

Industrializing an alternative source of phycocyanin from *G. sulphuraria* and driving side stream valorization





DHA ORIGINS®: a plant-based omega-3 that contributes to human health

Commercial

DHA
ORIGINS



Everzure™, BLUE ORIGINS®: a natural blue colorant and antioxidant

Pre-industrial

Blue
ORIGINS

Everzure™
Galdieria



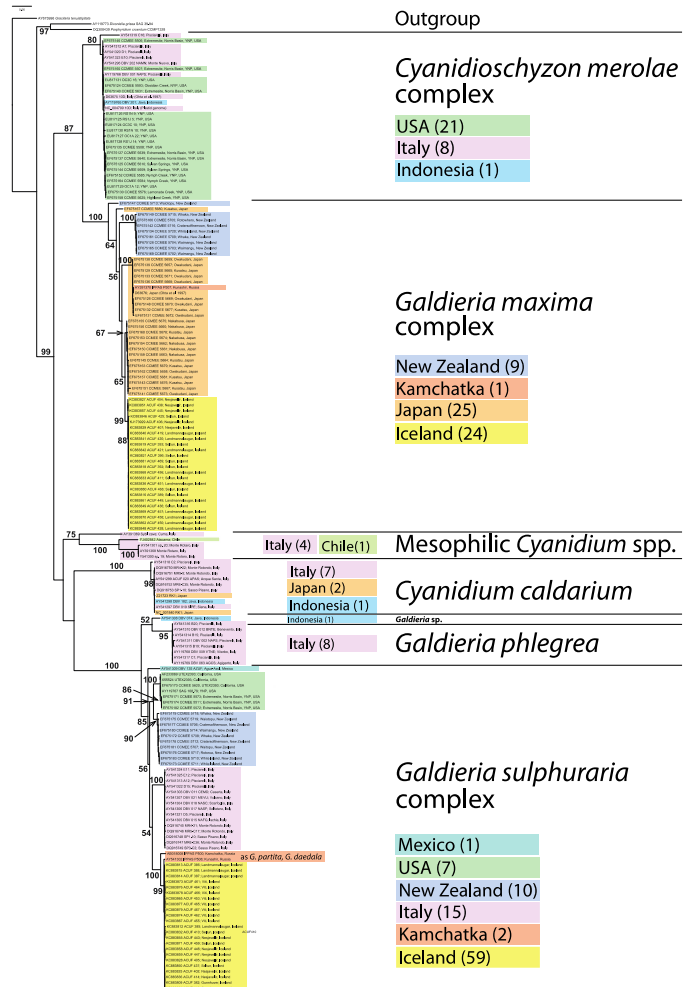
CARBON WORKS: industrializing CO₂ capture by microalgal photosynthesis

Development

 **SUEZ**


CarbonWorks
SMART NATURE SOLUTIONS

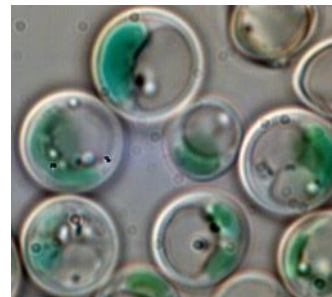
Another source of Phycocyanin



Ciniglia *et al.*, 2014

Galdieria sulphuraria

- * Extremophilic strain acidic pH (0 to 4) and up to 56°C
- * Mixotrophic and heterotrophic growth both possible
- * Consumes over 30 different carbon substrates including glucose
- * Culture in bioreactor
 - Biomass Productivity 50 to 100 x more than Spirulina
 - PC Productivity 20 to 30 x more than Spirulina

