





Abstract

Potential of Plasma Oxylipin Signature to Better Understand the Relationships between Diet, Fatty Acids and Oxylipins in Healthy Individuals: New Insights from Two Independent Cohort Studies [†]

Cécile Gladine ^{1,*}, Nils Schebb ², Mathilde Touvier ³, Arne Astrup ⁴, Philip Calder ⁵, Andrzej Szuba ⁶ and John Newman ^{7,8,9}

¹ UNH, INRAE, Université Clermont Auvergne, 63000 Clermont-Ferrand, France

² Chair of Food Chemistry, Faculty of Mathematics and Natural Sciences, University of Wuppertal, 42119 Wuppertal, Germany; nils@schebb-web.de

³ Nutritional Epidemiology Research Team (EREN), Sorbonne Paris Nord University, INSERM U1153, INRAE U1125, Cnam, Epidemiology and Statistics Research Center, University Paris Cité (CRESS), 93017 Bobigny, France; m.touvier@eren.smbh.univ-paris13.fr

⁴ Obesity and Nutritional Sciences, Novo Nordisk Foundation, 2900 Hellerup, Denmark; ara@novo.dk

⁵ NIHR Southampton Biomedical Research Centre, University Hospital Southampton NHS Foundation Trust and University of Southampton, Southampton SO16 6YD, UK; p.c.calder@soton.ac.uk

⁶ Department of Angiology, Hypertension and Diabetology, Wroclaw Medical University, 50-556 Wroclaw, Poland; andrzej.szuba@umed.wroc.pl

⁷ Obesity and Metabolism Research Unit, Western Human Nutrition Research Center, United States Department of Agriculture-Agriculture Research Service, Davis, CA 95616, USA; john.newman2@usda.gov

⁸ University of California Davis Genome Center, University of California, Davis, CA 95616, USA

⁹ Department of Nutrition, University of California, Davis, CA 95616, USA

* Correspondence: cecile.gladine@inrae.fr

[†] Presented at the 14th European Nutrition Conference FENS 2023, Belgrade, Serbia, 14–17 November 2023.



Citation: Gladine, C.; Schebb, N.; Touvier, M.; Astrup, A.; Calder, P.; Szuba, A.; Newman, J. Potential of Plasma Oxylipin Signature to Better Understand the Relationships between Diet, Fatty Acids and Oxylipins in Healthy Individuals: New Insights from Two Independent Cohort Studies. *Proceedings* **2023**, *91*, 335. <https://doi.org/10.3390/proceedings2023091335>

Academic Editor: Sladjana Sobajic

Published: 19 February 2024



Copyright: © 2024 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).

Abstract: Eicosanoids and other oxylipins represent a superfamily of bioactive lipids involved in the regulation of crucial biological processes such as inflammation, blood clotting or endothelial reactivity. Oxylipins are generated from polyunsaturated fatty acids (PUFAs) through various enzymatic and free-radical-mediated reactions. Interestingly, each metabolic step (PUFA availability, enzyme activity and oxidative stress) can be influenced by diet. Oxylipins could therefore be important mediators of the effects of diet on human health. To provide new insights into the relationships between oxylipins, fatty acids (FAs) and diet, we conducted two independent cohort studies nested in the Polish branch of the PURE international cohort and in the French Nutrinet-Santé cohort, respectively. The selected participants ($n = 318$) were healthy and fully characterized for their dietary intake. Our first objective was to determine if a healthy diet was associated with a specific oxylipin signature. Our secondary objective was to comprehensively investigate the relationships between diet, FAs and oxylipins. Participants were distributed into two groups according to the quality of their diet (based on the Alternative Healthy Eating Index (AHEI)). Targeted lipidomics was performed to comprehensively quantify plasma oxylipins and FAs. The association between oxylipins, FAs and the quality of the diet was modeled using conditional logistic regression. The relationships between oxylipins, FAs and diet were investigated using an unsupervised multiblock analysis (Multiblock Factorial Analysis (MFA)). We generated a unique database revealing unsuspected associations between diet, FAs and oxylipins. Validation studies are now required to further explore the potential of oxylipins to monitor the health effects of diet.

Keywords: lipid mediators; lipidomic; oxylipins; diet; health

Author Contributions: Conceptualization, C.G., J.N., N.S., M.T. and A.S.; methodology, C.G., N.S., J.N. and P.C.; formal analysis, C.G. and J.N.; investigation, C.G., N.S., J.N. and P.C.; resources, M.T. and A.S.; data curation, A.A.; writing—original draft preparation, C.G., J.N. and P.C.; writing—review and editing, C.G., N.S., M.T., A.A., P.C., A.S. and J.N.; visualization, C.G.; project administration, C.G.; funding acquisition, C.G., N.S., A.A., A.S. and M.T. All authors have read and agreed to the published version of the manuscript.

Funding: National research agencies: (i) French (grant N° ANR-16-HDHL-0004-01/02), (ii) German (BMBF grant N° 01EA1702), (iii) Danish (grant N° 4203-00006B) and (iv) Polish (grant N° ERAH.E220.18.001) in the framework of the Oxygenate project supported by the European Joint Programming Initiative “A Healthy Diet for a Healthy Life” (JPI HDHL). The main PURE study and its components are funded by the Population Health Research Institute, the Canadian Institutes of Health Research, Heart and Stroke Foundation of Ontario and through unrestricted grants from several pharmaceutical companies, Poland substudy: Polish Ministry of Science and Higher Education (grant No. 290/W-PURE/2008/0). And USDA CRIS Project 2032-51530-025-00D.

Institutional Review Board Statement: The study was conducted in accordance with the Declaration of Helsinki, and approved by the Institutional Review Board of the Wroclaw Medical University (IRB number: KB-443/2006) and by the International Research Board of the French Institute of Health and Medical research (IRB Inserm n°0000388FWA00005831) and the “Comité National Informatique et Liberté” (CNIL n°908450 and n°909216).

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: Any data or material that support the findings of this study can be made available by the corresponding author upon request.

Conflicts of Interest: The authors declare no conflict of interest.

Disclaimer/Publisher’s Note: The statements, opinions and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of MDPI and/or the editor(s). MDPI and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions or products referred to in the content.