Distinctive® Emul-Lipid BA

INCI: Polyglyceryl-10 Mono/Dioleate (and) Polyglyceryl-3 Oleate (and) Glycerin (and) Phosphatidylglycerol

December 31, 2013 rev.

DC3897

Bio-Active Emulsifier

Distinctive® Emul-Lipid BA is a unique, "*bio-mimetic",* oil-in-water emulsifier, offering a natural choice for improving product stability and performance while minimizing the potential of bio-incompatibility and irritation. It is derived from plant origin and can be formulated into a wide variety of o/w emulsions. Distinctive® Emul-Lipid BA is recommended for use in thin/low-viscosity emulsions where stability may be challenging. In addition, this emulsifier offers unique biological interactions for anti-aging, calming irritated skin, and skin hydration applications enabling the creation of base formulations which re-balance skin's natural regenerative processes, and support delivery of actives ingredients.

Distinctive® Emul-Lipid BA contains Phosphatidylglycerol (PG), an important constituent of cell membranes typically found in animal tissue at levels between 1-11% of the total lipid content. Research suggests PG offers a regenerative signaling pathway that prompts skin cells regulate cell proliferation and differentiation. It is this key, bio-identical constituent that helps make Distinctive® Emul-Lipid BA highly skin compliant and allows it to replenish naturally occurring components to the skin, rebalancing cellular homeostasis and restoring barrier function to protect against drying and environmental stress.

BENEFITS

- Hydrating/Moisturizing
- Cosmetic anti-aging benefits
- Unique sensory properties
- Unique "mini-emulsification" properties
- Rebalances cellular homeostasis
- Glycerol chemistry (PEG-free)
- Highly skin compliant
- 100% Plant Origin (Non-GMO)

APPLICATIONS

- Creams & Lotions
- Cleansers
- Hair care
- Sensitive skin
- Anti-aging
- Color cosmetics

TYPICAL PROPERTIES

Appearance	Liquid
Color	Dark Yellow to Light Brown
Odor	Characteristic
Specific Gravity	0.99 – 1.10
Loss on Drying (2 hrs, 2 grams, 105°C)	< 3.00

RESOURCES OF NATURE

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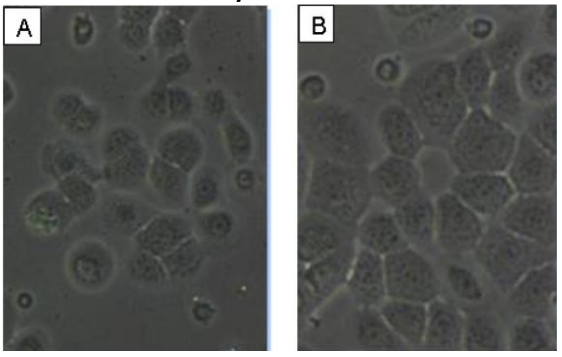
IN-VITRO STUDIES : Emul-lipid BA vs. Emul-lipid Control (No PG)

Human Gene Expression of Distinctive® Emul-lipid BA

TABLE II	Modulation of wnt pathway genes by 0.05% EMU-BA with phosphatidylglycerol, as compared to EMU-CTR (without phosphatidylglycerol).		
Position on array	Symbol	Fold Regulation vs. EMU CTR	Comments
C06	FRAT1	3.6	Activator of Wnt canonical signaling through inhibition of GSK-3.
C10	FZD2	2.0	Increased in differentiated tissues (Choi et al., 2008). Accordingly, Frizzled 2 increases the intracellular Ca^{2+} level, consistently with the role of this ion in keratinocyte differentiation (Niu et al., 2012).
D03	FZD8	7.3	Frizzled 8 decreases with age in progenitor cells. Its upregulation may "rejuvenate" these cells, making them more capable of tissue regeneration (Brunt et al., 2012).
D06	JUN	2.4	Jun is a target of Wnt canonical pathway. Jun is an early differentiation marker (Blatti & Scott, 1992; Murray et al., 2013) and an effector of TGF-beta – a key effector in skin homeostasis.
D07	KREMEN1	-2.1	Kremen1 (Krm1) is a negative regulator of the canonical Wnt signaling pathway.
E09	SFRP1	2.2	SFRP1 Induces differentiation, inhibits proliferation of epithelial cells and negatively regulates Wnt pathway.
F10	WNT10A	2.1	Induced by TGF-beta. Activator of WNT/β-catenin signaling. WNT10A, in addition to the formation of teeth and hair follicles, is of importance for the formation of nails, regeneration of the epidermis, papillae of the tongue and sweat gland function. Loss of function results in dry skin, abnormal hair patterns and nail malformations (Nawaz et al., 2009).
G10	WNT7B	2.0	Wnt7b plays an important role in stem cell homeostasis and in the tissue repair and regeneration (Lin et al., 2010; Kandyba et al., 2013).

