Oat Lipid e

DATA PACK

SUPERIOR OAT OIL WITH A UNIQUE LIPID PROFILE

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Oat Lipid e

Superior oat oil with a unique lipid profile

- **Unique lipid profile which also stabilises other oils :** This unique oil supports the skin health and confers stability to the unstable fats and oils.
- **Reduces lesions** and acts as a non-comedogenic emollient and functional oil, suitable for use in anti-acne products.
- **Outstanding skin absorbency** which results in a non-greasy skin feel.
- **Increases hair ceramide levels** and protects the hair from ceramide degradation due to UV light exposure, throughout the different hair structures (shafts, cuticle, and cortex).
- **Enhances hair shine and improves manageability :** It flattens the hair cuticles to smooth the hair texture and reduces tangle.

*image for illustration purposes only, actual product may vary

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● - NEW STUDY

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INGREDIENT PROFILE

Oat Lipid e is a superior oat oil with a unique lipid profile. The key characteristics of this functional ingredient include:

- Skin-identical ceramides
- Hydrating free fatty acids and triacylglycerols
- Beneficial sterols
- Natural antioxidants

*Product image for illustration purposes only, actual product may vary

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INTRODUCTION

Oat Lipid e's unique lipid profile will help to replenish skin and hair lipids lost through ageing and environmental factors.

CERAMIDES

Efficacy on Skin: Oat Lipid e contains approximately 1-2% skin-identical ceramides. Ceramides play a significant role in the structure and barrier function of the skin, such as preventing moisture loss and protecting against environmental damage.[1] Although the body naturally produces ceramides, levels in the skin decline with age (starting from 30-years-old).

	Oat Lipid e
Ceramides*	1-2%

Efficacy on Hair: Ceramides are a natural component of hair, found mainly in the cuticle, the outermost layer that protects and provides strength to the hair shaft. The cuticle is composed of dead cells that overlap with each other resembling roof shingles. Ceramides bind these "scales" of the cuticle together and in the case of healthy hair, result in smooth and silky strands. In damaged hair, ceramides are often significantly decreased, which results in dull, coarse and dry hair strands.[2]

FREE FATTY ACIDS

Efficacy on Skin: Oat Lipid e has approximately 9% natural free fatty acids. Although this percentage of free fatty acids is high in comparison to other similar oils, it is not a sign of degradation of the oil but means that these free fatty acids are freely available to go into the skin and act as a precursor to long chain fatty acids. Fatty acid deficiency contributes to a disrupted skin barrier. In dry skin conditions, long chain fatty acids like palmitic (C16) and stearic acids (C18) are known to be deficient.[3]

	Oat Lipid e
Free Fatty Acids* *of which*	9%
Palmitic Acid (C16)	14%
Stearic Acid (C18)	41%

Efficacy on Hair: Saturated and unsaturated fatty acids make up 85% of the total hair lipid content and are found in the cuticle and cell membrane complex. Although these lipids only make up 2-6% of the hair's overall weight, they play a crucial role in keeping hair healthy, influencing shine, feel and manageability.[4]

TRIACYLGLYCEROLS

Efficacy on Skin: High levels of triacylglycerols help to create a barrier on the surface of the skin, which helps to reduce skin dryness by decreasing the moisture loss.[5]

	Oat Lipid e
Triacylglycerol*	56%

Efficacy on Hair: Triacylglycerols help to increase the softness and smoothness of hair, reduce tangles and surface roughness.[6]

CHOLESTEROL/STEROLS

Efficacy on Skin: Oat Lipid e contains a high sterols level, which are known to contribute to overall skin wellbeing, particularly resilience and barrier function.[7]

	Oat Lipid e
Cholesterol / Sterols*	14%

Efficacy on Hair: Cholesterol and sterols provide healthy hair and scalp. It also nourishes and strengthens hair follicles and hair strands.[8]

*Indicative average typical values

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Oat Lipid e Profile

ANTIOXIDANTS

Efficacy on Skin: Tocotrienol and tocopherol (vitamin E) have antioxidant properties, to protect the stability of oils.[9] Oat Lipid e, thanks to its high level of tocotrienol and tocopherol, is a stable oil and will help the stability of other components.

	Oat Lipid e
Tocotrienol & Tocopherol*	400 ppm

Efficacy on Hair: Tocotrienol and tocopherol (vitamin E) support the scalp and give the hair a strong base to grow from by reducing oxidative stress and preserving the protective lipid layer. Vitamin E can replenish the protective layer (on the outside of the hair's cuticle) and bring back shine.[10]

CONCLUSION

Thanks to its unique profile, Oat Lipid e has many functional properties such as behaving as a moisturiser, a soothing agent and a replenishing antioxidant for skin and hair.

*Indicative average typical values

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CHEMICAL COMPOSITION

This section of the data pack evaluates the unique chemical properties of Oat Lipid e, including the analysis of ceramide, lipid, fatty acid, and antioxidant content. The high oxidative stability of Oat Lipid e is demonstrated compared to other oils.

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Ceramide Content Analysis

BACKGROUND

The study was designed to analyse the ceramide content of Oat Lipid e.

METHOD

Ceramide content was measured using the sphingolipid analysis as described by Markham and Jaworski (2007)[1]. A single solvent system with reversed-phase high-performance liquid chromatography coupled to electrospray ionization tandem mass spectrometry detection was used. This enabled the sphingolipids from Oat Lipid e to be separated and measured.

RESULTS

The results indicate an average total ceramide content in Oat Lipid e of 1-2% of total lipids. Analysis of the ceramide classes showed the following fractions:

Ceramide Classes	Skin Identical Ceramides Including Isomers	Skin Identical Ceramides Including Isomers and Analogs
Non-hydroxy-sphingosine (NS)	3%	23%
Non-hydroxy-phytosphingosine (NP)	35%	35%
Omegahydroxy-6-hydroxy-sphingosine (EOH)	6%	27%
Alphahydroxy-sphingosine (AS)	6%	12%
Alphahydroxy-phytosphingosine (AP)	3%	3%

Skin ceramides are divided into 12 classes of which there are hundreds of sub-species. These account for 40%-50% of the lipids in the stratum corneum.

CONCLUSION

Oat Lipid e contains a large varieties of ceramide classes. Ceramides form part of the barrier of the skin, which work to prevent excessive water loss and protect the skin from external aggressors. In the hair, ceramides are found in the cuticle, the outermost layer of the hair, protecting and providing strength to the hair shaft.

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Lipid and Fatty Acid Profile Comparison

BACKGROUND

An analysis of the lipid and fatty acid profiles of commonly used cosmetic oils was undertaken and compared to that of Oat Lipid e.

METHOD

Lipid Extraction and Fatty Acid Analysis

Oils were made up with Chloroform: Methanol according to the method of Folch et al. (1957). Fatty acid methyl esters (FAME) were prepared by acid-catalysed transesterification of total lipids according to the method of Christie et al. (2003). Extraction and purification of FAME was performed as described by Ghioni et al. (1996). FAME were separated by gas-liquid chromatography. Individual methyl esters were identified by comparison to known standards and by reference to published data (Ackman, 1980). Fatty acid content per gram of tissue was calculated using heptadecanoic acid (17:0) as internal standard.

Lipid Class Analyses

Oil lipid class compositions were determined by single-dimension double-development high performance thin-layer chromatography according to the method of Henderson and Tocher (1992). Lipid classes were quantified by charring followed by calibrated scanning densitometry using a Camag 3 Scanne. Identities of individual classes were confirmed by comparison with reference to Rf values of authentic standards run alongside samples.

