Systematic review: Low energy sweetener consumption, energy intake and body weight in animals and humans

PJ Rogers¹, PS Hogenkamp², C de Graff³, S Higgs⁴, A Lluch⁵, AR Ness¹, C Penfold¹, R Perry¹, MR Yeomans⁶ & DJ Mela⁷

¹University of Bristol, UK  ²Uppsala University, Sweden  ³Wageningen University, NL  
⁴University of Birmingham, UK  ⁵Danone Nutricia Research, France  ⁶University of Sussex, UK  
⁷Unilever R&D Vlaardingen, NL

INTRODUCTION

Low-energy sweeteners (LES) reduce dietary energy density, and might thereby reduce energy intake (EI). Concern however has been raised that LES use increases EI and body weight (BW).

OBJECTIVES

Review relevant studies in animals and humans consuming LES with ad libitum access to food.

METHODS / DESIGN

Systematic review, including meta-analyses.

RESULTS

Animal studies (90): 22↓ 40→ 28↑ BW gain when exposed to LES

Prospective cohort studies (12): No overall association with BMI

Short-term intervention studies (129 comparisons): EI from preload plus ad libitum meal was reduced when the comparison was LES versus sugar, and not affected when the comparison was LES versus unsweetened food, water or nothing

Sustained intervention studies (13 comparisons): Consumption of LES led to reduced EI and reduced relative weight

LES versus sugar -75 to -514 kcal/d (9 comparisons)
LES versus water -126 kcal/d (1 comparison)
LES versus sugar (adults, 8 comparisons): -1.41 kg (CI 95%: -2.62 to -0.20; p<0.001)
LES versus sugar (children, 1 comparison): -1.02 kg (CI 95%: -1.52 to -0.52; p<0.001)
LES versus water (adults, 3 comparisons): -1.24 kg (CI 95%: -2.22 to -0.26; p=0.013)

CONCLUSIONS

Based on a subset of animal studies it has been suggested that LES disrupt appetite control and increase BW. However, these studies do not mimic the use of LES by humans and differ in outcome from controlled studies in humans. Human prospective cohort data are inconsistent, but acute and sustained human intervention studies show that LES do not increase EI or BW, whether compared with caloric or non-caloric (e.g., water) control conditions. Indeed, the balance of evidence clearly finds that consumption of LES in place of sugar, in children and adults, leads to reduced EI and BW, and under sustained use seemingly also when compared with water.