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**New method to characterize epidermal Ceramides by Supercritical Fluid Chromatography (SFC) coupled to High Resolution Mass (Q-ToF) : Application to various samples with skin barrier defect. Conclusion & outlooks Skin ceramides extraction SFC-QTOF analysis Data Processing Ceramides characterization by MS/MS acquisition**

Cyrielle Clement, Julia Soullier, Roselyne Gautier, Carla Orlandi, Emilien Jamin, H el ene Duplan, Carine Jacques, Nathalie Jonca, Pauline Le Faouder, Justine Bertrand-Michel

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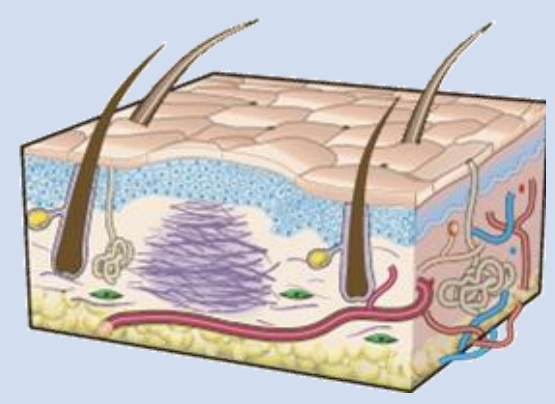
Cyrielle Clement, Julia Soullier, Roselyne Gautier, Carla Orlandi, Emilien Jamin, et al.. New method to characterize epidermal Ceramides by Supercritical Fluid Chromatography (SFC) coupled to High Resolution Mass (Q-Tof): Application to various samples with skin barrier defect. Conclusion & outlooks Skin ceramides extraction SFC-QTOF analysis Data Processing Ceramides characterization by MS/MS acquisition. ILS ( International Lipidomics Society) Conference, Aug 2023, Vienne, Austria. hal-04338851

# New method to characterize epidermal Ceramides by Supercritical Fluid Chromatography (SFC) coupled to High Resolution Mass (Q-ToF) : Application to various samples with skin barrier defect.

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## Biological context

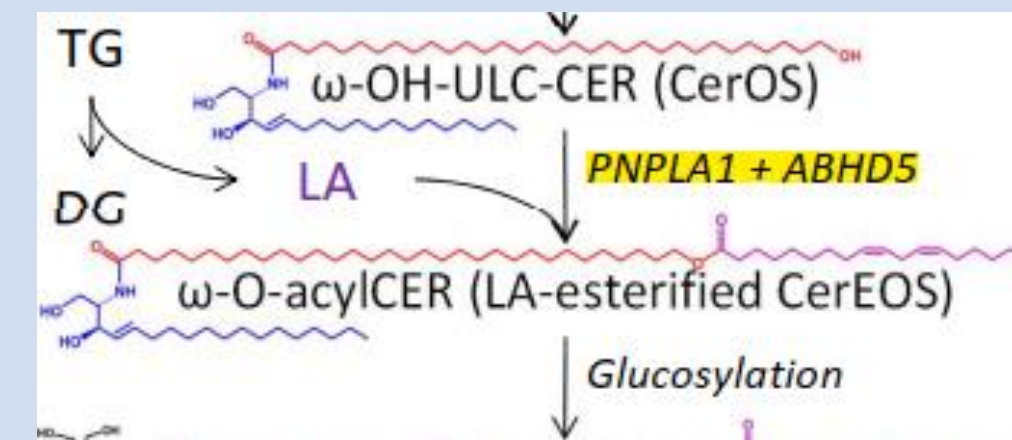
✓ Skin ceramide are key partners of epidermal barrier



**Stratum Corneum**  
Outermost layer of skin  
Barrier against environment

**Roles**  
Signal transduction  
Regulation of cells  
Permeability barrier function

➢ ω-O-Acylceramide is an epidermis specific lipid with a crucial role for skin barrier function