RESULTS

The results show that Oat Lipid e is unique amongst the oils tested for containing a polar lipid fraction along with a balanced saturated, monounsaturated, and polyunsaturated profile.

	Lipid Profile* (%)			Fatty Acid Profile* (%)		
	Total Neutral Lipids#	Pigmented Material	Total Polar Lipids	Total Saturated	Total Mono-unsaturated	Total Poly-unsaturated
Oat Lipid e	**87**	**3**	**10**	**17**	**43**	**40**
Almond Oil (Sweet)	99	1	0	10	65	25
Argan Oil	97	3	0	19	52	29
Canola Oil	97	3	0	9	54	37
Daikon Radish Seed Oil	96	4	0	11	69	20
Jojoba Golden Oil	98	2	0	1	98	1
Macadamia Nut Oil	98	2	0	18	77	5
Meadow Foam Oil	99	1	0	1	81	18
Rosehip Oil	96	4	0	6	15	79
Hemp Oil	96	4	0	11	15	74
Wheat Germ Oil	92	5	3	18	14	68
Safflower Oil	97	3	0	12	15	73

*These typical levels of naturally occurring molecules may vary between batches.
#without pigmented material

CONCLUSION

Oat Lipid e contains a unique ratio of lipids and fatty acids. Fatty acids contribute to the skin barrier function and play a crucial role in keeping hair healthy.

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Antioxidant Profile Comparison

BACKROUND

An analysis of the antioxidant content of commonly used cosmetic oils was undertaken and then compared to that of Oat Lipid e.

METHOD

Tocopherol and tocotrienol content in Oat Lipid e, was analysed following ISO 9936:2016. The content of free alpha-, beta-, gamma-, and delta-tocopherols and tocotrienols (referred to jointly as tocos) in vegetable fats and oils were determined by high-performance liquid chromatography (HPLC).

RESULTS

The results show that Oat lipid e contains potent natural antioxidants, including tocotrienols, tocopherols, together with alkyl phenolates, which are known to be as effective as Butylated hydroxytoluene (BHT) in an antioxidant capacity.

	Tocotrienol (ppm)*					Tocopherol (ppm)*				
	Alpha	Beta	Gamma	Delta	Total	Alpha	Beta	Gamma	Delta	Total
Oat Lipid e	**314.4**	**41.1**	**4.4**	**3.9**	**356.4**	**96.0**	**9.9**	**31.4**	**32.7**	**116.8**
Wheatgerm Oil	2.5	8.2	0.2	<LOQ	10.9	191.0	65.0	<LOQ	0.6	256.6
Coconut Oil	3.0	17.0	0.6	0,1	20.6	0.2	<LOQ	0.1	<LOQ	0.3
Corn Oil	0.9	<LOQ	1.1	0,26	2.0	18.0	1.1	44.0	2.2	65.3
Sesame Oil	<LOQ	<LOQ	0.3	<LOQ	0.3	7.9	0.4	36.0	1.2	45.5
Walnut Oil	<LOQ	<LOQ	0.2	<LOQ	0.2	6.6	<LOQ	39.0	4.6	50.2
Linseed Oil	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ	1.2	<LOQ	52.0	1.0	54.2
Sunflower Oil	0.1	<LOQ	<LOQ	0.3	0.4	59.0	2.4	1.4	0.3	63.1
Rapeseed Oil	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ	24.0	<LOQ	39.0	1.0	64.0
Camelina Oil	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ	3.8	0.1	72.0	1.3	77.2

* These typical levels of naturally occurring molecules may vary between batches.

CONCLUSION

Oat Lipid e has a high content of tocotrienol and tocopherol, which provide antioxidant properties.

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Oxidative Stability

BACKGROUND

Oil rancidity is the result of the oxidation or hydrolysis of unsaturated fats into short chain aldehydes and ketones giving rise to an unpleasant odour and taste. It is generally expected that oils containing high levels of unsaturated fats are less oxidatively stable than those with lower levels. A study was undertaken to assess and compare the oxidative stability of Oat Lipid e against two other oils rich in unsaturated fatty acids - Sunflower Oil and Wheat Germ Oil.

METHOD

A RapidOxy machine was used to test the oxidative stability of the test materials by increasing temperature (to 140°C) and oxygen pressure (7 bar initial) to accelerate the oxidative process. Sample oxidation is indicated by a fall in pressure to 20% of maximum pressure inside the oxidation chamber. The time taken to reach the set decrease in pressure is the induction period, a key characteristic of the oxidation curve that is expressed in minutes.

RESULTS

Figure 1:
Oxidative Stability of Oat Lipid e

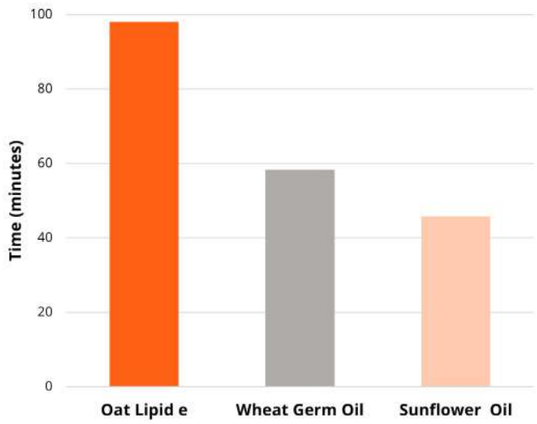

Table 1:
Level of unsaturated fatty acids content of tested oils

Oils	Unsaturated Fatty Acid Content*
Oat Lipid e	83%
Wheatgerm	82%
Sunflower	91%

The results demonstrated that Oat Lipid e was significantly more stable than wheat germ oil, with sunflower oil being the least stable.

*These typical levels of naturally occurring molecules may vary between batches.

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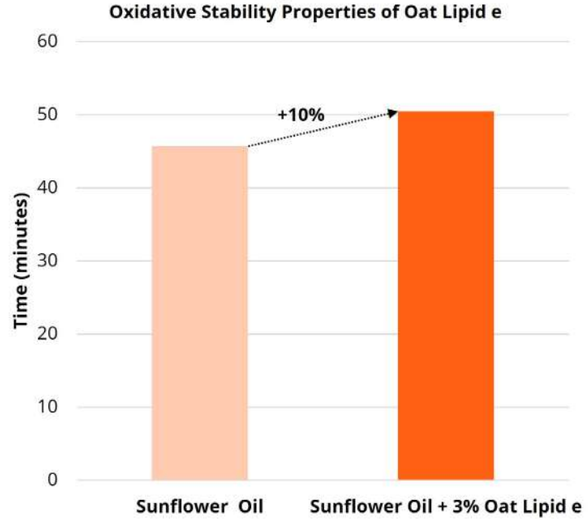
RESULTS (CONT.)

Figure 2:
Oxidative Stability Properties of Oat Lipid e



3% Oat Lipid e was added to the sunflower oil (which has a lower oxidative stability), this resulted in a 10% improvement in the time taken for sunflower oil to reach the 20% cut off point.

CONCLUSION

This study shows that Oat Lipid e is not only an inherently stable oil but that it also confers stability to unstable fats and oils. Oat Lipid e's rich antioxidant profile, including caffeic acid, ferulic acid, tocotrienols and tocopherols, has a significant effect on the inherent stability of Oat Lipid e, making it far more stable than its unsaturated lipid profile would indicate. These antioxidants can be donated to act as stabilisers for other oils in a shared system. It has been claimed that oat oil inhibits skin lipid peroxidation in response to ultraviolet irradiation of the skin. Skin lipid peroxidation can lead to skin ageing and inflammatory responses. This study indicates that this claimed inhibition may be due to the same mechanism described above.

