

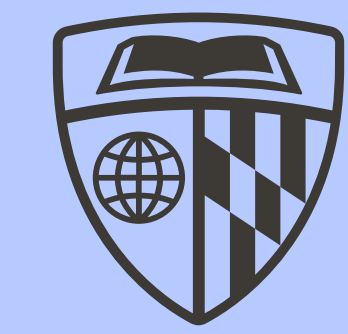


SEBANOVA

Stress Induced Acne Treatment

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JOHNS HOPKINS
WHITING SCHOOL
of ENGINEERING

Stressed? It Shows.

A Neurocosmetic Approach

Stress doesn't just affect mood—it can show up on skin. By disrupting hormones, inflammation, and the microbiome, stress can fuel breakouts. Traditional treatments target symptoms rather than causes of acne. Our neurocosmetic formulation takes a new approach, supporting skin and microbiome health while improving stability through its solid lipid emulsion.

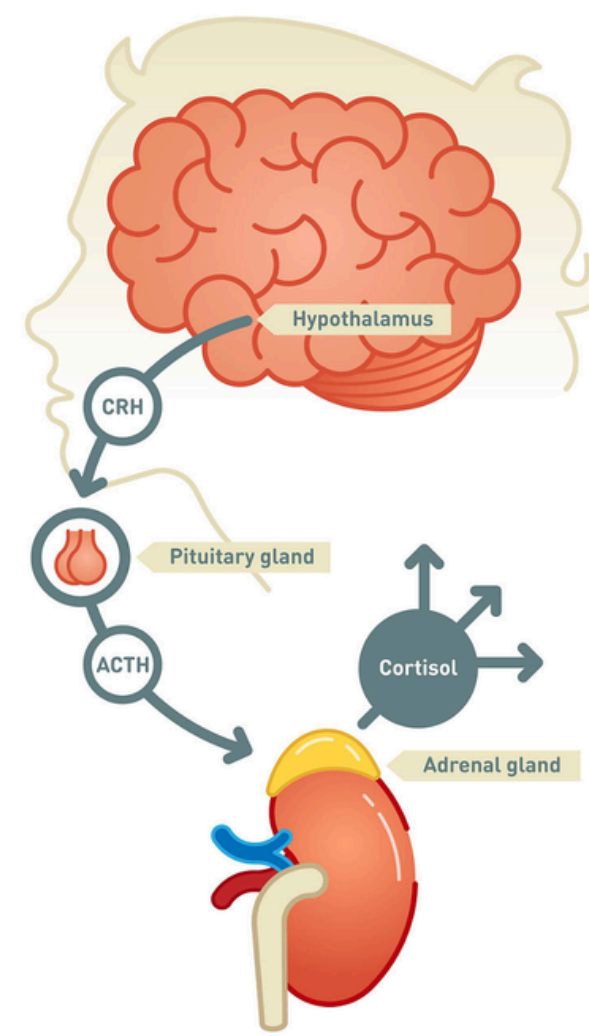


Skin Anatomy & Transport

HPA Axis:

The brain interprets stress and delivers the signal throughout the body via the hypothalamic pituitary adrenal axis. Cortisol is transported through the body as cortisone, and even produced in the skin to some extent. Cortisone is converted to cortisol by 11-Beta-Hydroxysteroid Dehydrogenase-1 in the skin, where it then acts to stimulate sebaceous glands. Overactive sebaceous glands cause oil buildup and *C. Acnes* growth.

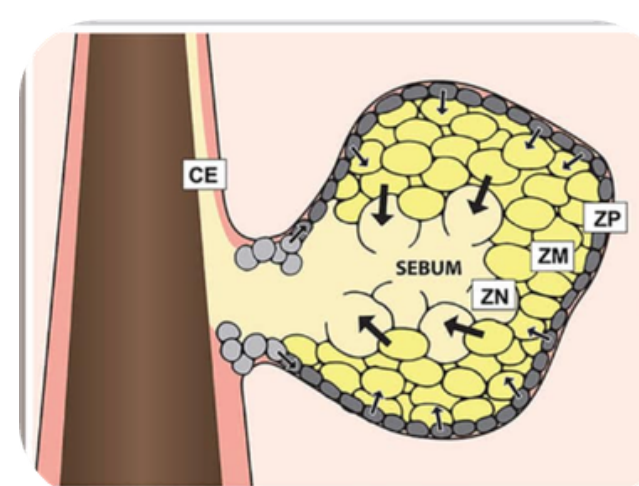
Our team targets 11B-HSD1 to reduce the skin response to stress, as well as the skin barrier and microbiome, to treat acne.



