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Polyphenol-rich dark chocolate: effect on fasting capillary glucose, total cholesterol, blood pressure and glucocorticoids in healthy overweight and obese subjects

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Excess cortisol is associated with various variables of the metabolic syndrome including hypertension, insulin resistance and dyslipidaemia[1]. This relationship is likely to be mediated via cortisol's ability to regulate NO bioavailability[2,3]. Since increased NO bioavailability is considered the main mechanism by which polyphenols improve glucose, blood pressure and lipid homeostasis, the present study aimed to investigate the effect of two doses of polyphenol-rich dark chocolate on fasting capillary glucose (FG), total cholesterol (TC), systolic (SBP) and diastolic blood pressure (DBP) and urinary free cortisol (F), cortisone (E) and cortisone : cortisol (E : F) in a group of overweight and obese subjects.

The study used a single-blind randomised cross-over design wherein fourteen subjects (eight males, six females; age 36 (SD 11) years; BMI 28 (SD 2.5) kg/m^2) consumed 20 g dark chocolate containing 500 mg or 1000 mg polyphenols for 2 weeks, separated by a 1-week washout period. This 20g portion corresponds to half a portion of habitual chocolate intake and provides similar concentrations of polyphenols as used in previous studies on healthy and hypertensive volunteers that have reported significant reductions in blood pressure following consumption of dark chocolate [4,5].

Capillary FG and TC levels were measured using a calibrated Accutrend GC system (Roche Diagnostics, Burgess Hill, West Sussex, UK). Blood pressure was measured using an automated A&D Medical UA-767 BP monitor (A&D Medical, San Jose, CA, USA). Subjects also completed three 3 d diet and physical activity diaries at baseline and during each intervention. Compliance was measured by direct interviewing, returning of empty chocolate foils and assessment of diet diaries.

Repeated-measures ANOVA revealed a significant reduction in capillary FG levels, SBP and DBP following both treatments. No significant differences were observed between dark chocolate containing 500 mg and 1000 mg polyphenols, suggesting that both doses were equally effective in improving these variables ($P>0.05$). No changes in anthropometrical measurements, capillary TC and urinary free glucocorticoids levels were observed.

	1000 mg polyphenols						500 mg polyphenols					
	Baseline		Week 1		Week 2		Baseline		Week 1		Week 2	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
FG (mmol/l)	4.42	0.70	4.21	0.82	3.97*	0.54	4.42	0.70	3.94	0.72	3.92*	0.86
TC (mmol/l)	5.02	1.01	–	–	4.98	0.90	5.02	1.01	–	–	5.03	0.77
SBP (mmHg)	119	10.5	114	12.0	112**	9.68	119	10.5	114	9.53	112**	9.51
DBP (mmHg)	78.6	7.74	74.5	7.17	74.6**	7.39	78.6	7.74	74.6	4.27	73.0**	5.06
F (nmol/d)	77.3	27.1	–	–	71.2	38.9	86.8	44.1	–	–	78.6	47.3
E (nmol/d)	54.3	26.9	–	–	45.8	17.3	59.6	32.6	–	–	45.8	20.3
E : F ratio	0.71	0.32	–	–	0.75	0.37	0.71	0.31	–	–	0.63	0.21

Mean values were significantly different from those at baseline: *$P<0.05$, **$P<0.01$.

In conclusion, the present study confirms previous findings of a reduction in blood pressure and fasting glucose following consumption of polyphenol-rich dark chocolate. This effect seems unlikely to be mediated through the glucocorticoid pathway, although involvement of the renin–angiotensin–aldosterone system cannot be excluded. Furthermore, it appears that increasing the polyphenol dose does not result in further improvement in the assessed variables, suggesting that a saturation effect may occur with increasing doses.

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