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Biochemical and biological effects of irisin in a model of diabetes mellitus

by

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Abstract

Diabetes mellitus (DM) is a highly prevalent health problem affecting more than 425 million people worldwide. It is associated with several detrimental complications such as neuropathy, nephropathy, retinopathy and cardiovascular diseases. Irisin is a novel hormone that plays a role in metabolism by stimulating the browning of white adipose tissue (WAT) into beige adipose tissue which acquires properties that are similar to those of brown adipose tissue (BAT). Several studies have attempted to characterize the roles of irisin in DM and obesity, however, contradictory results have been reported and physiological roles of irisin have been questioned by several researchers. In our study, we investigated the role of irisin in controlling glucose levels and insulin secretion in STZ-induced DM model and the mechanism by which irisin exerts its beneficial effects both *in vivo* and *in vitro,* using a variety of biochemical, morphological and cell biology techniques. We showed that irisin did not cause any significant reduction in weight or fasting blood glucose, however, it caused a significant glucose reduction 30 minutes after glucose challenge. Our data also showed that irisin co-localizes with insulin in pancreatic β-cells in both normal and diabetic animals while it co-localizes with glucagon only in diabetic animals. Moreover, irisin was also detected in skeletal muscle, visceral and subcutaneous adipose tissues. Irisin also reduced triglycerides and increased the level of high density lipoprotein (HDL) and total protein. We also provided evidence that irisin treatment can modulate the tissue level of different peptide hormones such as insulin, glucagon, incretins and leptin. In addition, irisin possesses a potent antioxidant activity and reversed oxidative stress induced by DM. Our *in vitro* investigations showed that irisin can stimulate the release of insulin from pancreatic β-cells. Irisin could be a potential therapeutic agent in the management of DM.

Keywords: Diabetes mellitus, irisin, metabolic parameters, rat, hormones, electron microscopy