

MINI REVIEW

Evaluating the Effect of Irisin on Obesity-Concerning Physical Activity

Onur Oral^{1*}  Pınar Tatlibal² Evangelia Stavropoulou³

1. Faculty of Sports Sciences, Ege University, Izmir, Turkey
2. Necat Hepkon Faculty of Sports Sciences, Dokuz Eylül University, Izmir, Turkey
3. Research in Information and Communication, University of Lorraine, France

ARTICLE INFO

Article history

Received: 11 August 2022

Revised: 29 August 2022

Accepted: 30 August 2022

Published Online: 31 August 2022

Keywords:

Physical activity

Irisin

Obesity

ABSTRACT

Background: The study aims to investigate and evaluate the impact of irisin on physical activity and obesity. **Materials and Methods:** In the search for scientific literature related to this review the US National Library of Medicine (PubMed) used MEDLINE and SportDiscus data and the terms “irisin”, “physical activity”, and “obesity”, were used. The relevant literature has also taken its source from the research of relevant articles from reference lists derived from data studies. **Results:** Irisin, an emerging myokine in the scientific community, has received high attention as a potential contributor to obesity. This hormone is also associated with physical activity. **Conclusions:** Irisin was recently identified as a myokine known to respond to physical activity. Adequate recognition of this hormone may play an active role in the prevention and treatment of obesity.

1. Introduction

Obesity is a global public health problem in several countries. Mexico and the U.S are the countries with the highest rates of obesity^[1]. Due to the positive effects of physical exercise and activities on the prevention of obesity, it is important that exercise is an indispensable part of a healthy life. The sedentary lifestyle, which occurs when children and adolescents who were born and grew up in the digital age, that is, intensively use modern age technologies such as the internet and smart phones, tab-

lets, computers, spend excessive time on computers and information technologies, can increase the risk of obesity in children and dolescents^[2-4].

Irisin was recently identified as a myokine that is known to be responsive to physical activity. In their study, Boström et al.^[5] introduced irisin to the world of science as a PGC-1 α -dependent myokine. Irisin affects white adipose tissue to stimulate UCP1 expression in mitochondria and enhances thermogenesis^[5]. Data state that irisin causes white fat to become brown, thus provoking mitochondria to burn more of the stored fat^[6,7].

*Corresponding Author:

Onur Oral,

Faculty of Sports Sciences, Ege University, Izmir, Turkey;

Email: onur.oral@ege.edu.tr

DOI: <https://doi.org/10.30564/jer.v4i2.4955>

Copyright © 2022 by the author(s). Published by Bilingual Publishing Co. This is an open access article under the Creative Commons Attribution-NonCommercial 4.0 International (CC BY-NC 4.0) License. (<https://creativecommons.org/licenses/by-nc/4.0/>).

Irisin is a myokine that was newly revealed in the world of science. According to the latest studies, cytokines and other peptides play important roles in multifactorial pathogenic mechanisms concerning obesity^[8].

Irisin has received high interest as a potential contributing factor to obesity. Irisin, a hormone, is secreted from fibronectin type III domain-containing protein 5 (FNDC5), which is found in skeletal muscle^[5,9,10].

Irisin is viewed as an attractive potential curative element for obesity and metabolic disorders. Nonetheless, the physiological determinants of irisin and its secretion form are not yet known exactly^[11-14].

2. Discussion

In a research study of Boström et al. add further information about irisin and in particular that irisin promotes mitochondrial biogenesis which improves fat metabolism. In addition, according to the mice study, when irisin level increases, more calories are spent regardless of the physical activity level. Another result of the study is that regular physical activity increases irisin levels, suggesting an exercise period of 3 weeks for mice and 10 weeks for humans. Boström and colleagues conducted a study on mice. The research resulted in increased irisin levels measured up to 65% after 3 weeks of swimming exercise^[5]. A similar human study by these investigators indicated consistent results as irisin levels increased after endurance exercise of 2.5 months^[15].

The amount of irisin release from adipose tissue was determined to be lower in lean rats than in obese rats^[16].

Short-term endurance exercise triggered the release of irisin by sc and visceral adipose tissue in rat studies. Similarly in a study that was conducted on human subjects, acute aerobic training increased circulating irisin but only transiently^[6,17,18].