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EFFICACY ON SKIN

Oat Lipid e is a superior oat oil with a unique lipid profile. This section of the data pack presents the variety of studies carried out as part of a rigorous research and extensive development process to demonstrate Oat Lipid e skin efficacy. The results demonstrate that Oat Lipid e is a non-comedogenic ingredient that helps to reduce lesions. Oat Lipid e has excellent absorbency and protective properties, as well as moisturising and skin soothing properties.

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IN VIVO

BACKGROUND

A study was undertaken to assess the comedogenicity potential (tendency of a product to clog pores) of Oat Lipid e. The objective of the study was to evaluate whether Oat Lipid e caused non-inflamed lesions (comedones) or inflamed lesions when used regularly over a 28-day period.

METHOD

Product Treatment

A single-centre, open-controlled user study was carried out on 30 female participants, aged 19 to 41 years old. Participants applied 100% Oat Lipid e, on the face every morning, for 28 days.

Assessment of Comedogenicity Potential

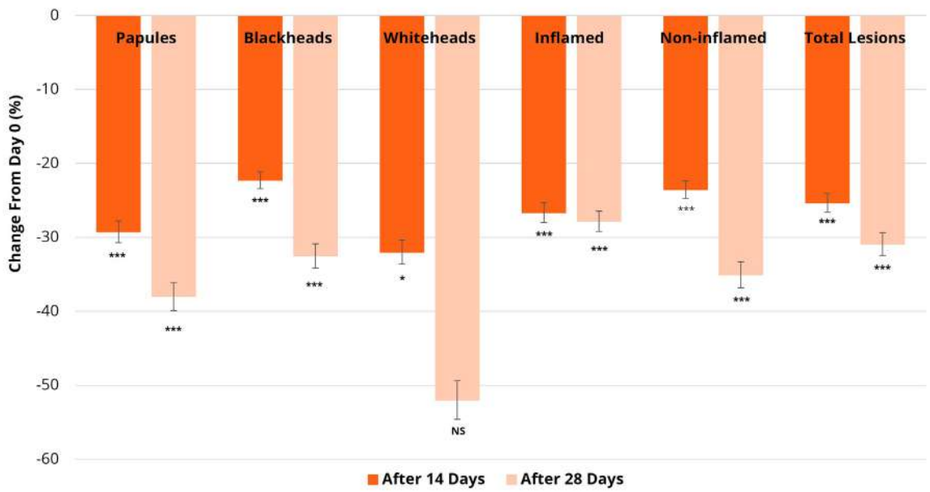
Participants had facial comedones (non-inflamed lesions – blackheads and whiteheads) and inflamed lesions (papules) counted on their forehead, cheeks, and chin (but not the nose), at day 0 (baseline, before product application), at day 14 and 28. The lesion count was performed by a trained assessor under standard Northlight, using a x4 magnification Northlight lamp. The lesion counts were performed by the same assessor at each time-point.

Assessment of Dermal and Subjective Tolerance

Participants were questioned about the tolerance of Oat Lipid e at day 14 and 28. A trained assessor reviewed the full face for signs of subjective irritation on the face (stinging, tightness, itching, redness and warm/burning sensations). Each subjective tolerance parameter was recorded using a 5-point scale: 0 = None, 0.5 = Very slight, 1 = Slight, 2 = Moderate, 3 = Severe.

RESULTS: COMEDOGENICITY POTENTIAL

Figure 1:
Total Inflamed and Non-inflamed Lesions After 28 Days of Use of Oat Lipid e



With the application of Oat lipid e, all lesion counts decreased after 14 days and continue after 28 days post-baseline assessments. There were no statistically significant increases in any lesion counts at day 14 or day 28 of the study. Therefore, Oat Lipid e can be considered non-comedogenic.

Significant: ***=p<0.001, *=p<0.05 (95%), NS= Non significant

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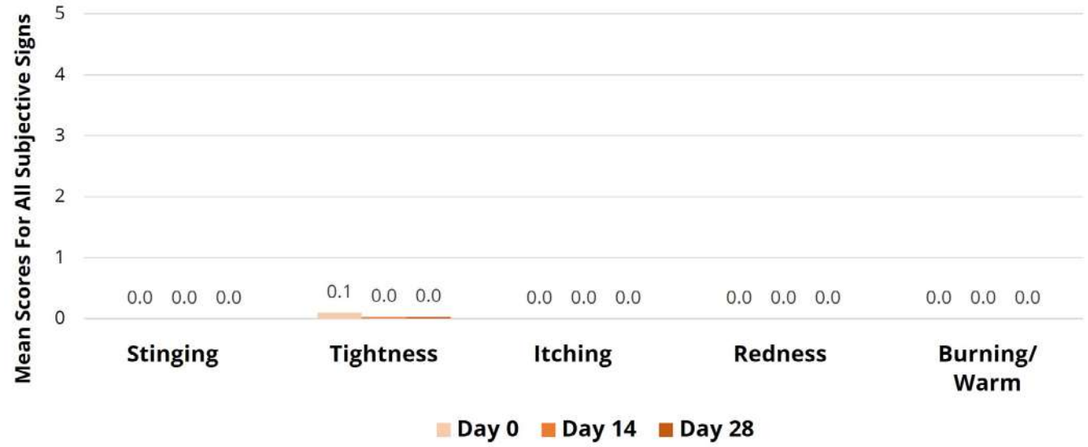
Non-Comedogenicity

IN VIVO

RESULTS: SUBJECTIVE TOLERANCE

Figure 2:
Subjective Tolerance After 28 Days of Use of Oat Lipid e



Assessments made by the trained assessor showed no negative reaction, whilst participants themselves felt a reduction in skin tightness when using Oat Lipid e.

CONCLUSION

These results show Oat Lipid e to be non-comedogenic.

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Consumer Perception Evaluation:
Effect of Oat Lipid e on Excessive Handwashing

IN VIVO

BACKGROUND

Excessive washing of the hands can have a significant impact on overall skin health and appearance. The skin cells in the stratum corneum, the outermost layer of skin, contain water-soluble compounds that absorb water from the lower layers. Each of these skin cells are surrounded by lipids: fats which prevent water on the skin from evaporating into the external environment. Excessive water and cleanser exposure may rid the skin of this protective lipid barrier, which functions to keep skin optimally supple and comfortable. A hand washing trial was performed to assess the ability of Oat lipid e to repair and replenish the skin. Participants were asked to compare a hand cream containing 5% Oat Lipid e and a placebo cream.

METHOD

Product Treatment

For 28 days, 35 participants, men and women aged between 16 to 60 with different skin types (dry, oily or combination), had to regularly wash their hands, at least 5 times a day, for 20 seconds or more, with antibacterial soap. After doing this for 7 days and applying no product, the participants were asked to apply the hand cream containing 5% Oat Lipid e for 7 days and the placebo for 7 other days. The participants continued to excessively wash their hands throughout the full 28 days. To ensure the trial was fair, 50% of participants applied the placebo first and 50% applied Oat Lipid e first.

Subjective Evaluation

Assessment of the efficacy of the product was performed through a self-assessment questionnaire. Data was analysed by AGR systems in real time (Ayton System Software).

