Glucaveen

DATA PACK

OAT BETA-GLUCAN FOR HEALTHIER HAIR

oatcosmetics.com

Glucaveen

DCI: Revision No: 3 Issue Date: 26th May 2022

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INGREDIENT PROFILE

Glucaveen is a powerful and unique oat active designed for healthier hair. This section of the data pack provides a deep dive into Glucaveen's impressive profile. The oat powder is characterised by a rich profile of hydrating beta-glucans, protective starches, and moisturising amino acids.

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PROFILING

Glucaveen is a unique powder active that is highly concentrated in beta-glucan and has a proven effect on hair physiology and appearance.

BETA-GLUCAN

Beta-glucan is one of two β-D-glucose polysaccharides naturally occurring in the cell walls of cereals, bacteria, and fungi with significantly differing physicochemical properties dependent on the source. Structurally, oat beta-glucan is a linear polymer of glucose consisting of 1,4 (70%) and 1,3 (30%) glycosidic linkages. For this reason, 1-3, 1-4-ß-D-glucan from oats is the most water-soluble beta-glucan.[1] This structure, a long chain of disaccharide units made up of two glucose derivatives, enables Glucaveen to bind large amounts of water in the hair to avoid hair dryness.

Glucaveen has a molecular weight of 900 kDa. Large molecules, greater than 10 kDa, are proven to be good film-formers helping fill in porosities in the cuticle. They act at the cuticle layers forming a moisture-holding and protective coating. Oat beta-glucans in Glucaveen also have the potential to improve hair's elasticity and strength.[2]

	Glucaveen
Beta-Glucan*	30.0g / 100g

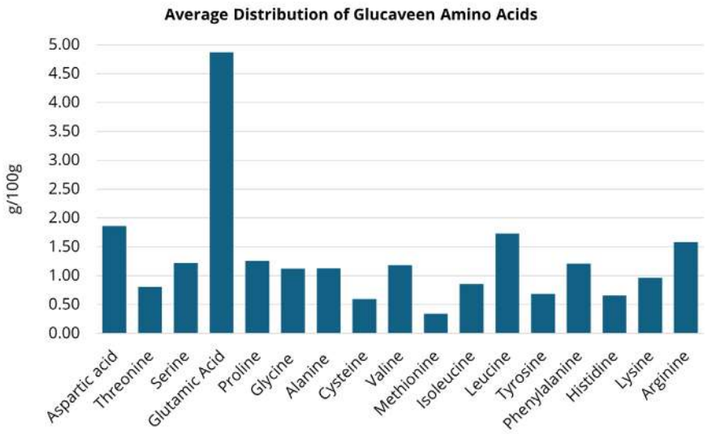
STARCH

Glucaveen contains starches. When dispersed in water, the small particles of Glucaveen create an "occlusive" barrier protecting the hair against external aggressions. This effect is due to the concentration of starches contributing to the formation of an occlusive film (also an effect from oat beta-glucans). Starches can absorb excess oils in the scalp offering a cleansing action.[3]

	Glucaveen
Starch*	19.0g / 100g

AMINO ACIDS

Glucaveen contains approximately 22% amino acids. Amino acids have a high affinity for keratin. Keratin can be linked to acidic amino acids such as glutamic and aspartic acid through ionic bonds. Amino acids in Glucaveen will help moisturise dry cuticles.[4]



