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PHYTOESTROGENS IN HUMAN HEALTH: FROM MENOPAUSAL RELIEF TO CANCER PREVENTION

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Phytoestrogens are plant-based polyphenols and also steroidal hormones. These compounds can copy or control activities of estrogen in the body. Examples of phytoestrogen sources are food like soybeans, flaxseed, and even beer also has phytoestrogens. Chemically, phytoestrogens have very similar structure to estradiol which is an estrogen hormone produced by the body. This means that they are able to bind with estrogen receptor sites, such as ER α and β. It should be noted that most phytoestrogens have high ER β binding activity. ER β is linked with cell inhibition, while ER α with cell proliferation. The objective here is to examine how phytoestrogenic compounds may offer distinct benefits or risks for menopausal symptoms, bone health, and overall safety compared to other phytoestrogens.

Phytoestrogens act like selective modulators of estrogen receptors. When there's not enough estrogen, these phytoestrogens step in and basically copy what estrogen would do. But if estrogen levels get too high, phytoestrogens then block the receptors so real estrogen can't bind easily. The amount of estrogen present matters here, whether it's lower or much higher than needed.

This bi-phasic effect makes it difficult particularly in the case of breast cancers. Some *in vitro* evidence seems to suggest that some phytoestrogens stimulate the growth of estrogen-dependent cancer cells; however, epidemiological evidence suggests that others help in protecting against exposure of estrogen and induce cell apoptosis. Epidemiologically, the rates of breast cancers seem to be relatively low among cultures that take soy through their lifetimes; however, this may vary according to certain factors, including the dose taken, age at which it is taken, and microbiome. It is also interesting to note that phytoestrogen consumption helps in reducing recurrence and mortality from breast cancer.

Clinical research points to phytoestrogens helping with menopausal symptoms in some ways. Mostly phytoestrogens in soy, genistein and daidzein, or from red clover. They can cut down hot flashes a little, make them happen less often. But when you look at all the symptoms, the effect is not that strong overall. It takes time for them to kick, it's slower than hormone therapy usually. A key variable in efficacy is an individual's ability to produce equol, a gut bacterial metabolite of the isoflavone daidzein; equol producers tend to experience significantly greater relief from vasomotor symptoms. Short-term use appears safe, with side effect profiles comparable to placebo.

What makes hops (*Humulus lupulus*), the plants used for beer brewing, different is that they contain a special phytoestrogen called 8-prenylnaringenin (8-PN) and that's what gives them their unique quality. The concentration for ER binding affinity is superior to the natural phytoestrogens than for 8-PN. Scientist research has been done on both hops and 8-PN in women for menopausal symptoms and osteoporosis for potential benefit. Studies on 8-PN so far revealed a significant increase in bone mineral density in different kinds of studies that have had varying results and that an actual danger exists when a person overdoses. Since overuse causes reproductive and fertility problems, a person should consume it in moderated way. The human body metabolizes the 8-PN in the liver by oxidation the phenyl group which affects the quantity you can utilize and its effect inside the body.

In conclusion, phytoestrogens will either mimic or block the effects of estrogen according to the needs of the body. In this group, 8-PN (8-prenylnaringenin) is one of the very potent phytoestrogens obtained from hops. Research conducted so far on this topic has produced some encouraging results regarding the increase in bone density and the relief of menopausal symptoms; however, results have been inconsistent. Excess use of phytoestrogens can lead to infertility and other reproductive insufficiencies.