# UNTARGETED HAIR LIPIDOMICS: COMPREHENSIVE EVALUATION OF THE HAIR-SPECIFIC LIPID SIGNATURE AND CONSIDERATIONS FOR RETROSPECTIVE ANALYSIS

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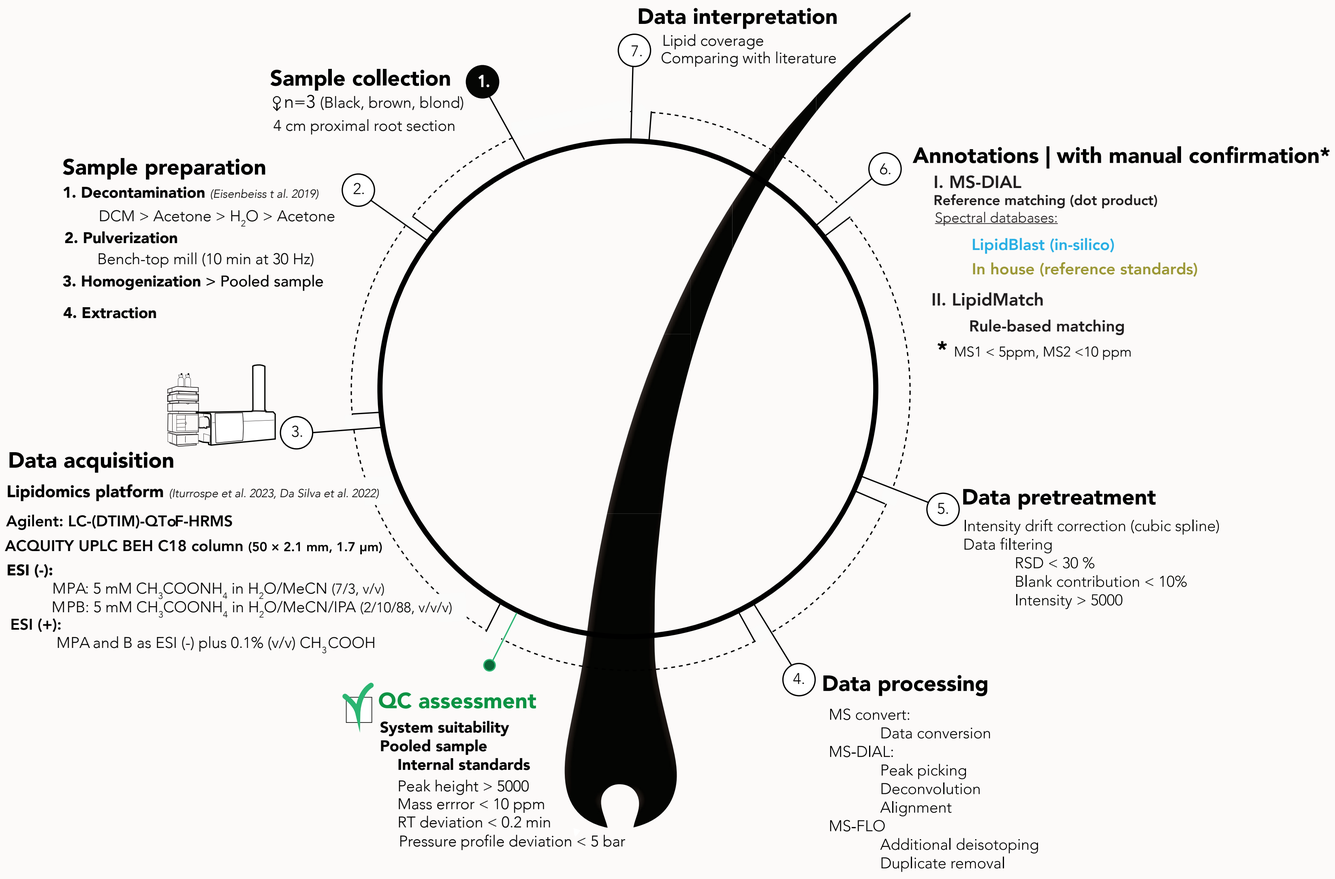
## BACKGROUND AND AIM

Hair has recently emerged as potential complementary sample type to identify biomarkers in early disease stages and retrospectively document an individual's metabolomic status due to its long detection window.
However, the limited coverage of lipid profiling presented in previous studies has hindered its exploitation.

