Exercise training (ET) has been shown to be beneficial in managing obesity-related disorders. ET was reported to have positive effects on the brain. Our project aims to define the role of irisin in this context. Irisin is an exercise-induced myokine also expressed in the hippocampus, an essential brain area for learning and memory.

**Aims**

1. Irisin’s contribution to the effects of physical activity on brain.
2. Impact of exercise volunteering on muscle-to-brain crosstalk.
3. Consequences of obesity on muscle-to-brain crosstalk.

**Methods**

**Morris Water Maze**

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**Brain Upon Physical Activity**

- **SOCS 3, STAT3, Akt, Erk 1/2**
- **BDNF Level**
- **FNDC5 Level**

**Muscle Upon Physical Activity**

- **Calcineurin**
- **AMPK-P**
- **PGC-1α**
- **ET**
- **Calcieurin**
- **FNDC5**

**FNDC5 Level**

- **Not-Voluntary ET**
- **Voluntary ET**

**Irisin Plasmatic Level**

- After 20 Weeks, Irisin concentration was measured by competitive ELISA. Three Way ANOVA, \( p < 0.008 \) T Vs UT

**Conclusion**

Irisin plasmatic level is increased by ET, whatever ET modality or diet. However, FNDC5 modifications are dependant of training modalities, is tissue-specific and influenced by diet:

- **Voluntary ET** is associated to an increased level of FNDC5 protein level in muscles of animals fed with a low-fat diet. This effect is impaired in HFD animals and is not observed in the brain cortex and hippocampus, whatever the diet. Enrichment in mice submitted to voluntary ET improves spatial learning and memory particularly in obese animals. However, the BDNF protein level is not modified by voluntary ET in the cortex and hippocampus whatever the diet.

- **Non-voluntary ET** does not modified FNDC5 protein level in muscular and brain tissues. Non-voluntary ET does not modify, per se, the spacial learning and memory in mice and BDNF protein level is not modified in hippocampus. However, an increased BDNF protein level is observed in the brain cortex in trained animals and also, surprisingly, in HFD mice.

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