Effect of involuntary muscle contraction on FNDC5/Irisin

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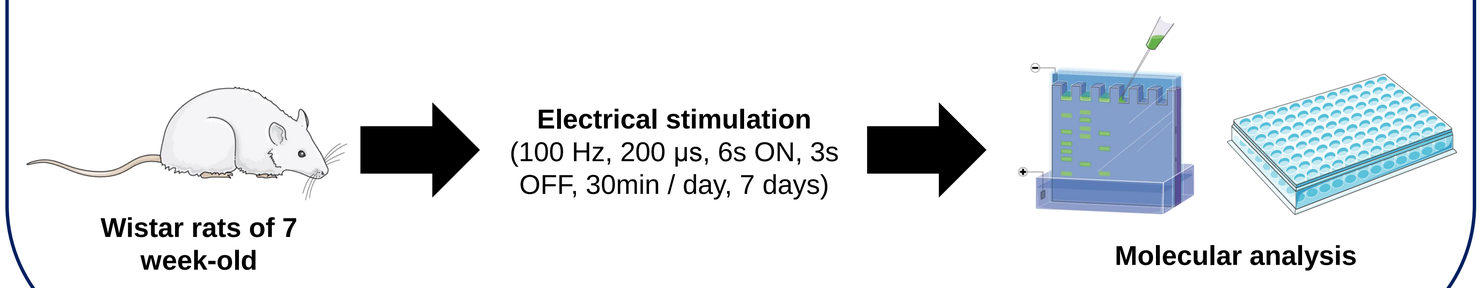
1. Introduction

Irisin that is a peptide derived from the transmembrane protein FNDC5 is secreted into the blood in response to muscle contraction. FNDC5 is also expressed by neurons. Recent studies support the idea that circulating irisin and cerebral FNDC5 are involved in the neuroplastic and pro-cognitive effects of aerobic endurance exercise (EX) through the induction of cerebral BDNF synthesis. The aim of this study is to explore whether electrically evoked involuntary muscle contraction (ES) can reproduce the effect of EX on muscular, cerebral and circulating FNDC5/Irisin.