8 out of 84 genes on the Wnt PCR array panel were differentially expressed by Emul-lipid BA. The directionality of the modulation indicates a controlled increase of expression of Wnt genes involved in proliferative/pro-regenerative progenitor cell homeostasis (FZD8, WNT7b, WNT10a), as well as cell differentiation (FZD2, JUN), consistent with the morphological changes observed microscopically (Fig. 2). This increase may be balanced by the negative regulator SFRP1, itself a powerful pro-differentiation effector. In conclusion, Emul-lipid BA is a bioactive material with progenitor (basal layer stem) cell - normalizing and skin -regenerative benefits, which could result in improved overall skin homeostasis.

Epidermal Human Keratinocytes Grown to a Differentiated State



Epidermal human keratinocytes grown in the presence of (A) Control and (B) Emul-lipid BA . Note the organized tight junctions between cells grown in the presence of Emul-lipid BA suggestive of a differentiated state, while cells in (A) are more scattered and isolated from each other, possibly geared towards further migration and/or proliferation (original mag. X100).

Modulating Hydration Related and Inflammatory Genes

TABLE II Gene expression in EMU-BA relative to EMU-CTR	AQP3	COX1	COX2 (PGS2)
Fold regulation	1.68	-1.07	-2.0

While the constitutively-expressed COX1 was not affected by Emul-lipid BA , the inducible proinflammatory COX2 was inhibited by Emul-lipid BA, while AQP3 was upregulated, as compared to the phosphatidylglycerol-free placebo Control

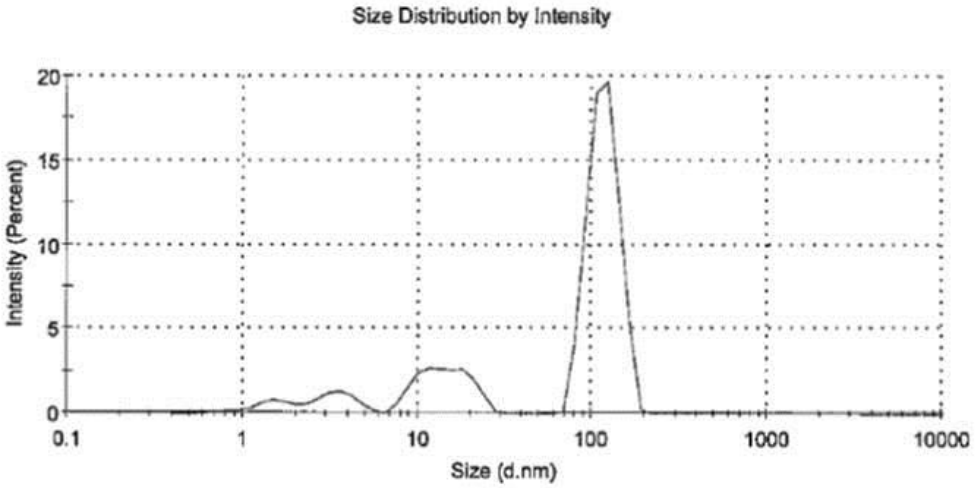
IN-VITRO STUDIES: Emul-lipid BA vs. Polysorbate 80

Collagen I Stimulation & Mitochondrial Metabolism in Human Dermal Fibroblasts

TABLE II Test Material	Type I Collagen (% Control)	p value	Mitochondrial Metabolism (% Control)	p value
H2O	100	1	100	1.000
Emu-BA 0.5% (5mg/ml)	60	0.000	84	0.028
Emu-BA 0.1% (1mg/ml)	51	0.000	81	0.007
Emu-BA 0.02% (200µg/ml)	102	0.712	107	0.202
PS80 0.5% (5mg/ml)	3	0.000	N/A	0.000
PS80 0.1% (1mg/ml)	3	0.000	12	0.000
PS80 0.02% (200µg/ml)	4	0.000	42	0.000
MAP	156	0.000	111	0.069

Emul-lipid BA is a non-disruptive emulsifier

IN-VITRO STUDIES: Evaluation of Droplet Size in Emulsion



Emul-lipid BA produces stable mini-emulsions

Distinctive® Emul-Lipid BA

INCI: Polyglyceryl-10 Mono/Dioleate (and) Polyglyceryl-3 Oleate (and) Glycerin (and) Phosphatidylglycerol

FORMULATION GUIDELINES

Recommended use level	2-6% to oil phase	Emulsifies high oil phases >30%
	Approx. HLB = 9	Compatible with organic UV filers
	Emulsifies a wide range of oils.	Formulate between pH 4.5 - 6.5

