

## Diet containing cocoa powder with flavanols and procyanidins inhibits platelet function

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Flavanols and their related procyanidins are flavonoids found in foods such as tea, wine and cocoa powder, and are powerful antioxidants *in vitro* (1). The consumption of a high intake of a cocoa beverage, containing 897 mg total flavanols and oligomeric procyanidins, inhibited platelet activation and function in an acute study (6 hours) in humans (2).

The current study investigated the long-term effect of a lower dose of flavanols and procyanidins from cocoa powder using a double blind, randomised, placebo-controlled study with 32 subjects. Subjects were stratified into active and placebo groups based on plasma vitamin C levels prior to the study. Subjects on the active diet consumed 234 mg of flavanols and procyanidins (CocoaPro™, Mars Inc) per day for 4 weeks, while subjects on the placebo tablet consumed an identical tablet made from cocoa powder with a low level of flavanols and procyanidins (< 1mg) for 4 weeks. Dietary restrictions were implemented to control the amount of flavonoids from the diet. Weighed food records, anthropometric measurements and fasting blood tests were performed at day 0 and 28. Plasma was analysed for F<sub>2</sub>-isoprostanes, TBARS, TRAP, the flavanols catechin and epicatechin, vitamin C, E, A, carotenoids and uric acid to determine the effect of oxidative damage. Plasma was also analysed for lipids and lipoproteins, while whole blood was analysed for platelet aggregation and platelet activation using flow cytometry.

Results showed that the plasma levels of epicatechin, catechin and vitamin C were significantly increased in the active group at day 28 and that platelet aggregation and activation (% of activated platelets) was significantly lower in the active group ( $p < 0.05$ ) compared with the control, using two different agonists, at day 28. There were no significant differences between groups for vitamin E, A, the carotenoids nor plasma lipids and lipoproteins. In terms of antioxidant protection, there were no significant differences in TBARS, TRAP and F<sub>2</sub>-isoprostanes between groups. These results with a relatively low intake of cocoa flavanols and procyanidins over a 4-week period support the short-term data showing benefits on platelet function. *In vitro* data suggest that flavonoids inhibit platelet function by reducing H<sub>2</sub>O<sub>2</sub> production, and in turn, phospholipase C activation in the platelet (3). Further investigations with different levels of supplementation are recommended.

1. Adamson GE, Lazarus SA, Mitchell AE et al. HPLC method for the quantitation of procyanidins in cocoa and chocolate samples and correlation to total antioxidant capacity. *J Agric Food Chem* 1999; 47: 4184–4188.
2. Rein D, Paglieroni TG, Wun T, Pearson DA, Schmitz HH, Gosselin R, Keen CL. Cocoa inhibits platelet activation and function. *Am J Clin Nutr* 2000; 72: 30–5.
3. Pignatelli P, Pulcinelli FM, Celestinin A et al. The flavonoids quercertin and catechin synergistically inhibit platelet function by antagonising the intracellular production of hydrogen peroxide. *Am J Clin Nutr* 2000; 72: 1150–1155.