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Systematic Review and Meta-analysis of Resveratrol's Effect on Glycemic Control in Type 2 Diabetes Mellitus

Paulo Oliveira*

Department of Biochemistry & Molecular Biology, University of Helsinki, Finland

Introduction

Type 2 diabetes mellitus (T2DM) represents a serious public health problem worldwide owing to its high prevalence among the adult population. T2DM triggers the appearance of micro and macrovascular complications, making it necessary to implement complementary therapeutic strategies to decrease blood glucose levels. In this sense, the therapeutic usefulness of naturally occurring compounds with hypoglycemic properties has been investigated, among which resveratrol (RV) stands out. Antioxidant, anti-inflammatory, and hypoglycemic effects are attributed to RV, because it has been observed that, in cell cultures and in animal models, it improves insulin sensitivity and reduces blood glucose [1-3]. It has been proposed that RV could improve pancreatic β-cell functionality by protecting them from oxidative damage and decreasing the production of pro-inflammatory cytokines in the islets of Langerhans, restoring β-cell secretory functions and normalizing insulin secretion.

Because of its high prevalence among adults, type 2 diabetes mellitus (T2DM) is a serious public health problem around the world. T2DM causes micro and macro vascular complications, necessitating the use of additional therapeutic strategies to lower blood glucose levels. In this regard, the therapeutic utility of naturally occurring hypoglycemic compounds has been investigated, with resveratrol (RV) standing out. RV is thought to have antioxidant, anti-inflammatory, and hypoglycemic properties because it improves insulin sensitivity and lowers blood glucose levels in cell cultures and animal models. RV has been proposed to improve pancreatic -cell functionality by protecting them from oxidative damage and decreasing pro-inflammatory cytokine production in the islets.

Description

In accordance with the foregoing, our research team discovered in a previous systematic review and meta-analysis that, after oral administration of RV, glucose, insulin, HbA1c, and HOMA-IR levels decrease in subjects with T2DM; however, the age-related effective dose could not be determined. In this regard, it has been proposed that the dose of RV is critical, because the biological mechanism of hormesis allows for an antioxidant or pro-oxidant effect depending on the dose administered. This type of inverse response to different doses administered to the same individual has been observed with a variety of drugs, allowing therapeutic doses to be specified based on the desired effect, which can be beneficial or harmful depending on the situation. This biphasic response rules out dose linearity and response threshold models, which aids in determining the therapeutic use of various drugs [4,5]. Given this, it has been proposed that RV may elicit opposing responses depending on the dose used, a phenomenon observed with other nutraceuticals such as vitamins C and E, which act as antioxidants at low doses but as pro-oxidants at high doses.

Conclusion

This type of inverse response to different doses administered to the same individual has been observed with various drugs, allowing therapeutic doses to be specified based on the desired effect, which can be beneficial or harmful depending on the situation. This biphasic response eliminates dose linearity and response threshold models, which aids in determining the therapeutic use of various drugs. Given this, it has been proposed that RV may elicit opposing responses depending on the dose used, a phenomenon observed with other nutraceuticals such as vitamins C and E, which act as antioxidants at low doses but pro-oxidants at high doses.

In terms of age, our previously published systematic review discovered that age could influence RV's therapeutic effects. In this regard, it was discovered that RV significantly reduces glucose, insulin, and HbA1c levels in individuals under the age of 60, which was not observed in subjects over the age of 60. In this context, it is well known that physiological function declines with ageing, which occurs as a result of the interaction of several cellular and molecular mechanisms, including oxidative stress, inflammation, and cellular senescence, among others, whose processes interact additively and even synergistically, altering normal cell functioning and causing damage to tissues, organs, and systems.

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***Address for Correspondence:** Paulo Oliveira, Department of Biochemistry & Molecular Biology, University of Helsinki, Finland, E-mail: PauloOliveira5@gmail.com.*

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