

Main contributors of non-nutritive sweetener consumption in healthy adults – results from the KarMeN study

Benedikt Merz, Bernhard Watzl, Ralf Krüger
Department of Physiology and Biochemistry of Nutrition, Max Rubner-Institut,
Karlsruhe, Germany

Objectives

Consumption of foods containing non-nutritive sweeteners (NNS) is widespread in Germany and other Western countries. Exposure data in particular regarding the combined intake of NNS as part of a regular diet is lacking. This study aims to assess the mixed NNS exposure along with their main contributing food groups in a healthy population.

Methods

Urinary concentrations (24h urine) of NNS acesulfame, advantame, aspartame, cyclamate, neohesperidin-DC, neotame, saccharin, steviol glucuronide, and sucralose from 301 healthy male and female participants (18–80 years) of the cross-sectional KarMeN (Karlsruhe Metabolomics and Nutrition) study, performed at the Max Rubner-Institut in Karlsruhe, were quantified using LC-MS/MS in MRM mode with internal calibration. Food intake was assessed using a 24h dietary recall, capturing the same 24h for which urine was collected. Correlation between dietary intake and 24h urine concentrations was investigated using Spearman rank correlation analysis.

Results

Mean concentrations for the sum of osmolality-normalized urinary NNS metabolites ranged from 0.50 ± 0.29 mmol/L per mOsm/kg urine in the lowest quartile up to 294 ± 592 mmol/L per mOsm/kg urine in the highest quartile. Herein, cyclamate, saccharin and acesulfame were the NNS with the highest urinary concentrations. Table sweeteners, NNS-sweetened beverages, Radler, and protein shakes were significantly associated with the sum of urinary NNS-concentrations and explained up to 40% of the observed variance.

Conclusions

Expected food groups such as soft drinks or table sweeteners were the main NNS sources. NNS excretion appeared highly variable between individuals. Most consumers ingested considerable amounts of more than one NNS throughout the day, suggesting regular and combined NNS consumption of a small population subgroup. Possible combination effects should be considered.