

## PHYTOSTEROLS For Optimal Well-Being By Carol Merlo, M.Ed.

This information is for educational purposes only and is not meant to replace medical advice. If you have any questions, please consult with your physician.

I Found a way off the roller coaster

around the age of 30 I had begun to have "PMS." I could function very well and felt happy three quarters of the month. But like clockwork 7 days before my period began I would find myself in a rage about someone or something. Then I would start to feel out of control and then get depressed. I wasn't able to handle even minor stresses. My entire way of thinking changed during this time. Then, the day my period started, my thoughts, perceptions, and emotions would go back to normal.

Had I had unlimited money I could have 'hidden out' during that week every month, but I had a son and responsibilities. The consequences were severe. My son developed behavior problems and I had conflicts with friends and employees. I tried a number of things to solve my problem. I knew that it wasn't psychological or I wouldn't have such predictability in my behavior. So I tried eliminating refined carbohydrates, and then eliminating meat, exercising, and meditating. I even took over the counter drugs. Nothing worked. Eventually, I came to the conclusion that I would have to live this way.

Then I found out about the incredible effects of plant sterols on the emotions and hormonal systems. I was introduced to a product that contains an herb called dioscorea combined with another phytosterol called beta sitosterol. I started doing research on phytosterols and learned that they are hormone precursors which have worked remarkably well to relieve PMS symptoms and other conditions.

I started taking a stabilized dioscorea product that also contained beta sitosterol and within 2 weeks I noticed that I had more awareness and sense of self than before. I could handle more stress. I felt good -- happy. I waited for my PMS time and, although I was still a little nuts, I had a greater ability to pull myself out of the crazy thoughts that, prior to this, I couldn't even tell weren't normally mine. Each month for the next 5 months it got a little better. Then one day my period started. I hadn't even known it was going to happen. I had been 'me' for an entire month, without rage outbursts, paranoia, or depression!

The Dance of the Hormones:

Moods, Metabolism, Sex, and Health

The endocrine [hormone] system is the part of the body that regulates how we metabolize food, function sexually, repair tissue damage, and greatly influences our moods and energy levels. This is accomplished through a number of glands that produce various pro-hormones and hormones. Pro-hormones like pregnenolone, DHEA, and progesterone are converted by the body into testosterone, estrogens, cortisol, cortisone, and other natural steroid hormones. These hormones are critical for good health. Many physical problems, such as obesity, high cholesterol, PMS, depression, lack of energy, and premature aging can be traced to hormonal irregularities.

There are two ways to balance these hormones: drugs and phytosterols. Steroid drugs and hormones are available from physicians. You can get a prescription for most hormones and some are available over the counter. Unfortunately, all synthetic hormones and steroids have potentially damaging side effects.

Phytosterols, on the other hand, are natural substances in plants that are very similar to hormones or hormone precursors. When humans eat plant foods, phytosterols are ingested and are found in the serum and tissues of healthy people (Zava 1997). Phytosterols have been shown to have a wide range of beneficial effects on the body, ranging from anti-inflammatory and cholesterol reducing effects to immune modulating activity. Our bodies have a mechanism for self-healing, and when given the necessary nutrients and building blocks, the body becomes able to regulate the hormones from within. When ingested, these phytosterols can naturally balance the hormone system and restore the body to its optimal functioning without causing a further imbalance in the hormones.

#### Beta Sitosterol

Another important phytosterol is beta-sitosterol which is found in herbs such as pygeum, stinging nettle, and pumpkin seeds, is abundant in soy beans, and is the active ingredient in saw palmetto berries, which have been used for centuries to treat people with prostate and urinary problems. Research done on beta sitosterol shows that it is a strong anti inflammatory, can reduce cholesterol levels and supports prostate health.

#### The Biological Pathways of Phytosterols How Dioscorea Converts to Hormones

Remember, phytosterols are not hormones. Rather, they are the food for hormone production in the body. Research has found that because phytosterols produce the prohormones DHEA and progesterone, a broad spectrum of conditions can be addressed or prevented through its use. These natural hormone precursors (DHEA and progesterone) made from dioscorea are easily absorbed into the system and have the ability to support the body's production of hormones. Let's see how this happens in the body.

