Feature Paper

Phytoestrogens - health significance and the food industry

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Analyses of new high phytoestrogen foods indicate that there is significant variation between food products as well as variation within the same product. If food companies are to use phytoestrogen concentration as a marketing strategy, a quality control program for regular isoflavone analysis is warranted.

Phytoestrogens are estrogen-like plant compounds classified in three main categories: isoflavones, coumestans and lignans. They can exert both estrogenic and anti-estrogenic activity by competing with estrogen for its receptors. The majority of research to date has focused on the isoflavones and the lignans. Isoflavones are found in legumes, while lignans are found in most plants. Examples of plants containing isoflavones include soybeans and red clover, while linseed is a good source of lignans (Wahlqvist & Dalais 1997). There are beneficial effects of some of these phytoestrogens, and diets high in phytoestrogens, of relevance to the Australian food industry.

To date, three broad areas of research into phytoestrogens and health have been pursued. They are cardiovascular disease, cancer and women's health - notably the menopause. Epidemiological studies have identified associations between high dietary intake of phytoestrogens and low incidence of cardiovascular disease. The Japanese and Chinese, who consume high levels of phytoestrogens, have among the lowest rates of cardiovascular disease (WHO Report 1993). Animal intervention studies further this association. For example, monkeys consuming diets high in soy have favourable lipid levels compared to a control, low soy diet (Anthony & others 1996). A meta-analysis of human intervention studies with high soy diets has demonstrated beneficial effects on lipid levels (Anderson & others 1995).

Asian population (ie high phytoestrogens intake) data pertaining to breast and prostate cancer, reveals lower incidences compared to Western populations (ie low phytoestrogen intake) (Rose & others 1986). Animal data show a cancer protective effect of individual isoflavones as well as diets high in soy (Lamartiniere & others 1995, Zhang & others 1997). Preliminary evidence shows that postmenopausal women with high excretions of isoflavones and lignans have a lower risk of breast cancer (Ingram & others 1997). There is also a case report of a prostate cancer patient consuming isoflavone tablets that showed signs of tumour repression (Stephens 1997).

The similarity in structure between phytoestrogens and estrogen raised the issue of similar benefits to hormone replacement therapy for the treatment of menopausal symptoms. Population comparison showed a difference in menopausal symptoms between women in Western and Eastern cultures, notably countries with a high phytoestrogen consumption (Boulet & others 1994). Adlercreutz & others (1988) finding that Japanese had significantly higher urinary isoflavone excretion compared to American and Finnish individuals led to the hypothesis that isoflavones could be responsible for the difference in menopausal symptomatology (Adlercreutz & others 1992). Since then there have been a number of studies examining the effects of diets high in phytoestrogens on menopausal symptoms (Wilcox & others 1990, Baird & others 1995, Murkies & others 1995, Brzezinski & others 1997, Albertazzi & others 1998, Dalais & others 1998). There is evidence for a reduction of the primary symptom of menopause, hot flushes, but given that measuring hot flushes is very subjective, the effect of phytoestrogens on hot flushes still remains to be elucidated. However, there seems to be a beneficial effect of phytoestrogens on vaginal cell maturation index, an indicator of estrogenicity (Wilcox & others 1990, Brzezinski & others 1997, Dalais & others 1998). The issue of phytoestrogens and bone is preliminary, but in-vitro, animal and human studies are indicative of a protective effect of phytoestrogens against bone loss (Anderson & Garner 1997, Arjmandi & others 1996, Dalais & others 1998).

Phytoestrogens in Australian foods

Based on the potential beneficial effects of phytoestrogens, a number of new food products high in phytoestrogens have been released onto the Australian food market. These include a range of breads containing soy and linseed, cereals containing soy and linseed and soymilks. Companies have used the potential health benefits of phytoestrogens to indirectly promote their respective products. We selected a number of new high phytoestrogen food products and analysed them for isoflavone content.

From the five brands of soy and linseed breads selected, there was a two fold variation in the isoflavone content between the different brands. More importantly, there was a two to three fold variation within the same brand for certain breads. This variation could be due to bread making techniques and variation occurring in various strains of soybeans used in the bread. There was a three-fold variation between the soymilks analysed. From the seven different varieties of soymilks analysed, three used isolated soy protein (ISP) and four used whole soybeans as their source of soy. This difference in soy source is the likely explanation for the variation. Due to processing, ISP has a lower concentration of isoflavones compared to whole soybeans.

Messina & others (1995) estimated the daily intake of isoflavones by Japanese to be between 60-90 mg. Based on this estimation and the analyses of the high

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phytoestrogen food products, Australians would have no difficulty in increasing their intake to Japanese levels. However, the potential health benefits of phytoestrogens are still at an exploratory stage. There are other components in soy (eg soy saponins) and linseed that may act together with the phytoestrogens or have beneficial effects of their own on the health issues discussed above and these should not be overlooked.

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