Space (for) oddity at the skin surface: Enlarged view on the ceramide bio-signature in sebaceous and non sebaceous areas in atopic dermatitis

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BACKGROUND Derangement of ceramide levels in the skin permeability barrier (SPB) is widely demonstrated in atopic dermatitis (AD). By GCMS chemometric analysis we have observed significant deficiency of sebum-specific free fatty acids (FFAs), i.e. species with odd carbon number and terminal branching, in association to sebostasis in AD sebum (see poster 117).

OBJECTIVE To investigate the distribution profiles of epidermal lipids in sebaceous and non-sebaceous areas in AD.

METHODS Targeted LCMS study on the ceramides NDS, NS, NP, NH, AS, AP, AH, EO-C18:2, free fatty acids C16:1, C18:2, C24:0 and cholesterol sulfate of the stratum corneum (SC) in sebaceous and non sebaceous areas. The multivariate ANOVA-simultaneous component analysis (ASCA) was used to determine the effect of the investigated factors.

STUDY POPULATION

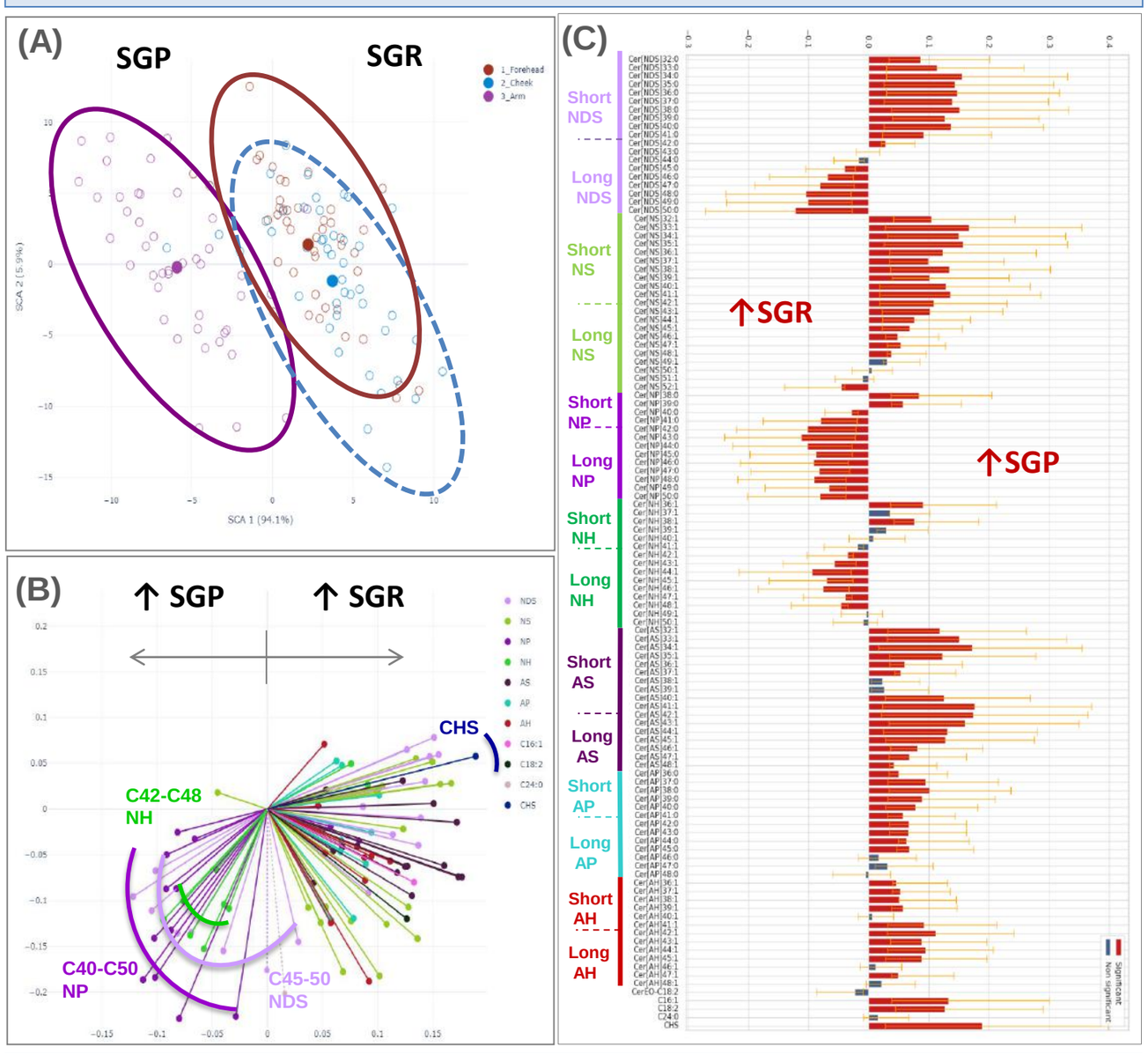
- **44 Controls (hC)**
- **54 Atopic dermatitis (AD):**
  20 with uninvolved face (fnAD)
  34 with involved face (fyAD)

