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Metabolic adjustments of normal and overweight subjects during overfeeding revealed by metabolomics

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The purpose of the present work was to compare early changes in metabolic status of male free living overweight (OW) and lean subjects (NW) during a moderate weight gain, using a metabolomic approach.

Nineteen lean and 19 overweight male volunteers were submitted to a lipid-enriched overfeeding protocol. Metabolic explorations, as well as plasma and urine metabolomic profiles acquired using UPLC-MS, were determined along 8 weeks to compare metabolic trajectories and identify early changes in metabolic processes.

Urinary metabolomic profiles during overfeeding evidenced differences in metabolic trajectories between groups, characterized by an increase over time of short-, medium-chain acylcarnitines, and bile acids in OW. For most of the anthropometric, metabolic parameters and plasma metabolomics data, the two phenotypes were discriminated but the time-course evolution of all subjects was similar. Plasma abundances of unsaturated lysophosphosphatidylcholines decreased over time more importantly in NW while those of the saturated isomers increased in both groups.

These findings not evidenced with classical parameters, indicate a differential response to overfeeding in urine metabolomes, suggesting different nutrient metabolic fate with weight status. Subtle metabolic changes, mostly related to inflammation and difference in β -oxidation indicate a lower metabolic flexibility of OW subjects facing weight gain induced by overfeeding.