

Metabolic profile analyses of diets with different degrees of food processing (EPIC cohort)

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Introduction

Diets have shifted towards the consumption of processed food. The NOVA system classifies it into (1) minimally processed, (2) culinary ingredients, (3) processed foods (PF) and (4) ultra-processed foods (UPF). There is evidence that PF and UPF are related with disease outcomes (obesity, diabetes, cardiovascular disease, cancer), and mortality but the metabolic signatures according to the degrees of processing is unknown.

Methods

There were 1,367 cancer-free participants from nested case-control studies within the EPIC cohort with measurements of endogenous metabolites (N=129) and fatty acids (FA)(N=37). The metabolite data was processed following the pipeline developed at IARC. Then linear regression models were performed with the metabolites (dependent) and the NOVA groups (independent), adjusting for sex, age, fasting status, body mass index, waist circumference, alcohol intake, smoking status, and physical activity. The p values were corrected by the Benjamini Hochberg method. A PLS model was performed to confirm directionality.

Results

Most of the participants were women (60.2%), with a median age at enrolment of 55.6 ± 9.01 years, and many were overweight (44.6%) or obese (13.6%). After adjustments Proline and kynurenine were positively associated with PF. Phosphatidylcholine acyl-alkyl (PC ae) C32:2 and C38:0, PC diacyl (PC aa) C36:5, C38:6 and C42:6, serin, lysine asparagine, sphingomyelin C24:1 and eicosapentaenoic acid (EPA 20:5n-3) were negatively associated with UPF. Stearic acid, monounsaturated FA (fatty acid) 18:1n-5, gamma-linolenic acid docosate-traenoic acid, ruminant trans conjugated linoleic acid CLA, -Vaccenic acid and industrial trans (iTFA) elaidic acid were positively associated with UPF.

Conclusion

Our findings might highlight metabolic pathways related to health outcomes particularly because iTFAs and stearic acid, which are positively associated with UPF in our study, are related with increased risk with non-communicable diseases, and mortality. Also serine and asparagine, which were negatively associated with UPF in our findings, are inversely associated with obesity and positively associated with increased WCRF/AIRC score.

Primary authors: BLANCO LOPEZ, Jessica (IARC - NME); YAMMINE, Sahar (Université Sorbonne Paris Nord and Université Paris Cité, INSERM, INRAE, CNAM, Center of Research in Epidemiology and Statistics (CRESS), Nutritional)

Co-authors: ROTHWELL, Joseph (Université Paris-Saclay, UVSQ, Inserm, Gustave Roussy, CESP, 94805, Villejuif, France.); HIS, Mathilde (Prevention Cancer Environment Department, Centre Leon Bérard, Lyon/ Inserm, U1296 Unit, "Radiation: Defense, Health and Environment"); KLIEMANN, Nathalie (CEPON - Centro de Pesquisas Oncológicas, Brazil); HUYBRECHTS, Inge (IARC)

Presenter: BLANCO LOPEZ, Jessica (IARC - NME)

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