g/mL. Native calcium, processing variation and analytical tolerance must be included.

7.2 Suspension is the central technical challenge

- Select the finest practical grade after evaluating dusting, wetting and handling.
- Pre-disperse under controlled shear; avoid dumping fine powder directly into a poorly agitated tank.
- Optimize hydrocolloid/stabilizer system, protein interactions, homogenization pressure and order of addition.
- Measure sediment height, redispersibility and calcium distribution at top/middle/bottom over shelf life.
- Validate heat treatment, UHT/retort stability, viscosity, color, flavor and package performance.
- State “shake well” when needed, but do not use it to compensate for inadequate content uniformity.

7.3 Technology claims require finished-product data

Litholife has observed stability and texture benefits in development applications, but performance depends on protein type, fat, pH, chelators, gums, particle size, thermal process and packaging. Claims such as “improves stability,” “reduces separation” or “extends shelf life” should be based on controlled comparison in the customer’s finished formula.

8. Clean-label and consumer communication

Communication territory	Suggested wording	Qualification
Origin	“Calcium from marine algae” / “algae-derived calcium.”	Confirm legal ingredient name and local labeling rules.
Composition	“Calcium with naturally occurring magnesium.”	Use quantitative claims only from finished-product analysis.
Organic	“Made with USDA Organic-certified Litholife algae calcium.”	Finished-product certifier must approve wording and seal use.
Sustainability	“Alternative to conventional quarried calcium sources.”	Avoid quantified superiority without comparative LCA.
Absorption	“Fortificant form influences absorption; published research on Lithothamnion is promising.”	Do not claim superior absorption for Litholife beverage without direct trial.
Plant-based fit	“Algae-derived mineral ingredient suitable for vegan formulations.”	Algae are not botanically plants; “algae-derived” is more precise.

9. Recommended positioning

Litholife is a USDA Organic-certified, marine algae-derived calcium ingredient for plant-based beverages. It supplies concentrated calcium together with naturally occurring magnesium, supports a differentiated clean-label and sourcing story, and is available in fine grades for beverage development—backed by lot-level quality and contaminant controls.

10. Evidence roadmap

- Run standardized bench and pilot comparisons against beverage-grade calcium carbonate and TCP at equal elemental calcium.
- Measure top/middle/bottom calcium distribution, sedimentation, redispersibility, viscosity and sensory performance through shelf life.
- Complete a comparative cradle-to-gate life-cycle assessment with consistent system boundaries.
- Characterize multiple Litholife lots for Ca, Mg, selected trace elements and particle-size distribution.
- Consider a randomized stable-isotope absorption trial using the final Litholife-fortified beverage if a superior-bioavailability claim is strategically important.

References and source notes

1. Litholife Seaweed Minerals Ltda. ET01, 325 mesh technical specification, rev. April 24, 2025.
2. Litholife Seaweed Minerals Ltda. ET03, 550 mesh technical specification, rev. January 26, 2026.
3. Litholife Seaweed Minerals Ltda. Commercial Presentation 2026, April 2026.
4. Zhao Y, Martin BR, Weaver CM. Calcium bioavailability of calcium carbonate fortified soymilk is equivalent to cow’s milk in young women. J Nutr. 2005;135:2379–2382. doi:10.1093/jn/135.10.2379.

5. Zenk JL, Frestedt JL, Kuskowski MA. Effect of Calcium Derived from Lithothamnion sp. on Markers of Calcium Metabolism in Premenopausal Women. J Med Food. 2018;21(2). doi:10.1089/jmf.2017.0023.

6. Zhu Y-S et al. Solubilisation of calcium and magnesium from the marine red algae Lithothamnion calcareum. Int J Food Sci Technol. 2014;49:1603–1610.

7. Shkembi B, Huppertz T. Calcium Absorption from Food Products: Food Matrix Effects. Nutrients. 2022;14:180.

8. Muleya M et al. A comparison of the bioaccessible calcium supplies of various plant-based beverages. Food Research International. 2024.

9. Kafu-Quvane B, Mlaba S. Assessing the Impact of Quarrying as an Environmental Ethic Crisis. 2024.

10. USDA Agricultural Marketing Service. National Organic Program regulations and labeling guidance, current edition.

Scientific and regulatory limitation

This article is a technical knowledge resource, not legal advice or a finished-formula recommendation. Evidence from other Lithothamnion ingredients cannot be treated as direct proof for Litholife. Ingredient naming, organic claims, nutrient-content claims, permitted fortificants and finished-product labeling must be reviewed for each market. Product-specific nutrition, stability, sensory and sustainability claims require product-specific evidence.