

sciforum-130508: Exercise-induced metabolic changes of cardiac rehabilitation after acute myocardial infarction: Insights from dried blood spot profiling

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Ischemic heart disease remains the leading cause of cardiovascular-related mortality worldwide. Although the benefits of cardiac rehabilitation (CR) through physical exercise after acute myocardial infarction (AMI) are well known, knowledge of metabolic adaptations remains limited. This study investigates the metabolic response to CR in AMI patients implying untargeted metabolomics and lipidomics analysis on dried blood spots (DBS).

Seventeen male subjects after a first AMI were enrolled in a three-week rehabilitation protocol. DBS samples were collected before and after training in three distinct times– first training, mid-protocol and final training. Untargeted metabolomics and lipidomics analyses were performed using ultra-high performance liquid chromatography coupled with mass spectrometry to assess training-induced changes. Statistical analysis was performed using paired t-test ($p < 0.05$), with results visualized in volcano plots.

Progressive training adaptations were observed over time, along with changes in energy metabolism and improved physical performance at the end of the CR protocol. Short-term change in lipid profile was also detected. In particular, phosphatidylserine (PS) levels increased significantly post-first training. PS are known to decrease after myocardial infarction, and previous studies suggest that boosting PS levels (e.g. oral supplementation) could be a potential therapeutic strategy by exerting cardioprotective effects. Our results suggest that training enhances PS biosynthesis through potential activation of phosphatidylserine synthase 1 (PSS1), indicating a potential benefit of CR in cardiac repair. Additionally, CR monitoring showed that blood levels of N-acetyl-L-tyrosine (NAT) increase with rehabilitation time. NAT has been shown to induce mitohormesis, an adaptive mitochondrial stress response, in mice and insects and has potential links to physical training in humans.

Comprehensively, our findings suggest that CR induces changes in both the metabolomic and lipidomic profiles of AMI patients, alongside improvements in physical performance. PS and NAT emerged as promising biomarkers for monitoring CR progress and may contribute to potential benefits on AMI recovery.



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