Lifelong exercise targets mitochondria phosphoproteome to improve heart function

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Moderate physical activity has been associated to the improvement of the cardiac function and, consequently, to the extension of the life span. Mitochondria play a key role in the adaptation of heart muscle to exercise-related metabolic demands. In order to disclose the molecular mechanisms underlying the beneficial effect of lifelong physical activity in the cardiac function, we performed label-free quantitative mass spectrometry-based proteomics of heart mitochondrial proteome and phosphoproteome. Data shown that 54-weeks of moderate treadmill exercise modulates the abundance of proteins involved in the generation of precursor metabolites and cellular respiration, suggesting an increase in carbohydrate oxidation-based metabolism.

Most of the proteins exhibiting significant alterations in specific phosphorylation sites were involved in metabolism. Motif analysis has aided in the identification of potential kinases responsible for the observed phosphorylation events, such as RAF and p38 MAPK, that have been further validated with immunoblotting techniques.

Taken together, data highlight the plasticity of heart mitochondria by the reprogramming of phosphoproteome, and it provides evidence for the kinases involved in the regulation of metabolic pathways and mitochondrial maintenance in response to long exercise programs.

REFERENCES

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FIGURE 1
Effect of lifelong exercise in the regulation of biological processes.

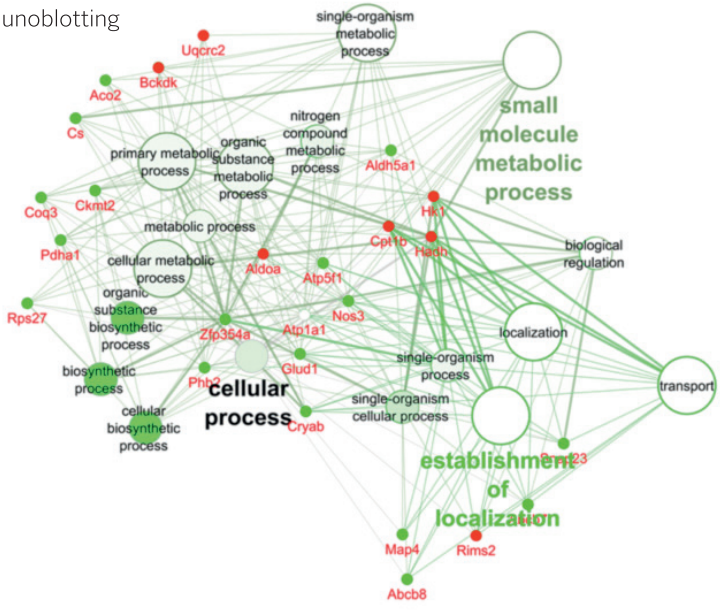

FIGURE 2
Predicted kinases distribution among groups based on specific phosphosites (network constructed using Cytoscape v2.8.3).