#### The First Pathway: Progesterone

In 1926, Lowe and Lange (Herrington 1990) found a female sex hormone in the urine of menstruating women and observed that the concentration of this hormone varied with the phases of a woman's menstrual cycle. This hormone is called progesterone. Progesterone is made in the ovaries and, as the major precursor of cortisone and cortisol, is also made in the adrenal cortex. Progesterone has many beneficial functions in the body.

#### What Progesterone Does

- " Reduces Symptoms of PMS
- " A Natural Antidepressant
- " Protects Against/ Eliminates Breast Fibro cysts
- " Is a Natural Diuretic
- " Helps use Fat for Energy

- " Helps Thyroid Hormone Action
- " Normalizes Blood Clotting
- " Maintains Libido (Sex Drive)
- " Helps Normalize Blood Sugar Levels
- " Normalizes Zinc and Copper Levels
- " Restores Proper Cell Oxygen Levels
- " Protects against Endometrial Cancer
- " Helps Protect against Breast Cancer
- " Stimulates Osteoblast-Mediated Bone Building
- " Necessary for the Survival of the Embryo
- " Protects against Osteoporosis
- " Facilitates Thyroid Hormone Activity and Protects against Salt and Water Retention.
- " Modulates the Function of the Hypothalamus in the Brain

### PMS, Menopause and Progesterone

#### PMS

Premenstrual Syndrome is a constellation of symptoms ranging from bloating, water retention, and breast tenderness to depression, anxiety, and irritability. Although no one knows exactly why some women have PMS it is theorized that women with PMS have lower than average progesterone levels (Lee 1993). In order to understand why phytoosterols are relevant to PMS we need to understand what happens during the menstrual cycle.

Estrogen is the dominant hormone during the first week after menses. When ovulation occurs, progesterone levels rise and then dominate over estrogen during the 2 weeks before menstruation. If there is too much estrogen or not enough progesterone during these 2 weeks there is an abnormal exposure to estrogen dominance which sets the stage for these phenomena:

- " Breast Stimulation
- " Increased Body Fat
- " Salt And Fluid Retention
- " Depression
- " Headaches
- " Impaired Blood Sugar Control.

#### Progesterone and the Brain

Progesterone levels also affect the hypothalamus, the organ in the brain that regulates body temperature, blood pressure, hunger, thirst, sex drive, and emotional reactions such as fear and anger. If there is a deficiency in progesterone the hypothalamus becomes hyperactive, and can magnify conditions such as PMS symptoms, emotional imbalances, high cholesterol, and high blood pressure, etc.

#### Menopause-What Happens

This imbalance between estrogen and progesterone can create menopausal symptoms. As a woman ages, usually between the ages of 40-55, the amount of estrogen made in her ovaries starts to taper off so that the menstrual cycle no longer occurs. Although estrogen production is reduced it is not eliminated. Estrogen is still made from a prohormone in the fat cells called androstenedione. We also receive compounds from petrochemical pollutants, some insecticides, and other compounds that

have estrogen-like activity in the body called xenoestrogens, which have been correlated with early onset of menses, and reduced sperm counts in North Americans. So you see, the problem is not so much reduced estrogen but that progesterone levels from the ovaries fall to zero. Whereas PMS is the result of estrogen dominance and low progesterone on a cyclical basis, menopause creates chronic estrogen dominance because no progesterone is being made in the body.

#### Are Menopausal Symptoms Natural?

Progesterone deficiency doesn't exist in cultures whose diets are rich in fresh vegetables and legumes containing natural phytoosterols. Women in these cultures continue to have a strong sex drive, strong bones, and no menopausal symptoms. This shows that foods rich in phytoosterols promote progesterone synthesis.

#### Some Effects of Menopause

" Hot flashes. Low levels of sex hormones cause heightened hypothalamic activity. (When progesterone levels rise estrogen receptors become more sensitive and hot flashes subside).

"Vaginal dryness. Many times when a woman supplements with natural progesterone she doesn't have vaginal dryness.

"Osteoporosis. Osteoporosis is a reduction in bone density that usually occurs in post-menopausal women. Both estrogen and progesterone play a role in this. Estrogen inhibits calcium re-absorption into bone and progesterone stimulates bone formation. Phytoosterol supplements can possibly reverse osteoporosis.

