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Rethinking Beauty Science

Oat cosmetics

Protective effects of skin barrier integrity against emotional stress, by an enriched Oat β-Glucan complex derived from *Avena sativa L.*

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Introduction

A stress response is the activation of the endocrine, neurologic and immune systems triggering a cascade of impacts, that are both systemic and cutaneous.[1] The consequential release of cortisol, catecholamines and neuropeptides have multiple effects including an increase in skin inflammation, impaired skin barrier function, impaired wound healing, and suppressed immunity.[2]

β-Glucans (BG) are natural cell wall polysaccharides found in yeast, fungi, seaweed, and cereal. Oat β-glucan (OBG) is a polysaccharide made of a linear branched chain of D-glucose monosaccharides bonded by mixed β(1 → 3) and β(1 → 4) linkages. In this poster, the OBG complex is obtained from oat bran subject to an enzymatic treatment and wet milling, followed by centrifugation and ultrafiltration (manufacturing process optimized to preserve the original and natural structure of oat molecules).

Cortisol is a primary (psychological) stress hormone and prolonged exposure to elevated levels causes an increase in reactive oxygen species and increased oxidative stress.[3] As a result, skin loses elasticity resulting in fine lines and wrinkles.[1]

To address this issue, these studies evaluate **how an oat β-Glucans complex, counteract the detrimental effects of stress induced-skin ageing**.

Materials & Methods

Effect on Stratum Corneum Integrity under Stress (ex vivo)
Human skin model: 35-year-old female Caucasian
Product treatment:

	Control (3 skin explants)	Stress (3 skin explants)	Stress + 1% OBG complex (3 skin explants)
Day 0			**Topical application of 1% OBG complex** (fresh sample diluted in ultra-pure water)
24 Hours			
Day 1	Culture Medium Renewal	Culture Medium Renewal	Culture Medium Renewal
24 Hours		**Layers of stratum corneum removed** with a **stripping procedure** using a sequential contact of M3 tapes on skin explant surface)	**Layers of stratum corneum removed** with a **stripping procedure** using a sequential contact of M3 tapes on skin explant surface
		Topical application of aqueous solution of **cortisol 0.001%** (27,59 µM)	**Topical application** of aqueous solution of **cortisol 0.001% + 1% OBG complex**
Day 2	Culture Medium Renewal	Culture Medium Renewal	Culture Medium Renewal
24 Hours		**Reapplication of cortisol**	**Reapplication of cortisol + 1% OBG complex**
Day 3	*Renewal previous step, each day*	*Renewal previous step, each day*	*Renewal previous step, each day*
Day 6	Solution of fluorescent dye (Lucifer Yellow) added on the surface of the skin explants		
Incubated for 1 hour	Skin explants sampled, embedded in OCT for cryo-preservation and stored at -80⁰C until analyses		

1. **Stratum Corneum Thickness** with Hematoxylin and Eosin staining
2. **Number of Corneocytes Layers** with Safranin-O red solution staining
3. **Skin Barrier Integrity** with DAPI (4',6-diamidino-2-phenylindole) staining

By evaluation of the specific fluorescent signal intensity and collection of light microspore images (epi-fluorescent microscope).

Effect on Skin Roughness (double-blind half-face in vivo)

Product Treatment
- Over 56 days
- 20 women, aged 30-55
- 1% OBG complex in vehicle control or vehicle control
- Applied twice a day on the face

