

The impact of xenoestrogens in the diet: feminizing agents or functional foods?

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Xenoestrogens are synthetic or naturally-occurring chemical compounds in the environment that are able to mimic the action of the female hormone, 17 β -estradiol (estrogen). This wide range of chemicals share a common mechanism involving occupancy of the estrogen receptor site to form a complex which may then bind to a specific region of a target gene, initiating protein synthesis and cell division. The estrogenicity of a wide range of compounds has been tested by measuring relative binding affinities, gene expression or cell proliferation.

International interest and concern about the significance of these compounds to human health has arisen from wildlife effects including the feminization of marine snails, reduced penis size in alligators, the thinning of egg shells and impaired reproductive function of seals. Possible human health effects include reduced sperm count and quality, cryptorchidism, hypospadias, male breast and testicular cancer. On the other hand, some groups of xenoestrogens, in particular the isoflavones and flavonoids, have beneficial effects which may reduce the risk of breast cancer in women, help to alleviate postmenopausal symptoms, and reduce the risk of cardiovascular disease, atherosclerosis and cancer generally.

Food is a major route of exposure to xenoestrogens and we have assessed the daily intake of 20 naturally-occurring (soy isoflavones, lignans, coumestans, flavonoids, and resorcylic lactones) and synthetic xenoestrogens (organochlorine pesticides, PCB congeners, alkylphenols) known to occur in food. Dietary exposure of the wider New Zealand population was estimated from either New Zealand or international reports of concentrations of xenoestrogens in food and New Zealand consumption data (1,2). For an adult male, the estimated daily intakes were 0.015 mg estrogen equivalents/day on the basis of binding affinity to the receptor site and 0.003 mg estrogen equivalents/day on the basis of resulting cell proliferation. More than 98% of total estimated intake was from isoflavones and flavonoids.

When bioavailability is taken into account by factoring intake estimates with plasma concentrations, the estimated circulating blood level from all xenoestrogens combined, for an adult male, is approximately half the circulating level of endogenous estradiol. This would appear pharmacologically significant.

1. Ministry of Health. NZ Food: NZ People. Key results of the 1997 National Nutrition survey. Wellington: Ministry of Health, 1999.
2. Cressey P, Vannoort R, Silvers K, Thomson B. 1997/98 New Zealand Total Diet Survey. Part 1: Pesticide residues. ESR Client Report FW9964. Wellington, New Zealand: Ministry of Health, 2000.