

Plasma bioavailability of lignans and isoflavones following acute and prolonged phytoestrogen supplementation in vegetarian and non-vegetarian subjects

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Both epidemiological and clinical studies suggest a protective role of phytoestrogens (PE) for cardiovascular disease, hormone-dependent cancers and post-menopausal symptoms¹. In humans, intestinal metabolism of the plant PE precursors produces biologically active metabolites, notably the isoflavones (genistein, daidzein, and equol) and lignans (enterodiol and enterolactone) from PE precursors in soy-based foods and linseed, respectively. A measure of these compounds bioavailability is important in assessing their potential *in vivo* health benefits.

This pilot study aimed to determine the plasma concentrations of these five endogenous PEs:

(1) over a 30 hr period after a single meal (acute ingestion) of foods containing PE precursors, (2) during 24 days of PE supplementation (on days 1, 7, 15), and (3) during a four day washout period, in four vegetarian and five non-vegetarian volunteers. PEs were supplied as specific soy and linseed foods. The single meal contained 137 mg isoflavones and 208 mg lignans, while PE supplementation contained approximately 60 mg isoflavones and 80 mg lignans per day.

Following acute ingestion, the peak plasma levels post meal occurred at 5 hr for genistein (106 ng/mL) and at 14 hr for both enterodiol and enterolactone (171 ng/mL and 131 ng/mL respectively), with high levels persisting for the entire 30 hr period. During the PE supplementation period, plasma concentrations of all PEs were elevated compared with baseline. During the washout period, plasma genistein and enterodiol both decreased after two days, whereas the secondary metabolites, equol (from daidzein) and enterolactone (from enterodiol) continued to increase over the four days. For all subjects, enterolactone and equol achieved highest concentrations after chronic feeding, indicating that regular consumption of soy and linseed foods may influence PE metabolism. This is significant given that these secondary metabolites are likely to have more significant physiological effects than their precursors, daidzein and enterodiol, respectively.

Vegetarians appeared to have increased ability to absorb and metabolise PEs, which may result from differences in their gut flora². In this study, vegetarians produced enterodiol and enterolactone earlier, and maintained elevated plasma levels for longer. During PE supplementation, vegetarians also showed a trend towards higher plasma concentrations of enterodiol, enterolactone and equol, though not statistically significant.

1. Tham DM, Gardner CD, Haskell WL. Potential Health Benefits of Dietary Phytoestrogens: A Review of the Clinical, Epidemiological, and Mechanistic Evidence. *J Clin Endocrinol Metab* 1998; 83(7):2223-2235
2. Rowland I, Wiseman H, Sanders T, Adlercreutz H, Bowey E. Metabolism of oestrogens and phytoestrogens: role of the gut microflora. *Biochem Soc Trans* 1999; 27(2): 304-208.