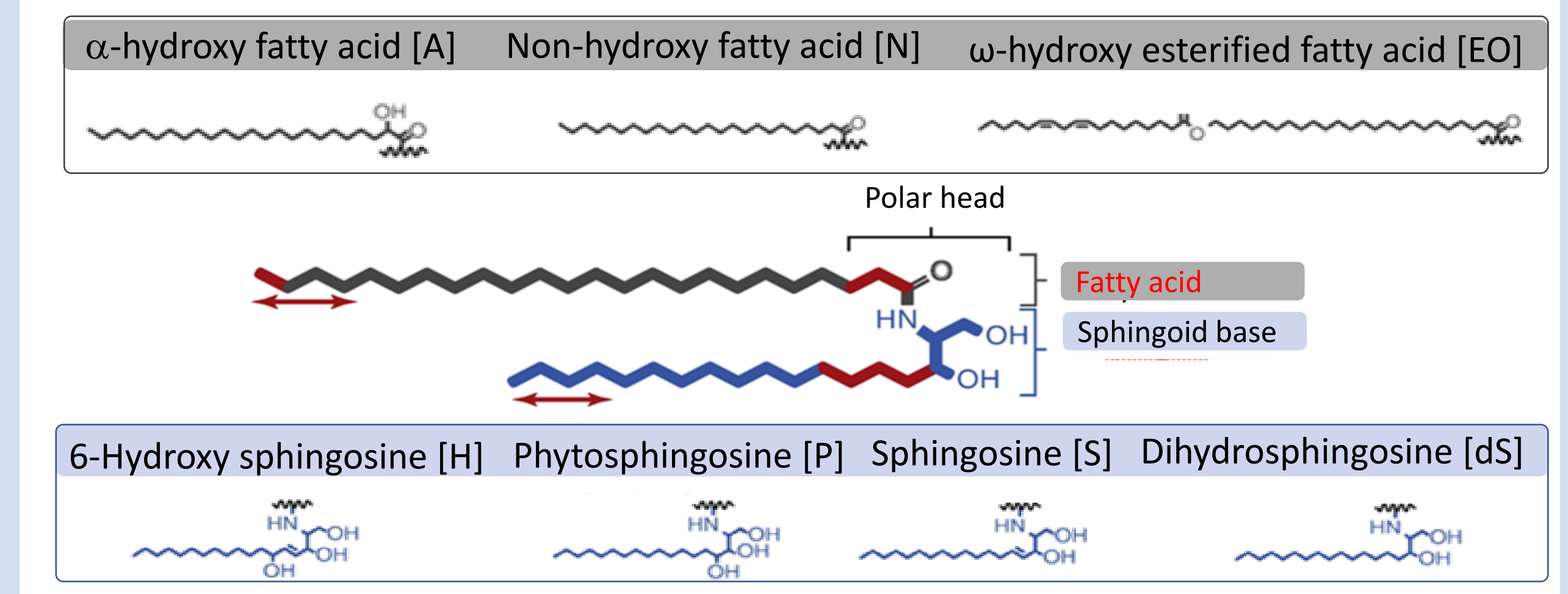


✓ Diseases such as ichthyosis are impacted by ceramide quality

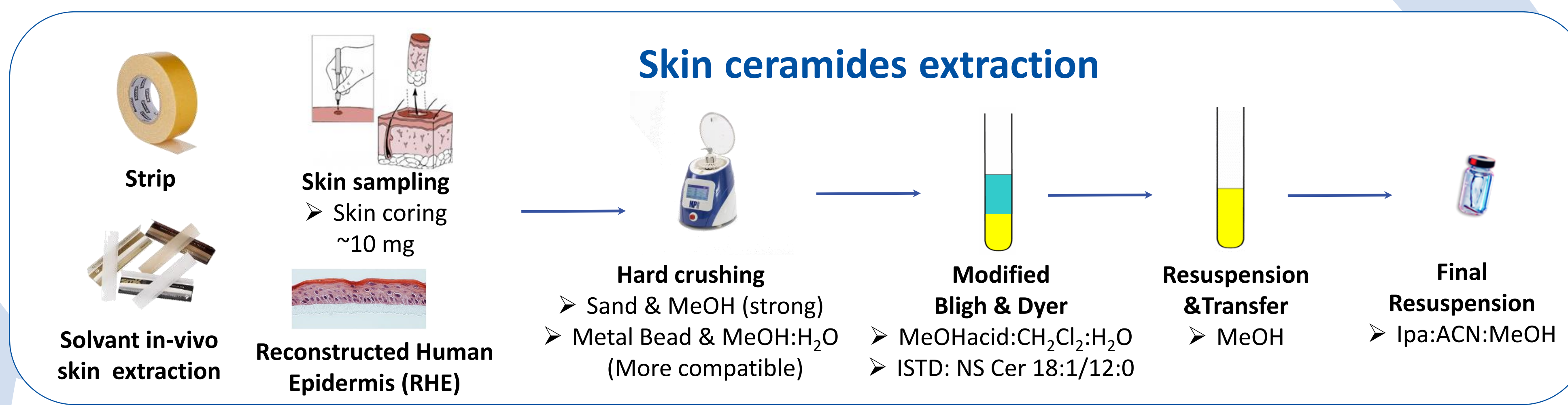
➢ PNPLA1 mutated patients present a default in CerEOS synthesis