*Indicative Typical Values

Independently tested by Campden BRI, Jan 2021

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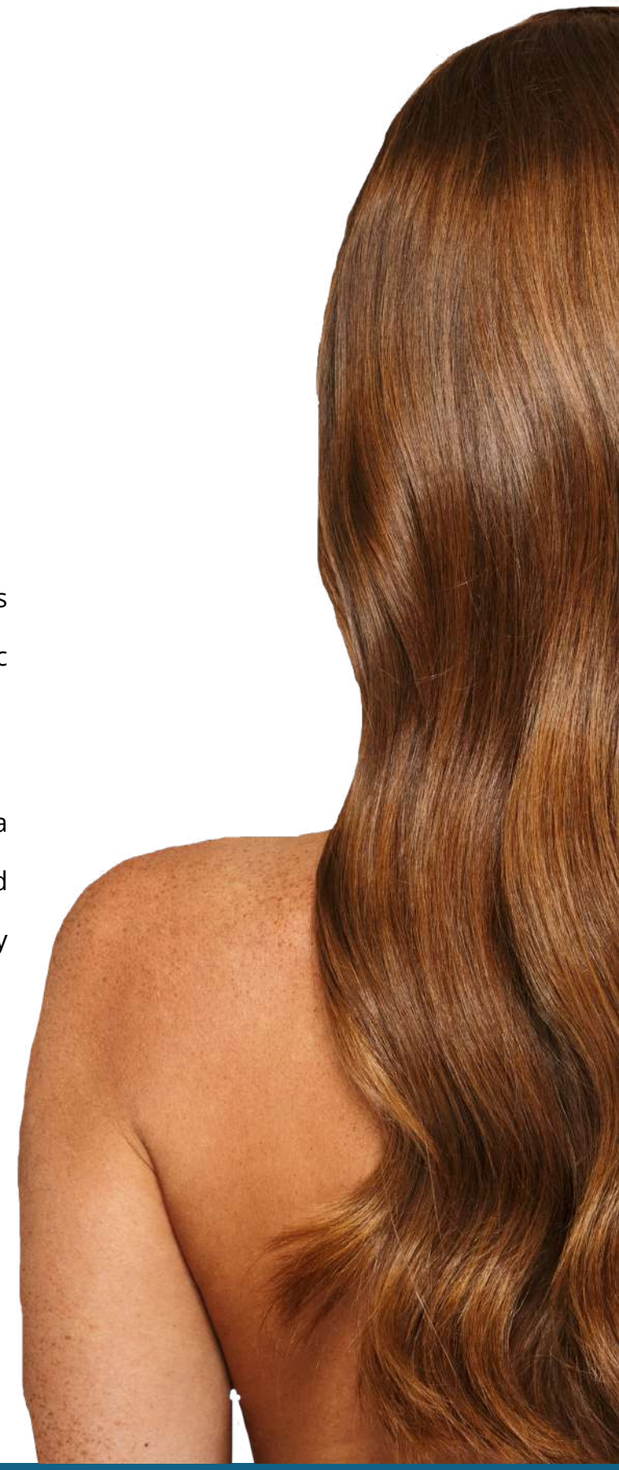
EFFICACY ON HAIR

Exclusive to our Oat Hair range, Glucaveen is an oat active specifically designed for cosmetic formulations for the hair.

Promoting healthier hair, this section of the data pack presents our rigorous testing methods and significant results that show Glucaveen's ability to repair, strengthen, and moisturise the hair.



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BACKGROUND

Dry hair is a key concern for consumers. Hair can become dry due to the loss of moisture which is the result of a damaged hair surface. This leaves the hair looking and feeling rough. Every hair strand has a protective layer called the cuticle. The cuticle protects the hair from damage. It helps to hold the moisture in, leaving the hair hydrated and feeling both soft and smooth. Hair damage can be caused by hair styling and lifestyle factors such as the weather, stress, pollution, UV rays, etc. This study was designed to determine the potential of Glucaveen to increase moisture content in the hair compared with a placebo.

