Proceedings of the Nutrition Society (2010), **69 (OCE1)**, E129 doi:10.1017/S002966510999317X

Over- and undernutrition: challenges and approaches. 29 June–2 July 2009

Effects of acute consumption of fruit- and vegetable-puree-based-drink on plasma antioxidant status and flavonoid metabolites

S. Waroonphan, T. W. George, C. Niwat, J. A. Lovegrove and M. H. Gordon

Hugh Sinclair Unit of Human Nutrition, School of Chemistry, Food Biosciences and Pharmacy, The University of Reading, Whiteknights, PO Box 226, Reading RG6 6AP, Berks., UK

Current recommendations suggest that a daily intake of 400 g fruit and vegetables is required for the prevention of chronic diseases[1]. Fruit and vegetables in the form of puree-based-drinks still contain vitamins, fibre, carotenoids, S compounds and organic acids, which contribute to health effects, but they also contain a wide variety of phenolic phytochemicals, which are increasingly recognised as effective against oxidative stress[2,3]. Since 1974 there has been a constant increase in fruit juice consumption in the UK, from 30 g per person per week in 1974 to 284 g per person per week in 1999. In contrast, the general consumption of vegetables has remained reasonably constant and there has been a modest increase in fruit consumption[4]. Thus, juice products may be a potentially-useful source of beneficial dietary phytochemicals.

An investigation into the effects of acute consumption of 400 ml fruit- and vegetable-puree-based-drink (FVPD; equivalent to five portions of fruit and vegetables) on bioavailability, antioxidant status and risk factors for CVD was performed. The study was a single-blind randomised controlled cross-over dietary intervention study with a 4-week washout period. A 400 ml FVPD or control drink (fruit-flavoured squash matched for sugar composition) was consumed on the morning of the study day by twenty-four volunteers who had followed a low-flavonoid diet for the preceding 5 d. Blood samples were taken at baseline and at twelve intervals during the 8 h study day. Urine samples were collected at baseline and at two-hourly intervals during the study day. Biochemical variables in the blood and urine were measured.

There was a highly significant difference in plasma vitamin C concentration for treatment ($P=0.004$), time ($P=0.014$) and time $\times$ treatment ($P=0.013$). Plasma vitamin C increased significantly in volunteers who consumed the FVPD compared with the control drink, reaching a maximum concentration approximately 120 min after consumption. There was a significant time and time $\times$ treatment effect ($P<0.01$) for *ex vivo* LDL oxidation, with a longer lag-phase time after the FVPD consumption compared with control over the 4 h intervention period. The antioxidant capacity of plasma, assessed by the ferric-reducing antioxidant power assay, increased significantly compared with the control during the 4 h period after juice consumption, particularly at 60 min ($P=0.018$). Significant increases in plasma and urinary phenolic metabolites, especially hippuric acid, vanillic acid, *p*-hydroxybenzoic acid, benzoic acid, salicylic acid and *p*-hydroxyphenylacetic acid were detected over the 6 h period after consumption of FVPD ($P<0.05$) but not the control. Acute consumption of FVPD increased the antioxidant capacity of plasma and reduced the oxidisability of LDL. In addition, increased concentrations of phenolic metabolites were detected in plasma and urine after consumption of the FVPD. The FVPD was matched with the control drink for sugar content and therefore it can be concluded that the increase in antioxidant capacity was a result of other components in the FVPD such as flavonoids and their metabolites.

Funding provided by Unilever Bestfoods and The Royal Thai Government is gratefully acknowledged.

1. World Health Organization (2003) *Diet, Nutrition and the Prevention of Chronic Diseases. Report of a Joint WHO/FAO Expert Consultation*. Geneva: WHO.
2. Kris-Etherton PM, Hecker KD, Bonanome A *et al.* (2002) *Am J Med* **113**, 71–88.
3. Manach C, Williamson G, Morand C *et al.* (2005) *Am J Clin Nutr* **81**, Suppl., 230S–242S.
4. Buttriss J (2003) In *Plants: Diet and Health*, pp. 1–26 [G Goldberg, editor]. Oxford: Blackwell Publishing.