Science & Sports (2016) xxx, xxx—xxx

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Elsevier Masson France EM|consulte www.em-consulte.com

BASIC STUDY

Effects of exercise on the circulating concentrations of irisin in healthy adult individuals: A review

Effets de l'exercice sur les concentrations de l'irisine circulatoire chez les adultes sains : revue générale

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Received 4 April 2016; accepted 8 July 2016

KEYWORDS
Physical activity;
Exercise training;
Irisin

Summary
Aims. — Irisin is a myokine induced by exercise and is responsible for regulating the uncoupling protein 1 (UCP-1) in beige fat. The aim of this review was to examine evidences that acute and chronic exercise influence the circulating concentrations of irisin in healthy adult individuals.
News. — A review of articles published between January 2012 and March 2016 was conducted in *Medline* and *ScienceDirect* databases using the following index terms: *irisin*, *acute exercise*, *chronic exercise* and *exercise training*. Original studies on the effects of exercise on the circulating concentrations of irisin in healthy humans are included. For analysis, the studies were divided into acute exercise and chronic exercise. Sixteen articles met the inclusion/exclusion criteria, eight studies on acute exercise, four on chronic exercise and four on both. Only two out of eight studies on acute exercise did not observe increases in serum and plasma concentrations of irisin after the exercise session. Resistance and high-intensity exercise were more effective in increasing the circulating concentrations of irisin as compared with aerobic and low-intensity exercise, respectively. Regarding chronic exercise, only one study found increased circulating

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http://dx.doi.org/10.1016/j.scispo.2016.07.005

concentrations of irisin when compared post- and pre-training data. Another study observed increased circulating concentrations of irisin in trained group as compared to control group.
Conclusion. — Acute exercise increases the circulating concentrations of irisin; and resistance and high-intensity exercise protocols were more effective. Chronic exercise seems not to affect the concentrations of circulating irisin.

MOTS CLÉS
Activité physique ;
L'entraînement physique ;
Irisine

Résumé
Objectifs. — L'irisine est une myokine induite par l'exercice, responsable de la régulation de la protéine découplante 1 (UCP-1) dans le tissu adipeux beige. Cette étude vise à faire le point sur les effets d'exercice aigus et chroniques sur les concentrations circulantes d'irisine chez les adultes sains.
Informations. — Nous avons réalisé, à partir des bases de données *Medline* et *ScienceDirect*, une revue de la littérature parue entre janvier 2012 et mars 2016, en utilisant les termes d'indexation suivants : irisine, exercice aigu, exercice chronique et entraînement. Pour les besoins de l'analyse, les études ont été divisés en exercice aigu et exercice chronique. Seize articles répondaient aux critères d'inclusion/exclusion, huit études portant sur l'exercice aigu, quatre avec l'exercice chronique et quatre avec les deux. Parmi les études portant sur l'exercice aigu, deux seulement n'ont pas observé d'augmentation des concentrations sériques et plasmatiques d'irisine après la séance d'exercice. L'exercice en résistance et l'exercice à haute intensité augmentaient davantage l'irisine que l'exercice aérobie et que l'exercice à faible d'intensité. Une seule étude a révélé une augmentation des concentrations circulantes d'irisine après plusieurs semaines d'entraînement en comparaison aux concentrations mesurées avant entraînement. Une autre étude a observé une augmentation des concentrations circulantes d'irisine dans le groupe entraîné par rapport au groupe témoin.
Conclusion. — L'exercice aigu augmente les concentrations circulantes d'irisine. L'exercice en résistance et l'exercice à haute intensité augmentent davantage l'irisine. Par contre, un entraînement prolongé de plusieurs semaines ne semble pas modifier les concentrations circulantes d'irisine.

1. Introduction

A sedentary lifestyle is one of the main risk factors associated with overall mortality, and it is estimated that sedentary individuals have a 20% to 30% higher risk of death compared to physically active individuals [1]. A sedentary lifestyle and a lack of exercise are considered key factors for obesity in addition to metabolic disorders such as chronic inflammation, diabetes mellitus type 2 and cardiovascular disease [2].

Exercise has been used as a non-pharmacological therapeutic strategy for the prevention and treatment of various diseases. Studies have observed that physical exercise protects against various diseases including type 2 diabetes mellitus [3,4] and cardiovascular diseases [2,5]. Exercise is considered a major contributor to the reduction in adipocyte size and lipid content and the increase in mitochondrial proteins such as the transcriptional co-activator receptor peroxisome proliferator activated c co-activator-1a (PGC-1α) in adipose tissue [6].

Recently, studies have found that skeletal muscle has an endocrine function, secreting hormones called myokines, and this discovery emphasizes the role of skeletal muscle as a major source of hormone secretion induced by exercise [7]. The ability to produce and secrete chemokines is mainly due to the metabolic changes associated with the muscle contractions induced by exercise, leading to an increase in the release of several myokines capable of interacting with the adipose tissue, such as interleukins 6 and 15 (IL-6 and IL-15) and irisin [8].

Irisin is considered a myokine induced by exercise and is responsible for activating thermogenesis in beige adipose tissue by increasing the expression of uncoupling protein 1 (UCP-1) [7]. Irisin is generated by a proteolytic cleavage of the transmembrane protein fibronectin type III domain containing 5 (FNDC5) in skeletal muscle [7]. In turn, gene expression of FNDC5 is stimulated by an increase in PGC-1α expression, induced by physical exercise.

After the discovery of irisin as a hormone induced by exercise in mice and humans, several studies have investigated the production and release of irisin in the bloodstream in response to exercise. Although some studies consider irisin a target for the treatment of obesity and metabolic disorders [9,10], more studies are needed to elucidate how exercise works in the production and release of irisin, and the role of irisin in regulating metabolism and, consequently, body composition [11].

Although some studies have observed a significant increase in the circulating concentrations of irisin after a workout session [12—15], these findings are not conclusive. Variables, such as intensity, duration and type of exercise (aerobic and resistance) and the profile of the subjects

Please cite this article in press as: Rodrigues AC, et al. Effects of exercise on the circulating concentrations of irisin in healthy adult individuals: A review. Sci sports (2016), http://dx.doi.org/10.1016/j.scispo.2016.07.005