➢ Mutation in patatin-like phospholipase domain-containing 1 (PNPLA1) causes autosomal recessive congenital ichthyosis

## Ceramides structures

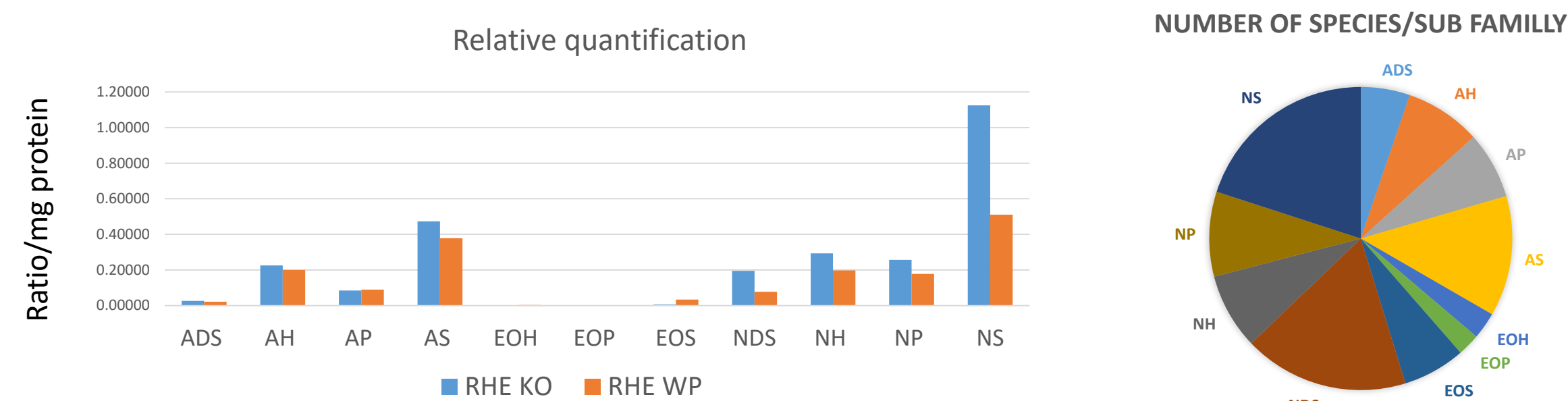


✓ Huge and complex diversity of epidermal ceramides

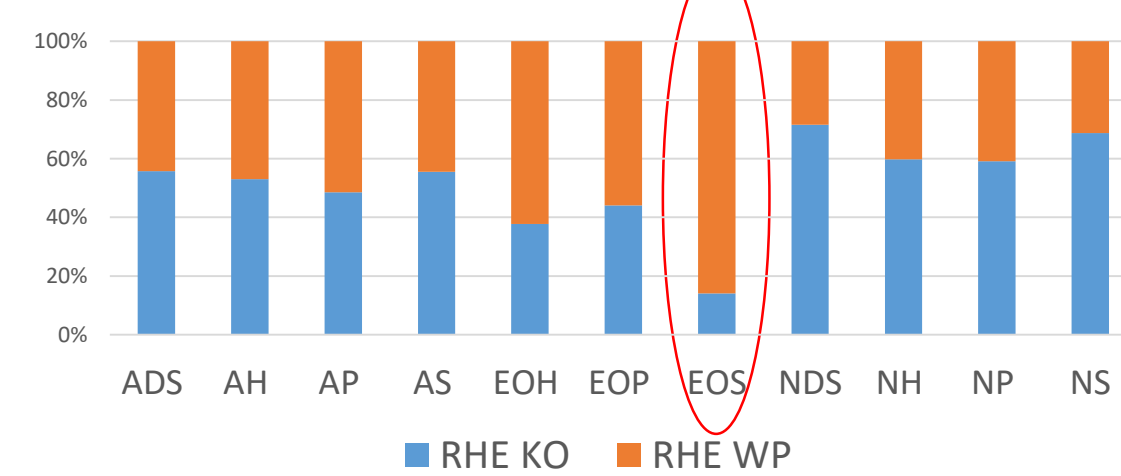