Skin Penetration:

Most ingredients of our formulation have good solubility in one or other of the phases in the emulsion. However, azelaic acid complicates this. Azelaic acid, as an acid, reduces the pH of our system, requiring a pH stabilizer NaOH to be added. The required amount of NaOH was calculated based on the Henderson Hasselbach equation.

Azelaic acid is also poorly soluble in our emulsion, meaning its diffusion is explained by the Higuchi model as opposed to Fickian diffusion. The solubility of azelaic acid can be improved through the addition of glycerine. In order to determine if glycerine would be necessary to improve the delivery of azelaic acid, the Higuchi model and Fickian model were solved for diffusivity, showing that the delivery would be greatly improved with the addition of glycerine.



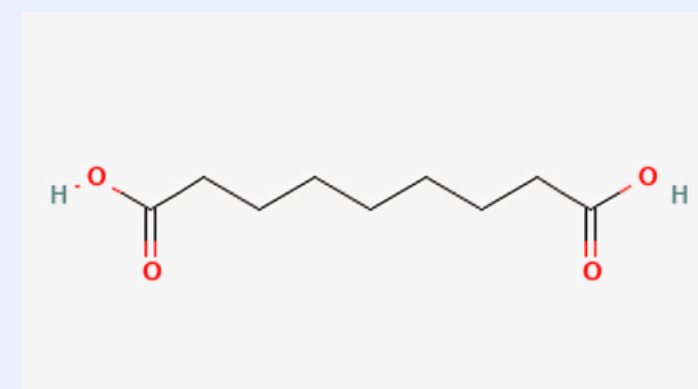
$$Q = \sqrt{D_{AB}(2C_0 - C_s)C_s t}$$

$$\frac{\partial C}{\partial t} = D_{AB} \frac{\partial^2 C}{\partial x^2}$$

$$\frac{Q}{M_{tot}} = 1 - \frac{8}{\pi^2} e^{-\frac{\pi^2 D_{AB} t}{L^2}}$$

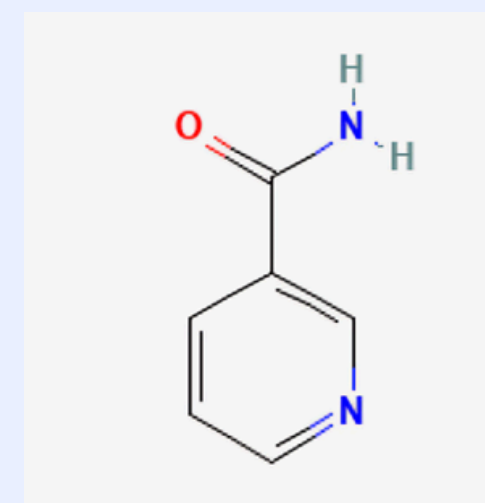
1 KEY INGREDIENTS:

Lactobacillus Ferment Lysate
Modulates the skin microbiome
Inhibits pathogenic strains of *C. acnes*



Azelaic Acid
Inhibits *C.Acnes* protein synthesis
Anti-androgenic
Ideal for sensitive skin

Niacinamide
Regulates keratinocytes in hair follicles to prevent clogging
Stimulates ceramide production to improve skin barrier



Japanese Indigo Seed Extract
Reduction of cortisol (70%) by preventing cortisone metabolism
Increase in dopamine and endorphins in the skin

Monotov 202: Botanical emulsion formula. Highly biocompatible, without the use of palm oil products

- Arachidyl Alcohol
- Behenyl Alcohol
- Arachidyl Glucoside



Our Product



	Ingredients	Wt%
Aqueous	Distilled Water	61.68%
	Xanthan Gum	0.44%
	Glycerine	3.49%
	Phenoxyethanol	0.87%
Organic	Lye (NaOH)	0.67%
	Rice Bran Oil	14.85%
	Monotov 202	3.49%
Cooled Emulsion	Glycerol Monostearate	3.00%
	Lactobacillus Ferment Lysate	3.00%
	Azelaic Acid	5.00%
	Indigo Seed Extract	0.10%
	Niacinamide	3.00%
	Purple Sweet Potato	0.40%