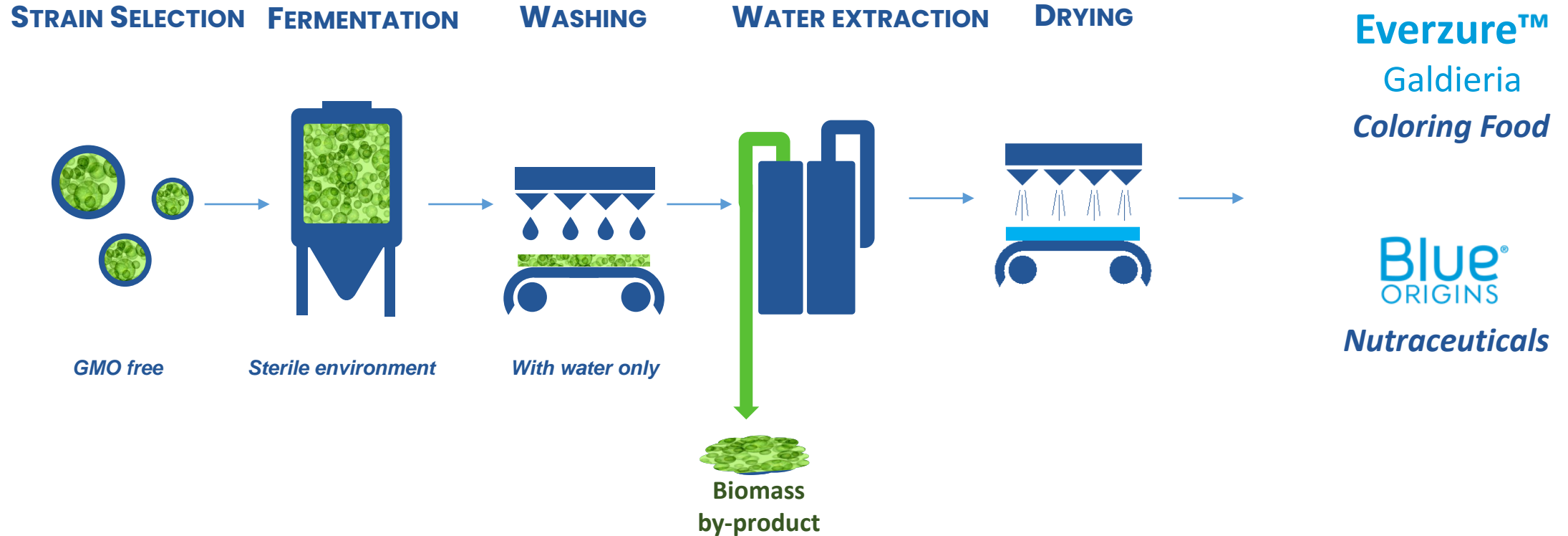


Mixotrophy



Heterotrophy

Industrialization



- ☑ **Complete traceability** from start to finish
- ☑ A pure product with **no external contaminants**
- ☑ **Produced in Europe**

- ☑ **Reliable supply** year-round
- ☑ A quality, **consistent product**

**The Blue
Shift**

Phycocyanin in Food and Beverage



Foods trends - Growing demand for natural colorants

Phycocyanin from Spirulina is currently the only alternative to the artificial blue colorants such as Patent Blue V (E131) or Brilliant Blue FCF (E133).



PC from Spirulina is not suitable for all food industry applications



Phycocyanin Performance: Spirulina vs Galdieria

Ice Cream



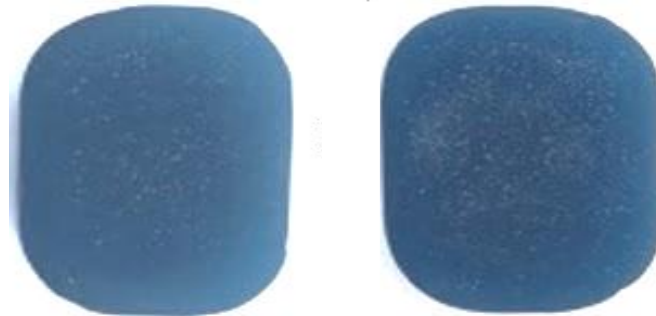
Spirulina



Galdieria



Confections



Spirulina



Galdieria



Acid Gummies



Spirulina



Galdieria



Galdieria is the Only Acid Stable Natural Blue Color Similar In Hue to Blue #1



Spirulina

Galdieria

Blue 1

+ Sweet Potato Color =



Purple

+ Beta-Carotene Color =



Green

How to Improve Sustainability and Profitability ?



