The effects of chocolate-containing foods on postprandial blood glucose and insulin

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Claims that chocolate elicits high postprandial insulin responses, resulting in rebound hypoglycaemia and hunger have little scientific justification. While some chocolate products have been shown to generate greater insulin responses relative to their glycaemic responses, this may not be due to the chocolate content *per se* (1). The aim of this study was to compare the effects of equal-carbohydrate portions of common chocolate-containing products vs their non-chocolate counterparts on postprandial blood glucose and insulin levels.

Six pairs of foods were tested. Within each pair, one food contained chocolate and the other food was a non-chocolate version of the same food with a similar macronutrient content. The study was conducted in two parts, and three pairs of food and the reference food were tested in each part. A separate group of 10 healthy, non-smoking, normal-weight subjects was recruited to participate in each part of the study. The study employed a repeated-measures design, such that in both parts of the study, each subject consumed the six test foods on one occasion and the reference food on two occasions. Subjects fasted for = 10 h overnight and then reported to the test centre the next morning, where they first gave a fasting finger-prick blood sample and then consumed a fixed portion of the reference food or a test food containing 50 g of available carbohydrate. Additional finger-prick blood samples were obtained at 15, 30, 45, 60, 90 and 120 min after eating commenced. For each subject, a GI value was calculated for each food by dividing the area under the 120-min plasma glucose response curve (AUC) for that food by the average AUC value for the reference food and then multiplying by 100. An II value for each food was calculated using the same formula with insulin instead of glucose AUC values. The mean ± SEM GI and II values for the six pairs of foods are shown below (n = 10 except for foods labelled with * where n = 9).

Chocolate test food	GI value (%)	II value (%)	Non-chocolate test food	GI value (%)	II value (%)
Chocolate premium ice cream	37 ± 3	71 ± 3	Vanilla premium ice cream	38 ± 3	54 ± 4
Chocolate cake with icing	41 ± 4	88 ± 14	Vanilla cake with icing	41 ± 4	67 ± 12
Chocolate reduced-fat milk	41 ± 4	86 ± 11	Strawberry reduced-fat milk	35 ± 3	59 ± 5
Plain milk chocolate	42 ± 7	71 ± 13	Plain white chocolate	43 ± 6	63 ± 13
Chocolate instant pudding	47 ± 4	80 ± 5	Vanilla instant pudding	40 ± 4*	62 ± 5
Chocolate puffed rice cereal	76 ± 3*	79 ± 10	Plain puffed rice cereal	84 ± 4	64 ± 6
Food group mean value	47 ± 3	80 ± 4	Food group mean value	47 ± 3	62 ± 3

The mean GI values of the two food groups were not significantly different, but the mean II value for the chocolate food group was significantly greater than the mean II value of the non-chocolate food group (paired two-tailed t-test; $P = 0.004$). The individual subjects' glucose AUC values were significantly associated with their corresponding insulin values for the non-chocolate products ($r = 0.37$, $n = 60$, $P < 0.01$), but not for the non-chocolate products ($r = 0.23$, $n = 60$, NS). The disproportionately higher II values for the chocolate products could be due to higher cephalic phase insulin secretion, due to the greater sensory enjoyment of these foods, or specific insulinogenic compounds in chocolate. The physiological significance of the greater insulin secretion, which has also been observed for some other dairy products, remains to be determined.

Reference

1. Brand-Miller JC, Pang E, Broomhead L. The glycaemic index of foods containing sugars: comparison of foods with naturally-occuring v. added sugars. Br J Nutr 1995; 73: 613–23.

Key words: glycaemic index, insulin, chocolate