IMPACT OF UV RADIATIONS ON VARIOUS CUTANEOUS MARKERS - BIOCHEMICAL EXPLORATION

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INTRODUCTION

Today, it is well known that UV radiation is responsible of various harmful responses at the cutaneous level. UV rays generate reactive oxygen species and are a source of oxidative stress [1, 2].

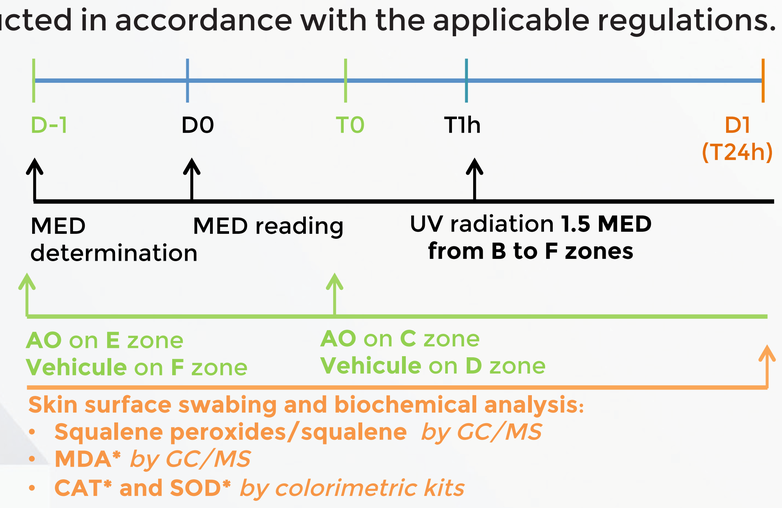
The aim of this study was to explore the impact of a single UV exposure on several indicators of cellular damages thanks to a new non invasive in vivo skin surface sampling and to confirm its interest for the evaluation of the antioxidant capacity of a formulation.

MATERIAL AND METHODS

These 2 tests were open and intra-individual. They took place at Laboratoire Dermscan (France) and were conducted in accordance with the applicable regulations.

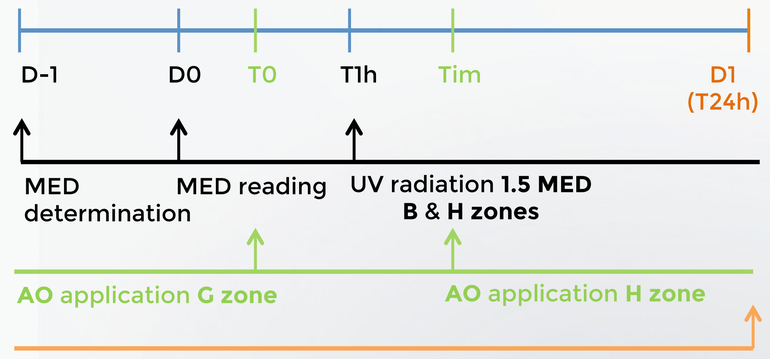
1. PREVENTIVE ACTION

Subjects	Studied zone: *Back*			Studied products
6 women Mean age: 23 years [19-27 years] with normal to greasy skin type and untanned skin on the back Phototype II	*No application*	A	Non treated - non irradiated	**Antioxidant formulation AO** {15% L-ascorbic acid + 1% DL-α-tocopherol + 0.5% trans-ferulic acid} at pH=3
	No application	B	Non treated - irradiated	
	t1h before UV (D0T0)	C	Treated AO - irradiated	
		D	Treated vehicle - irradiated	
	t24h before UV (D-1)	E	Treated AO - irradiated	
		F	Treated vehicle - irradiated	



2. CURATIVE ACTION

Subjects	Studied zones: *Back*		Studied products
15 women Mean age: 32 years [19-51 years] with normal to greasy skin type and untanned skin on the back Phototype II	A	Non irradiated - non treated	**Antioxidant formulation AO** {15% L-ascorbic acid + 1% DL-α-tocopherol + 0.5% trans-ferulic acid} at pH=3
	B	Irradiated - non treated	
	G	Non irradiated - treated AO	
	H	Irradiated - treated AO	



MDA: malondialdehyde ; CAT: catalase ; SOD: superoxide dismutase.

RESULTS & DISCUSSION

1. PREVENTIVE ACTION

The preventive action of the AO formulation and its vehicle were tested after a single application, either one hour (zones C or D) or 24 hours (zones E or F) before UV radiation. Results were compared to either the non-treated, non-irradiated zone (versus A) or the non-treated, irradiated zone (versus B).