**This study aimed to evaluate the lipid coverage of hair using an untargeted lipidomics platform.**

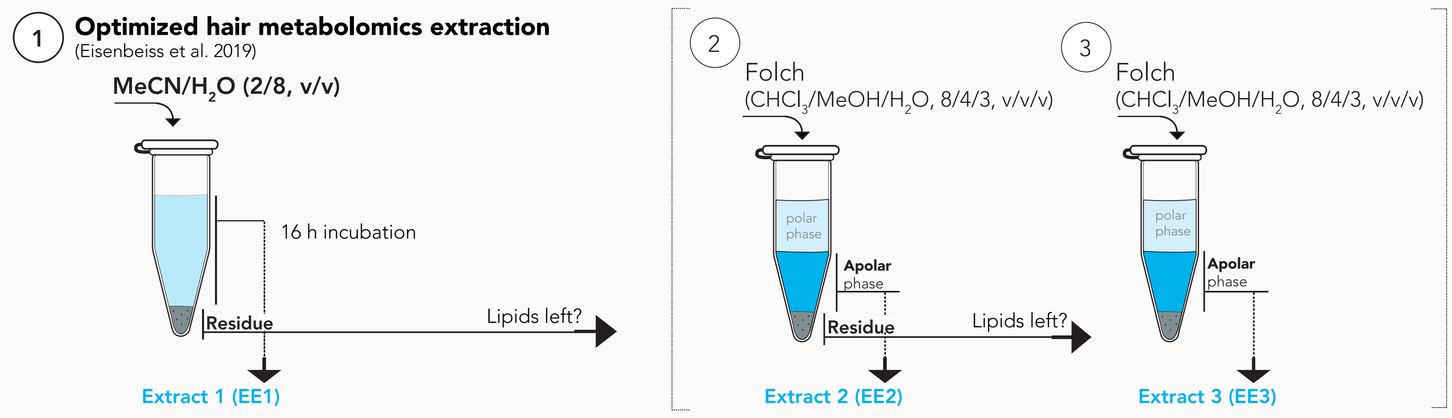
Two different three-step exhaustive extraction experiment were conducted using a hair metabolomics one-phase extraction technique and the two-phase Folch extraction method, considered the gold standard for lipid extration in biological matrices, respectively. The hair lipidome was compared with the blood and sebum lipidome to understand its role in reflecting health and disease status.

