

BIOSIGNATURES OF DEFECTIVE SEBACEOUS GLAND ACTIVITY IN SEBUM-RICH AND SEBUM-POOR SKIN AREAS IN ADULT ATOPIC DERMATITIS

ANALYSIS OF LIPID PROFILES IN ATOPIC DERMATITIS

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INTRODUCTION

Atopic dermatitis (AD) is a complex disease characterised by a disruption of the skin permeability barrier (SPB) in the *stratum corneum*. Recent data suggest a dysfunction in sebaceous gland (SG) activity in the pathophysiology of AD.

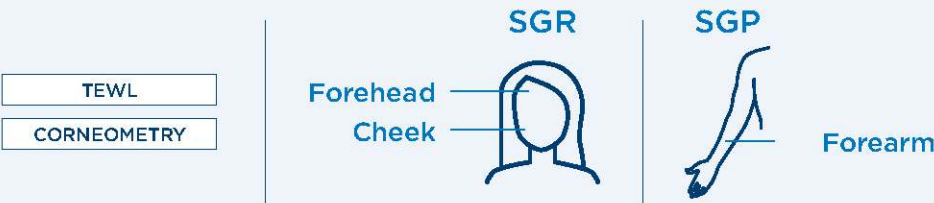
The objective of the study was to investigate lipid and amino acid profiles of sebum and *stratum corneum* in sebaceous gland-rich areas (SGR*) and sebaceous gland-poor areas (SGP**) in subjects with AD.

MATERIALS & METHODS

The samplings of sebum and *stratum corneum* were collected from SGR areas (forehead and cheek), and of *stratum corneum* in SGP areas (forearm), in 54 adult subjects with AD (34 with clinical involvement of face [fyAD] and 20 without clinical involvement of face [fnAD]), as well as in 44 age and sex-matched healthy controls (hC). Biophysical properties (corneometry and TEWL***) of the skin were evaluated on all sampling sites.

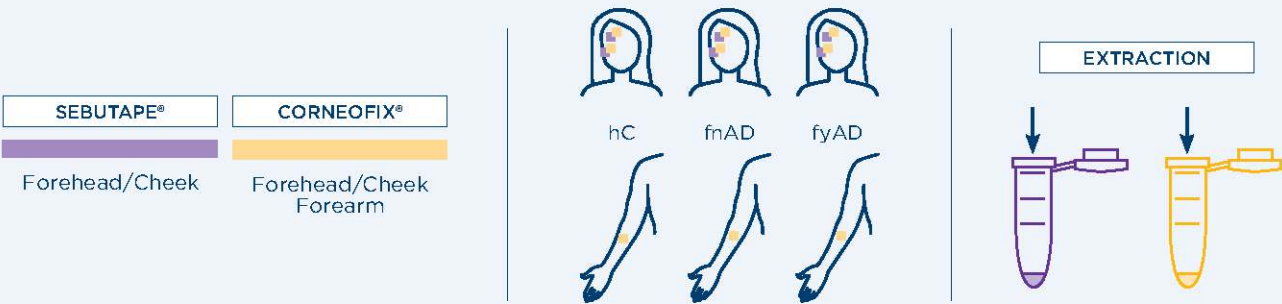
1. SITES & SKIN BIOPHYSICS

Sebaceous gland-rich areas (SGR) and sebaceous gland-poor areas (SGP) evaluated in a biophysical way (transepidermal water loss and corneometry) and for the lipid profile of sebum and of *stratum corneum*.



2. GROUPS & SAMPLING

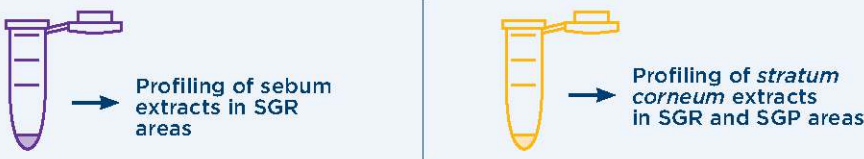
Sampling of sebum by Sebutape® in SGR areas and of *stratum corneum* by Corneofix® from SGR and SGP areas.



hC: Healthy controls. fnAD: Atopic subjects without involvement of face. fyAD: Atopic subjects with involvement of face.

3. ANALYSES OF SAMPLE EXTRACTS

Analyses by liquid chromatography and gas chromatography coupled with mass spectrometry of lipids and metabolites in sebum and *stratum corneum*.



*Sebaceous Gland Rich. **Sebaceous Gland Poor. ***Transepidermal Water Loss.

RESULTS PRESENTED ONLY FOR LIPIDS

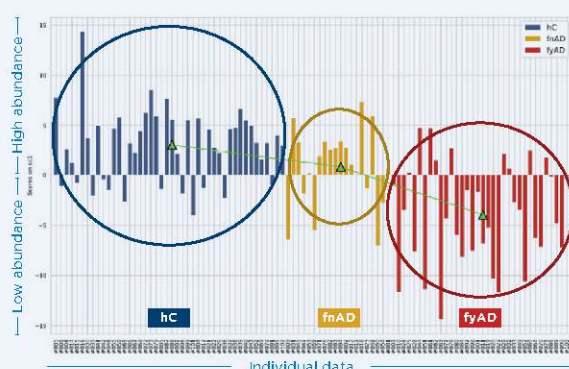
Description of the population (cf. Table 1 below): The groups presented homogeneous age and gender distribution. TEWL was significantly higher in AD groups vs. hC at the forehead site, and in fyAD vs. fnAD subgroups on lesional forearms. The sebum level at the forehead site allows differentiation between the fyAD and fnAD groups.