## RHE analysis

✓ Analysis of 209 ceramides species in 11 subclasses



✓ Decrease of CerEOS in PNPLA1 KO



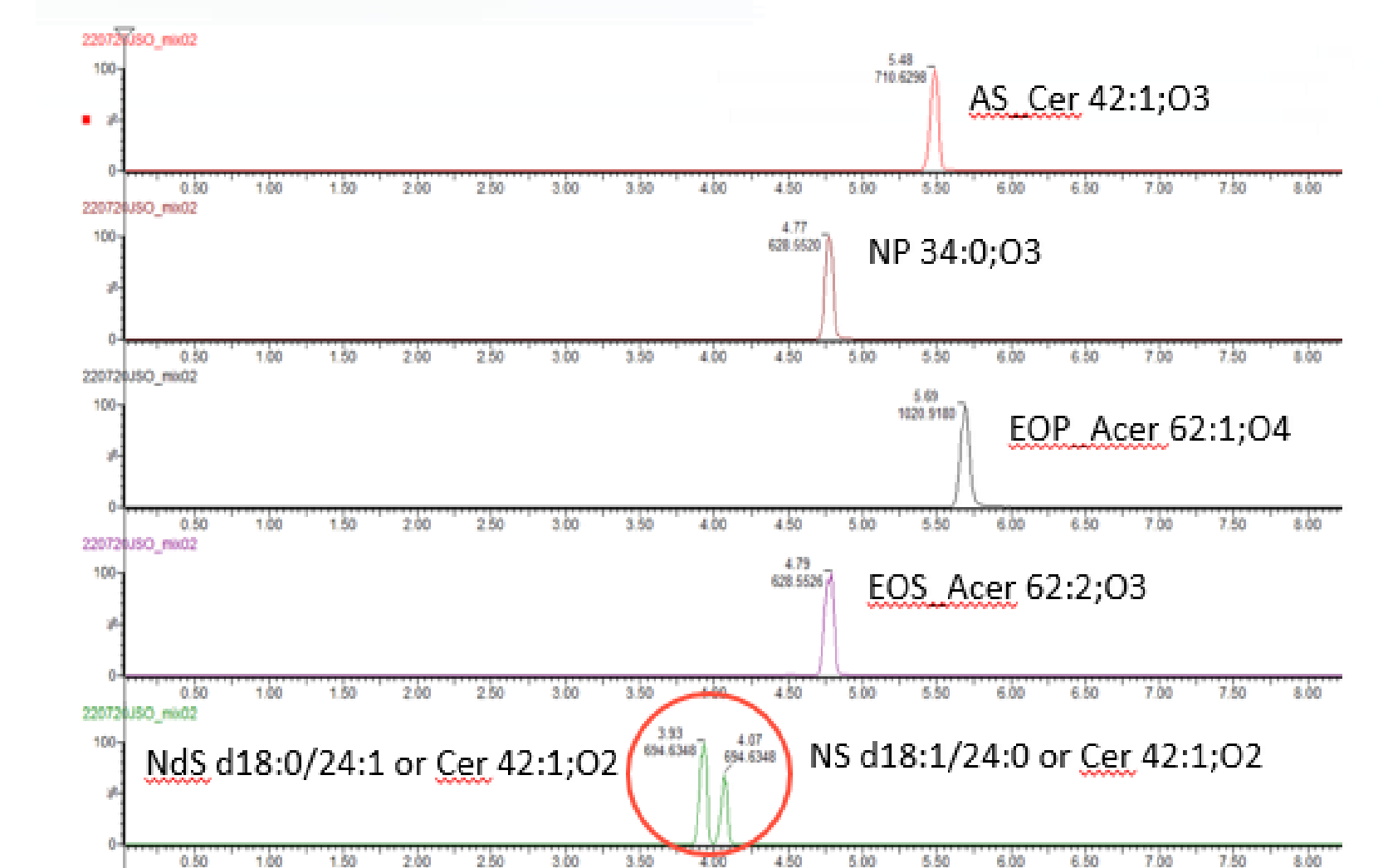
## SFC-QTOF analysis

✓ Optimized SFC conditions

**Column** : Torus DIOL 130Å, 1.7µm, 3 x 100 mm; Waters  
**A solvent** : SCCO<sub>2</sub>  