## LIPIDOMICS WORKFLOW

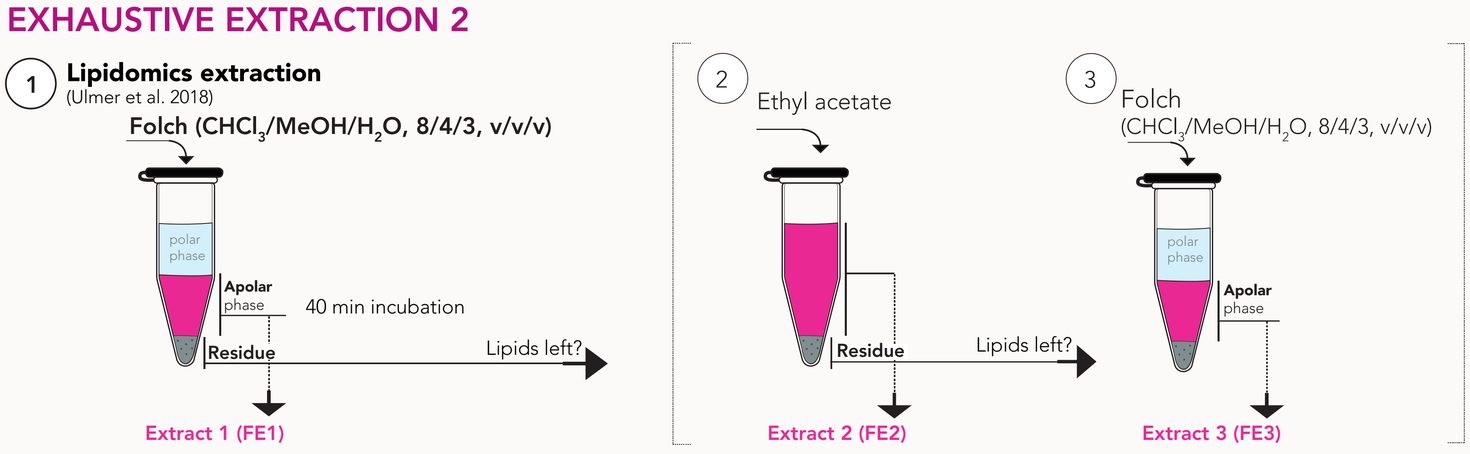



## STUDY DESIGN

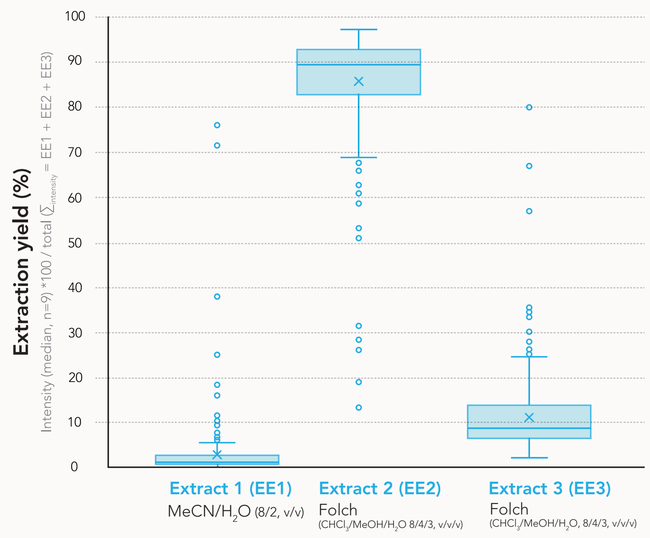
### EXHAUSTIVE EXTRACTION 1

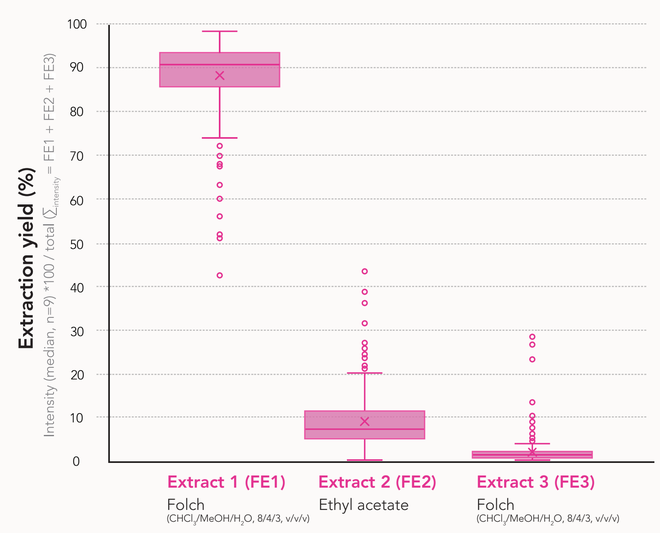



### EXHAUSTIVE EXTRACTION 2

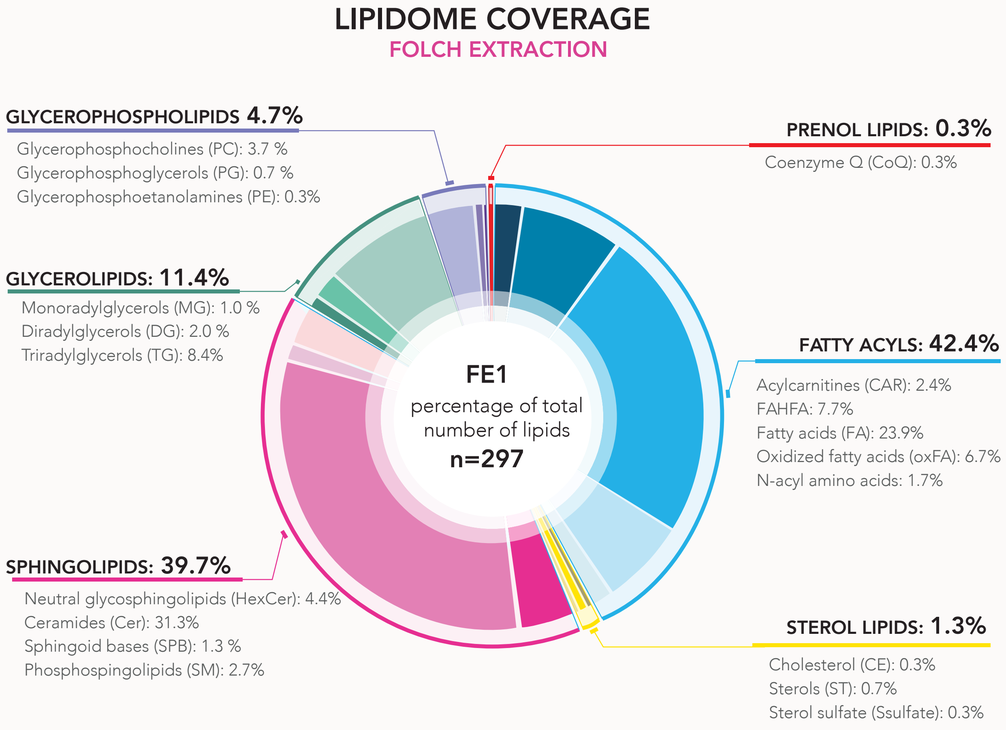



## RESULTS 1




## RESULTS 2

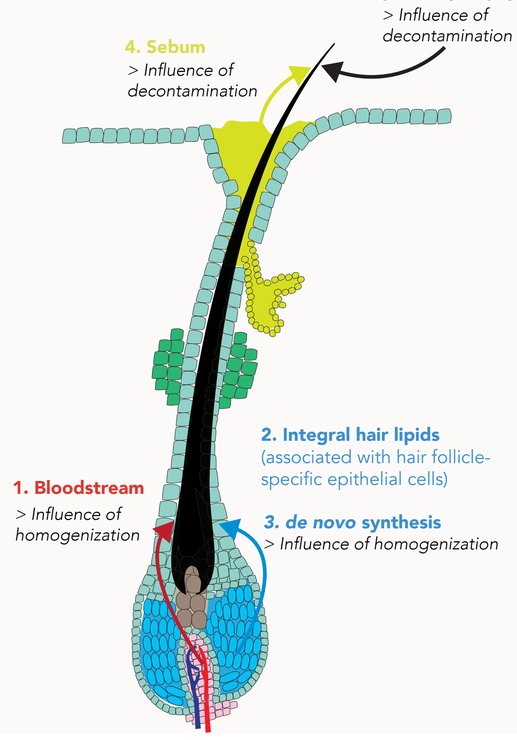



## CONCLUSION

The Folch two-phase extraction method was superior to an optimized one-phase protocol for hair untargeted metabolomics resulting in the extraction of a higher number of lipids (n=297, covering 6 lipid categories) and a higher yield of extracted lipid (90.8%). Furthermore, **N-acyl amino acids, OxFas, FAHFAs, DGs and coenzyme Q10** were reported in hair for the first time.

Moreover, this study performed a comprehensive review of the origin of hair lipid incorporation of the annotated lipid and suggested pre-analytical decontamination, homogenization, and extraction protocols for upcoming targeted and untargeted hair analysis research. The reconstructed hair lipidome and literature-based results suggest that **hair lipids originate from blood, sebum, environment or are *de novo* formed** within the hair shaft.

The results of this work offers valuable insights to contextualize untargeted hai analysis and facilitate the use of hair in translational studie in the field of toxicology, dermatology an clinical research.

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