The following formulation was used in this study:

Phase	Trade Name	INCI	% w/w
A	Purified Water BP	Aqua	71.550
A	Mekirol Rapeseed	Glycerin, Aqua	2.500
A	Euxyl PE9010	Phenoxyethanol, Ethylhexylglycerin	1.000
B	Surfac MCTG	Caprylic/Capric Triglyceride	8.000
B	**Oat Lipid e**	***Avena sativa* (Oat) Kernel Oil**	**5.000**
B	Cutina GMS V	Glyceryl Stearate	3.500
B	Surfac Stearic Acid	Stearic Acid	3.500
B	Lanette O	Cetearyl Alcohol	2.850
B	Beeswax	Cera Alba	1.000
B	Surfacare Vit E Acetate	Tocopheryl Acetate	0.200
C	Surfac Triethanolamine Pure 90%	Triethanolamine, Aqua	0.900

*Placebo formulation was identical minus 5% Oat Lipid e – remaining % was made up with water.

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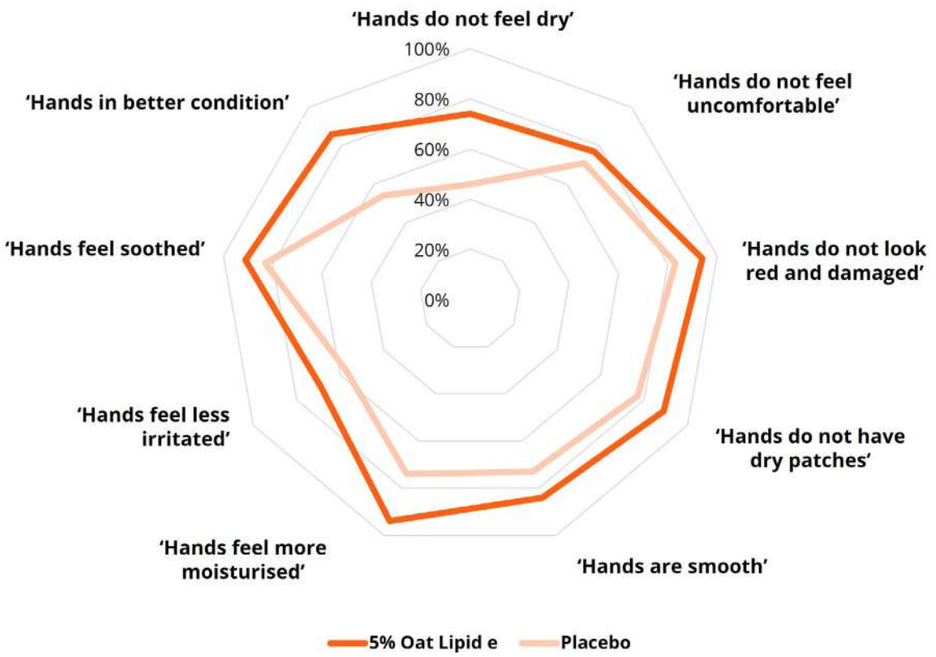
Consumer Perception Evaluation:
Effect of Oat Lipid e on Excessive Handwashing

IN VIVO

RESULTS

The participants were asked identical questions regarding the condition of their skin after 7 days of excessive handwashing (before applying the product), after applying Oat Lipid e and after applying the placebo. Figure 1, represent the percentage of participants "Strongly agree"/"Agree" with following parameters:

Figure 1:
Subjective Evaluation of the Efficacy of Oat Lipid e After Excessive Handwashing



For each skin parameters, participants rated Oat Lipid e better, in term of moisturisation, smoothness, comfort, irritation and redness compared to the placebo.

CONCLUSION

The polar lipids (ceramides and phospholipids) and neutral lipids (phytosterols and PUFAs) found in Oat Lipid e replenish the skin's lipid barrier and restore the hydrolipidic film following disruption. Ceramides, phospholipids and phytosterols, which are known as a key part of the stratum corneum's "cement", can migrate between cells and help to restore the skin barrier, whilst PUFAs stay on the surface of the skin and help to prevent trans-epidermal water loss (TEWL). This is verified with this consumer evaluation which shows that 5% Oat Lipid e alleviates signs of skin damage, improves hydration and smooths the skin.

Independently tested by Ayton Global Research, Aug 2020

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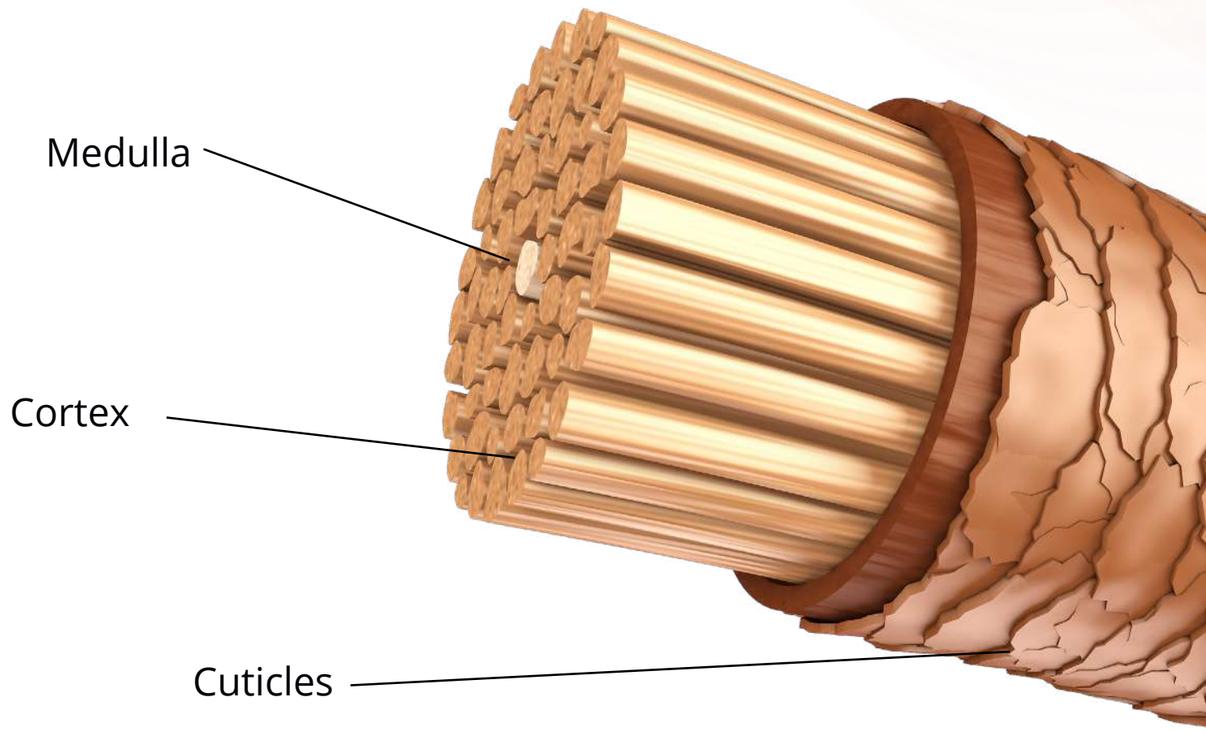
EFFICACY ON HAIR

Oat Lipid e is a superior oat oil with a unique lipid profile. This section of the data pack presents the variety of studies carried out as part of our rigorous research and extensive development process to demonstrate Oat Lipid e hair efficacy.

The results demonstrate that Oat Lipid e increases ceramide levels. Oat Lipid e can flatten the hair cuticles, enhancing shine, smoothing the hair, and improving hair manageability.

