

LIPIDOMICS PROFILING OF HUMAN HAIR

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INTRODUCTION

Hair has the potential as a new, promising matrix in lipidomics studies. The **long detection window** of weeks to months provides the opportunity to monitor metabolomic alterations over a longer timeframe with the potential to identify small molecules that play a key role in (early-stage) chronic conditions.

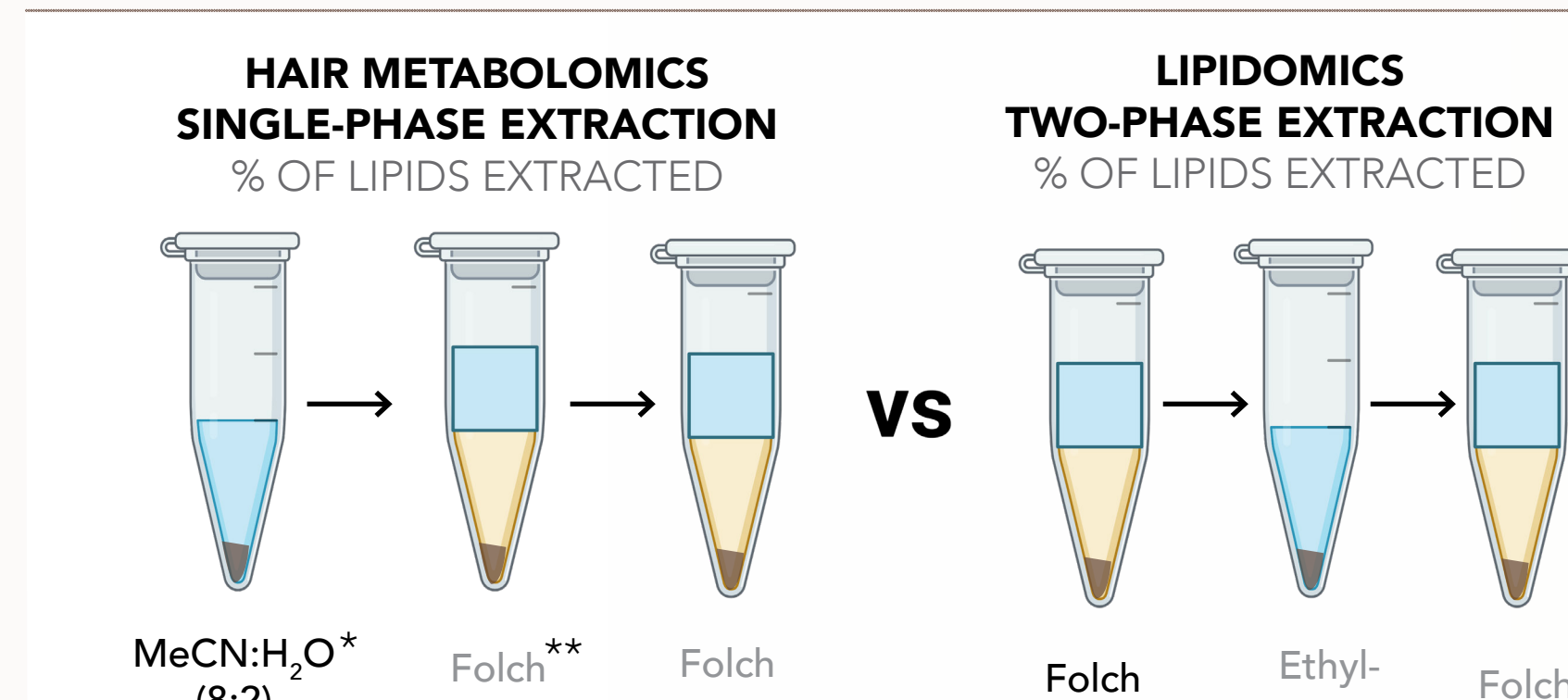
Current untargeted hair metabolomic studies rely on forensic hair analysis methodologies detecting polar (exogenous) compounds. Nevertheless, lipids play an essential role in various chronic diseases. However, up to date, there is no comprehensive and accurate identification of the hair lipidome.