D1 (T24h)		UV alone	Application 1h before UV		Application 24h before UV	
			AO	Vehicle	AO	Vehicle
		Δ% [B]	Δ% [C]	Δ% [D]	Δ% [E]	Δ% [F]
Squalene peroxides / squalene	*Versus A*	↑ 52.1% *(p=0.006)*	↑ 42.7% *(p=0.011)*	↑ 52.3% *(p=0.008)*	↑ 31.5% *(p=0.005)*	↑ 34.8% *(p=0.004)*
	Versus B	X	↓ -6.2% *(p=0.005)*	↔ 0.1% ***(p=0.930)***	↓ -13.5% *(p=0.014)*	↓ -11.4% *(p=0.015)*
MDA	*Versus A*	↑ 108.6% *(p=0.001)*	↑ 81.6% *(p=0.002)*	↑ 103.2% *(p=0.001)*	↑ 66.9% *(p=0.001)*	↑ 86.1% *(p=0.002)*
	Versus B	X	↓ -12.9% *(p=0.042)*	↔ -2.6% ***(p=0.213)***	↓ -20.0% *(p=0.016)*	↔ -10.8% ***(p=0.083)***
Catalase	*Versus A*	↑ 100.5% *(p=0.000)*	↑ 54.0% *(p=0.003)*	↑ 79.1% *(p=0.000)*	↑ 50.0% *(p=0.000)*	↑ 81.0% *(p=0.001)*
	Versus B	X	↓ -23.2% *(p=0.003)*	↓ -10.7% *(p=0.039)*	↓ -25.2% *(p=0.000)*	↔ -9.7% ***(p=0.094)***
SOD	*Versus A*	↑ 148.7% *(p=0.002)*	↑ 81.5% *(p=0.002)*	↑ 109.4% *(p=0.001)*	↑ 72.0% *(p=0.002)*	↑ 102.4% *(p=0.001)*
	Versus B	X	↓ -27.0% *(p=0.011)*	↓ -15.8% ***(p=0.053)***	↓ -30.9% *(p=0.011)*	↓ -18.6% *(p=0.049)*

- Effect of UV radiation (see B versus A): significant increases in lipid peroxidation (squalene peroxides, MDA) and detoxification systems (SOD, CAT) were measured.
- Effect of AO application (see C and E zones versus B): **a single application of AO formulation BEFORE UV aggression reversed all modifications and conferred a significant protection on lipid peroxidation markers and detoxification systems.**

D1 (T24h)	Squalene Peroxides / Squalene	MDA	Catalase	SOD
Comparison AO 1h before (*C zone*) versus 24h before (*E zone*)	p=0.072	p=0.057	p=0.536	p=0.028

- **The preventive effect appeared more important when the AO formulation was applied 24h before** compared to 1 hour before UV radiation.
- Comparison AO versus Vehicle: results were significantly different for detoxification markers (p<0,05) and limit significant for lipid peroxidation markers (p<0.1). **Preventive effect of AO application was superior to its vehicle.**

2. CURATIVE ACTION

D1 (T24h)	Effect of AO application	Effect of UV radiation	UV radiation + AO	Curative effect of AO
	Δ% [G-A]	Δ% [B-A]	Δ% [H-A]	Δ% [H-B]
Squalene peroxide / squalene	↔ 0% (p=0.942)	↑ 38.4% (p=0.000)	↔ 3.0% (p=0.600)	↓ -25.5% (p=0.001)
MDA	↓ -4.8% (p=0.025)	↑ 82.9% (p=0.000)	↑ 35.8% (p=0.000)	↓ -25.8% (p=0.000)
Catalase	↑ 7.70% (p=0.000)	↑ 187.2% (p=0.000)	↑ 113.6% (p=0.000)	↓ -25.6% (p=0.005)
SOD	*Interference in the dosage*	↑ 172.7% (p=0.000)	↑ 70.5% (p=0.000)	↓ -37.5% (p=0.001)
Fatty acids	↔ 0.66% (p=0.679)	↓ -46.9% (p=0.000)	↓ -17.4% (p=0.000)	↑ 55.6% (p=0.000)

- Application of the anti-oxidant formulation did not modify the studied markers except for MDA and CAT (see Δ% [G-A])
- UV radiation (see Δ% [B-A]): as seen in the first study, significant increases in lipid peroxidation markers and detoxification systems were noticed. Fatty acids content was significantly reduced.
- Protection of AO (see Δ% [H-B]): **when performed immediately AFTER the UV aggression, a single application of AO formulation reversed all modifications and conferred a significant protection on lipid peroxidation markers, detoxification systems and lipid content.**

N.B. In another study performed on 6 women, we compared the curative action of AO versus its vehicle. Results obtained on the 2 zones were significantly different from each other for MDA and SOD markers (p<0.02) and near significant for Squalene ratio and CAT (p<0.10) (data not shown). These results highlighted the superiority of curative action of the AO formulation on its vehicle, after UV radiation.

CONCLUSION

- The present study highlighted the effects of a single UV exposure (1.5 MED) on several biomarkers of oxidative stress, *in vivo*. One day (T24h) after the aggression, it was observed: ↑ **lipid peroxidation markers** (squalene peroxides and MDA) ↑ **detoxification systems** (SOD and CAT) ↓ **fatty content**
- The single application of an antioxidant mix 24h before or immediately after UV radiation was able to significantly reversed these alterations.
- Skin surface sampling was performed thanks to an innovative technique. A specific surface swabbing was used, presenting several advantages: easy to performed; non-invasive; it provided a lot of biological material and preserved it from any biochemical alteration, facilitating its analysis later on.
- **The sensitive approach used in these 2 studies will be useful to evaluate the preventive and/or curative effects of cosmetic formulations on UV radiation.**

BIBLIOGRAPHY

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Presented at the 28th IFSCC Congress - Paris, France - October 26-30, 2014