

The effect of dietary glucose supplementation on gastric emptying of a hypertonic glucose solution

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The rate of gastric emptying is a rate limiting step in the delivery of nutrients and fluid to the intestine and, therefore, absorption. Previous studies have observed that dietary supplementation with 400 g of glucose for three days increases the rate at which a hyperosmotic solution empties from the stomach and that this appears to be nutrient specific⁽¹⁾. Similar results have been observed when fat has been added to the diet⁽²⁾. The aim of this study was to observe whether supplementation with a smaller quantity of glucose elicits the same effect on gastric emptying rate of glucose in humans.

Following Ethical approval, nine healthy males volunteered to participate in this study which consisted of two experimental trials. For two days prior to the first experimental trial, participants were asked to record all food and drink consumed. In the 24 hours prior to the trial, participants were asked to refrain from alcohol and strenuous physical activity as well as to fast from 9pm with the exception of a pint of water approximately 90 minutes before arrival at the laboratory. Upon arrival, participants were asked to empty their bladder prior to being weighed before collection of a baseline breath sample and completion of a visual analogue scale (VAS) asking subjective feelings of hunger, fullness, prospective food consumption, bloatedness and nausea. Participants then ingested 595 mL of a 10% glucose monohydrate containing 100 mg of C¹³ sodium acetate. Breath samples were collected at 10 minute intervals following drink ingestion for one hour and VAS were completed at the same times. The second experimental trial was completed at least 7 days later. Participants were asked to replicate their diet with the addition of four 500 ml solutions per day with each solution containing 50 g of glucose monohydrate. The same pre-trial standardization was followed as were the experimental procedures. Breath samples were analyzed for C¹³ enrichment using infrared isotope spectroscopy. Results are presented as mean (SD).

Half emptying time ($T_{1/2}$) of the hypertonic solution was 85 (19) and 90 (38) minutes for the non supplementation and supplementation trial respectively ($P = 0.678$). T_{lag} was 42 (9) and 41 (13) minutes for the non supplementation and supplementation trial respectively ($P = 0.837$). Two factor repeated measures ANOVA reported no main effect of supplementation ($P = 0.071$), a main effect of time ($P < 0.001$) and an interaction effect ($P = 0.033$) for breath DOB data. No significant differences were observed in any subjective feelings measurements.

The results of this study suggest that two days of dietary supplementation with 200 g glucose was not sufficient to induce the changes in gastric emptying observed in previous studies. Future studies in this area should focus on the effects of manipulating smaller constituents of the diet on gastrointestinal function.

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