THIN SERUM Formula: RON19-44

PHASE	INGREDIENT	% BY WEIGHT
A	Water	qs
A	Cetyl Hydroxyethylcellulose	0.15
A	Glycerin	3.00
A	Xanthan Gum	0.20
A	Butylene Glycol	3.00
B	**Distinctive® Emul-Lipid BA (RON)**	**4.00**
B	Cetyl Alcohol	2.00
B	Dimethicone	2.00
B	Butyrospermum Parkii (Shea) Butter	3.00
B	Caprylic/Capric Triglyceride	3.00
B	**Vegelight 1214LC (RON)**	**5.00**
B	Dicaprylyl Ether	5.00
B	**Distinctive® Emul-Lipid ST (RON)**	**1.00**
C	Diocide	1.00
		100.00

PROCEDURES

- To the main vessel, add water and begin mixing with a propeller mixer.
- Add Cetyl Hydroxyethylcellulose and heat to 70°C-75°C.
- Premix Glycerin, Butylene Glycol and Xanthan Gum and add to batch.
- In a side container, combine Phase B ingredients and heat to 75-80°C.
- Add Phase B to Phase A, mix 15 minutes, until uniform.
- Begin cooling batch. At 40°C, add Phase C.
- Mix until uniform.
- Cool to Room Temperature.

Viscosity: 3600 cps

DISTINCTIVE® EMUL-LIPID BA SUNSCREEN Formula: RON20-30

PHASE	INGREDIENT	% BY WEIGHT
A	Water	q.s.
A	Cetyl Hydroxyethylcellulose	0.15
A	Glycerin	3.00
A	Xanthan Gum	0.20
A	Disodium EDTA	0.10
A	Citric Acid (25% solution)	0.04
B	**Distinctive® Emul-Lipid BA (RON)**	**6.00**
B	C12-15 Alkyl Benzoate	4.00
B	Ethylhexyl Methoxycinnamate	7.50
B	Butyl Methoxydibenzoylmethane	2.00
B	Homosalate	10.00
B	Ethylhexyl Salicylate	3.00
B	**Vegelight 1214LC (RON)**	**3.00**
B	Glyceryl Cocoate	0.70
B	Behenyl Behenate	0.50
B	Cetyl Alcohol	0.50
C	Tocopheryl Acetate	0.50
D	Phenoxyethanol (and) Ethylhexylglycerin	1.00
		100.00

PROCEDURES

- To the main vessel, add water and begin mixing with a propeller mixer.
- Add Cetyl Hydroxyethylcellulose and heat to 70°C-75°C. Mix at 75°C until fully hydrated.
- Premix Glycerin, Butylene Glycol and Xanthan Gum and add to batch. Add Disodium EDTA.
- In a side container, combine Phase B ingredients and heat to 75-80°C.
- Add Phase B to Phase A, mix 5 - 10 minutes, until uniform. Homogenize batch for 5 minutes at 75°C. Switch to propeller mixer and begin cooling batch.
- At 40°C, add Phase C. Mix until uniform.
- At 40°C, add Phase D. Mix until uniform.
- Cool to Room Temperature.

Viscosity: 3500 – 4000 cps
pH: 5.00 – 5.50

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Distinctive® Emul-Lipid BA

INCI: Polyglyceryl-10 Mono/Dioleate (and) Polyglyceryl-3 Oleate (and) Glycerin (and) Phosphatidylglycerol

SQUALANE BARRIER MILK Formula: RON19-63

PHASE	INGREDIENT	% BY WEIGHT
A	Water	q.s.
A	Cetyl Hydroxyethylcellulose	0.15
B	Glycerin	1.00
B	Xanthan Gum	0.10
C	Butylene Glycol	5.00
C	Lexgard Natural	1.20
D	Sodium Benzoate	0.20
D	Citric Acid 25% solution	0.15
E	**Distinctive® Emul-Lipid BA (RON)**	**6.00**
E	C14-C22 Alkane	8.00
E	Dicaprylyl Ether	8.00
E	Squalane	5.00
E	Farnesol	3.00
E	**Distinctive® Emul-Lipid ST (RON)**	**0.70**
		100.00

PROCEDURES

- To the main vessel, add water and begin mixing with a propeller mixer
- Add Cetyl Hydroxyethylcellulose and heat to 70-75°C.
- Premix Phase B ingredients and add to batch at 75°C.
- Add Phase C ingredients and mix until uniform.
- Add Phase D and mix until uniform.
- In a side container, combine Phase E ingredients and heat to 70-75°C.
- Add Phase E to main vessel mix 5 - 10 minutes, until uniform.
- Homogenize batch for 5 minutes at 70°C.
- Switch to propeller mixer and begin cooling batch.
- Cool to Room Temperature.

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