P31

Chewing and Caco-2 cells as part of an *in-vitro* human digestive model

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**Background** – *In-vitro* models of the human digestive system are useful for identifying factors that may influence the molecular behaviour of nutritional ingredients during digestion and passage into the circulatory system. It is important that models faithfully represent important digestive processes with the minimum of operational complexity. Current models (a) usually use mechanical size reduction to mimic chewing and (b) sometimes use a Caco-2 epithelial cell monolayer to estimate uptake into cells, but not to evaluate metabolism across the cell layer.

**Objectives** – To investigate (a) whether chewing can be substituted by mechanical size reduction and (b) whether passage across Caco-2 cells can be used to assess the potential for metabolism of food components during uptake.

**Design** – (a) Using fresh and processed fruit as example foods, the size profile and microstructure of chewed (ready to be swallowed) pieces was examined. Subsequent release of fruit sugars during simulated gastric and intestinal processing was monitored. (b) The passage of beta-carotene and catechin across a Caco-2 epithelial cell monolayer was studied.

**Outcomes** – (a) Physiologically, chewing cannot be simulated with simple size reduction methods because of the heterogeneity of chewed particle sizes (75 µm – 7 cm) and shapes, and the effects of oral processing on bolus characteristics. The large size (> 0.5 cm) of chewed fresh or dried fruit results in incomplete release of sugars after simulated gastric and small intestinal digestion (up to 47% lower compared with juice). (b) After 2 h assay, beta-carotene is metabolized by the Caco-2 cell monolayer more extensively (in total, approximately 8.03% conversions to retinol) than catechin (about 1.43E-5% conversion to catechin metabolites).

**Conclusion** – (a) Chewed particle characteristics are a likely determinant of subsequent nutrient release from solid foods and should not be overlooked in the development of *in-vitro* digestion models. (b) the Caco-2 cell monolayer can be used to monitor metabolic transformation of nutrients that may be relevant to first pass metabolism *in-vivo*.

P32

Daily dietary selenium intake of a randomly selected population of Victorian women: Age group differences and food sources

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**Background** – Selenium deficiency may be associated with increased risk of viral virulence, cancer, negative mood states and immunological dysfunction, and Se intakes above the minimum requirements appear to have a positive effect on the later three. There is relatively little detailed information on selenium intake in Australian adults.

**Objective** – This study aimed to estimate selenium intake of a randomly selected population of Victorian women enrolled in the Geelong Osteoporosis Study; to ascertain the main food groups contributing to daily selenium intake and to investigate the effect of the age group differences in food choices on Se intake and Se sufficiency.

**Design** – A detailed-history semi-quantitative food frequency questionnaire (FFQ) was administered to randomly selected women (n=556), aged 20–88 y, from the Barwon Statistical Division, representative of Australia in several demographic factors. Se values for Australian foods were used where available (Australian NZ Food Authority).

**Outcomes and conclusion** – The FFQ captured responses on 359 foods. Se intake (mean±SD) was 77±29 µg/day; median 73 µg/day – which is higher than NZ and most European countries, but lower than US and Canadian mean Se intakes. Mean intake was 1.1±0.4 µg/kg body weight (range (0.2 – 3 µg/kg)). 43% of women consumed less Se compared to the Australian NHMRC recommended intake (70 µg/day) for women. Wheat products, fish, vegetables, beef, fruit (Australian canned fruit has relatively high Se), dairy and poultry provided 20%, 10%, 10%, 10%, 9%, 9% and 7% respectively of the total Se intake. Significant age group differences were also found. Women 40-49y were those mostly at risk of Se insufficiency and older women consumed more Se from fruits, lamb, peas and beans. Younger women consumed more Se from mixed dishes (includes many “take away” food), chocolate foods and non-wheat grains.