**B solvent (=Modifier)** : IPA:ACN:MeOH 30:30:40 (v/v/v)  
 0.1% acid formic  
**Flow rate** : 1.1 mL/min  
**ISM** : Methanol at 0.1 mL/min



✓ Separation by polar heads in 8min

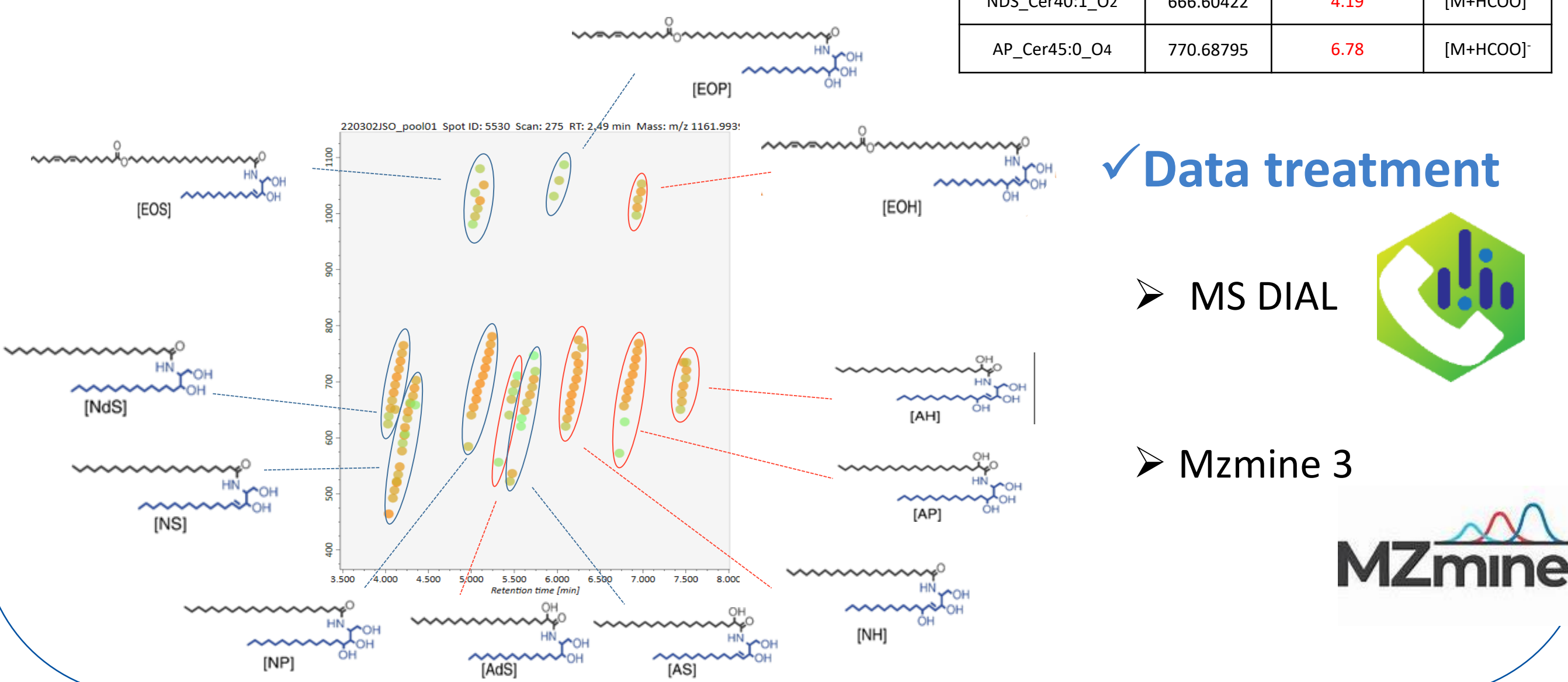


## Data Processing

✓ Home made data base:

➢ 280 species for 11 sub-classes

| Metabolite     | m/z       | RT (min) | Adduct                |
|----------------|-----------|----------|-----------------------|
| ADS_Cer34:0_O3 | 600.52088 | 5.09     | [M+HCOO] <sup>-</sup> |
| NDS_Cer40:1_O2 | 666.60422 | 4.19     | [M+HCOO] <sup>-</sup> |
| AP_Cer45:0_O4  | 770.68795 | 6.78     | [M+HCOO] <sup>-</sup> |



✓ Data treatment

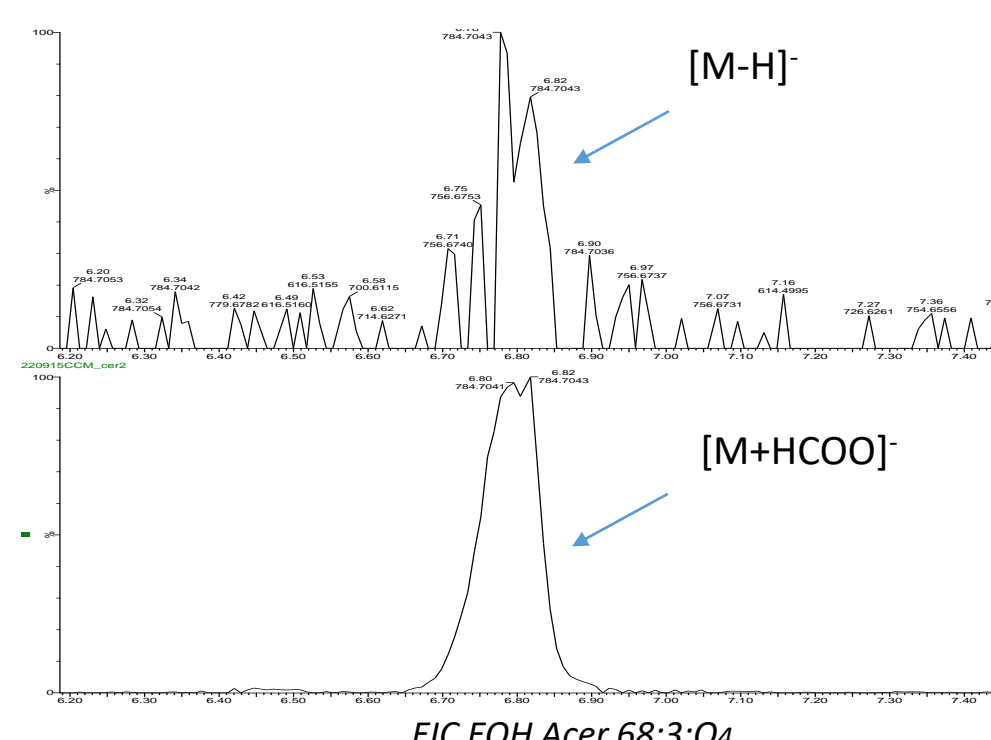
➢ MS DIAL

➢ Mzmine 3

## Ceramides characterization by MS/MS acquisition

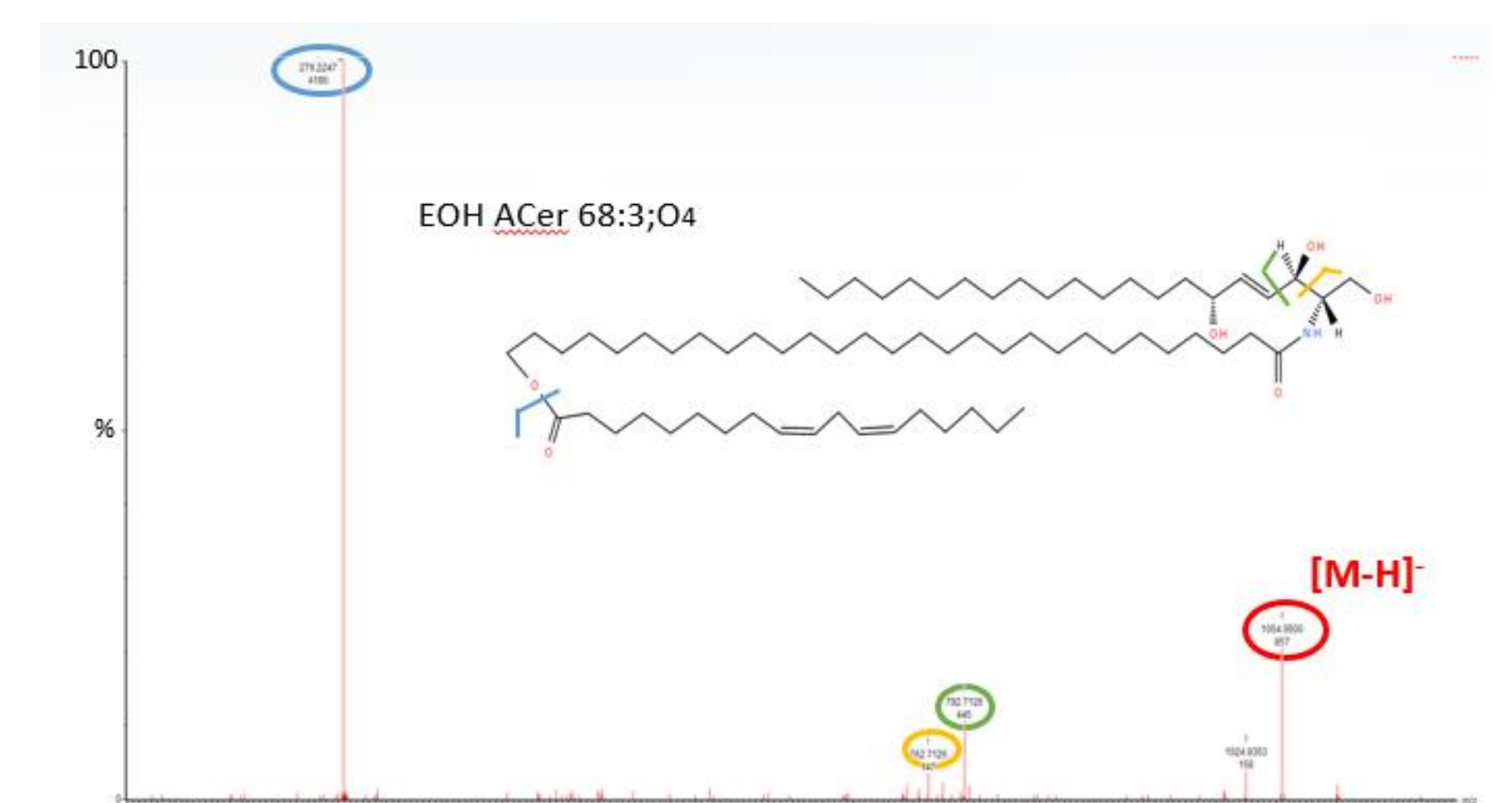
✓ Mass detection

➢ ESI negative mode  
 ➢ [M+HCOO]<sup>-</sup> adduct



✓ MS/MS fragmentation

➢ Validation of MS/MS for all on [M+HCOO]<sup>-</sup>



## Conclusion & outlooks

- ✓ Development of a specific and robust method for skin ceramides quantitative profiling using SFC-QTOF
- ✓ Application to RHE sample in the context of ichthyosis diseases
- ✓ Need to develop the analysis of Cer EOS precursor: CerEOS
- ✓ Continue the optimization of extraction on various sample (i.e Strip)

## References

- [1] Smeden et al, Biochimica et Biophysica Acta, 2014 (https://doi.org/10.1016/j.bbali.2013.10.002)
- [2] Smeden et al, Biochimica et Biophysica Acta, 2014 (http://dx.doi.org/10.1016/j.bbali.2013.11.006)
- [3] Jamin et al, EJMS, 2018 (DOI: 10.1177/1469066718815380) Forum lipidomic meeting, ILS, Vienna, 2023

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