TAGATOSE BENEFICIAL EFFECTS IN A RICH-IN-FRUCTOSE DIET INDUCED DYSMETABOLIC SYNDROME

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The global increase in type 2 diabetes prevalence is a major health issue and it will inevitably lead to increase morbidity and mortality due to cardiac complications. Diets rich in fructose produce metabolic alterations associated to dysmetabolic syndrome, hence in hyperglycemia, increased production of advanced glycation end-products (AGEs), and of triglycerides and glucose intolerance. AGEs are responsible for oxidative stress and inflammation. A nutraceutical strategy for reducing insulin resistance and cardiovascular inflammation could be based on the replacement of fructose with tagatose, an isomer of D-galactose and stereoisomer of D-Fructose, that has been established as GRAS (Generally Recognized as Safe) by the FAO/WHO since 2001 for use in food and beverages. In preliminary studies in humans, tagatose induced low postprandial blood glucose and insulin response. Its proposed mechanism of action may involve interference in the absorption of carbohydrates by inhibiting intestinal disaccharidases and glucose transport. It may also act through hepatic inhibition of glycogenolysis. When D-tagatose enters the liver, it is phosphorylated by ketohexokinase to tagatose-1-P and then cleaved by aldolase B to enter glycolysis. Very little tagatose is released into the systemic circulation (Espinosa et al., 2010)

The aim of this research was to assess the actions of tagatose in the prevention of metabolic syndrome and cardiovascular inflammation induced by high fructose diet in mice and rats.

Both wistar rats and C57BL/6 mice underwent 12 weeks long diet and where divided in 5 groups (30% solid and liquid fructose, 30%solid and liquid tagatose and standard diet, ssniff Spezialdiäten GmbH, Soest, Germany). Animals weights and arterious blood pressure were monitored for the entire period as well as glycemia and insulinemia. Blood samples were collected at 6 and 12 months. At the end of the experiment heart, kidney, liver, gastrocnemius and abdominal fat were collected for biomolecular essays and histological immunostaining.

Fructose fed animals showed a significant weight gain, 30% increase in fructose groups versus 20% in standard diet, versus 5% in tagatose groups. Arteriosus pressure increased in fructose fed animals (+ 10%), no variations in tagatose and standard diet. Plasmatic levels of leptin, IL6, TNF□□□IL 1□□ were significantly higher in fructose fed animals and close to normal in tagatose and standard diet as well as AGEs (HBA1c), triglycerides and LDL cholesterol. COX 2 and AGE receptor expression in tissue samples were significantly higher in fructose fed animals; livers were heavier and fat infiltrated.

The results of this research proved to be useful for the validation of tagatose in regulating the enzymatic pathways that lead to an increased synthesis and a reduced use of glycogen suggesting a role of this drug in fighting overweight and type 2 diabetes. Furthermore, our data indicate that tagatose has a high potential for technology transfer and development of innovative nutraceutical approaches for the prevention of metabolic syndrome and its complications.

Espinosa et al.(2010) Expert Opin Investig Drugs.19:285-94.