1- Process Optimization

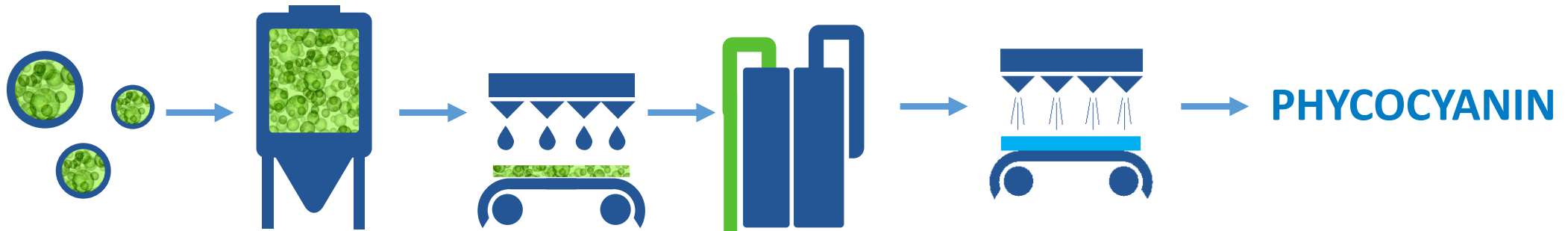
2- Sourcing

3- Valorization of side streams

Optimization, Sourcing, and Valorization the by-products

Process Optimizations

- ☑ Increase productivity
- ☑ Energy saving
- ☑ Water recycling



Glucose ~~X~~ Lactose
from dairy industry

Carbon alternatives

- ☑ Reduce carbon footprint

Co-Product Valorization

- ☑ Feed, Aqua, Pet Food
- ☑ Cosmetics
- ☑

Kalveā⁺ A Protein Rich Co-Product for Feed, Aqua and Petfood

RICH IN HIGHLY VALUABLE PROTEINS

- ✓ **Rich in proteins** (>60-65%)
- ✓ Rich in **Essential AA** (methionine, lysine)
- ✓ **Digestibility** (> 90%)

OTHER NUTRITIONAL ASPECTS

- ✓ Presence of **natural pigments** (phycocyanin) for Aox effects
- ✓ **Rich in fibers** for potential prebiotic effects
- ✓ Rich in minerals
- ✓ Rich in vitamins (B vitamins, vit E)

+ OTHER BENEFITS TO BE CONFIRMED



Galdieria Co-Product extract is a natural active for skin



Healthy Skin Barrier

Reconstructed Human Epidermis (RHE) confirming the promotion of healthy skin barrier

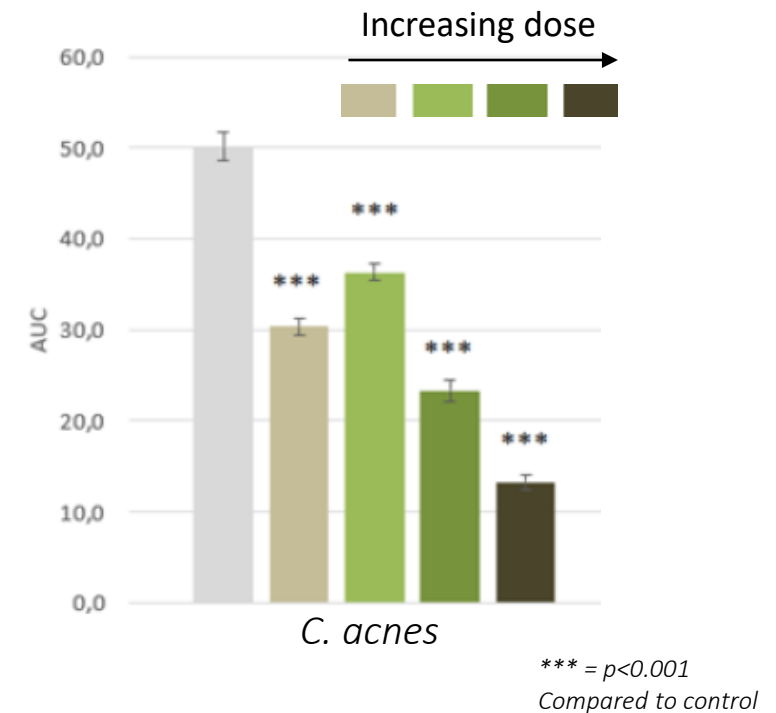
Proteomic analysis



Skin Microbiome Balance

inhibition of pro-acne bacteria

In vitro dose dependent significant effects





Thank you



October 2024