OBJECTIVES

- 1 PROVE THE POTENTIAL OF HUMAN HAIR AS NOVEL MATRIX IN LIPIDOMICS...
- 2 INVESTIGATE THE IMPACT OF SAMPLE PREPARATION FACTORS ON LIPID ABUNDANCE...
- 3 ESTABLISH THE GLOBAL COMPOSITION OF THE HAIR LIPIDOME...

METHODS

- 1 ...BY COMPARING A SINGLE-PHASE EXTRACTION (USED IN HAIR METABOLOMICS) WITH A LIPIDOMICS EXTRACTION TECHNIQUE



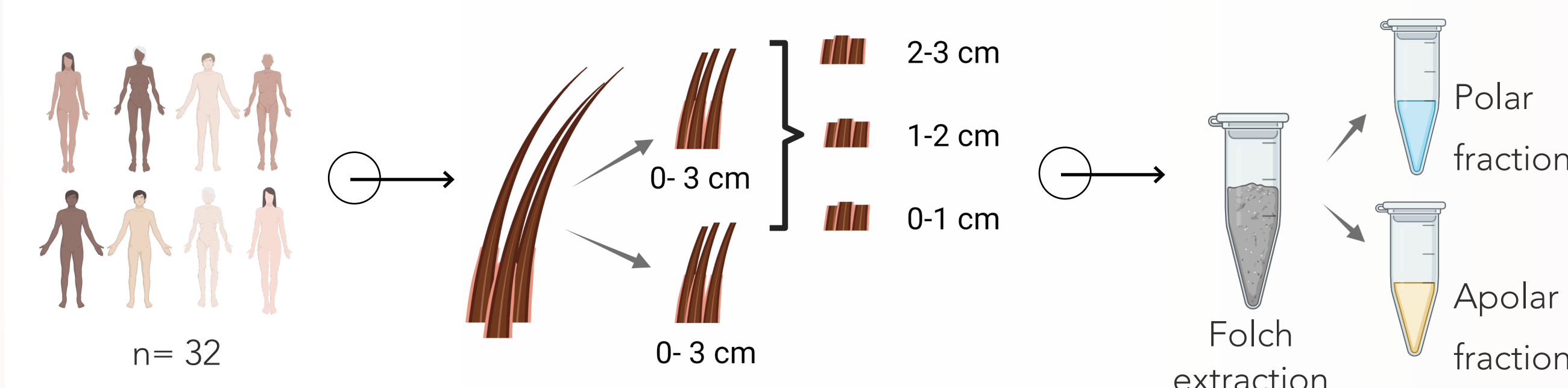
- 2 ... BY PERFORMING A FRACTIONAL FACTORIAL DESIGN EXPERIMENT

Factor	Level 1	Level 2	
Pulverization time	3 min	10 min	*Matyash: MBTE:MeOH:H ₂ O, 10:3:2.5, v/v/v.
Extraction solvent*	Matyash	Folch	** 1 mM (NH ₄) ₂ EDTA, 0.5 mM ascorbic acid and 1 mM BHT
Addition of AOX**	Yes	No	
Sample-to-solvent ratio	1:30	1:120	
Incubation technique	Shaking @ 20°C	On ice	
Extraction time	30 min	240 min	

