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COMPARISON OF THE URINE METABOLOMES OF STRATIFIED SU.VI.MAX2 SUBJECTS TO IDENTIFY BIOMARKERS OF FRUIT AND VEGETABLE INTAKE

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The "Food metabolome" is the subset of all in vivo metabolites originating from the digestion of food components. Global analyses of these metabolites by high-resolution mass spectrometry, coupled with multivariate statistical methods, allow individuals with different dietary patterns to be distinguished. Further, the comparison of groups of low and high consumers of a given food can then be used as a basis for the identification of biomarkers of consumption. In a proof-of-concept study on citrus, we showed that urine profiling of cohort subjects stratified by consumption could be a more effective strategy for discovery of sensitive biomarkers of intake than intervention studies. As part of the ANR PhenoMeNEp project, we further tested this approach for the intake of 20 selected plant foods. Using dietary questionnaire data (1994-2009), 144 high and 66 low consumers of fruit and vegetables (F&V) were selected from the SU.VI.MAX2 cohort. Morning spot urine samples were analyzed by UPLC-QTOF with positive and negative electrospray ionisation. Subgroups of low and high consumers were selected for each of the 20 foods from reported consumption, excluding from each selection any subject with a high intake of other foods. Data were treated with both univariate (Anova with BH correction) and multivariate analysis (PLS-DA) performed after an Orthogonal Signal Correction (OSC). Good discriminations were observed for most foods, but particularly for 10 foods that are frequently consumed and rich in phytochemicals. The number of significant ions ranged from 133 for coffee to 428 for apple. Some of these discriminants, although highly correlated with consumption of the target food, were not specific enough to make good candidate biomarkers. The long-term low and high consumption of F&V were also clearly reflected in the urine metabolomes, mainly through variations in endogenous metabolites. The most discriminating and specific ions are being currently identified and several new biomarkers have already been identified in coffee. The study provided a useful insight into the conditions for success and the limitations of the approach of applying metabolomics to cohort samples for rapid discovery of a wide range of nutritional biomarkers.

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