'Bitter brake' activates gut hormones and suppresses food intake

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New research presented at the European Obesity Summit in Gothenburg (1-4 June) shows that a New Zealand produced bitter plant extract can supress food intake by stimulating the secretion of gut peptide hormones involved in appetite regulation. The study is by Dr John Ingram and colleagues from the New Zealand Institute for Plant & Food Research Limited and the University of Auckland, New Zealand.

Gut chemosensory mechanisms, particularly those involved in detecting and relaying to the brain the chemical composition of food during digestion, play an important role in regulating appetite and food intake. The researchers hypothesised that activation of specific bitter taste receptors which are expressed throughout the gastrointestinal tract by hormone secreting 'enteroendocrine' cells, could also regulate food intake by triggering the release of satiety or 'fullness' hormones, a mechanism termed by Ingram and his colleagues as the "bitter brake".

The team screened over 900 plant extracts for their ability to stimulate enteroendocrine "I cell" hormone release before identifying a highly bitter, non-nutritive plant derived ingredient they have called "Amarasate extract" to take forward into clinical testing. Full details of the extract composition will be disclosed in a future publication.

Their aim was to establish the efficacy of the Amarasate extract to modify acute energy intake, subjective ratings of appetite and gut peptide hormone concentrations. Twenty lean healthy male volunteers were recruited (mean body mass index 23.4 kg/m2) with 19 completing

all three treatments within the randomised, double-blind, placebo controlled cross-over study.

On each of the three treatment days, overnight fasted participants were provided with a standardised 2MJ (578 calorie) energy breakfast at 0900h. Treatments comprising 500 mg Amarasate extract or a placebo were administered in either gastric pH resistant (at 1100H AM) or standard (1130H AM) hypromellose capsules for targeted intestinal (duodenal) or stomach (gastric) release, respectively. The site of action within the gut is a key part of the hypothesised "bitter brake" mechanism. To maintain treatment blinding, placebo capsules were also administered as part of each treatment.

Energy intake was recorded at an ad libitum lunch (1200h) and ad libitum snack (1400h), where participants were asked to eat until they felt comfortably full. Blood samples and subjective ratings of appetite were taken throughout the day. This was followed by a minimum of one week rest ('washout') period between treatments.

The authors found that, compared with placebo, both gastric and duodenal delivery of the Amarasate extract stimulated significant increases in the gut peptide hormones CCK, GLP-1 and PYY while significantly reducing total (lunch plus snack) ad libitum meal energy intake by 911 kJ (218 calories) and 944 kJ (226 calories), respectively. However, no significant treatment effects were observed for any subjective ratings of appetite or nausea.

The authors conclude: "We have demonstrated that activation of the 'bitter brake' mechanism by a bitter plant extract can stimulate the release of gut peptide hormones involved in appetite regulation and suppress subsequent feeding behaviour in healthy men."

Dr Ingram and his colleagues are currently undertaking research to

optimise the required dosage of Amarasate extract and are working with New Zealand industry partners to develop Amarasate extract into a supplement and functional food product.

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