METHOD

5 hair tresses were treated with a shampoo containing 1% Glucaveen and 5 with a placebo shampoo. These natural Caucasian blonde, 9-inch long hair tresses were pre-washed with a sodium lauryl sulphate shampoo prior to use in the study. The treatment consisted of:

1. Soaking hair in water for 1 minute at 37°C
2. Applying 2g of shampoo to the surface of the tress, massaging for 30 seconds, and leaving it on for 2 minutes
3. Rinsing with water for 30 seconds at 37°C
4. Drying the tress naturally

Room temperature and humidity were controlled at 25°C ± 2°C and relative humidity 75% ± 5%

Thermogravimetric analysis was performed (TGA/SDTA851, Mettle Toledo) to measure the loss of moisture content with the increase in temperature. It is a method of thermal analysis in which the mass of a sample is measured over time as the temperature changes. In order to differentiate between external and internal water of the hair, 2 successive heat treatments were carried out on the hair samples:

1. From 30°C to 65°C at 20°C/min and a temperature of 65°C (normal temperature used by a hairdryer) was maintained for 40 minutes
2. The temperature was increased from 65°C to 140°C at 20°C/min and was kept at 140°C for 40 minutes (in order to evaporate all the water contained in the hair)

Images from the surface of the hair were taken with a Scanning Electron Microscope (SEM) after the hair treatment.

The following formulation was used in this study:

Phase	Trade Name	INCI Name	% w/w
A	Purified Water BP	Aqua	60.25
B	**Glucaveen**	***Avena Sativa (Oat)* Bran Extract**	**1.00**
C	Carbopol Aqua SF-1 Polymer	Aqua, Acrylates Copolymer	4.00
D	Sulfopon 1216 G/MB	Sodium Coco-Sulfate	10.80
E	Plantacare 818 UP	Coco-Glucoside, Aqua	19.20
E	Lamesoft PO65 MB	Coco-Glucoside, Aqua, Glyceryl Oleate, Citric acid, Hydrogenated Palm Glycerides Citrate, Tocopherol	1.00
E	Salicylates Saliethanol	Phenoxyethanol	0.70
F	Euperlan PCO	Aqua, Styrene/Acrylates Copolymer, Coco-Glucoside, Benzoic Acid, Citric Acid	0.50
G	50% Citric Acid N1560 Solution	Aqua, Citric Acid	2.05
G	Purox S	Sodium Benzoate	0.50

*Placebo formulation was identical minus 1% Glucaveen – remaining % was made up with water.

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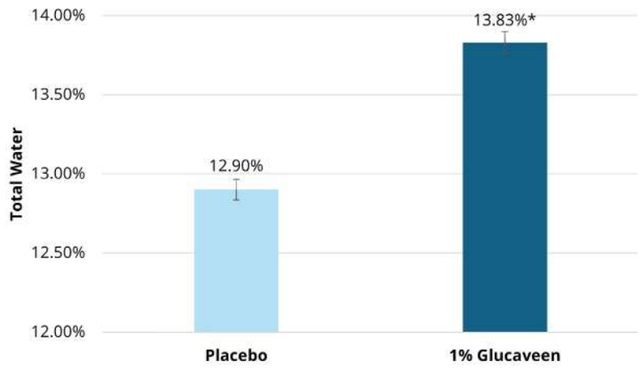
Rinse-off Effect on Hair Moisture

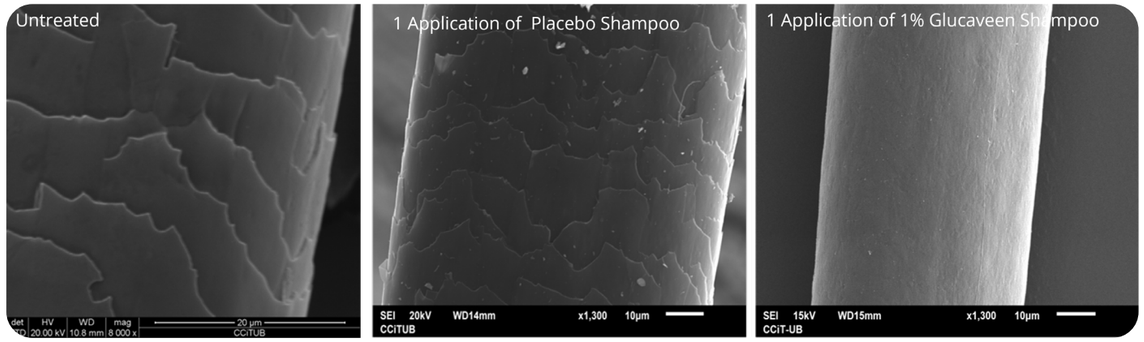
RESULTS

Figure 1:
Variation of Water Content in the Hair After Only 1 Application of Glucaveen Shampoo Treatment in Comparison With Placebo