16 experiments in duplicate

- 3 ... BY DETERMINING THE STABLE HAIR LIPIDOME USING AN UNTARGETED APPROACH

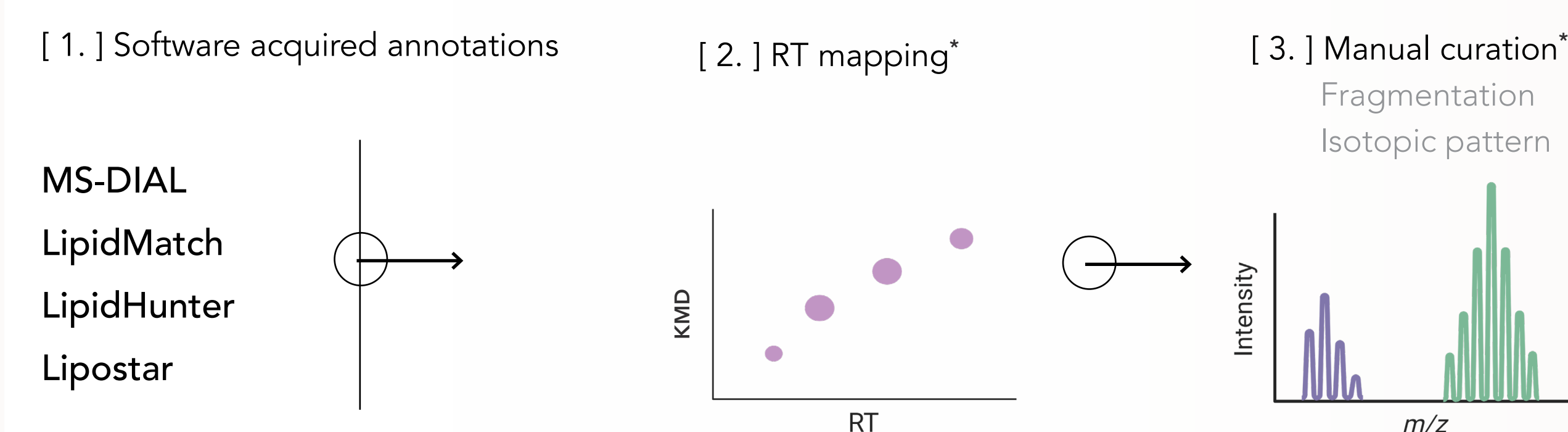
STUDY DESIGN



DATA ACQUISITION

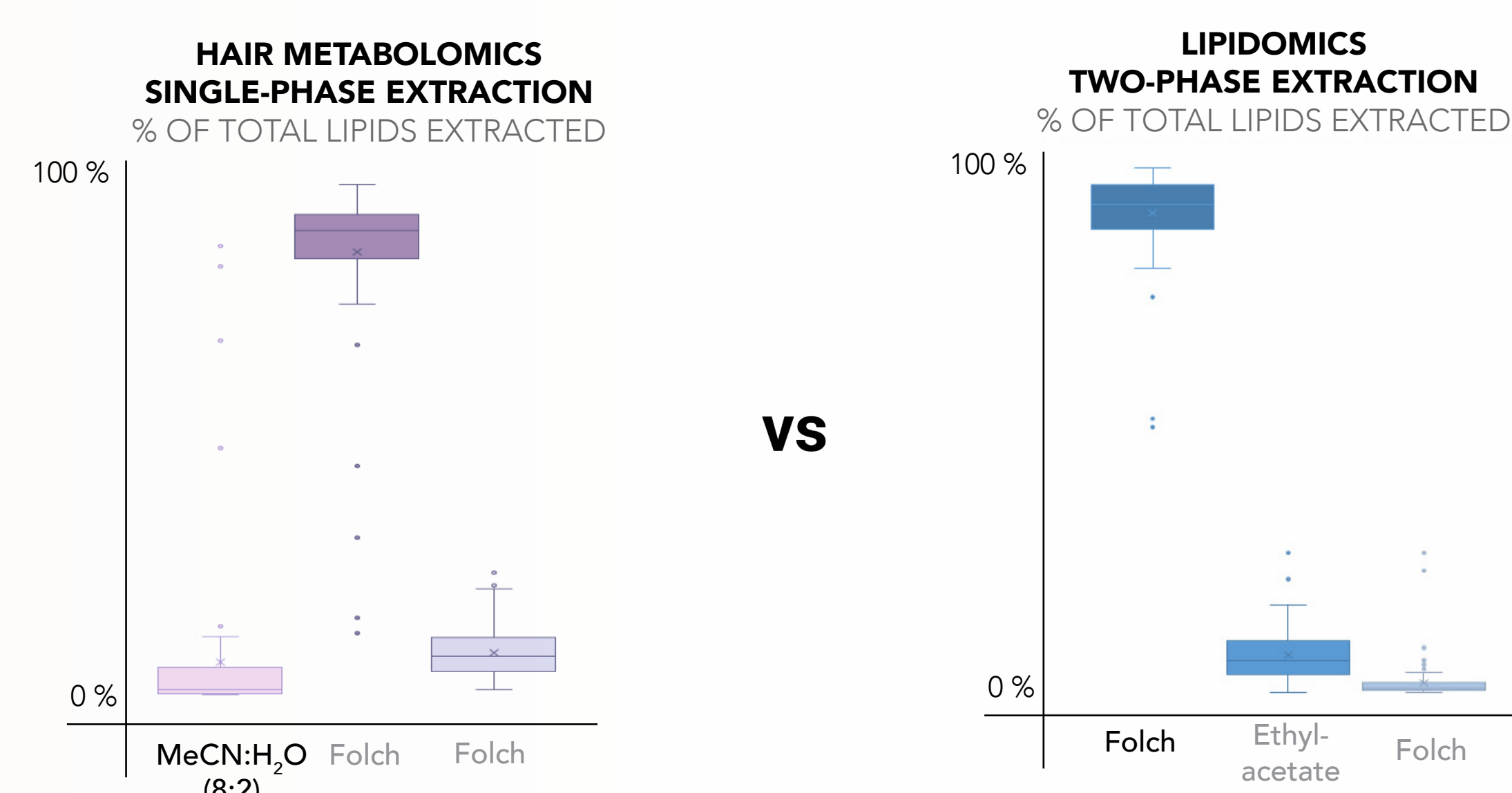


DATA ANALYSIS