In one study targeting pigs, however, no effect of exercise on FNDC5 gene expression was found^[19]. But however, another study found that exercise increased irisin release in mice and humans^[5].

A study by Stengel et al. determined lower plasma irisin levels in people with anorexia and a linear association between irisin and BMI^[20].

Pardo et al. claimed that for every 1kg increase in fat mass, there is a twofold increase in irisin^[21]. And research on adults demonstrated that FNDC5/irisin secretion increases after short periods of endurance training^[16]. And in another research in obese subjects determined an increase of irisin levels by 12% after 12 months of lifestyle

change. However, they weren't found associated with BMI alterations^[22].

Irisin is a recently discovered hormone. It is reported to have an important role in energy homeostasis and obesity^[23-25].

Results of a study demonstrated a positive relationship between irisin and BMI, fasting blood glucose, TG, and diastolic BP. In addition, the study indicated a negative relationship between irisin and circulating HDL cholesterol^[20,26].

3. Conclusions

It is possible to come across many scientific publications that physical activity is a very effective method among many methods for the healthy regulation of energy balance in the treatment process of the obesity problem, which is increasing its impact all over the world due to a sedentary life and unhealthy eating habits. With a more comprehensive examination of this positive effect in terms of the irisin hormone, the importance of this hormone for a healthy life will be understood more clearly.

It is known that a physically active life is very important for a healthy life. The habit of regular exercise, which increases the secretion of irisin and some other hormones, especially increases muscle endurance, muscle strength, muscle flexibility, as well as prevents obesity (excessive weight), helps maintain weight, reduces the risk of cardiovascular disease, regulates sleep quality, increases bone mineral density, increases blood flow. It has been shown that it contributes to the reduction of fat and glucose levels, thus reducing the incidence of certain types of cancer and chronic health complaints that may occur with aging.

Acknowledgement

We would like to express our special thanks of gratitude to George N. NOMIKOS for his very successful contribution to the literature research process and unique academic support in the publication during the process of this review article.

Conflict of Interest

The author certifies that there is no conflict of interest with any financial organization regarding the material discussed in the manuscript.

Funding

The author certifies that there is no funding from any financial organization regarding the material discussed in the manuscript.

Author's Contributions

All authors read and approved the final version of the manuscript.