2 PACKAGING:

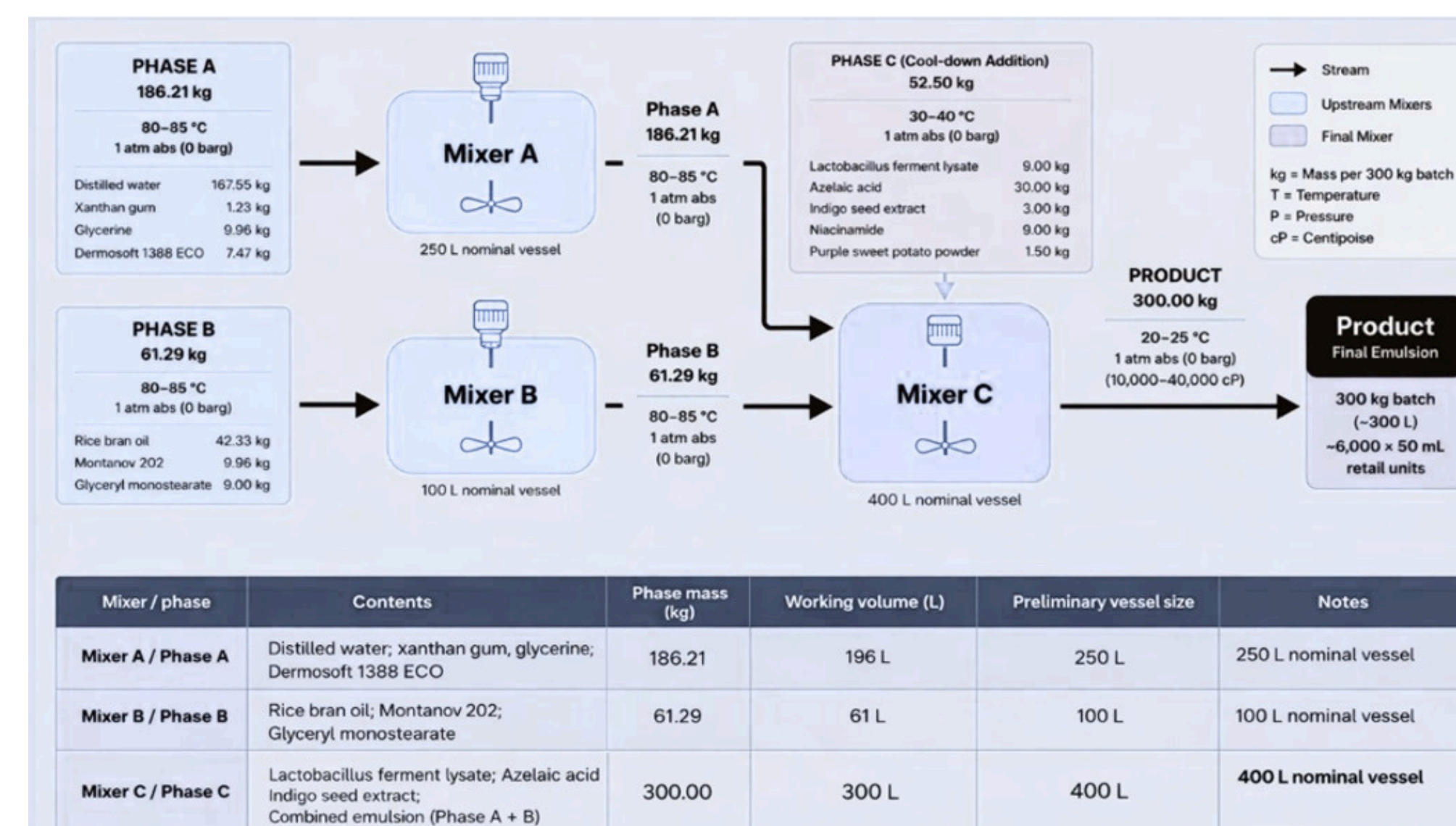
Opaque Bottle (50 mL):

- Protection from light: Indigo seed extract, purple sweet potato powder, rice bran oil