Assessment of Skin Roughness
Sa, Stm by AEVA-HE V4 system

Results & Discussion

Effect on Stratum Corneum Integrity under Stress

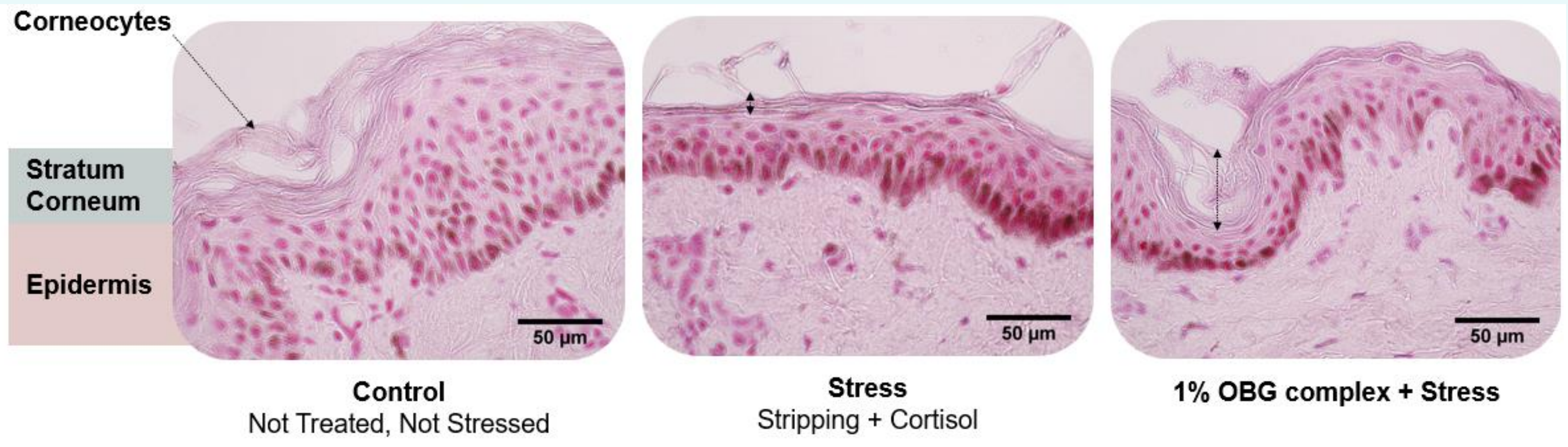


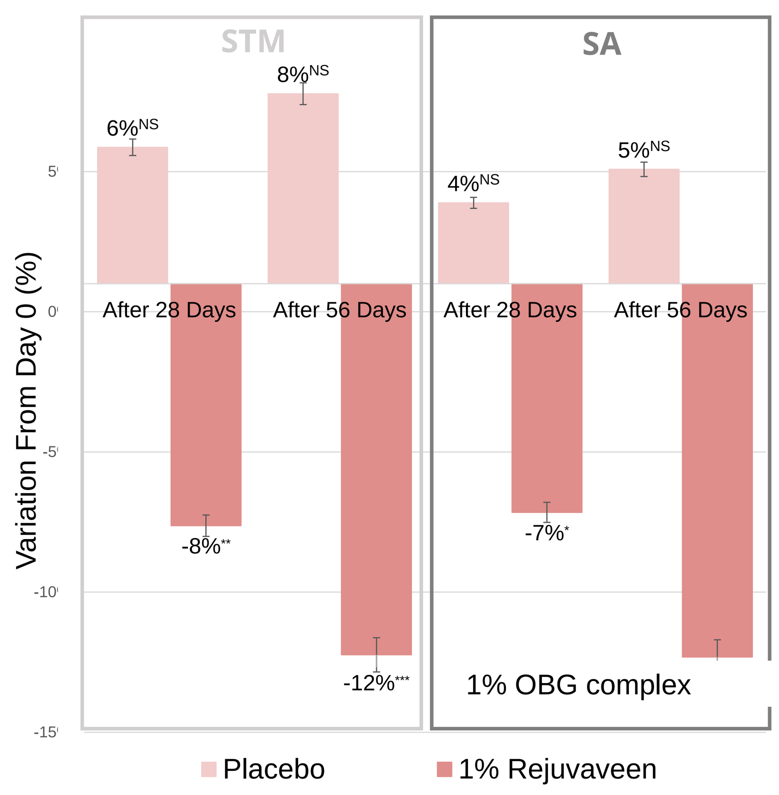
Figure 1: *In situ* visualisation of the stratum corneum layers (40x objective)

With 1% OBG complex in combination with cortisol, the skin was protected from the stress-induced decrease of stratum corneum (and epidermis) thickness.
OBG complex can prevent the effect of cortisol-induced oxidative stress on the stratum corneum thickness by 15%* (p<0.1), and the number and integrity of corneocyte layers by 31%*** (p<0.001).

Figure 2: *In Situ* visualisation of fluorescent dye permeability for skin barrier integrity evaluation (10x objective)

When the stress was applied with **1% OBG complex, the skin was significantly protected from damage to its barrier integrity** (by 82%***, p<0.001).

Effect on Skin Roughness



OBG complex displayed smoothing and anti-roughness effects after 56 days, substantiated in a significant decrease of roughness parameters, as compared to the baseline values.

Conclusions

Modern day lifestyle results in sustained stress levels that can make the skin appear visibly aged. From these findings, it has been demonstrated that topical application of **oat β-Glucans complex is able to protect the skin from the undesirable effects of a stressful lifestyle**. OBG complex **prevents the consequences of cortisol induced oxidative stress**, **protects against stress-induced skin thinning** and **improves skin texture**.

References

1. Passerson T. et al. Adult skin acute stress responses to short-term environmental and internal aggression from exposome factors. *JEADV*. 2021, 35:1963–1975.
2. Graubard R. et al. Stress and skin: an overview of mind body therapies as a treatment strategy in dermatology. *Dermatol Pract Concept*. 2021, 11(4):e2021091.
3. Lee D. et al. Technical and clinical aspects of cortisol as a biochemical marker of chronic stress. BMB Rep. 2015, 48:209-16.