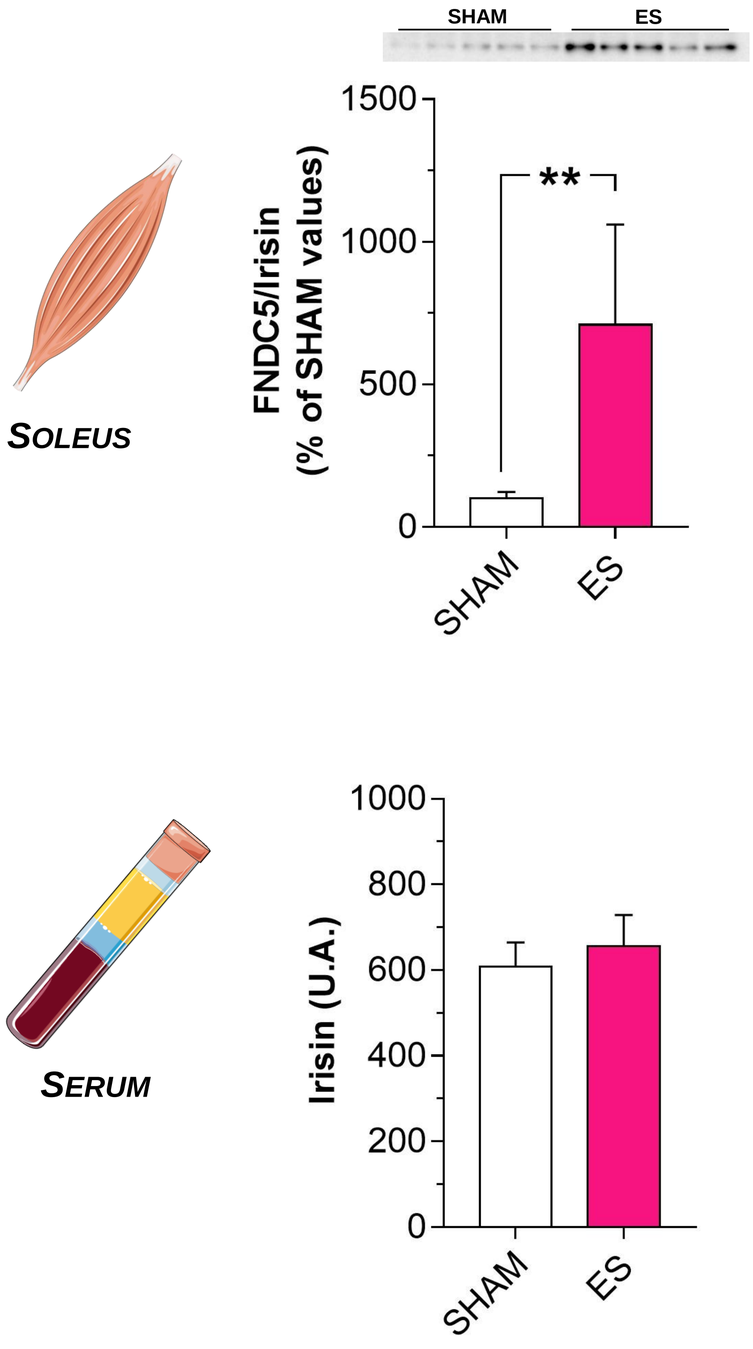
2. Methods

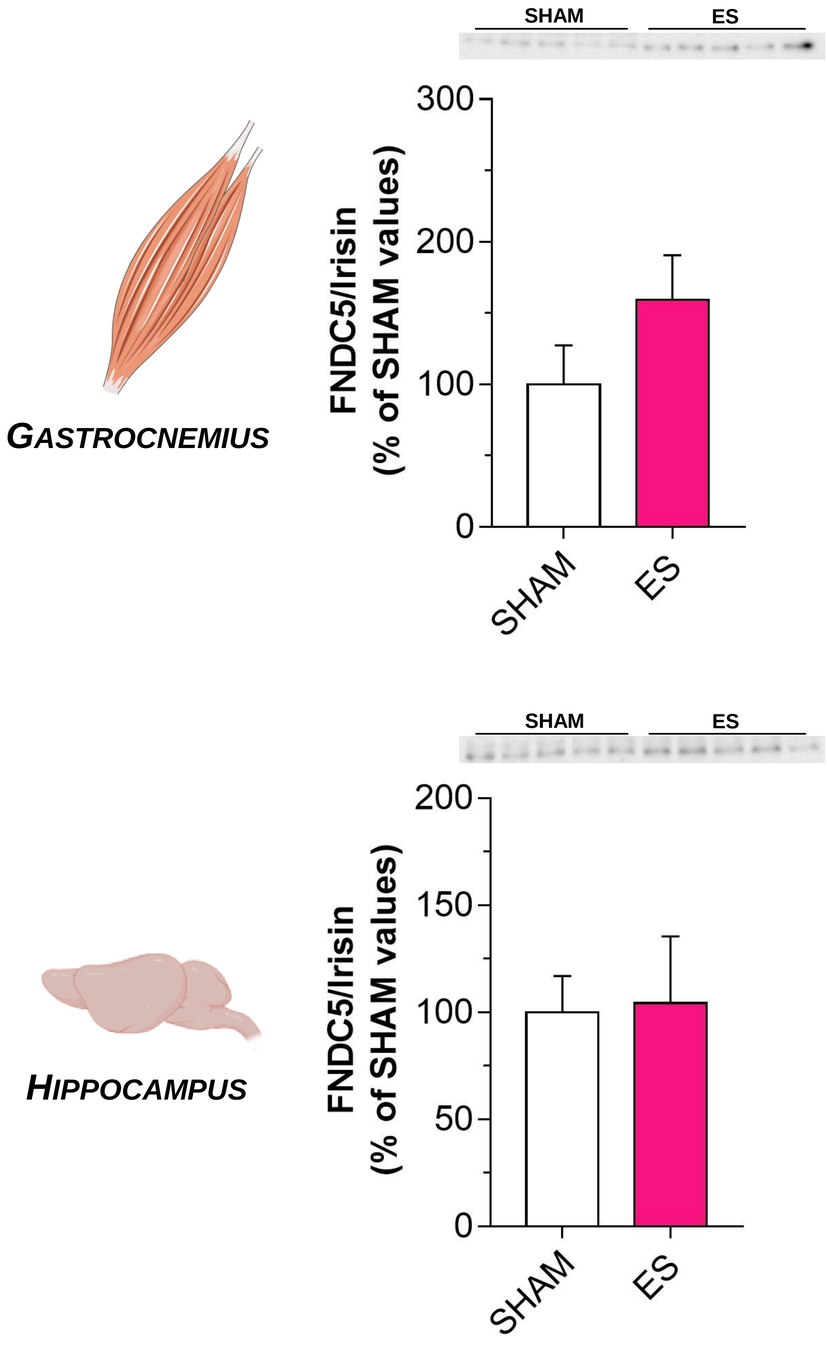
The simultaneous ES of hindlimbs was induced in anaesthetized male Wistar rats (n=5) by transcutaneous stimulation of the lumbar roots L6 30 min/day during 7 consecutive days. Sham unstimulated rats (n=5) were run in parallel. Twenty-four hours after the last session of stimulation, FNDC5/Irisin levels were measured in the soleus and gastrocnemius muscles and the hippocampus using Western blotting analysis, and in the serum using ELISA tests. BDNF levels were also measured in the hippocampus using Western blotting analysis.



3. Results

The results showed that ES increased the level of FNDC5/Irisin only in soleus muscle without any effect on its level in the gastrocnemius muscle, the hippocampus and the blood. BDNF levels did not differ between sham and stimulated rats.





4. Conclusion

We conclude that ES involving a large muscular mass does not reproduce the effect of EX since no increase was observed on serum and hippocampal FNDC5/irisin levels, thus questioning ES as a substitute for EX to induce neuroplasticity and by extension to improve cognitive abilities.

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