# Effect of D-allulose on satiation hormone response, glycemic control and gastric emptying: a randomized, controlled trial

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## (1) Introduction

Excess sugar consumption, mainly as sucrose and glucose-fructose syrups, is one of the risk factors contributing to the development of obesity and associated metabolic disorders, especially type 2 diabetes mellitus. Beside a reduction of sugar intake in general, the replacement of these sugars by alternative sweeteners would be an effective preventive measure. D-allulose, a monosaccharide, which has 70% of the sweetness of sucrose but almost zero calories, seems to favorably affect glycemic control and metabolism as shown in animal and in a few human trials. The aim of our study was to assess the effect of D-allulose on satiation hormone response, glycemic control, and gastric emptying (GE), which has not been studied in humans yet.

## (2) Methods

The study was performed as a randomized, controlled, double-blind, crossover study, including 18 healthy, normal weight subjects. The study subjects received an intragastric administration of 25g D-allulose dissolved in 300 mL water or 300 mL water as a placebo treatment. Blood samples to determine glycemic control (glucose and insulin) and measure satiation hormones (glucagon-like peptide-1 (GLP-1), cholecystokinin (CCK), and peptide tyrosine tyrosine (PYY)) were collected before and up to 180 minutes after administration. To determine GE rates, a [$^{13}$C]-sodium-acetate breath test was used. End-expiratory breath samples were taken at fixed time intervals before and after the administration of the test solution. Analyses were performed using SAS version 9.4 (SAS Institute Inc., Cary, NC, USA).

## (3) Results

All 18 subjects (5 males, 13 females; mean age: 24 ± 4.2 yrs, range 19-39 yrs; mean BMI: 21.9 ± 1.7 kg/m$^2$, range 19.1 – 24.3 kg/m$^2$) completed both treatments. D-allulose lead to a significant CKK release ($P < 0.001$). Plasma glucose and insulin concentrations decreased significantly after D-allulose administration ($P < 0.001$ and $P < 0.05$ respectively). D-allulose did not affect GE rates.

## (4) Conclusions

The present results suggest that acute intragastric administration of 25g D-allulose significantly stimulates CCK release. This might lead to a feeling of fullness and satiation, similarly to glucose. Furthermore, D-allulose decreases both plasma glucose and insulin, which might influence glycemic control. Diabetic patients could benefit from these findings and use D-allulose as an alternative sweetener. The findings from this study have both public health and clinical relevance and could help in the development of dietary interventions targeting obesity and associated metabolic disorders.