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“A spoonful of sugar”: delayed effects of coffee, tea and sucrose on postprandial glycemia in lean, young, healthy adults

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Background – In observational studies, habitual coffee consumption has been linked to a lower risk of type 2 diabetes. We hypothesized that the mechanism may be related to delayed effects on postprandial glycemia.

Objective – To investigate the glycemic and insulinemic effects of consumption of caffeinated and decaffeinated coffee, sweetened and unsweetened, tea and sucrose, 1 h prior to a high carbohydrate meal.

Design - On separate occasions in random order, lean young healthy subjects (n = 8) consumed a potato-based meal 1 h after consumption of 250 mL of black coffee (COF), black coffee sweetened with 10 g of sucrose (COF+SUC), decaffeinated coffee (DECAF), black tea (TEA), 10 g sucrose (SUC) or hot water (CON). Fingerprick blood samples were taken at regular intervals over 2 h and the glucose and insulin responses quantified as a rea under the curve.

Outcomes – Compared to CON, COF caused a 28% increase in postprandial glycemia (P=0.022). In contrast, COF+SUC decreased glycemia compared with either COF (-38%, P<0.001) or CON (-20%, P=0.100) but had no effect on insulin responses. DECAF, TEA and SUC had no significant effects on postprandial responses. SUC and DECAF reduced the absolute glucose concentration at the start of the meal (P<0.01).

Conclusion – Only sweetened coffee significantly reduces postprandial glycemia. This observation may explain the paradoxical findings of observational and clinical studies relating coffee drinking to diabetes risk.

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Theoretical limits to the accuracy of glycaemic impact, glycaemic load and glycaemic index as linear predictors of glycaemic response

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Background – Glycaemic glucose equivalents (GGE) and glycaemic index (GI), from which glycaemic load (GL) is calculated, are usually measured on a single food quantity and extrapolated linearly to other quantities. As glycaemic response is non-linear such extrapolations lose accuracy with distance from the measurement point.

Objective – To determine the effect of non-linearity in the glucose dose-blood glucose response curve on the accuracy of GGE and GI, and therefore of GL, and on the inaccuracy generated by using linear summations of GGE or GL values of individual foods to predict the glycaemic impact of meals.

Design – A universal, quadratic glucose dose-response curve was generated by combining normalized results of published glucose (GGE) dose-glycemic response studies. Reference points on the curve were identified for 10, 20, 30, 40, 50 and 60 g glucose doses, and disparities between the linear extrapolations to zero from these points and the quadratic (“true”) response were quantified. True GGE values, and linear estimates of them based on the references, were determined for the foods in 20 realistic meals. For each reference, and for each meal, the sums of GGE estimates of foods in a meal were compared with the true GGE values for the whole meals.

Outcomes – For individual foods, quadratic-linear disparities were equivalent in effect to a few grams of glucose within the normal range of food intakes. In meals, linear addition of GGE values of individual foods lead to disparities of more than 5 GGE between true meal GGE and the estimate based on linear summation. However, the disparity could be kept to within acceptable bounds (< 5 GGE) by not exceeding recommended GGE intakes in a meal, by basing GGE determinations on glucose references in the same range as the true meal GGE, and by limiting the number of foods that would contribute to the inaccuracy.

Conclusions – In general, GGE database values for foods based on equiglycaemic analysis provide an accurate measure of the relative glycaemic impact of individual foods, but simple linear addition of GGE values for foods in meals could lead to inaccuracies depending on the number of foods added, and the total GGE intake in the meals.