**LONGITUDINAL NMR-BASED METABOLOMICS ANALYSIS OF MOUNTAIN ULTRAMARATHON RUNNERS: NEW PERSPECTIVES FOR ATHLETES MONITORING AND INJURY PREVENTION.**

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This study aims to explore how metabolomic approach could provide valuable information about changes in athletes’ metabolome occurring during a mountain ultramarathon race.

To achieve this goal, we built a longitudinal cohort of athletes enrolled in “TOR des Géants”. Using an 1H-NMR-based metabolomic approach, we evaluated metabolic changes that arise during both the race effort and the recovery phase and correlate them with functional muscles, cardiac, inflammatory, and kidney biomarkers already used in clinics. Processed data were analyzed with tools dedicated to longitudinal study design (ASCA+) and allowed us to assess specific changes in the metabolome and clinical biomarkers across the different time points. The data illustrated how the metabolism of athletes is impacted during the race and that 3-days recovery didn’t allow a return to metabolic and functional baseline. Innovative pathway analysis such as single samples Pathway Analysis (ssPA) was employed to emphasize the signaling routes that play a crucial role in endurance effort and recovery. These analyses shed light to the metabolic shift that occurs during an extreme mountain ultramarathon race and how athletes recover from it after a 72h recovery period.

Metabolomics-based analysis in the field of endurance sport is improving our understanding in the physiological responses to extreme effort. By its ability to provide valuable information about athletes’ status in real condition, this methodology provide new tools for athletes’ fitness evaluation, performance prediction, nutrient supplementation and the development of personalized follow-up, metabolomics offers the keys for a rationalized and healthy approach of extreme sport endurance practice.