HAIR STRUCTURE

Hair shaft is composed of cuticle, cortex, and medulla. The cuticle is the outermost protective layer that provides sensory and shine characteristics. The cuticles overlap like roof shingles, protecting the hair from chemical and physical treatments.[1] The cortex is the major component of hair and is responsible for its mechanical strength and pigmentation.[1] The innermost layer is the medulla. The structural integrity of hair is due to its specific chemical composition, primarily keratin proteins, lipids and water. These proteins are complex natural compounds that contribute to hair's physicochemical properties. Hair is also comprised of 1-9% lipids, which contribute to enhanced conditioning properties such as flexibility, surface gloss, and lubricity of hair.[2] The majority of lipids are cholesterol, free fatty acids, triglycerides and ceramides. Lipids in the internal part of hair provide structural reinforcement and rigidity.



Ceramide Protection – Leave On

Type 1 and 2 Hair

EX VIVO

BACKGROUND

Ceramides are lipids that naturally occur in the hair strand. Their main purpose is to act like the glue that helps the cuticle layer lay flat and remain intact. Healthy hair needs a tightly packed cuticle layer to maintain its strength, elasticity and shine. Without it, hair becomes vulnerable to unwanted damage. Although ceramides occur naturally in the hair, UV exposure, overuse of chemical treatments, excessive use of heat appliances and over-cleansing in time depletes ceramides and leads to raised cuticles. This results in a loss of moisture, making the hair dry and frizzy. A blind study was designed to evaluate the ceramide protective efficacy of Oat Lipid e after exposure to UV light.

METHOD

Properties of Hair Tresses Tested	
Hair Type	1,2
Hair Colour	Blonde
Hair Length	9 inches
Hair State	Bleached
Ethnicity	Caucasian

	Control (Untreated) (3 Hair tresses)	**Vehicle Control + UV Exposure** (3 Hair tresses)	**0.5% Oat Lipid e + UV Exposure** (3 Hair tresses)
Hour 0	**Hair Shaft Treatment**		
10 minutes		**Hair tresses were dipped into the vehicle control (C12-15 Alkyl Benzoate)**	**Hair tresses were treated with 0.5% Oat Lipid e in vehicle control, (C12-15 Alkyl Benzoate)**
		Hair tresses were transferred onto an inert grid, the excess of the product was eliminated	**Hair tresses were transferred onto an inert grid,** the excess of the product was eliminated
		Hair was dried by natural air circulation	**Hair was dried by natural air circulation**
Hour 1	**Stress Conditions**		
6 Hours		**UVA irradiation 365nm, giving a total dose of 84J/cm²**	**UVA irradiation 365nm for, giving a total dose of 84J/cm²**
Hour 7	**Hair tresses were sampled, prepared, embedded in OCT for cryopreservation and conserved until analysis**		

Image Collection and Analyses

Hair shaft sections were obtained using a cryostat (Leica) for the sagittal view.

Assessment of Ceramide Levels

Ceramides were detected by using a primary specific antibody, then revealed using a secondary antibody coupled with a fluorophore.

Quantification of ceramides levels was performed on the cuticle, cortex regions and on total surface of sagittal hair slices (hair shaft cross sections) by the integration of the intensity of fluorescence signal normalised by the evaluated area or visualised on the cuticle surface.

Visual Assessment of the Protection Effect

Fluorescent images were collected with an epi-fluorescent microscope and analysed with ImageJ software.

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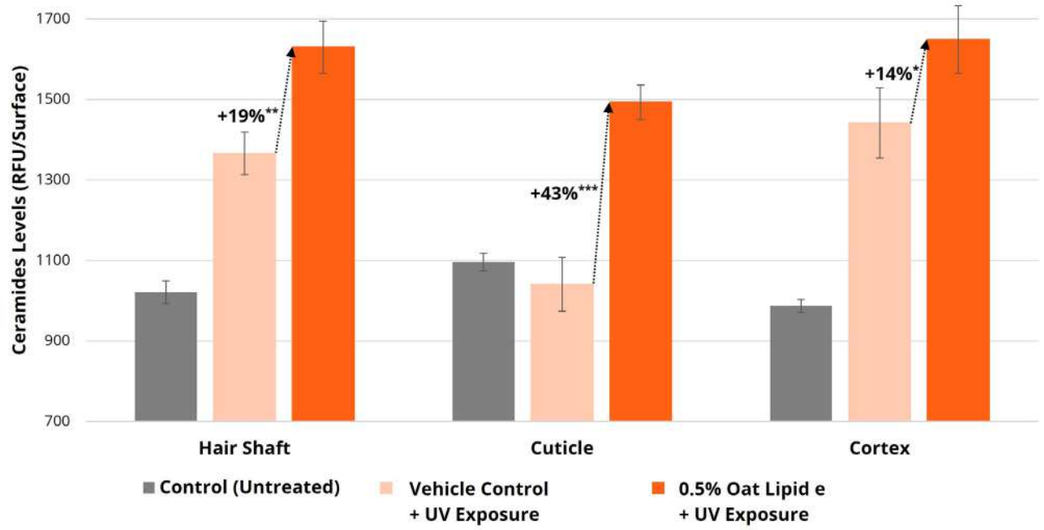
Ceramide Protection – Leave On

Type 1 and 2 Hair

EX VIVO

RESULTS

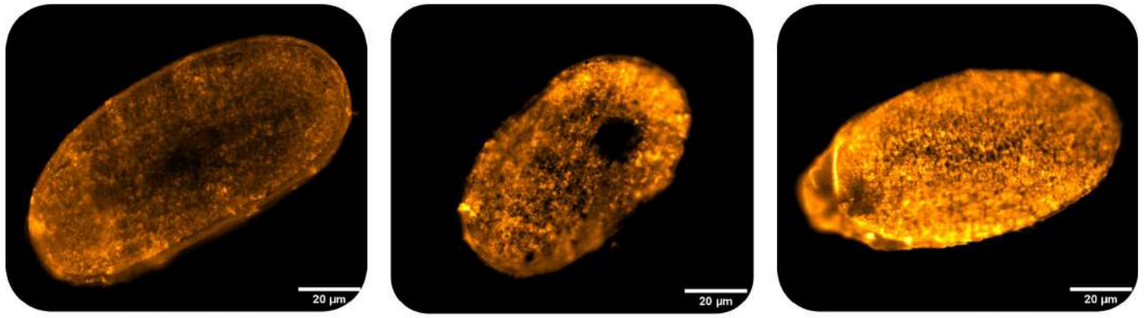
Figure 1:
Ceramide Levels on the Hair Shaft, Cuticle and Cortex After UVA Exposure



A significant increase of ceramides is observed on hair shaft, cortex, and cuticle regions, upon 0.5% Oat Lipid e application in presence of UVA-stress. When compared to the control (not treated and not exposed to stress):

- +60%*** of ceramides with 0.5 % Oat Lipid e on the whole sagittal section of hair.
- +67%*** of ceramides with 0.5 % Oat Lipid e on the cortex region
- +36%*** of ceramides with 0.5 % Oat Lipid e on cuticle region.

Figure 2:
***In situ* Visualisation of Ceramides - Sagittal View (40x Objective)**



Untreated | Vehicle Control + UV Exposure | 0.5% Oat Lipid e + UV Exposure

Significant: ***=p<0.001, **=p<0.01 (99%) and *=p<0.05 (90%)

Independently tested by Centro de Tecnologia Capilar, Dec 2022

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Ceramide Protection – Leave On

Type 1 and 2 Hair

EX VIVO

RESULTS (CONT.)

In situ detection of ceramides (carbonylation) was performed by epifluorescence microscopy on sagittal sections (Figure 2). The application of 0.5% Oat Lipid e increases the ceramides levels in hair fibres, when compared to the control and vehicle control.

