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The *in vitro* prebiotic potential and glycaemic index (GI) of wholegrain-oat-based cereals

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Epidemiological studies show a positive association between increased dietary intake of whole grains and reduced risk of chronic disease (e.g. diabetes, CHD)[1]. Two possible mechanisms of protection are through the low glucose and insulin response often observed with wholegrain foods (low glycaemic index (GI))[2] and the ability to mediate a prebiotic modulation of gut microbiota[3]. To date very little work has been carried out on the functionality of oats in maintaining a healthy gut.

An investigation into identifying a wholegrain-oat-based cereal demonstrating prebiotic properties was performed. After *in vitro* digestion eleven cereal samples were supplemented to pH-controlled anaerobic batch-culture fermenters inoculated with human faecal samples. Bacterial enumeration was carried out using the culture-independent technique, fluorescent *in situ* hybridisation[4]. Cereals demonstrating prebiotic potential were selected for GI determination in twelve healthy subjects. The reference food used for GI testing was glucose (25 g and 50 g). Five test foods were prepared according to manufacturer's instructions, representing the food as normally consumed with 250 ml skimmed milk. Either 50 g (or 25 g if the volume of food was too large for 50 g) portions of available carbohydrate of the test foods were consumed randomly with 250 ml water. Subjects are tested after a 10–12 h overnight fast. The finger-prick method was used to obtain capillary blood samples before the meal and at 15, 30, 45, 60, 120 and 180 min following consumption of the food. Glucose was determined in the capillary blood samples using a HemoCue® analyser (HemoCue AB, Ängelholm, Sweden). The incremental area under the blood glucose response curve, ignoring the area beneath the baseline, was calculated to obtained final GI values. The study was subject to ethical review and was allowed to proceed. Subjects gave informed consent.

Total bacteria populations increased significantly ($P<0.05$) in all treated cultures, and the fermentation of an oat cluster cereal was particularly associated with a proliferation of the *Bifidobacterium* genus ($P=0.02$). Smaller but significant increases in *Bifidobacterium* genus was observed for a further four oat-based cereals tested. Increases in *Lactobacillus–Enterococcus* group were observed for this group of cereals and fructo-oligosaccharide (FOS) (a documented prebiotic)[5], but reached significance only for the oat cluster cereal ($P=0.008$). *Clostridium histolyticum* subgroup significantly increased for instant porridge ($P=0.008$), while non-significant decreases were recorded for FOS and the four other cereals. The oat cluster cereal achieved the lowest GI value (40), the three other cereals ranged between 44 and 74, with the instant porridge resulting in a GI value of 102.

The current study provides evidence that wholegrain-oat-based cereals have significant prebiotic activity when tested in a batch-culture system and medium-to-low GI, with the oat cluster cereal having the lowest GI and greatest prebiotic potential. Determination of the metabolic and prebiotic effects of the chronic consumption of oat cluster cereal will be investigated in a subsequent human feeding study.

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