GROUP	N	AGE (years)	EASI	TEWL (forehead)	TEWL (cheek)	TEWL (lesional forearm)	TEWL (non-lesional forearm)	CORNEOMETRY (forehead)	CORNEOMETRY (cheek)	CORNEOMETRY (lesional forearm)	CORNEOMETRY (non-lesional forearm)
hC	44	35.6 ± 15.2	NA	16.5 ± 6.73	20.4 ± 7.89	NA	9.68 ± 3.15	51.3 ± 14.0	44.3 ± 12.1	NA	38.8 ± 12.2
fnAD	20	29.5 ± 11.1	28.7 ± 10.8	22.9 ± 6.59°	25.8 ± 11.6	22.4 ± 10.6	11.9 ± 4.28	39.6 ± 9.77°	41.6 ± 12.8	22.6 ± 11.8	32.1 ± 7.83
fyAD	34	31.2 ± 12.9	36.4 ± 10.6*	33.1 ± 15.6°	32.3 ± 17.2°	32.2 ± 13.8*	13.1 ± 6.58°	30.7 ± 14.3*°	33.2 ± 33.2°	18.8 ± 8.90	28.7 ± 8.06°

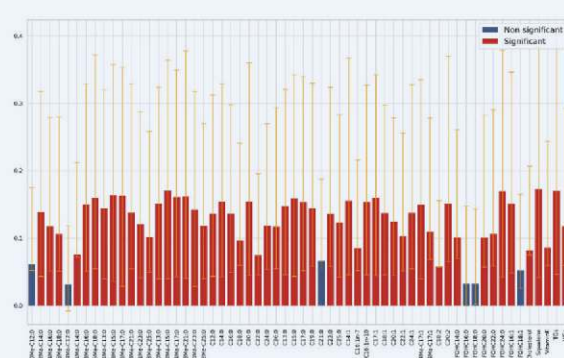
Table 1: Description of the population
(NA = Not applicable; *: $p < 0.05$ versus the fnAD subgroup; °: $p < 0.05$ versus the hC group)
The results presented are means ± SD (standard deviation).

Lipid profiling in sebum (cf. Figures A2 and B2 below): The abundance of lipids such as C12:0, C14:0, C16:0, C16:1, C18:0, C18:1, C18:2, C20:1, C22:1, FOHC22:0, squalene and wax esters naturally present in sebum was significantly decreased in AD, especially at the cheek site.

A2 Clustering of study participants according to their scores from sebum data. Most of the controls and fyAD presented positive and negative scores, respectively.



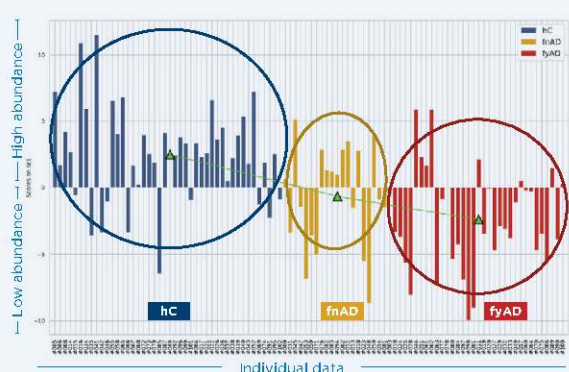
B2 Loadings' plot identifying the species presenting higher abundance in control sebum in contrast to lower abundance in AD. The red bars indicate that the difference is statistically significant.



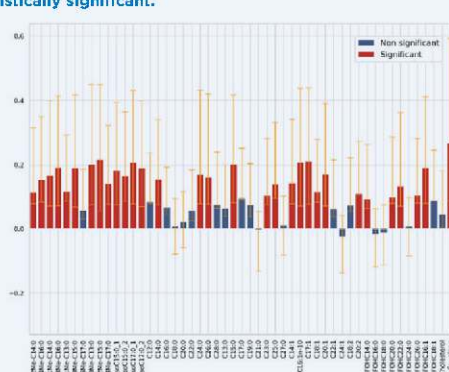
Figures A2 and B2: Lipid profiling of sebum in sebaceous gland-rich area (sampling site: cheeks)

Lipid profiling in stratum corneum of SGP areas (cf. Figures A3 and B3): The abundance of lipids, both epidermal (e.g. lignoceric acid, C24:0) and sebaceous (e.g. squalene) types, were significantly less abundant at the non lesional forearm site in AD.

A3 Clustering of study participants according to their scores from stratum corneum data in SGP areas. Most of the controls and fyAD presented positive and negative scores, respectively.



B3 Loadings' plot identifying the species presenting higher abundance (positive loadings) in control stratum corneum in contrast to lower abundance in AD. The red bars indicate that the difference is statistically significant.



Figures A3 and B3: Lipid profiling of sebum and stratum corneum in sebaceous gland-poor area (sampling site: forearms)

CONCLUSION

In conclusion, sebaceous gland activity was different in adult women and men with AD, in sebaceous gland-rich and sebaceous gland-poor areas. Lipid and amino acid profiles and biophysical properties of the skin could serve to define phenotypic groups associated with the severity of AD.

n.b. More extensive and significant changes of the aminoacids' abundance were detected in the stratum corneum from SGR areas.

Cavallo A, Camera E, Bottillo G, et al. Biosignatures of defective sebaceous gland activity in sebum-rich and sebum-poor skin areas in adult atopic dermatitis. *Exp Dermatol.* 2024;33:e15066. doi:10.1111/ezd.15066

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