Quantitative Data
Variation of water content in the hair is defined as the evolution, in percentage, of the water content value before and after treatment. Figure 1 shows that using 1% Glucaveen induces a statistically significant increase in hair moisture, by more than 7.19%*, compared to the placebo.

Qualitative (Observation) Data
The hair was observed under a Scanning Electron Microscope. As is shown in the following images, the use of a shampoo with 1% Glucaveen visibly flattened the hair cuticles in comparison to the untreated and placebo hairs. The images highlight that Glucaveen has the ability to form a film on the hair shaft, sealing in moisture and slowing down the loss of water from the hair to the surrounding air.



SEM images of untreated hair (on the left), SEM images of hair after one application of placebo shampoo (in the middle), and SEM images of hair after one application of 1% Glucaveen shampoo (in the right).

CONCLUSION

Glucaveen helps keep the hair moisturised as demonstrated in this study. Its emollient properties help prevent the loss of moisture through the hair's surface when its outer layer, the hair cuticle, is damaged. Glucaveen allows moisture retention as it forms a natural moisture barrier.

Significant: *=p<0.05 (95%

Independently tested by Centro de Tecnologia Capilar, Mar 2021

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Rinse-off Effect on Hair Strength
(Protection and Repairing)

BACKGROUND

The hair fibre is composed of three main structures: the cuticle (outermost layer), the cortex (thickest layer), and the medulla (innermost layer). The weight of the human hair is made up of about 80% keratin, a fibrous and helicoidal protein. The rest is mainly composed of water, lipids, pigments, and other components. Keratin is rich in sulphur-containing amino acids, mainly cysteine, and this gives hair its strength. The hair's resistance to breakage is a function of the diameter and condition of the cortex which is negatively affected by chemical treatments. The study was designed to determine Glucaveen's potential to improve hair strength compared with a placebo and a competitor product.

METHOD

5 hair tresses were treated with a conditioner containing 1% Glucaveen, 5 with a placebo conditioner, 5 with a conditioner containing 1% competitor oat beta-glucan, and 5 with a conditioner containing 5% hydrolysed wheat protein (the dosage of the competitors' products was matched to the pricing of Glucaveen). For each tress, the hair samples used were displayed in the form of a strand with the upper part fixed by adhesive insulating tape. The 22-inch long, naturally Caucasian dry tresses were pre-washed with a sodium lauryl sulphate shampoo prior to use, designed to mimic real-life hair washing. The study consisted of:

1. Determination of initial hair strength by the tensile test of all the tresses (T0)
2. Application of products according to the following requirement:
    a. Soaking the hair in water for 1 minute at 37°C (±1°C)
    b. Applying about 2g of conditioner to the surface of the tress and leave on for 4 minutes
    c. Rinsing with water for 2 minutes at 37°C (±1°C)
    d. Drying the tress naturally
3. Application of hair straighteners (>230°C) (thermal aggressions) in order to damage the hair surface
4. Determination of hair strength by the tensile test of all the tresses (T1) – *protection effect determination*
5. Application of products with the same requirement (as mentioned above)
6. Determination of hair strength by the tensile test of all the tresses (TF) – *repairing effect determination*

Room temperature and humidity were controlled to be at 20°C ± 2°C and relative humidity at 65% ± 4%.

The tensile test was performed by a Universal test machine (Zwicki Z0.5 TN, Zwick, Ulm). Tensile strength measures the force per unit area (the maximum amount of tensile stress) required to break the hair which characterises the structural integrity of individual hair fibres.

