

Steviol Glycosides and Their Impact on Health



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Dr Per Bendix Jeppesen is an Associate Professor (Supervisor) in the Department of Clinical Medicine at Aarhus University. Professor Jeppesen is a leading expert in bioactive compounds and their physiological effects, and has high expertise in both, human clinical and animal studies in the areas of carbohydrate and lipid metabolism and, in the prevention of diabetes. He has more than 20 years of experience with steviol glycosides. He has experience as a project manager and participant in several projects and his scientific experience spans several countries. He is an honorary member of the European Stevia Association (EUSTAS), a full voting member, since 2009 and a board member of the Diabetes and Nutrition Study Group (DNSG) of the European Association for the study of Diabetes (EASD) since 2010. He is also a member and founder of the Education Committee and Working Group (MEF) for Molecular Nutrition and Food Technology, Science/Health, at Aarhus University, Denmark which has been running since its' implementation in 2008.

ABSTRACT

The Western population has changed their diet and physical activity patterns during the last century. This has resulted in increased prevalence of lifestyle diseases such as Metabolic Syndrome (e.g., obesity, type-2 diabetes, abnormal blood lipid profile, and hypertension). Despite the reduction in fat intake during the last decade, the obesity epidemic has continued to grow unaltered. Due to this paradox and due to the significant increase in sugar intake from 1.8 kg/year/capita in the 17th century to about 70 kg/year/capita in 2009, focus has shifted to reducing the intake of foods high in simple sugars such as sucrose, fructose and High Fructose Corn Syrup (HFCS). The Stevia plant contains several steviol glycosides (SG), which all are known as zero-calorie and high-intensity natural sweeteners. They are cost effective alternatives to sugar as they are 300– 450 times sweeter than sugar. Our department has in the last 25 years been working with steviol glycosides and different stevia fractions to explore the health-beneficial effects of these natural compounds, and determine how stevia compounds affect, blood glucose, insulin resistance (IR), steatosis, blood pressure and dyslipidaemia particularly in type-2 diabetics.

This presentation will include data from both animal and human studies. For example, in a recent animal study with pre-diabetic Wister rats, we found that high daily intake of HFCS (13 % of total energy intake) resulted in large increases in fasting blood TG levels (0.71 ± 0.04 vs 1.53 ± 0.14 mM; $p < 0.005$); development of IR (HOMA-IR: 55.55 ± 10.69 vs 128.20 ± 21.67 ; $p < 0.01$) and a 43 % increased storage of lipids in liver and muscle tissue (MR-scanning). However, steviol glycosides or aspartame, given the same amount related to sweetener effect, did not change any of the above data significantly when compared with a control group. In addition, only HFCS markedly changed the gene expression profile of key regulatory genes such as, Srebf-1, FAS in the liver and FAS and GLUT 4, as well as PGC1A in muscle tissue. Further, in an acute blinded crossover human intervention study with diabetic subjects, we replaced sugar with stevia sweetener in a standard breakfast. The substitution reduced the calorie content by 84 %, although only a small portion of the meal was changed, namely, the grapefruit juice and we observed a post-prandial blood glucose reduction of 156 % in the participants who consumed the stevia sweetener versus those in the sugar group. Furthermore, in a preliminary human study on sport athletes supplemented with steviol glycosides together with carbohydrate, we saw a significant increase in the glycogen resynthesis rate, of 35%, compared to placebo, which is very unique.

If stevia sweeteners are capable of helping to reduce the world's enormous sugar intake and thereby help improve health conditions, they have a right to be described as "a new sugar revolution". However, in Europe a recent common agricultural policy change that lifts the HFCS quota is raising health concerns regarding its implications for other health policies that are calling for reductions in dietary sugar intake.