	♀	♂
(hC)	27 F (age 35,7±16,3)	17 M (age 35,5±14,1)
(fnAD)	11 F (age 30,4±12,9)	18 M (age 28,4±9,1)
(fyAD)	11 F (age 32,1±14,2)	18 M (age 30,4±12,0)

SC TAPE STRIPPING

RESULTS

HEALTHY CONTROLS: ASCA model on 'site' effect



HEALTHY CONTROLS vs ATOPIC DERMATITIS: ASCA model on 'skin condition' effect

Fig.1 ASCA model on the effect of site in hC. **(A)** Scores plot on the first (x-axis) and second (y-axis) simultaneous components. The scores indicate the separation between SGR and SGP areas. **(B)** Loadings plot on the SC1 and SC2 components. Long chain [NDS], [NP] and [NH] ceramides display high loadings in the SGP area. **(C)** Details of loadings on the SC1. Annotation of each lipid compound identified and quantified is reported on the side. Statistical significant loadings are coloured in red.

Fig.2 ASCA model on the effect of skin condition. Scores plot on the simultaneous components SC1 and SC2, on the x- and y-axis, respectively, referred to (A) SGP area and to (C) SGR area. Loadings plot on the SC1 and SC2 of (B) SGP area, and (D) SGR area. Cer[NS], Cer[AS], and CHS display high loadings in AD's SGP area (B). [NS], [AS], and [NH] ceramides showed high loadings in AD's SGR area (D); CHS, C16:1, C24:0 display high loadings in hC's SGR area.

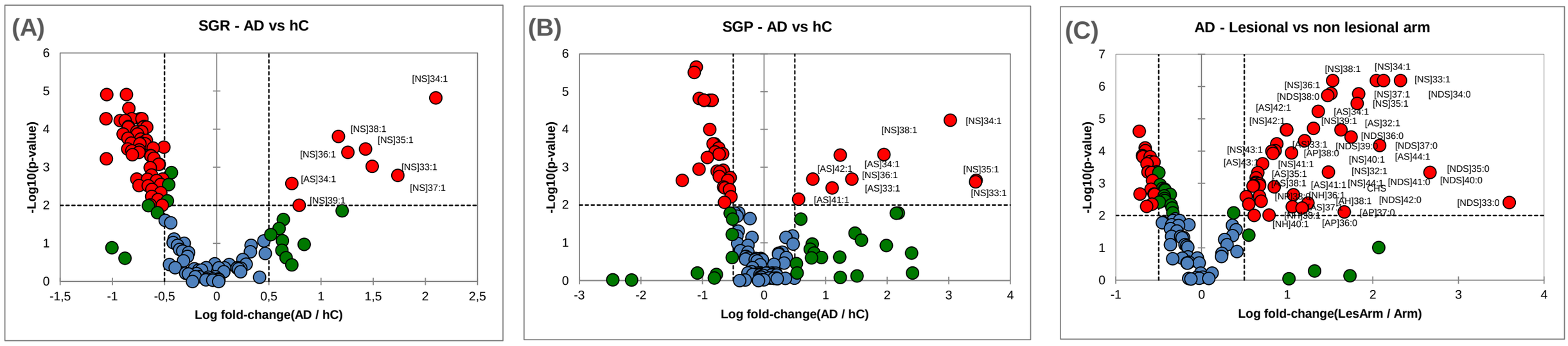


Fig.3 Volcano plots depicting the differences between hC and AD ceramide profiles in SGR (A), and SGP areas (B), and differences between clinically uninvolved and lesional skin in SGP areas in AD patients (C).

DISCUSSION/CONCLUSION

Medium-to-short and odd chained ceramide species (C≤42) participated into the discrimination between sebaceous and non-sebaceous areas in healthy conditions. Facial (SGR) sphingolipid signature was more effective than arm (SGP) sphingolipidome in discriminating controls from both AD groups. Modification of AH, AP, and NS ceramides levels was more pronounced at SGR areas than arm. Odd-chained ceramides accounted for half of the total discriminating species in all cases. These findings support a role played by the SG in the plasticity of the SPB in both physiologic and pathologic conditions. Ceramide bio-signature in sebaceous areas may empower the characterization of AD patients.

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