The following formulation was used in this study:

Phase	Trade Name	INCI Name	% w/w
A	Citric Acid 50% Solution	Citric Acid	0.043
A	Euxyl PE9010	Phenoxyethanol, Ethylhexylglycerin	1.000
A	Natrosol 250 HHR	Hydroxyethylcellulose	0.400
B	Dehyquart A-CA	Cetrimonium Chloride	0.500
C	Cutina GMS	Glyceryl Stearate	0.500
C	Lanette O	Cetearyl Alcohol	2.000
C	Mineral Oil 350cst	Paraffinum Liquidum	0.500
C	Microcare Quat BHG	Behentrimonium Chloride, Glyceryl Stearate, Cetearyl Alcohol, Lauryl Alcohol, Myristyl Alcohol	1.000
D	**Glucaveen**	***Avena Sativa* (Oat) Bran Extract**	**1.000**
	Water Deionised	Aqua	Up to 100.000

*Placebo conditioner formulation was identical minus 1% Glucaveen – remaining % was made up with water

** Oat beta-glucan competitor conditioner formulation was identical minus 1% Glucaveen – remaining % was made up with Oat beta-glucan (34% active)

***Competitor conditioner formulation was identical minus 1% Glucaveen and 4% water – remaining % was made up with Hydrolysed Wheat Protein (20% active)

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Rinse-off Effect on Hair Strength
(Protection and Repairing)

RESULTS

Hair strength is calculated by the mN/µm value, where mN corresponds to the maximum force and µm corresponds to the diameter of the hair. This reference is important to rule out the effect of the size of the strand on the breaking point of the hair. The study was designed to assess the effectiveness of the product in protecting and repairing the hair surface after heat shock. Keratin contains a high degree of disulfide bonding, which confers rigidity and chemical resistance. These chemical bonds are sensitive to heat and the structure of the hair will be temporarily changed. The hair will sheath and harden leading to breakage.

RESULTS: PROTECTION EFFECT

Figure 1:
High Strength Protection Effect of Glucaveen After Only 1 Application

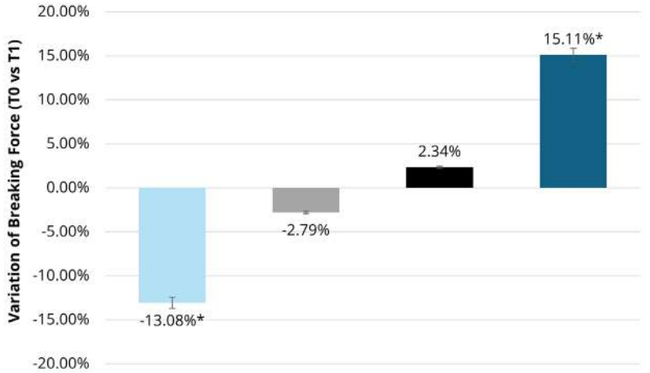

Figure 1 shows that 1% Glucaveen is significantly better at strengthening the hair and protecting it from damage compared to the placebo and competitors. Variation of breaking force is defined as the evolution (in percentage) of hair strength before and after the first treatment.

RESULTS: REPAIRING EFFECT

Figure 2:
Hair Strength Repairing Effect of Glucaveen After 2 Applications

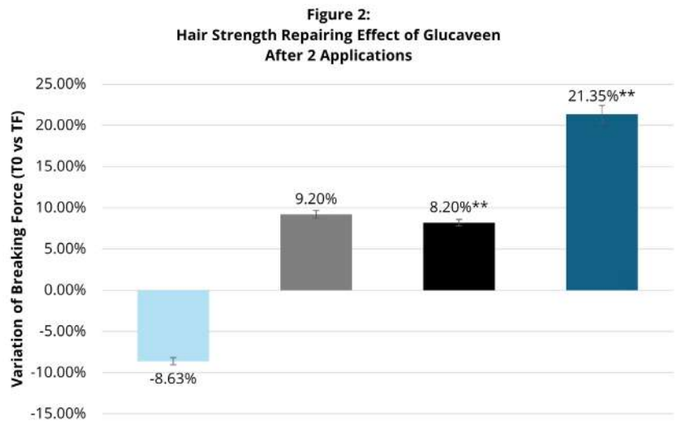

Figure 2 shows that after damaging the hair and applying the product again, 1% Glucaveen significantly repaired the damage caused by thermal aggressors, and did so better than the competitors and placebo treatments by more than 30%. Variation of breaking force is defined as the evolution (in percentage) of hair strength at the beginning of the experiment and after the second treatment.