References

- [1] Elder, J.P., 2013. Mexico and the USA: the world's leaders in the obesity epidemic. *Salud Pública México*. 55, 355.
- [2] González-Gross, M., Gómez-Lorente, J.J., Valtueña, J., et al., 2008. The "healthy lifestyle guide pyramid" for children and adolescents. *Nutrición hospitalaria*. 23(2), 159-168.
- [3] Oral, U., 2020. Political Perception Of Generation Z In Turkey. *International Journal of Advanced Science and Technology*. 29(11s), 493-500.
- [4] Martinez-Gomez, D., Moreno, L.A., Romeo, J., et al., 2011. Combined influence of lifestyle risk factors on body fat in Spanish adolescents-the Avena study. *Obesity Facts*. 4(2), 105-111.
- [5] Boström, P., Wu, J., Jedrychowski, M.P., et al., 2012. A PGC1- α -dependent myokine that drives brown-fat-like development of white fat and thermogenesis. *Nature*. 481, 463-468.
- [6] Kraemer, R.R., Shockett, P., Webb, N.D., et al., 2014. A transiently elevated irisin blood concentration in response to prolonged, moderate aerobic exercise in young men and women. *Hormone and Metabolic Research*. 46(2), 150-154.
- [7] Wu, J., Boström, P., Sparks, L.M., et al., 2012. Beige adipocytes are a distinct type of thermogenic fat cell in mouse and human. *Cell*. 150, 366-376.
- [8] Pedersen, B.K., Febbraio, M.A., 2012. Muscles, exercise, and obesity: skeletal muscle as a secretory organ. *Nature Reviews Endocrinology*. 8(8), 457-465.
- [9] Elizondo-Montemayor, L., Silva-Platas, C., Torres-Quintanilla, A., et al., 2017. Association of Irisin Plasma Levels with Anthropometric Parameters in Children with Underweight, Normal Weight, Overweight, and Obesity. *BioMed Research International*. 2628968.
DOI: <https://doi.org/10.1155/2017/2628968>
- [10] Jedrychowski, M.P., Wrann, C.D., Paulo, J.A., et al., 2015. Detection and quantitation of circulating human irisin by tandem mass spectrometry. *Cell Metabolism*. 22(4), 734-740.
- [11] Anastasilakis, A.D., Polyzos, S.A., Saridakis, Z.G., et al., 2014. Circulating Irisin in Healthy, Young Individuals: Day-Night Rhythm, Effects of Food Intake and Exercise, and Associations With Gender, Physical Activity, Diet, and Body Composition. *The Journal of Clinical Endocrinology & Metabolism*. 99(9), 3247-3255.
DOI: <https://doi.org/10.1210/JC.2014-1367>
- [12] Moreno-Navarrete, J., Ortega, F., Serrano, M., et al., 2013. Irisin is expressed and produced by human muscle and adipose tissue in association with obesity and insulin resistance. *The Journal of Clinical Endocrinology and Metabolism*. 98, E769-E778.
- [13] Polyzos, S.A., Kountouras, J., Shields, K., et al., 2013. Irisin: a renaissance in metabolism? *Metabolism*. 62, 1037-1044.
- [14] Boström, P.A., Fernández-Real, J.M., Mantzoros, C., 2014. Irisin in humans: recent advances and questions for future research. *Metabolism*. 63, 178-180.
- [15] Saraslanidis, P., Petridou, A., Bogdanis, G.C., et al., 2011. Muscle metabolism and performance improvement after two training programmes of sprint running differing in rest interval duration. *Journal of Sports Sciences*. 29, 1167-1174.
- [16] Roca-Rivada, A., Castela, C., Senin, L.L., et al., 2013. FNDC5/irisin is not only a myokine but also an adipokine. *PLoS ONE*. 8(4), e60563.
- [17] Huh, J.Y., Panagiotou, G., Mougios, V., et al., 2012. FNDC5 and irisin in humans: I. Predictors of circulating concentrations in serum and plasma and II. mRNA expression and circulating concentrations in response to weight loss and exercise. *Metabolism: Clinical and Experimental*. 61(12), 1725-1738.
DOI: <https://doi.org/10.1016/j.metabol.2012.09.002>
- [18] Norheim, F., Langleite, T.M., Hjorth, M., et al., 2014. The effects of acute and chronic exercise on PGC-1 α , irisin, and browning of subcutaneous adipose tissue in humans. *Federation of European Biochemical Societies Journal*. 281, 739-749.
- [19] Fain, J.N., Company, J.M., Booth, F.W., et al., 2013. Exercise training does not increase muscle FNDC5 protein or mRNA expression in pigs. *Metabolism*. 62, 1503-1511.
- [20] Stengel, A., Hofmann, T., Goebel-Stengel, M., et al., 2013. Circulating levels of irisin in patients with anorexia nervosa and different stages of obesity—correlation with body mass index. *Peptides*. 39(1), 125-130.
- [21] Pardo, M., Crujeiras, A.B., Amil, M., et al., 2014. Association of Irisin with fat mass, resting energy expenditure, and daily activity in conditions of extreme body mass index. *International Journal of Endocri-*

- nology. Article ID 857270, 9 pages.
- [22] Blüher, S., Panagiotou, G., Petroff, D., et al., 2014. Effects of a 1-Year Exercise and Lifestyle Intervention on Irisin, Adipokines, and Inflammatory Markers in Obese Children. *Obesity*.
DOI: <https://doi.org/10.1002/oby.20739>
- [23] Park, K.H., Zaichenko, L., Brinkoetter, M., et al., 2013. Circulating irisin in relation to insulin resistance and the metabolic syndrome. *The Journal of Clinical Endocrinology and Metabolism*. 98(12), 4899-4907.
DOI: <https://doi.org/10.1210/jc.2013-2373>
- [24] Timmons, J., Baar, K., Davidsen, P., et al., 2012. Is irisin a human exercise gene? *Nature*. 448, E9-E10.
- [25] Villarroya, F., 2012. Irisin, turning up the heat. *Cell Metab*. 15, 277-278.
- [26] Liu, J.J., Wong, M.D., Toy, W.C., et al., 2013. Lower circulating irisin is associated with type 2 diabetes mellitus. *Journal of Diabetes and Its Complications*. 27, 365-369.