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Characterising a novel regulator of dietary fat digestion as a potential obesity treatment; from microplate to synthetic gut system

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Sodium alginate derived from seaweed has demonstrated pancreatic lipase inhibition *in vitro*[1], and other seaweed extracts containing bioactive compounds have also shown a reduction in digestive enzyme activity[2]. Four extracts, containing biopolymers of *Fucus vesiculosus* were analysed for their potential to inhibit pancreatic lipase using modified turbidimetric methodology[3] and an olive oil substrate. Inhibition of pancreatic lipase prevents triacylglycerol breakdown, potentially reducing dietary fat digestion *in vivo*. All extracts demonstrated significant inhibition. 100% lipase inhibition was observed with 5 mg/ml and 2·5 mg/ml supernatant extract, and 5 mg/ml homogenate extract ($P < 0{\cdot}0001$; data not shown). Dose-response data indicated potency, whereby: homogenate > supernatant > alginate > pellet (data not shown).

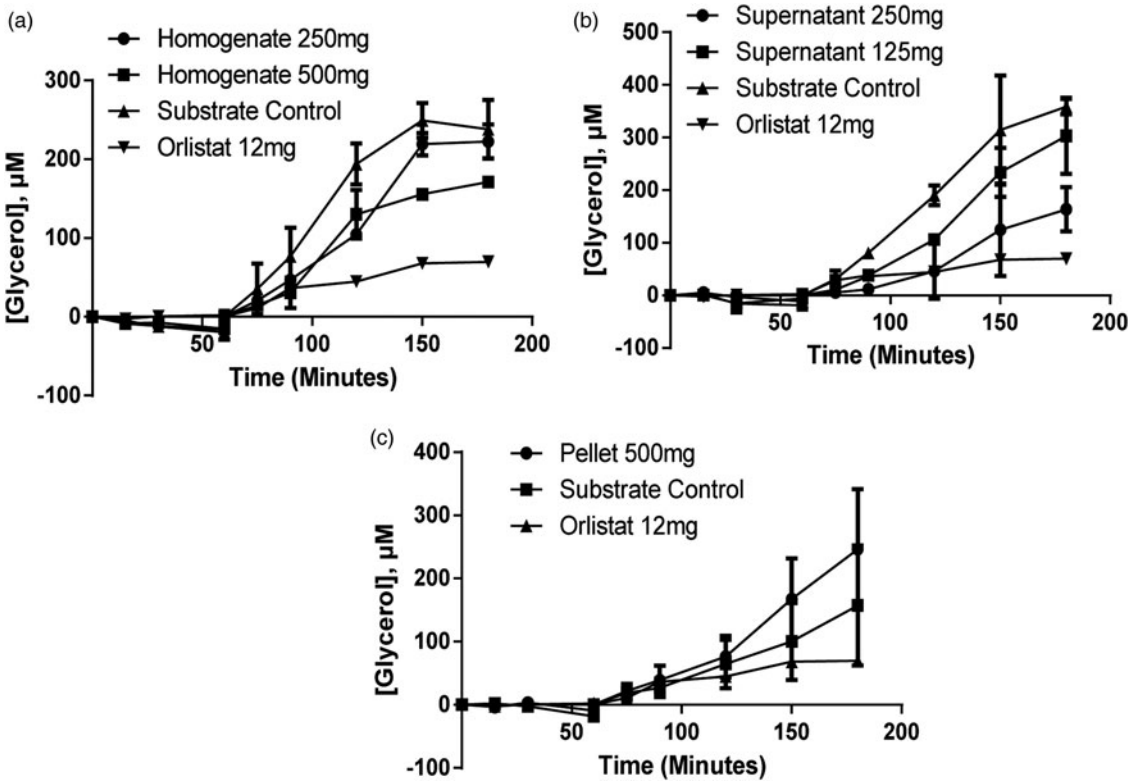

Fig. 1. Free glycerol concentration during gastric and small intestinal phases of the gut model.

The most potent extracts were analysed in a model gut system, using olive oil. The inhibitory potential of extracts was assessed during salivary, gastric and small intestinal phases of digestion. The homogenate extract reduced fat digestion significantly, to 62·4% of the substrate control after 150 minutes (Fig 1; $P < 0{\cdot}0001$), while the ethanol supernatant reduced fat digestion significantly, to 24·3% of the substrate control after 120 minutes (Fig 1; $P < 0{\cdot}001$).

Given the inhibition of pancreatic lipase observed *in vitro*, and the nutritional value of *Fucus vesiculosus*, seaweed extracts are potential functional food ingredients, and may also be used concomitantly with the weight control drug Orlistat.

1. Wilcox MD, Bownlee IA, Richardson JC *et al.* (2014) *Food Chem* **146**, 479–484.
2. Balasubramaniam V, Mustar S, Mustafa Khalid N *et al.* (2013) *J Appl Phycol* **25**, 1405–1412.
3. Vogel WC & Zieve L. (1963) *Clin. Chem* **9**.