CONCLUSION

Glucaveen strengthens damaged hair, as well as repairs and protects it from breakage. Glucaveen is an ideal ingredient for products designed for fine/dull and very dry/dehydrated, damaged hair becuase it promotes stronger and healthier hair.

Significant: *=p<0.05 (95%), **=p<0.01 (99%)

Independently tested by Centro de Tecnología Capilar, Mar 2021

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EFFICACY ON SCALP

Scalp care is an essential part of the overall haircare routine.

This section of the data pack demonstrates Glucaveen's prebiotic effect on the scalp which inhibits the growth of dandruff causing microorganisms.

An in vitro study was performed using 1% Glucaveen to study its effect on the scalp microbiome. Glucaveen was successful in exhibiting antifungal properties by significantly inhibiting the growth of *Malassezia furfur.*

BACKGROUND

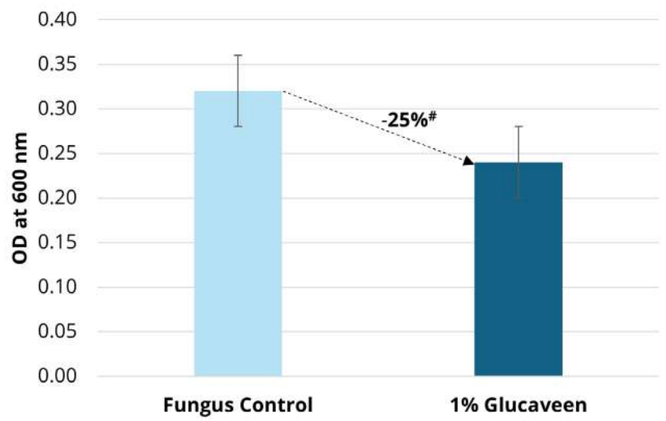
Dandruff is a common disorder of the scalp, characterised by excessive amounts of dead skin flakes, often combined with itching and skin irritation. There are two types of flaking that dandruff can cause. First are the large, yellowish flakes that stick to the scalp and are associated with an overproduction of *Malassezia.* The second type are small, white flakes that shed skin and occur due to a dry scalp.[1] *Malassezia* is part of the natural cutaneous microbiota of healthy individuals. These lipophilic species are believed to digest sebaceous triglycerides, producing free fatty acids such as oleic acid. The free fatty acids penetrate the stratum corneum and disrupt the skin barrier function, leading to the range of typical symptoms.[2,3]An in vitro study was performed to evaluate the prebiotic effect of 1% Glucaveen on the growth of a common microorganism found on the scalp.

METHOD

To monitor the influence of 1% Glucaveen on the growth of one fungal community, 1 cultural plate was cultivated in a 48-wells plate in presence and absence of 1% Glucaveen. The fungal community, representing the most abundant phylum on the scalp, used was: *Malassezia furfur*. A culture medium with known quantity of this fungus (colony-forming unit, cfu/ml) was added to the wells of the 3 plates. 1% Glucaveen was added simultaneously with fungus. After being incubated for 72 hours, the solutions were taken from the wells and optical density (OD) was measured, with a spectrophotometer at 600 nm, to evaluate the quantity of planktonic microorganisms.

RESULTS

Figure 1:
Effect of Glucaveen on *Malassezia furfur* Growth After 72 Hours



Quantitative Data
1% Glucaveen significantly decreases the growth of *Malassezia furfur* growth by 25% after 72 hours.