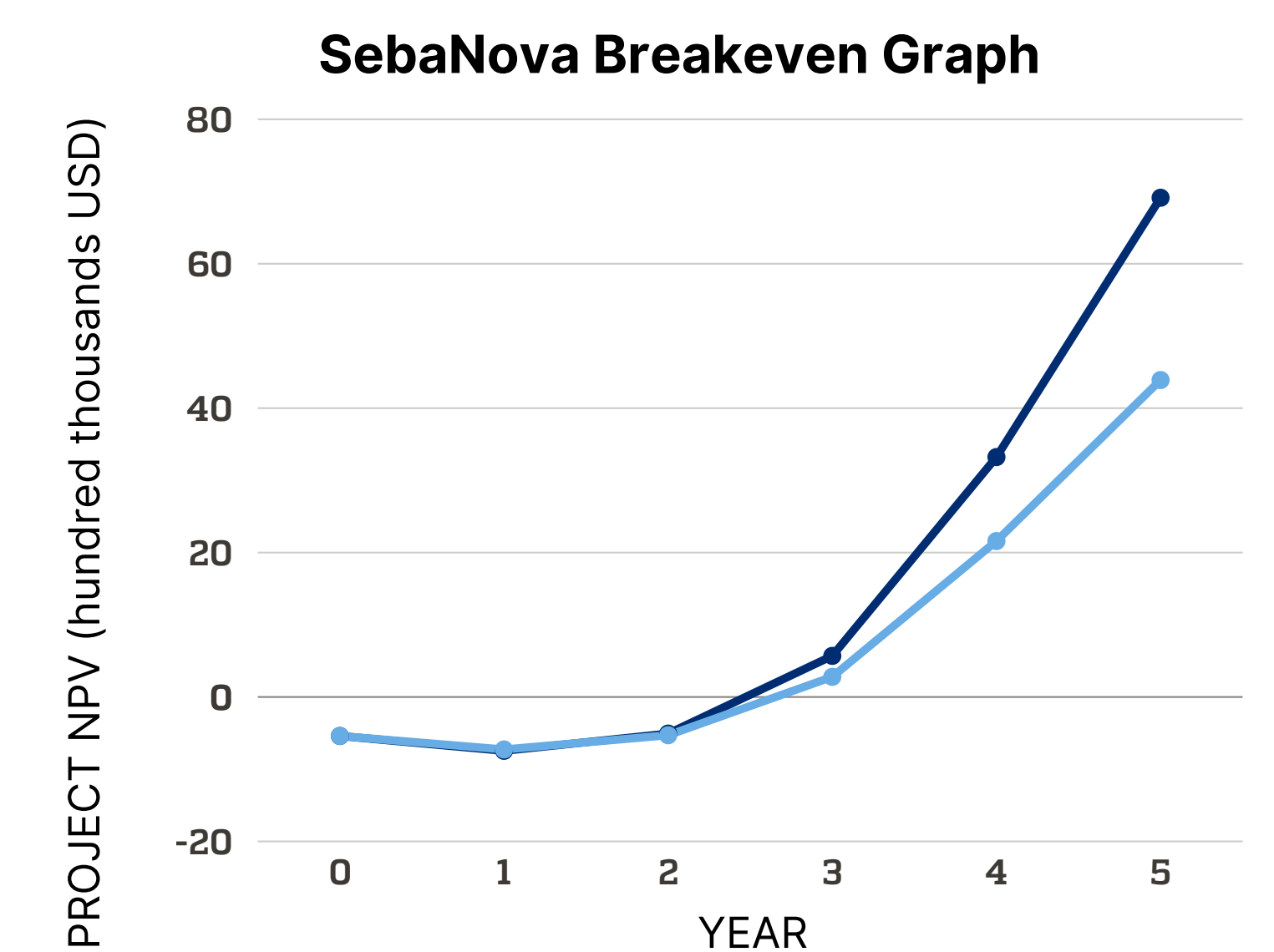
Airless Pump (0.5 mL):

- Vacuum piston
- Protection from oxidation: Lactobacillus and rice bran oil
- Maintains emulsion viscosity

3 MANUFACTURING PLAN:



- ## 4 FINANCIAL ANALYSIS:
- Capital and Business Costs:** Storage Warehouse (\$100,000), Marketing and Administration (\$600,000/yr).
 - Development and Operating Costs:** R&D/Market Testing (\$68,500), RMC (\$0.15/unit), Shipping (\$0.10/unit), Manufacturing (\$0.90/unit), Bottling (\$1.00/unit).
 - Other Costs:** Retailing (50% markup), Distribution (3% of revenue), Corporate Income Tax (35% of gross income).



Shows change in project NPV by summation of cash flows in first 10 years of operation. Navy is unadjusted cashflow while light blue incorporates a discount rate of 10%.

References & AI Disclosure

