Novel food concepts with health benefits adjunct to the insulin resistance syndrome; Optimization of carbohydrates and proteins for facilitated glycaemic regulation and improved cognitive function

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The group has for many years been engaged in research aiming at optimisation of the glycaemic, hormonal and satiating impact of carbohydrate foods. A major focus has been on the importance of various types of processing on post-prandial blood glucose and hormonal responses to starchy foods in healthy subjects. Several in vitro procedures have emanated from the group such as e.g. enzymatic procedures for prediction of post-prandial glycaemia or resistant starch content, respectively. The group has participated in several international inter-laboratory studies aiming at standardising the procedure for Glycaemic Index determination. A wide range of food factors have been identified as operative tools for modulating post-prandial blood glucose excursions such as e.g. the degree of starch gelatinization, extent of starch retrogradation, amylase/amyllopectin ratio, the physical food form, the dietary fibre matrix, and/or the botanical food structure. Many of these food factors also affect the content of resistant starch; making it possible to design starchy foods which promote a lowered rate and extent of starch digestion. With this knowledge, the group has tailored food products for enclosure in studies of the longer-term effects in type 2 diabetics and pre-diabetic subjects. These studies have provided evidences for longer-term health benefits of a diet characterised by slow release starchy foods. Health benefits include improved blood lipids, normalised fibrinolysis and improved insulin economy.

Examples of publications;


During the last few years, the negative health effects of oscillatory hyperglycaemic episodes have increasingly been acknowledged. Such episodes are associated with oxidative stress and elevated expression of pro-inflammatory metabolites, thus providing a link between post-prandial hyperglycaemia and cardio-vascular disease. More recently, efforts regarding food tailoring in the group has been extended to include also food factors capable of affecting glycaemia, insulinaemia and associated IRS risk factors at proceeding meals. In these studies, the impact of various food
Factors/food features are studied not only at the immediate test meal, but also at subsequent standardised “second”- or “third” meals. This type of research has enabled us to identify prototype cereal products which lowers glycaemia and associated IRS risk factors at three consecutive meals, or in the perspective from an evening test meal to a subsequent standardised breakfast. Whereas the acute benefits of slow release starchy foods is mediated through the lente properties per se, observed benefits at a meal ingested about 10h thereafter has been shown to be associated with colonic fermentation of specific and prebiotic carbohydrates. Of particular interest are new findings suggesting that the prebiotic content of the evening meal may beneficially affect several acknowledged physiological parameters linked to insulin resistance the proceeding morning, and promote satiety. This knowledge opens for technological design of a new generation low glycaemic Index foods capable of improving metabolic risk factors at several consecutive meals. Examples of physiological parameters that are being studied include B-glucose, insulin, glucagon, GLP-1, GIP, cytokines, adiponectin, apetite hormones, FFA, short-chain fatty acids, subjective satiety. In particular, the work aims at correlating these parameters to specific food components e.g. bioactive components; or to the type and extent of food processing.

**Examples of publications;**


More recently the work on glycaemic regulation has focused on the potential impact of various food proteins. Consequently, certain food proteins e.g. whey proteins appears to facilitate glycaemic regulation in healthy and type 2 diabetic subjects by acting as an insulin secretagouge. The mechanism appears to be mediated by a high protein solubility which favour the release of specific insulinotrophic amino-acids in post prandial plasma. These findings are currently being exploited to elucidate the effectiveness of such food protein fractions to facilitate normoglycaemia in type 2 diabetics and subjects with impaired glucose tolerance.

**Examples of publications;**


Very little is known on the importance of food composition and nutrient release features on cognition functions. In the group we recently reported that a lower glucose tolerance in a group of healthy elderly subjects; albeit within the normal range, led to a measurable decline in cognitive performance as measured using tests of working memory and selective attention. Interestingly, the maintenance of a net-increment in glycaemia in the late post-prandial phase proved beneficial. Such
features are more common in the case of low glycaemic index foods. These data imply that the course of glycaemia is important. These new observations are among the first to disclose the importance of a specific food entity on cognitive performance, and provide a basis for optimisation of food products for cognitive merits. Such studies are in progress emphasising not only the food composition but also bioavailability aspects as affected by type and degree of food processing.

Examples of publications;


Examples of current research programmes;

The group is currently engaged in several research programmes such as e.g.

**HEALTHGRAIN.** Exploiting the bioactivity of European Grain; an integrated project within EU framework 7 where Inger Björck coordinates the nutrition module.

**Funcfood.** An interdisciplinary PhD programme in Functional Food Sciences at Lund University.

**Antidiabetic Food Centre.** A centre of excellence in research and innovation funded by Vinnova, industry, public actors and Lund University.