Concurrent Session 7A: Micronutrients, Cereals and Milk

The association of iron absorption with serum ferritin and pro-hepcidin in Inflammatory Bowel Disease patients and matched controls

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Background – Patients with Inflammatory Bowel Disease (IBD) are exposed to high risk of iron deficiency and iron deficiency anaemia mainly due to blood loss and reduced iron absorption. Traditionally, serum ferritin is used as a clinical biomarker for iron store and also for classification of iron deficiency. Recently, a novel peptide named hepcidin, which directly regulates iron absorption was discovered. However, due to complex hepcidin structure, only the level of its pro-hormone named pro-hepcidin can be measured using ELISA.
Objective – To determine and compare the association of ferritin and pro-hepcidin with iron absorption in patients with mildly active Inflammatory Bowel Disease and controls.
Design – A case-control study where 28 IBD patients and 28 matched controls undertook an iron absorption test which measured sequential rises in serum iron over four hours following ingestion of 200 mg ferrous sulphate. At baseline, haemoglobin, serum iron, transferrin saturation, ferritin and pro-hepcidin were measured. Thereafter only serum iron was measured (30-240 minutes).
Outcomes – Significant increase in serum iron concentrations from baseline in both groups ($P<0.001$). No association with peak iron concentration between ferritin and pro-hepcidin in IBD group. In controls, only ferritin was significantly associated with peak iron concentration (-0.6, $P=0.001$).
Conclusion – Iron absorption in mildly active IBD patients is comparable with controls. Ferritin only predicts iron absorption in controls but not in IBD patients probably due to the presence of inflammatory cytokines. Pro-hepcidin does not accurately predict iron absorption in IBD patients and controls. There is an urgent need for the development of a simple assay (ie: ELISA) for serum hepcidin quantification to study iron metabolism.

Controlling plant cell wall microstructure through processing to enhance the release and absorption of phytonutrients

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Background – It is known that phytonutrients, particularly carotenoids consumed from raw fruit and vegetables are not efficiently absorbed by human body. The release and bioaccessibility of these compounds are strongly affected and may be enhanced by the disruption of the plant tissues and by microstructure created during processing. The development of an appropriate '*in vitro*' model provides a cost-effective approach to measure the release and subsequent absorption of these micronutrients in the digestive tract from plant structure modified by process designs.
Objective – To investigate the effect of plant cell wall microstructure on the release and bioavailability of phytonutrients using an in vitro digestion methodology coupled with a cell culture model to assess gut absorption.
Design – Carrots were processed using a combination of thermal (raw, blanched and cooked) and shear to control plant cell particle morphology. The release kinetics of phytonutrients was assessed using a simulated gastric and small intestine digestion methodology. The released carotenoids and polyphenols were identified using HPLC and LC/MS and antioxidant properties of the digesta also measured. To determine the absorption characteristics of these nutrients, a Caco-2 cell model was established measure the rate of transfer across a cell layer that mimics the gut wall.
Outcomes – Different cell microstructure resulted in different rate of carotenoid release. Small cell particles i.e. single cells obtained by cooking/shearing gave the highest release of carotenoid (~38%). The rate of carotenoid and phenolic absorption was also assessed.
Conclusion – Processing resulted in enhanced release and potential bioavailability of phytonutrients from plant cell wall materials.