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The total polyphenol content of various commercial cocoa beverages, with and without the addition of cow's milk

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Polyphenols, specifically flavonoids are found abundantly in many plant foods such as fruit, vegetables, tea and cocoa, and are beneficial for health. Specifically, polyphenols in cocoa may reduce chronic inflammation[1,2]. The purity of cocoa influences the polyphenol content, with high purity cocoa powder containing a greater concentration of polyphenols compared to more processed powders. Cocoa powder can be made into beverage form, and the addition of ingredients such as diary milk may alter the bioavailability of the polyphenols in a sample[3].

The aim of this study was to determine the total polyphenol content of a range of cocoa beverages, with and without dairy cows milk. From the results of this study, the two beverages with the least and the greatest polyphenol content will be determined.

Total polyphenol content of the test beverages was measured using the Folin-Ciocalteu method[4]. Cocoa drinks were purchased from Waitrose supermarket and were made using a standard protocol. Table 1 shows the various cocoa powders used and the polyphenol content of each beverage per gram of sample, with or without semi skimmed milk.

Table 1.

	Water	SD	Milk	SD
Green & Blacks[1]	50·74[a]	2·19	105·52*[a]	4
Cadbury[2]	15·99[b]	0·61	24·57[b]	2·75
Waitrose[3]	25·78[b]	1·64	35·83[b]	1·45
Cadbury Bournville[4]	51·61[a]	0·97	124·37*[a]	12·4
Options White[5]	20·78[b]	0·98	20·37[b]	0·1

Values are means of three independent experiments (One-way ANOVA, Tukey post hoc). SD = standard deviation. *= significantly greater polyphenol content compared to the same drink made with water. [a,b] = significantly different polyphenol content between cocoa powders; $p < 0{\cdot}05$. Cocoa powders included: Green & Blacks Organic Cocoa Fair Trade[1]; Cadbury Fair Trade Drinking Chocolate[2]; Waitrose Luxuriously Rich Drinking Chocolate[3]; Cadbury Fair Trade Bournville Cocoa[4]; Options Instant White Chocolate[5]

Overall, when made with both water and milk the pure cocoa beverages (Green & Blacks and Cadbury Bournville) were shown to be richer in total polyphenols compared to lower purity cocoa powder varieties. The addition of semi skimmed milk to Green & Blacks and Cadbury Bournville cocoa beverages significantly increased the amount of available polyphenols.

These results show that milk may enhance the *in vitro* concentration of cocoa polyphenols, yet human studies would need to be performed. Although the addition of milk to cocoa powder has been shown to alter the absorption rate of polyphenols in humans, the overall polyphenol concertation was shown to be similar compared to the beverages made with water[5]. The results from the current trial will be used for a future human trial looking at the effect of a high polyphenol pure cocoa beverage compared to a low polyphenol control on chronic inflammatory status.

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