LIGNANS

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The phytoestrogens are a group of naturally occurring compounds with estrogenic properties and found in plant foods. They can be divided into a number of classes, the principal of which are the iso-flavones (including genistein), the coumestans, and the lignans. The Lignans are a class of phenolic compounds related to the polyphenolic plant structural compounds, the lignins. Whereas the iso-flavones are virtually found only in legumes (and particularly soya), the lignans are found in almost all cereals and vegetables, with the highest concentrations found in oilseeds. Like many plant anutrients of interest, they are usually present in plant foods as their glycosides. Like the related lignins, the lignans have no nutritive value to humans and until the last 25 years were largely ignored.

Interest in the lignans was aroused when they were first demonstrated in human urine. The lignan glycosides can, of course, be hydrolysed in the gut by bacterial enzymes to release the free lignan. However the major human urinary lignans, principally enterodiol and enterolactone, are not the aglycones of the lignans present in the diet. They are, however, produced in the colon by bacterial action on dietary precursers. Their concentration in urine is increased with increasing intake of dietary fibre and of whole grain foods, and decreased by increasing tobacco consumption. They are weak estrogens, able to bind to estrogen binding sites, particularly the ER-beta sites.

There has been a growing interest in the study of these compounds in recent years because consumption of foods rich in phytoestrogens has been vigorously advocated for the prevention of breast, prostate and colon cancer. The incidence of all three cancers is lower in Asia than in western countries; the intakes of phyto-estrogens in general (and lignans in particular) is much higher in Asian populations than in those living in the west. The principal lignans in human urine are enterodiol and enterolactone; the concentration of both is higher in the urine of Asian populations (with a low incidence of the cancers of interest) than of Euuropean populations.

So why should we think that this is a causal and not a coincidental relationship? For breast cancer the arguments are superficially the strongest. The risk of breast cancer is inversely related to fibre intake; this may be due to the effect on lignan levels rather than to an effect of dietary fibre. Furthermore, many breast cancers are estrogen dependent, and contain estrogen receptors to bind the hormone and concentrate it in the tumour. Early attempts at treatment of these breast cancers involved removal of the ovaries and adrenals, and this slowed the growth of the tumours. If lignans bound to the estrogen receptors sites were able to block the uptake of the hormone, that could also inhibit the rate of tumour growth. Lignans have also been cited as offering an explanation for the relation between breast cancer risk and obesity and fat intake. The same explanation could be applied to prostate and colon cancer risk in relation to obesity and fat intake.

Similarly the rate of growth of prostate cancers responds to estrogen therapy. Perhaps there is a protective effect of lignans because of their estrogen activity. Finally, colon cancer risk is related to fibre intake, and the lower risk in women suggests a role for estrogens. Perhaps the protective effect of whole grain cereals and of fibre rich foods is not due to their dietary fibre content, but to their effect on lignan levels.