Phytoestrogens and Their Health Effect

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isoflavones and increased bone mineral density [24]. Other studies also state that there are bone sharing benefits from the consumption of phytoestrogens. The daily consumption of 200 mg/kg phytoestrogens in OVX rats for 8 weeks increases the concentration of femoral calcium but also increases the weight of the uterus. Likewise with the administration of isoflavones-rich soy milk for 2 years can increase 2.4% of bone mineral density in older women [25].

Also, the administration of phytoestrogens combined with vitamin D in aged ovariectomized female rats also increases bone mineral density. Vitamin D was given as 2,400 IU/kg singly or in combination with various types of phytoestrogens (resveratrol, quercetin, and genistein) with multilevel doses. The results of this study prove that the combination of phytoestrogens with vitamin D has synergistic effects and may be effective in reducing bone loss after menopause [26]. This increase in bone mineral density may be caused by the consumption of phytoestrogens which can increase osteoblast synthesis and reduce bone resorption, but this positive effect is obtained from long-term consumption of phytoestrogens, at least six months [5]. So, the effect of phytoestrogens on bone health is influenced by the dose, duration, and age of the subject. For many women, adding soy to an already healthful diet may be an option to help stave off bone loss in midlife [5], [27].

Phytoestrogens and cognitive function

The interaction of phytoestrogens with estrogen receptors is also a positive influence on cognitive function. Phytoestrogens as neuroprotectors and antioxidants can reduce the risk of Alzheimer's disease [28]. Phytoestrogens affect the workings of the nervous system via steroid receptors and 5-hydroxytryptamine receptors or by increasing serotonin reuptake. Also, it also can influence the synthesis and uptake of catecholamines through estrogen receptors in the plasma membrane [12].

Phytoestrogens and skin health

Phytoestrogens can act as antiaging in the skin through estrogen receptors or increased production of hyaluronic acid, collagen, and extracellular protein matrix. Also, phytoestrogens can also increase vascularisation of skin, proliferation, prevent skin from oxidative stress and apoptosis. Ageing of the skin can be inhibited by the administration of phytoestrogens [3].

The protective effects of phytoestrogens on skin health can occur through several mechanisms. It can reduce UV-induced cell death in cultured keratinocytes, improve skin elasticity, increase the depth and increase the production of type 1 procollagen. It offers protection against UV induced senescence by significantly upregulating intracellular SOD activity in a dose-dependent manner. Phytoestrogens also have potent antioxidant effects with strong anti-inflammatory properties [29]. Other studies also proved that the provision of concentrated, isoflavone-rich soy extract during the six consecutive months caused significant increases in epithelial thickness, the number of elastic and collagen fibres, as well as the blood vessels. This study was conducted on 30 postmenopausal women before and immediately after treatment with 100 mg/day of isoflavones-rich, concentrated soy extract for six months [30].

Phytoestrogens and the immune system

Phytoestrogens affect the immune system through its ability to inhibit intracellular signalling pathways associated with NF-kappaB and immune responses. Genistein can suppress specific immune responses and lymphocyte proliferation [12].

Phytoestrogens suppress the immune response in vivo and in vitro. Phytoestrogens can suppress specific immune responses and suppress lymphocyte proliferation. Also, genistein can inhibit an allergic inflammatory response. Genistein can increase cytokine production from T cells and enhance cytotoxic responses mediated by natural killers and cytotoxic T cells [31].

A study in mice that gave 8-80 mg/kg of genistein over 28 days found that there were 46–67% decreases in the delayed-type hypersensitivity response, and these effects were reversible. Its also found that there was a decrease in cell infiltration in genetically treated animals compared with controls, and the numbers of CD4 + and CD8 + T cells in normal lymph nodes were reduced on histopathological examination. This study concluded that Dietary genistein (1000 or 1500 ppm) decreased cell-mediated immunity while producing serum genetic concentrations for humans under certain nutritional conditions [32]. However, the mechanism of action of phytoestrogens for the immune system needs to be studied further.

In conclusion, phytoestrogens have many positive benefits for the health of various organs. Many sources of phytoestrogens are also spread in the world which can be used as an alternative to external estrogen substitutes or hormone replacement therapy.

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