

addressing the regulation of functional foods. 'Functional foods' is a concept that everyone knows about but for which there is no official policy. The FDA must face the issues raised by these products to ensure that functional foods become a public health boon rather than the snake oil of the 21st century."

Estrogen's a Natural in Herbal Remedies

Patricia Eagon, an associate professor of medicine at Pennsylvania's University of Pittsburgh, decided to consult an herbalist after she began to suspect that Premarin, the prescription estrogen she was taking for menopausal symptoms, was causing a rash on her leg. The herbalist, whom she had consulted before on other health matters, gave her a mixture of several herbs to take instead of Premarin. The concoction both relieved Eagon's hot flashes and piqued her curiosity about how the herbal ingredients worked.

Eagon decided to launch her own experiment to find out. She conducted an estrogen-binding assay on 15 herbs commonly used in treating menopause, including 3 from the remedy she had taken herself. Herbs that showed estrogenic activity in the screening were then fed to rats that had undergone ovariectomy. To test the herbs' estrogenicity, Eagon weighed the rats' uteri at the end of the study and measured changes in the concentration of luteinizing hormone in their blood (enlarged uterus and decreased luteinizing hormone concentration are both indicators of estrogenic activity). The tests indicated an estrogenic effect in four of the herbs—chaste tree berry (*Vitex agnus-castus*), dong quai (*Angelica sinensis*), American ginseng (*Panax quinquefolium*), and black cohosh (*Cimicifuga racemosa*). Eagon reported her findings on 11 April 1999 at the annual meeting of the American Association for Cancer Research and is currently preparing the results for publication.

Eagon's findings have implications for the fast-growing number of people who are embracing alternative medicine. According to the U.S. Food and Drug Administration (FDA), more than half of all U.S. adults use over-the-counter vitamins, dietary supplements, or herbal remedies. Ann Fonfa, founder of the New York City-based Annie Appleseed Project to promote the study of alternative cancer treatments, estimates (based on national averages for the general population) that 30% of menopausal women treat themselves with medicinal

herbs, many because they believe such herbs are safer and gentler than prescription drugs. Yet they have no proof of the herbs' medicinal value and safety beyond the folk wisdom of herbalists; unlike pharmaceutical manufacturers, manufacturers of herbal remedies are not required by the FDA to prove their products' safety and efficacy.

Eagon's discovery of estrogenicity in the herbs she tested comes as no surprise to some researchers. "While the specific findings are new, there is well-known, well-described estrogenic activity in plants," says Daniel Sheehan, director of the Endocrine Disruptor Knowledge Base Program of the FDA's National Center for Toxicology Research in Jefferson, Arkansas. He points to the example of subterranean clover, a type of clover that farmers have known for 50 years to cause reproductive failure in sheep.

While Eagon's research may help explain why certain herbs may relieve hot



Herbal estrogens. A recent study by associate professor of medicine Patricia Eagon suggests that some herbs may have powerful estrogenic properties.

flashes and other menopausal symptoms, it raises several more questions. Of key interest is how these phytoestrogens react in the body. "We really need to measure these things in women," Eagon says.

Premarin has long been doctors' drug of choice in treating menopause because it not only relieves symptoms but also helps prevent osteoporosis and heart disease. However, the synthetic hormone also elevates women's risk of breast and uterine cancer, which scares many would-be users away.

Because of the estrogenic activity she observed in the herbs she studied, Eagon feels compelled to warn women at high risk of breast or uterine cancer against taking them, as estrogen has been implicated in some forms of cancer. Yet she admits she doesn't know if the herbs promote cancer. In fact, she says, "We may test these further and find they inhibit cancer. It looks as if soy has a positive effect in preventing breast

cancer. These herbs may also be able to prevent it."

Eagon also doesn't know if estrogenic herbs give women the same protection against heart disease and osteoporosis that synthetic estrogen does. "One question is, how do estrogenic substances from plants compare in activity with pharmaceutical estrogens," says Fredi Kronenberg, director of the Rosenthal Center for Complementary and Alternative Medicine at Columbia University College of Physicians and Surgeons in New York City. "Do they have a broad spectrum of estrogenic activity or are they more selective in action? We don't have the answer yet."

Some of those answers may come out of Eagon's upcoming research. She first plans to investigate whether the herbs inhibit or promote breast cancer by feeding them to rats with a genetic susceptibility to the disease. Eagon also plans to delve into the herbs' effects on premenopausal women. Younger women take chaste tree berry and dong quai for premenstrual syndrome, amenorrhea, and infertility; American ginseng is recommended for stomach upset, lack of appetite, physical exhaustion, and infection. Eagon would use mice with intact ovaries to simulate the impact on premenopausal women.

"People think [taking herbal remedies] is like eating another serving of broccoli," Eagon says. "These things are not all benign. The more we know about them, the better off we'll be."

Harvesting Monoclonal Antibodies from Plants

When monoclonal antibodies were first developed 20 years ago, they were hyped as a magic bullet for curing cancer and other diseases. However, killing cancer cells with these immune proteins, which are artificially produced and which neutralize one specific antigen or foreign protein, was not as straightforward as first assumed, and clinical failures occurred. Moreover, the high cost of producing monoclonal antibodies by traditional cell fermentation methods limited their applications. These setbacks have forced scientists to look more realistically at monoclonal antibodies.

Now, researchers at EPIcyte Pharmaceutical, based in San Diego, California, hope to revitalize interest in monoclonal antibodies with a new technology that produces large supplies of the proteins inexpensively. Their new technology uses green