The Role of Plant Based Foods in the Fight against Obesity

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At a time when the world is experiencing an obesity epidemic, much research is focused on finding successful dietary interventions to reverse the rising trend. The evidence for plant based foods in the fight against obesity was examined at a recent satellite symposium, hosted by the Alpro Foundation, at the 17th European Congress on Obesity (ECO2009).

Peptides in the prevention of obesity

Dr Magni, from the University of Milan, discussed the role of peptides in influencing pathways that affect satiety. He explained how the hypothalamus acts as an appetite centre in the brain, receiving signals from the body that regulates both food consumption and energy balance. For example, the hormone leptin, produced mainly by adipose tissue, acts on the hypothalamus to decrease food intake and increase energy expenditure through its action on various peptides. In this way leptin signals to the brain that the body has had enough to eat. Counter to this, the hormone ghrelin stimulates hunger. Blood levels rise before meals and fall after eating. Again, ghrelin influences a number of peptides resulting in an increase in food intake and a decrease in energy expenditure. Soy protein has been shown to influence such pathways. For example when soy protein hydrolysates have been infused directly into the brain of rats, the rate of body weight gain is reduced, independent of food intake. It has been suggested that soy peptides may increase energy expenditure possibly by acting as exogenous peptides. In another study, peptides from black soy beans decreased appetite and body weight gain in rats through leptin like mechanisms. In a study of 72 men, soy protein significantly prolonged the postprandial suppression of ghrelin, as well as other hormones involved in appetite, resulting in a reduced energy intake.

Another possible way soy may be influencing weight gain, is via mechanisms directly involving adipocytes. In vitro studies have found that soy ingredients embed active peptides in fat cells that inhibit lipid accumulation.

<u>Unsaturated fatty acids and obesity</u>

As well as protein, type of fat may also have a role in preventing obesity. Although fat has been seen as the major culprit for the high obesity rates *Dr Kersten, from Wageningen University in the Netherlands*, presented how different types of fat may not be all equal when it comes to weight management. Dietary unsaturated fats have been shown to limit adipose tissue gain in animals, however there is little human data available. Nevertheless the properties of unsaturated fats may provide some clues as to why these could be beneficial:-

1. Unsaturated fats as fuel – The presence of double bonds results in a lower yield of energy compared to saturated fatty acids. As a result more unsaturated fatty acids would need to be oxidised to produce the same amount of energy as saturated fatty acids. Furthermore unsaturated fats are more easily oxidised than saturated fats.

2. Unsaturated fats increase satiety - Human studies have shown that unsaturated fatty acids result in a greater release of satiety hormones compared to saturated fats resulting in a greater feeling of fullness and reduced hunger.

3. Unsaturated fats influence gene expression involved in fatty acid oxidation - Unsaturated fatty acids have been shown to down-regulate the genes involved in fatty acid synthesis and up-regulate the genes in fatty acid oxidation.

As well as these possible benefits in relation to weight management, Dr Kersten suggested that unsaturated fat intake should be boosted in favour of saturated fat due to its favourable effects on risk factors associated with obesity related diseases such as Cardiovascular Disease (CVD).

Soy and Familial Hypercholesterolaemia

 Keeping with the theme of CVD risk factors, *Professor Widhalm, from the University of Vienna*, examined the specific effects of soy-substituted diets in children and adolescents with familial hypercholesterolaemia (FH). Diet is the cornerstone of treatment in this group due to safety concerns of drug therapy. Prof. Widhalm explained he recommends a Phase 1 diet for 3 months which includes modifying fat (rapeseed oil (5-30g/ day), a reduction of animal fat in meat, sausages, milk products and cheese), as well as increasing complex carbohydrates. If there is no dramatic reduction in cholesterol, then a Phase 2 diet is initiated. This involves adding soy dairy alternatives instead of milk and yogurt (soy protein: 0.5g/ kg bodyweight/ day). Short term studies have found total cholesterol can be reduced by between 7 and 30% following the inclusion of soy protein into the diets of children and adolescents with FH. To determine the longer term effects of such a diet, Prof Widhalm presented the results of a study involving 10 children diagnosed with FH who followed a fat-modified dietary regime for 17 months, with an average soy protein intake of 0.5g / kg body weight/ day from commonly available soy drinks and desserts. Compared to the baseline measurements, there was a 15.6% reduction in total cholesterol, a 19.9% reduction in LDL cholesterol and an 18% reduction in Apo B. Data from this study, as well as shorter term studies, suggest that soy substitution may be considered a key strategy in the long term treatment of FH in children. Longer term studies are now underway.