CONCLUSION

Conventional anti-dandruff shampoos use zinc pyrithione, climbazole or piroctone-olamine, which are primarily antifungal against dandruff causing yeast, *Malassezia.* Reduction in *Malassezia* species reduces free fatty acids, thereby reducing scalp flaking and itch. Glucaveen significantly inhibits the growth of *Malassezia furfur*.

Independently tested by Bio-EC, May 2021

Significant: #=p<0.10 (90%)

CREDENTIALS

We are continually working on developing our portfolio of credentials for our ingredients. Ensuring the safety and quality of all our natural ingredients is at the heart of our research at Oat Cosmetics.

Concluding the Glucaveen data pack, we share its hypoallergenic and non-irritant qualities demonstrated through the HRIPT test and the biodegradability of Glucaveen, under environmental conditions through the Manometric Respirometry test.

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 Glucaveen when applied to the skin of healthy participants.

METHOD

The study consisted of 55 volunteers (male and female aged 32 to 72 years old) and 3 phases: Induction, in which 10 patches were repetitively applied over the course of 3 weeks; Incubation, a rest period; and Revealing/Challenge phase. Repeated contact with a potential allergen in the formula, if present, generates a series of immunological reactions in the body of the test subject (the volunteer) 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 the application, the observation area was rinsed with water, dried, and examined for any skin changes. Following the examination, a new patch with a fresh test product was applied. The test products were applied on the selected zones every second day, 3 times per week, over 3 consecutive weeks.

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

Challenge Phase (or Revealing Phase): The application site used during the Challenge Phase was different from 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, Glucaveen was diluted at 10% with Vaseline.

RESULTS

Glucaveen did not produce any signs of cutaneous irritation or skin sensitisation. That is, no volunteers showed signs of erythema, presence of oedema, vesicles, blisters, ulcerations, or reported immediate or delayed reactions such as redness, irritation, itching or other sensations.

CONCLUSION

Glucaveen can be considered both hypoallergenic and non-irritant. Furthermore, given the control provided by a dermatologist during the study, the test products may also bear the claim 'tested under the control of a dermatologist' or 'dermatologically-tested'.

Independently tested by Evalulab, May 2021

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Biodegradability
(Manometric Respirometry Test)

BACKGROUND

A study was undertaken to measure the ready biodegradability of Glucaveen 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 product was added to water with mineral nutrient stock to allow the development of the bacteria. The inoculum used for this test was activated sludge from a sewage treatment works receiving predominantly domestic waste.

Following this, a measured volume of inoculated mineral medium, containing a known concentration of the test substance as the nominal source of organic carbon, is stirred in a closed flask at a constant temperature for up to 28 days. During the course of the test, oxygen is consumed and carbon dioxide evolved. The carbon dioxide is absorbed in sodium hydroxide. The drop in pressure in the test vessels therefore determines the oxygen consumption. The caps of the test vessels contain a pressure transducer and microprocessor to measure and calculate BOD.

The OXITOP^{R} measuring heads (data collector to determine how much carbon dioxide was rejected by the fungi) 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 has been given off by the fungus. 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

Glucaveen gave a positive result, exceeding 60% degradation relative to the ThOD with a maximum average degradation of 97% achieved respectively on Day 28. The test protocol requires that a 10-day window is applied to the degradation results (60% degradation to be reached within 10 days of 10% of the theoretical oxygen demand). 60% degradation was achieved after 7 days, Glucaveen therefore achieved 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, so they can reappear in another form later. It can be concluded that Glucaveen is readily biodegradable under environmental conditions.

Independently tested by Chemex, July 2021

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References

Glucaveen Profile *(pg 2-3)*

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Scalp Microbiome: Antifungal Activity *(pg 9)*

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GET IN TOUCH

For more information about Glucaveen, or any other enquires about our offerings at Oat Cosmetics, please contact our Sales team at **sales@oat.co.uk**

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