CONCLUSION

Oat Lipid e protects ceramide degradation from UV light, in the different hair regions (shafts, cuticle and cortex). Protecting ceramides from damaged hair can improve the binding of the scales of the cuticle and restore the natural properties of the hair. Ceramides keep the hair cuticle flat, helping to smooth hair, enhance shine, promote elasticity and aid in strengthening hair.

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EX VIVO

Hair Shine – Rinse Off

Type 1 Hair

BACKGROUND

Healthy hair with smooth outer cuticles will reflect light and give the hair a shiny appearance. Environmental conditions such as pollution, UV exposure, dry or cold air and the use of harsh products or styling tools (heat styling) can cause dull hair. Dull hair tends to lack moisture which is caused by damaged cuticles. The study was designed to determine the potential of Oat Lipid e to increase hair shine compared with a placebo and a competitor.

METHOD

Properties of Hair Tresses Tested	
Hair Type	1
Hair Colour	Blonde
Hair Length	9 inches
Hair State	Natural
Ethnicity	Caucasian

Placebo (5 Hair tresses)	**1% Silicone** (5 Hair tresses)	**0.5% Oat Lipid e** (5 Hair tresses)
Hair samples were pre-washed with a sodium lauryl sulphate shampoo prior to use in the study		
Assessment of Hair Shine (Before Product Application)		
Measurement of specular reflection gloss was performed by a glossmeter (Micro-TRI-glossmeter). Shine is determined by projecting a beam of light at a fixed intensity and angle onto a surface and measuring the amount of reflected light at an equal but opposite angle.		
Application of Test Shampoos		
Soaking hair tresses in water for **1 minute at 37°C.**	Soaking hair tresses in water for **1 minute at 37°C.**	Soaking hair tresses in water for **1 minute at 37°C.**
Applying **2 grams** of placebo shampoo to the surface of the tress, massaging for **30 seconds** and leave for **2 minutes**.	Applying **2 grams** of 1% dimethicone (5 cps) shampoo to the surface of the tress, massaging for **30 seconds** and leave for **2 minutes**.	Applying **2 grams** of 0.5% **Oat Lipid e** shampoo to the surface of the tress, massaging for **30 seconds** and leave for **2 minutes.**
Rinsing with water for **30 seconds at 37°C.**	Rinsing with water for **30 seconds at 37°C.**	Rinsing with water for **30 seconds at 37°C**.
Hair was dried by **natural air circulation**	Hair was dried by **natural air circulation**	Hair was dried by **natural air circulation**
Assessment of Hair Shine (After Product Application)		
Visual Assessment of Protective Effect with SEM (After Product Application)		
Images from the surface of the hair were taken with a Scanning Electron Microscope (SEM) after hair treatment.		

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The following formulation was used in this study:

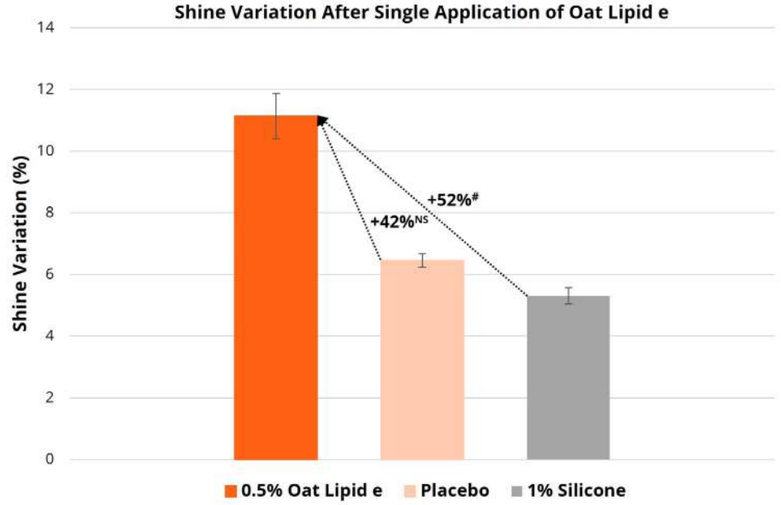
Phase	Trade Name	INCI	% w/w
A	Purified Water BP	Aqua	60.850
B	Carbopol Aqua SF-1 Polymer	Aqua, Acrylates Copolymer	4.000
C	Sulfopon 1216 G/MB	Sodium Coco-Sulphate	10.800
D	Plantacare 818 UP	Coco-Glucoside, Aqua	19.200
D	Lamesoft PO65 MB	Coco-Glucoside, Aqua, Glyceryl Oleate, Citric Acid, Hydrogenated Palm Glycerides Citrate, Tocopherol	1.000
D	Salicylates Saliethanol	Phenoxyethanol	0.700
D	**Oat Lipid e**	***Avena sativa* (Oat) Kernel Oil**	**0.500**
E	Euperlan PCO	Aqua, Styrene/Acrylates Copolymer, Coco-Glucoside, Benzoic Acid, Citric Acid	0.500
F	50%Citric Acid N1560 Solution	Aqua, Citric Acid	1.950

*Placebo shampoo formulation was identical without 0.5% Oat Lipid e – remaining % was made up with water.

**Silicone shampoo formulation was identical without 0.5% Oat Lipid e and 0.5% water – remaining % was made up with silicone (Microcare® Silicone DM350).

RESULTS: QUANTITATIVE DATA

Figure 1:
Shine Variation After Single Application of Oat Lipid e



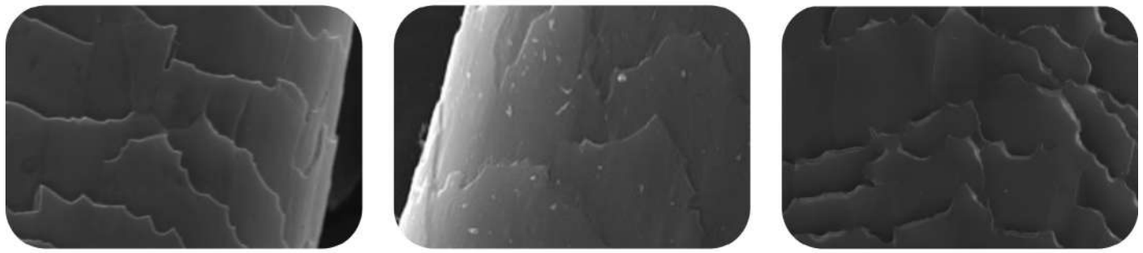
Using 0.5% Oat Lipid e increased hair shine by 42% compared to placebo, and by 52% compared to the silicone shampoo.

Significant: #=p<0.10 (90%), NS= Non-significant

Hair Shine – Rinse Off
Type 1 Hair
EX VIVO

RESULTS: QUALITATIVE DATA

Figure 2:
SEM Images Comparison of Hair After Single Application of Different Shampoos



Untreated Hair | **Single Application of 0.5% Oat Lipid e Shampoo** | **Single Application of 1% Silicone Shampoo**

The hair was observed under a Scanning Electron Microscope. The images in figure 2, show that the use of a shampoo with 0.5% Oat Lipid e flattened the hair cuticles, in comparison to untreated hairs. Softer hair cuticles reflect lighter and smooth the hair. As the SEM images show, silicone does not seal the cuticle layer of the hair shaft, so shine is not increased. Silicone forms an additional layer and will 'sit' on the surface of the hair. Silicone will not allow the shampoo to penetrate the hair and will weigh the hair down, making it limp and dull.

