

Relationships between satiety and plasma glucose and insulin responses to foods

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Several studies have found that low-glycaemic index (GI) carbohydrate-rich foods are more satiating within 2-4 h of consumption than their high-GI counterparts, possibly because they sustain a modest rise in blood glucose levels for a longer period. Other experimental evidence has shown that plasma glucose levels and glucose oxidation play a role in governing satiety. However, interrelationships among glucose, insulin, and satiety responses to real foods have not been well examined. This study investigated whether postprandial glucose and insulin responses were related to concurrent changes in satiety following the consumption of common foods with different sensory and nutrient profiles.

Isoenergetic portions of 38 common foods, separated into six food categories, were fed to groups of 11-13 fasting subjects. Finger-prick blood samples and satiety ratings were obtained every 15 min over 120 min after which a standard meal was presented and ad libitum food intake was recorded. Satiety, glucose and insulin responses were quantified as the area under the 120 min response curve (AUC).

Among the 38 test foods, there were no significant relationships between satiety and plasma glucose or insulin AUC responses. However, insulin AUC responses correlated negatively with ad libitum energy intake at 120 min ($r = -0.40$, $P < 0.01$, $n = 38$). Thus, satiety, as measured by food intake, was inversely related to the cumulative 120 min insulin response, ie. higher insulin responses were associated with less food intake. The total carbohydrate content of the foods was positively related to the insulin AUC responses ($r = 0.42$, $P < 0.01$, $n = 38$), whereas the fat content of the foods was negatively associated ($r = -0.32$, $P < 0.05$, $n = 38$). Thus, the total amount of carbohydrate consumed (relative to fat) may have a more dominant effect on satiety than the glycaemic impact of the meal. This agrees with previous studies supporting a primary role for carbohydrate metabolism in the regulation of appetite. Carbohydrate-rich foods are more satiating than fat-rich foods but not necessarily because they produce higher blood glucose and insulin responses.

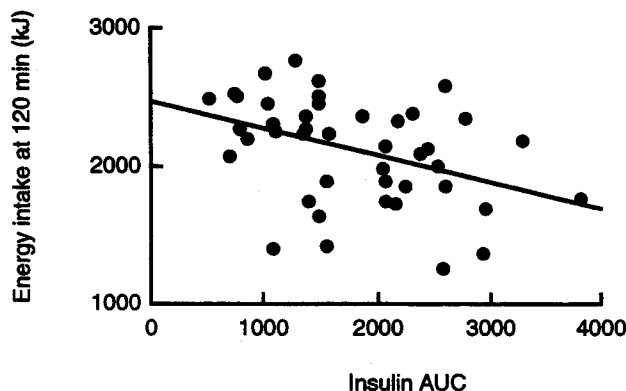


Figure. The relationship between mean insulin AUC responses and ad libitum energy intakes at 120 min ($r = -0.4$, $P < 0.01$, $n = 38$)

This study examined changes in satiety and plasma glucose and insulin responses occurring within a very short time period only. Differences among the foods' sensory properties and serving weights may have confounded the results. Further studies are required to determine whether postprandial glycaemia and insulin secretion reflect the degree of glucose oxidation and whether this relates to changes in satiety over a longer period.