Soy foods and satiety, food intake and subjective sensations

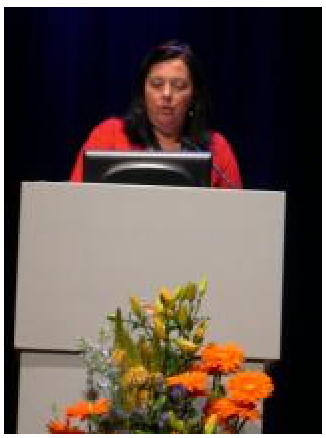
 *Dr Lawton from the University of Leeds* discussed the effects of soy foods on satiety and subsequent food intake in humans. She explained that calorie for calorie protein is more satiating than fat or carbohydrate. Reasons for this could be due to

- Protein stimulating the release of several satiety mediating hormones;
- Some amino acids (e.g. tryptophan, tyrosine) acting as precursors for satiety increasing mediators
- Protein inducing thermogenesis.

The results from a study that investigated the effects of soy foods on satiety, food intake and subjective sensations were then presented. Twenty young healthy males (mean age 21 years, mean BMI 22kg/m^2) were provided with a 400kcal breakfast and 1000kcal lunch, both containing soy protein (SP), and were then allowed to eat an *ad libitum* buffet dinner and evening snack foods. Following a one week washout the same men were provided with a breakfast and lunch matched in terms of appearance, weight and macronutrient composition to the SP meals, however the Protein was from a non-soy (NSP) source. Consuming soy at breakfast and lunch significantly reduced food eaten at dinner compared to the NSP meals by 172kcals (16% reduction). Across the total day (taking into account the calories consumed from the *ad libitum* evening snack foods) there was a reduction of 144kcals on the SP day compared to the NSP day. Both diets were rated as equally palatable. Subjective measures of appetite, including fullness and desire to eat, also showed that the SP breakfast was consistently more satiating than the NSP breakfast with similar trends at lunch. Furthermore, significantly greater mental alertness was observed over the day when the SP meals were consumed.

Dr Lawton concluded by suggesting that the effects on satiety, and subsequent calorie reduction, were due to the effect of whole soybeans, which as well as containing protein, are also naturally high in fibre.

Plant based diets and BMI



Prof Vansant, from the Catholic University Leuven in Belgium concluded by presenting evidence from cross-sectional studies investigating BMI in vegetarians and meat eaters.

The Oxford cohort of the European Prospective Investigation into Cancer (EPIC) examined BMI in four diet groups. A total of 37,875 healthy men and women, aged between 20 and 97 years were included. Age-adjusted mean BMI was significantly different between the four diet groups, being highest in the meat-eaters (24.41 kg/m^2 in men, 23.52 kg/m^2 in women) and lowest in the vegans (22.49 kg/m^2 in men, 21.98 kg/m^2 in women). Fish-eaters and vegetarians had similar BMI. A follow-up of this cohort after 5 years found that the mean annual weight gain was 400g but the lowest weight gain was seen among those who, during the 5 year period, had changed to a diet containing fewer animal foods (242g in men and 301g in women).

The recently published Adventist Health Study 2, conducted in 2002-2006, included 22,434 men and 38,469 women from the Seventh-Day Adventist church across North America. They were categorised into types of vegetarian diets– vegans (no animal products), lacto-ovo vegetarians (include dairy and eggs), pesco-vegetarians (include fish), semi-vegetarians (largely vegetarian but may include some meat and fish, as well as dairy and eggs) and non-vegetarians (eat animal products on most days). Mean BMI was lowest in vegans (23.6 kg/m^2) and incrementally higher in lacto-ovo vegetarians (25.7

kg/m^2), pesco-vegetarians (26.3 kg/m^2), semi-vegetarians (27.3 kg/m^2), and non-vegetarians (28.8 kg/m^2). The authors concluded that the 5-unit BMI difference between vegans and non-vegetarians indicates a substantial potential of vegetarianism to protect against obesity.

Prof Vansant concluded by explaining that despite the existence of dietary recommendations, getting people to change their dietary habits is extremely difficult. However by using a variety of behavioural techniques, these lifelong habits can be modified helping people to achieve a lasting healthier diet and lifestyle.

The evidence presented at this satellite symposium clearly demonstrates that plant based foods have a potential role in weight management. Although the mechanisms aren't clearly understood, by including more plant based foods, at the expense of animal foods, favourable effects on other obesity related disease risk factors can also be achieved.