CONCLUSION

Mechanical stress, structural deficiencies, or damage to the cuticles will dull the natural lustre of hair. Oat Lipid e flattens the hair cuticles, enhancing shine and smoothing the hair. This resulted in a 11% increase in glossiness after one application of 0.5% Oat Lipid e. Oat Lipid e is rich in oleic acid, linoleic acid, and vitamin E. Its nutrient-rich nature will nourish and strengthen hair, creating the ideal conditions to increase hair shine. Oat Lipid e can be claimed as being a natural replacement to synthetic ingredients in haircare products like silicones where shine, lustre, and a strengthening effect are needed.

Combability of Hair- Rinse Off

Type 1 and 2 Hair

EX VIVO

BACKGROUND

The combability of hair is one of the most important properties the consumer looks for when assessing the manageability of hair. Good combability indicates smooth and healthy hair that is free from knots and enables easy and quick styling. The study was designed to determine the potential of Oat Lipid e to avoid single hairs getting entangled with each other, improving the combability of the hair, compared with a placebo and a competitor.

METHOD

Properties of Hair Tresses Tested	
Hair Type	1,2
Hair Colour	Blonde
Hair Length	9 inches
Hair State	Bleached
Ethnicity	Caucasian

Placebo (5 Hair tresses)	**1% Jojoba Oil** (5 Hair tresses)	**0.5% Oat Lipid e** (5 Hair tresses)
Application of standard shampoo		
Determination of Wet (medium) Combing Force (Before Product Application)		
After combing the tresses by hand, baseline measurements were carried out (ten times per hair tress) using a Universal Test Machine. It evaluates the combability of hair by the force that is needed to pull hair through the combing segment.		
Application of Test Conditioner		
Wetting the hair tresses in water for **90 seconds and applying 0.2 ml of placebo conditioner per gram of hair.**	Wetting the hair tresses in water for **90 seconds and applying 0.2 ml of 1% Jojoba oil conditioner per gram of hair.**	Wetting the hair tresses in water for **90 seconds and applying 0.2 ml 0.5% of Oat Lipid e conditioner per gram of hair.**
Massaging into the hair for **1 minute**, leaving it on for **30 seconds** and rinsing **for 90 seconds.**	Massaging into the hair for **1 minute**, leaving it on for **30 seconds** and rinsing **for 90 seconds.**	Massaging into the hair for **1 minute**, leaving it on for **30 seconds** and rinsing **for 90 seconds.**
Applying hair dryer for 6 minutes with **15 cm of distance** between the hair strand and the hair dryer.	Applying hair dryer for 6 minutes with **15 cm of distance** between the hair strand and the hair dryer.	Applying hair dryer for 6 minutes with **15 cm of distance** between the hair strand and the hair dryer.
Determination of Wet (medium) Combing Force (After Product Application)		

The following formulation was used in this study:

Phase	Trade Name	INCI	% w/w
A	Purified Water BP	Aqua	94.100
A	Euxyl PE9010	Phenoxyethanol, Ethylhexylglycerin	1.000
A	NAtrosol 250 HHR PC	Hydroxyethylcellulose	0.400
B	Dehyquart A-CA	Aqua, Cetrimonium Chloride, Citric Acid	0.500
C	Lanette O	Cetearyl Alcohol	2.000
C	Microcare Quat BHG	Behentrimonium Chloride, Glyceryl Stearate, Cetearyl Alcohol, Lauryl Alcohol, Myristyl Alcohol	1.000
C	Cutina GMS V	Glyceryl Stearate	0.500
C	**Oat Lipid e**	***Avena sativa* (Oat) Kernel Oil**	**0.500**

*Placebo conditioner formulation was identical without 0.5% Oat Lipid e – remaining % was made up with water.

**Competitor conditioner formulation was identical without 0.5% Oat Lipid e and 0.5% water – remaining % was made up with jojoba oil.

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Combability of Hair- Rinse Off

Type 1 and 2 Hair

EX VIVO

RESULTS

Figure 1:
Reduction of Combing Force on Wet Hair After Single Application

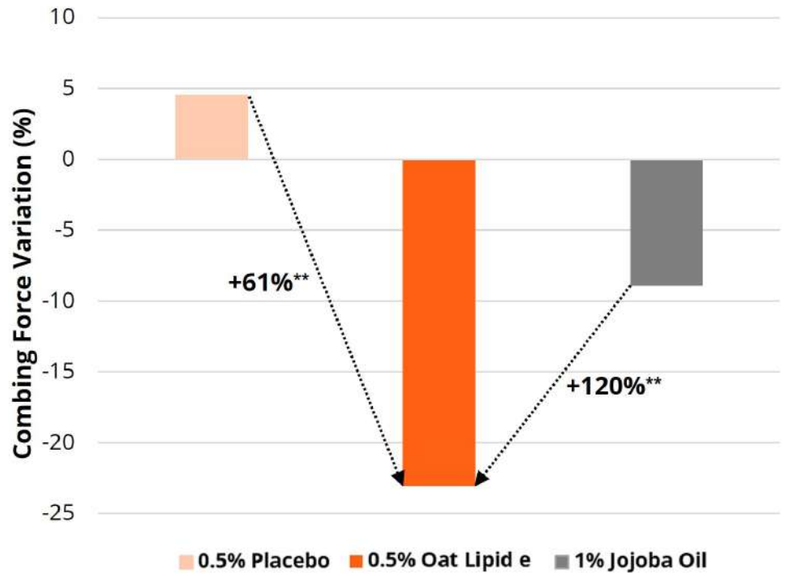

Figure 1 shows the percentage of relative reduction of the medium combing force in wet hair, determined by the evolution of the medium combing force before and after the conditioner application. The placebo conditioner shows a 5% increase in wet combing force and therefore does not have a significant impact on the wet combing force. The conditioner with 0.5% Oat Lipid e shows a reduction (statistically significant) in wet combing of 23%. 0.5% Oat Lipid e performed more than 2.6 times better than 1% Jojoba Oil.

CONCLUSION

Simple brushing and combing can cause significant breakage of damaged hair. Using 0.5% Oat Lipid e in a rinse-off application, significantly reduces the force required to comb wet hair after only one application. Oat Lipid e helps to reduce entanglements of the hair and improves hair manageability.

Significant: **=p<0.01 (99%)

