

Concurrent Session 1: Functional Foods I

Soy isoflavone supplementation improves spatial working memory in healthy males

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Background – Women generally perform better at certain memory related tasks than men. Such gender differences in certain aspects of cognitive performance may be attributable to higher levels of circulating oestrogen activating oestrogen beta receptors (ER β) which are prevalent in brain regions mediating cognitive functions. Soy isoflavones and the metabolite equol can activate ER β . Thus isoflavone supplementation in males may lead to improved cognitive performance.

Objectives – To investigate effects of chronic isoflavone supplementation on cognition, specifically memory and executive function, in healthy males and to see whether any benefit is dependent on equol production.

Design – 34 healthy males aged 18-70 yrs participated in a 12 week double-blind, placebo controlled cross-over trial. Participants were randomised to take 4 capsules/d containing IsoLife 40 (donated by Frutarom, The Netherlands; 120mg/d isoflavone equivalents: 68mg daidzein, 11mg genistein) or placebo for 6 weeks followed by the alternative for a further 6 weeks. Cognitive assessments relating to measures of memory (associative, working, spatial, short- and long-term recall) and executive function (planning, verbal fluency, mental flexibility) were performed at the beginning and end of each treatment period.

Outcomes – Isoflavone supplementation significantly improved spatial working memory (SWM) ($P<0.02$), a test in which females consistently perform better than males. Males taking isoflavones committed fewer working memory errors ($P=0.016$) and located the required information in fewer attempts ($P=0.014$) than while taking placebo. Isoflavones did not affect associative, short or long term memory (Paired Associate Learning, Rey's Auditory Verbal Learning Task) or executive function (Mental Rotation, Digit Span, Trail Making and Letter-Number Sequencing). Effects of isoflavones on cognitive performance did not differ significantly between equol producers ($n=8$) and non-producers ($n=26$).

Conclusion – Isoflavone supplementation in healthy males may enhance specific cognitive processes which are dependent on oestrogen activation.

Exposure to estrogenicity from phytoestrogens in food

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Background – Phytoestrogens are plant derived chemicals that can mitigate a biological response via an estrogen receptor mechanism. This range of food constituents comprises coumestans, flavonoids, isoflavones and lignans that occur in commonly consumed foods such as bread, grapefruit, celery and tea. Since any biological effect will be related to dose, and foods are consumed in combination, it is useful to have a measure of total 'estrogenicity' from a typical diet and to know where this is coming from.

Objective – To review the current knowledge of intake of phytoestrogens and assess exposure to total estrogenicity from phytoestrogens in typical Western and Asian diets.

Design – Mean dietary intakes of phytoestrogens, including assessments from Australia and New Zealand, were collated from the literature and combined with relative potency data to derive a dose of estrogenicity for each phytoestrogen, with consideration of bioavailability. Assuming additivity, a total "estrogenic" dose was estimated from the sum of individual phytoestrogens.

Outcomes – Total intake of phytoestrogens is approximately 2.3 mg/kg bw/day for a Western diet and 3.0 mg/kg bw/day for an Asian diet. Genistein (43%), naringenin (18%) and apigenin (10%) make the greatest contribution to estrogenicity from phytoestrogens for an adult Western diet, with the most significant contributing foods being soy-containing processed foods (eg bread), citrus fruits, grain foods and celery. For an Asian diet, estrogenicity is dominated by the isoflavones, genistein (83%) and daidzein (9%) from the consumption of soy. Exposure in Western populations is particularly variable, depending on dietary choices.

Conclusions – Phytoestrogens will make an increasing contribution to total estrogenicity in the diet with the increasing use of soy as a food ingredient. Whether Western and Asian peoples respond similarly to these constituents, whether they have positive and/or negative impacts on human health, and whether individual phytoestrogens have an additive effect, remains to be elucidated.