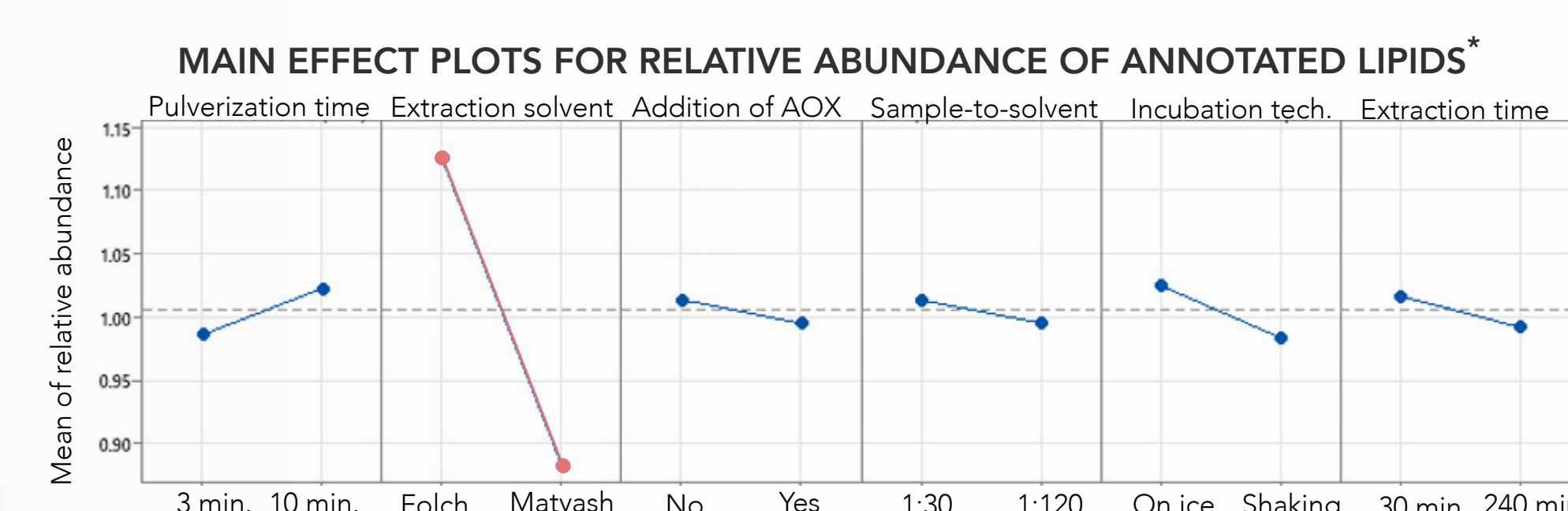


RESULTS

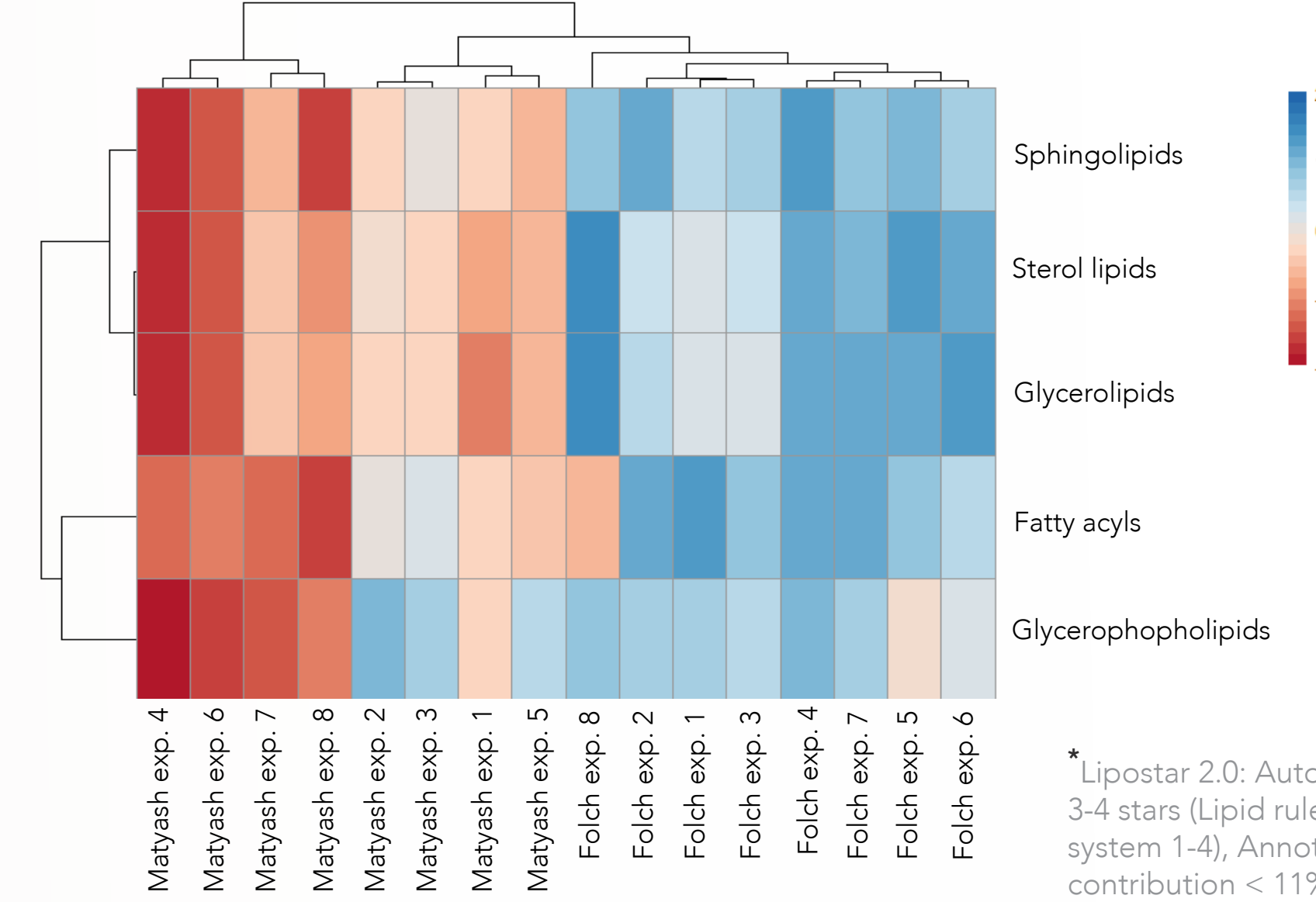
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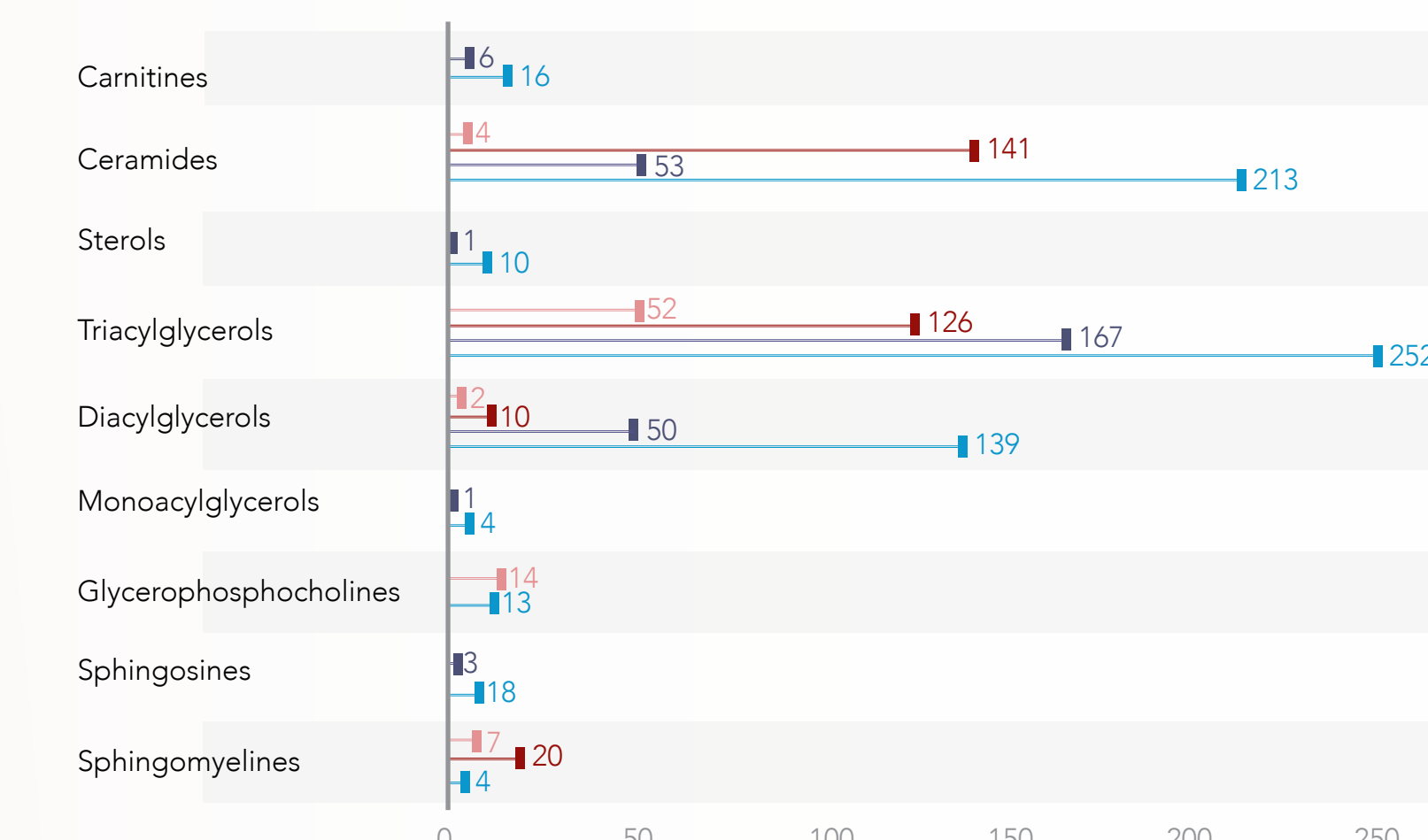


RELATIVE ABUNDANCE OF ANNOTATED LIPIDS*



3

NUMBER OF ANNOTATED LIPID SUBCLASSES (ESI +)*



CONCLUSION

A significant increase in the percentage of extractable lipids is uncovered using a lipidomics-based extraction method.

The type of extraction solvent has a significant impact on lipid signal intensities: The Folch extraction procedure is the preferred extraction method to detect low-abundance lipids in hair.

A total of 659, 281, 297 and 79 lipids were annotated (ESI +) using MS-DIAL, LipidMatch, LipidHunter and Lipostar, respectively.