Independently tested by Centro de Tecnología Capilar, Mar 2021

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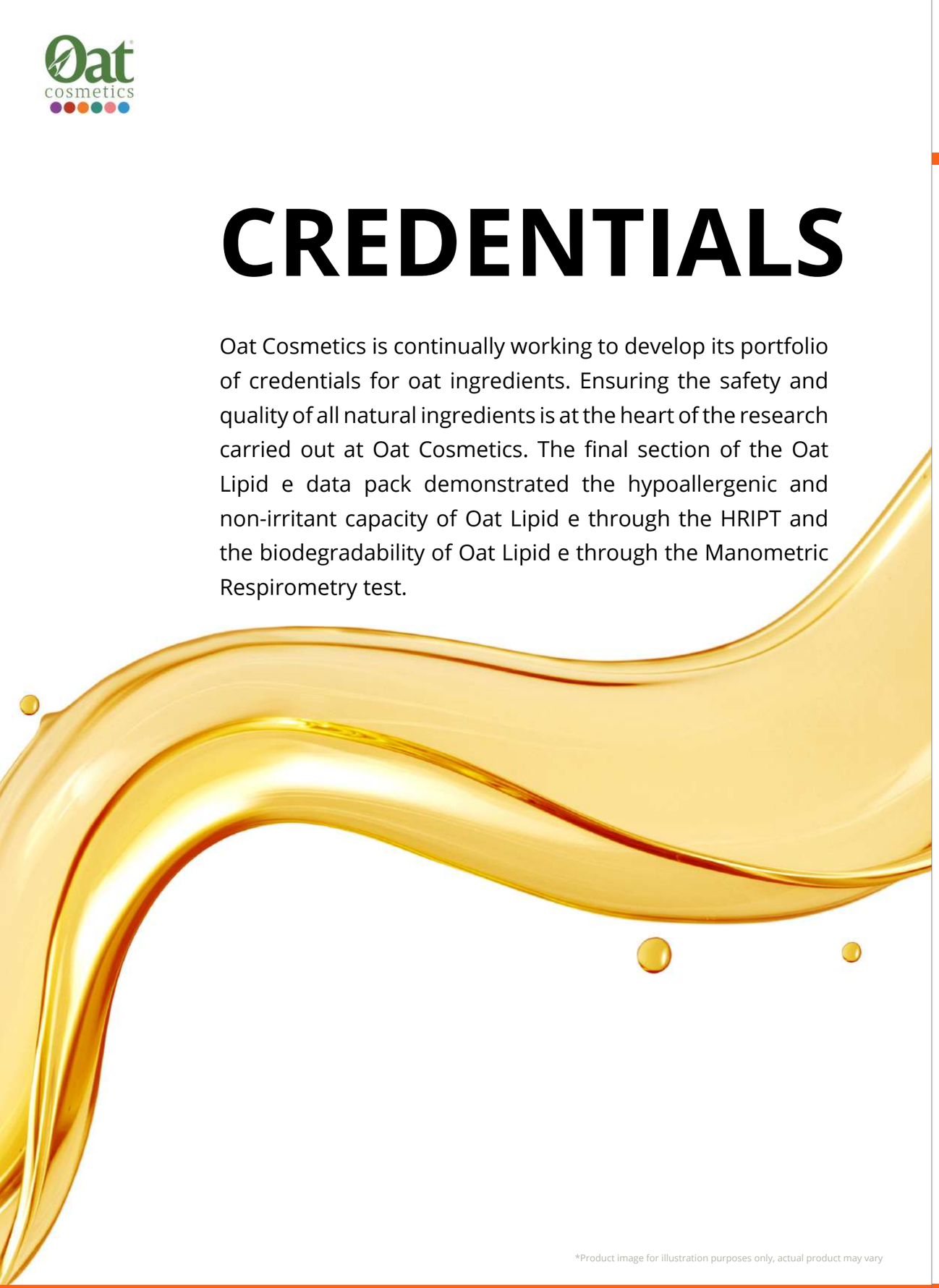
CREDENTIALS

Oat Cosmetics is continually working to develop its portfolio of credentials for oat ingredients. Ensuring the safety and quality of all natural ingredients is at the heart of the research carried out at Oat Cosmetics. The final section of the Oat Lipid e data pack demonstrated the hypoallergenic and non-irritant capacity of Oat Lipid e through the HRIPT and the biodegradability of Oat Lipid e through the Manometric Respirometry test.



*Product image for illustration purposes only, actual product may vary

IN VIVO

Human Repeat Insult Patch Test

BACKGROUND

A Human Repeat Insult Patch Test (HRIPT) was carried out to determine the cutaneous irritation (contact dermatitis) and sensitisation (contact allergy) potential of Oat Lipid e when applied to the skin of healthy participants.

METHOD

The study consisted of 52 participants (male and female aged 20-78) and 3 phases: Induction, in which 10 patches were repetitively applied over the course of 21 days; Incubation, a rest period; and revealing, a challenge phase. Repeated contact with a potential allergen in the formula, if present, generates a series of immunological reactions in the body of the participants and induces a visible reaction on the application site. Any reactions were observed, recorded and evaluated by a dermatologist to confirm the allergenicity of the product and hence the product's safety.

Repeated Skin Contact Test (Induction Phase): Prior to applying the patches, the test area - upper back, between the two shoulder blades - was carefully examined. A patch containing the test products and the control was applied to the test area and left in contact with the skin for 48 hours. When this first patch was removed at the laboratory 48 hours after application, the observation area was rinsed with water, dried, and examined for any skin changes. Following the examination, a new patch with fresh test product was applied. The test products were applied on the selected zones every second day, over 21 consecutive days.

Rest Period (or Incubation Phase): After the completion of the Induction Phase, a Rest Period of 10 to 14 days took place.

Challenge Phase (or Revealing Phase): The application site used during the Challenge Phase was different to the one used in the Induction Phase. For this phase, the patch was removed at the laboratory 48 hours after application. The test site was cleaned and examined for any signs of intolerance or irritation.

Throughout the study, Oat Lipid e was applied at 100%.

RESULTS

2 participants showed symptoms of barely noticeable erythema during only one of the nine induction periods. 1 participant displayed mild or slight erythema in the patch zone, 2 days after application during the challenge period. 0 participant showed sign of presence of oedema, vesicles, blisters or ulcerations.

CONCLUSION

Oat Lipid e can be considered both hypo-allergenic and non-irritant. Furthermore, given the control provided by a dermatologist during the study, Oat Lipid e may also bear the claim "tested under the control of a dermatologist" or "dermatologically-tested".

Independently tested by Evalulab, Nov 2020

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Biodegradability Study
Manometric Respirometry Test

BACKGROUND

A study was undertaken to measure the ready biodegradability of Oat Lipid e in a freshwater environment. Biodegradability is the mechanism whereby microorganisms such as bacteria and fungi break down the organic matter of a product and use the nutrients for energy and growth or make it available to the environment. This degradation is defined as the ratio of the Biochemical Oxygen Demand (BOD) to either the Theoretical Oxygen Demand (ThOD) or the Chemical Oxygen Demand (COD) within 28 days.

METHOD

The 28-day BOD was determined by a procedure following the OECD Guidelines for Testing of Chemicals reference 301F. To begin, the test products were added to water with mineral nutrient stock to allow the development of bacteria. The inoculum used for this test was activated sludge from a sewage treatment works receiving predominantly domestic waste. Following this, air was brought into a bottle to bubble up in a solution that works to capture the carbon dioxide. The air then passed into a test tube in which the bacteria used the oxygen to breathe and produce carbon dioxide, comprised of the oxygen present in the air and the carbon present in the substance. Finally, the carbon dioxide passed into a third bottle where there was again a solution to capture it.

The OXITOPR measuring heads (a data collector used to determine how much carbon dioxide has been rejected by the bacteria) recorded readings of biodegradation every 112 minutes for 28 days. The test solutions were stirred at 20.2 – 23.3°C for the duration of the study.

An equation was used to calculate how much carbon dioxide was given off by the bacteria. The amount of oxygen taken up by the microbial population during biodegradation of the test substance is expressed as a percentage of ThOD or, less satisfactorily, COD. After 28 days the percentage of break down was assessed. It is standard to consider a substance to be easily biodegradable when this exceeds 60% in 28 days.

RESULTS

Oat Lipid e gives a positive result, exceeding 60% degradation relative to the ThOD value with a maximum average degradation of 96% achieved respectively on day 28. Oat Lipid e achieved 10% degradation after 1 day, and 60% was reached after 4 days, passing the 10-day window.

CONCLUSION

When a product is biodegradable, it decomposes and the carbon and other elements in its molecules can be assimilated into new biomass, they can reappear in another form over time. It can be concluded that Oat Lipid e is readily biodegradable under environmental conditions.

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Oat Lipid e Profile Pg 2-3

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GET IN TOUCH

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