“Tofu Shrinks Brain!”

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Phytoestrogens--Soy Self Defense

Tofu and other soybean foods contain isoflavones, three-ringed molecules bearing a structural resemblance to mammalian steroidal hormones. White and his fellow researchers speculate that soy’s estrogen-like compounds (phytoestrogens) might compete with the body’s natural estrogens for estrogen receptors in brain cells.

Plants have evolved many different strategies to protect themselves from predators. Some have thorns or spines, while others smell bad, taste bad, or poison animals that eat them. Some plants took a different route, using birth control as a way to counter the critters who were wont to munch.

Plants such as soy are making oral contraceptives to defend themselves, says Claude Hughes, Ph.D., a neuroendocrinologist at Cedars-Sinai Medical Center. They evolved compounds that mimic natural estrogen. These phytoestrogens can interfere with the mammalian hormones involved in reproduction and growth--a strategy to reduce the number and size of predators.

Concerns About Giving Soy to Infants

The most serious problem with soy may be its use in infant formulas. "The amount of phytoestrogens that are in a day’s worth of soy infant formula equals 5 birth control pills," says Mike Fitzpatrick, a New Zealand toxicologist. Fitzpatrick and other scientists believe that infant exposure to high amounts of phytoestrogens is associated with early puberty in girls and retarded physical maturation in boys.

A study reported in The Lancet found that the "daily exposure of infants to isoflavones in soy infant-formulas is 6-11 fold higher on a bodyweight basis than the dose that has hormonal effects in adults consuming soy foods." (This dose, equivalent to two glasses of soy milk per day, was enough to change menstrual patterns in women. In the blood of infants tested, concentrations of isoflavones were 13,000-22,000 times higher than natural estrogen concentrations in early life.)

Soy Interferes with Enzymes

While soybeans are relatively high in protein compared to other legumes, they are a poor source of protein because other proteins found in soybeans act as potent enzyme inhibitors. These "anti-nutrients" block the action of trypsin and other enzymes needed for protein digestion. Trypsin inhibitors are large, tightly folded proteins that are not completely deactivated during ordinary cooking and can reduce protein digestion. Therefore, soy consumption may lead to chronic deficiencies in amino acid uptake.

Soy’s ability to interfere with enzymes and amino acids may have direct consequence for the brain. As White and his colleagues suggest, "isoflavones in tofu and other soyfoods might exert their influence through interference with tyrosine kinase-dependent mechanisms required for optimal hippocampal function, structure and plasticity." High amounts of protein tyrosine kinases are found in the hippocampus, a brain region involved with learning and memory. One of soy’s primary isoflavones, genistein, has been shown to inhibit tyrosine kinase in the hippocampus, where it blocked "long-term potentiation," a mechanism of memory formation.