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**Title:** Metabolic signatures in nutrition and health: short-term diet response, sexual dimorphism and hormone chronobiology

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The power of personalized nutrition lies in being able to conduct clinical research on healthy people while capturing metabolic markers sensitive to the impact of environmental and metabolic stressors (e.g., diet, changing sex hormones and the menstrual cycle). Using clinical biomarkers, metabolomics, and diet interventions with intake analyses, we demonstrated the metabolic impact of vegan and animal diet interventions using fasting plasma analysis after 48 hours and using postprandial plasma analysis after meals and snacks. Sexually dimorphic responses were differentiated using proteomics and pathway analyses in two larger, sex-balanced cohorts. Finally, clinical biomarker and metabolomics analyses identified metabolic subtypes across menstrual cycle phases. Although challenges with integrating -omics technology and nutrition remain, the fundamental information generated from these research studies may provide a foundation for future novel personalized nutrition strategies.

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