"Loss of Sex Drive. The hypothalamus diminishes sex drive due to reduced levels of progesterone.

"Fibrocystic Breasts. These are caused by estrogen dominance. Often supplementing with plant sterols clears it up.

#### Why Phytoosterols are better for you than Synthetic Progesterone (Progestins)

Progestins are progesterone-like substances which are patented by drug companies. They are not as safe as natural progesterone and do not provide the full spectrum of its biological activity. Women with menopausal, PMS or fertility problems can get these from their physicians, but there may be side effects from these drugs. It is clear that natural progesterone derived from phytoosterols is a much safer alternative to progestins.

#### Side Effects of Progestins (Synthetic Progesterone)

" Breast Tenderness

" Edema

" Acne

" Breakthrough Bleeding

" Changes In Weight

" Jaundice

" Depression

" Insomnia

" Nausea

## The Second Pathway-DHEA

DHEA, dehydroepiandrosterone, is known as the "mother hormone". It is used by our bodies to produce at least 50 other hormones that are important to over-all health. Maintaining proper DHEA levels ensures energy, vitality, and the support of most functions involving our endocrine systems. It is produced by the adrenal glands in large amounts, and in the gonads and brain in lesser amounts.

Although synthetic DHEA is available in stores, it is better for the body to synthesize its own hormones from phytosterols than to ingest synthetic DHEA. There has been some clear evidence to show that synthetic DHEA ingestion can result in liver damage (Schwartz, 1988). Numerous articles have been published in both professional journals and popular magazines relating to the positive effects of natural DHEA on human health. DHEA levels decline as we age. Scientists can estimate a person's physiological age based on DHEA levels in the blood. This decline is the determinant of age-related disease and death. Phytosterols have been shown to benefit the body as it ages.

DHEA is the prohormone from which the sex hormones are made. When we are in our 20's our bodies are peaking with DHEA in order to ensure the maximum potential for procreation. As we age, the production of DHEA becomes increasingly limited because there is less of a need to procreate. However, the demands upon the body for hormones remains. In women progesterone production stops during menopause so corticosteroid production gets converted from the progesterone pathway to the DHEA pathway placing even greater demands upon DHEA than ever before. We may need some cortisone for a strained joint, some testosterone (women have testosterone, too) for energy and sex, and some cortisol for cellular metabolism all at the same time. If we are undergoing stress, DHEA stores are allocated to stress reduction and are depleted rapidly.

Because our DHEA resources become more limited as we age, the available DHEA is prioritized by the greatest need. If there is a greater need for one of the hormones DHEA creates, and there is only a limited allotment of DHEA that day, the other organ systems needing hormones are deprived in favor of the needier organ system. Stress further taxes this already diminished system by depleting our stores of DHEA at a rapid rate. DHEA and cortisol are made only while we sleep at night, so we receive our daily allotment once every 24 hours. Once our DHEA stores are depleted for the day, there is no more available until the next day. These depleted systems are the ones that will eventually become diseased if the body cannot manufacture additional DHEA.

Almost all degenerative diseases are correlated with lower than normal DHEA levels in the body. After the early 20's DHEA levels decrease an average of 3.1% per year until, by the age of 85, DHEA levels have diminished by 95%. Sadly, supplementing with synthetic DHEA can exacerbate the imbalance of DHEA and cortisol and make problems even worse!

DHEA levels are determined by four factors: chronological age, genetic predisposition, stress, and diet. People at the age of 30 can have DHEA levels of a 50 year old or, through phytosterol supplementation, a 50 year old can have the DHEA levels of someone 30 years of age. This seems to be why some people experience degenerative disease earlier than others.

## The Critical Balance between DHEA and Cortisol

It's important to understand that both biochemical pathways need to be supported. Taking just synthetic DHEA or just progesterone supplements can create imbalances. Imbalances create many problems. During stress, extra cortisol can be released in high amounts, which can lead to obesity, suppressed thyroid function and other health consequences. Phytosterols can help! New research has shown that phytosterols can normalize the DHEA: cortisol ratio. (Bouic et al., 1999). Although you may have never heard of cortisol before, it has a very important role in your health. Cortisol is produced when your body undergoes stress. Here are some of the effects of a cortisol imbalance:

- " Low energy
- " Muscle Dysfunction
- " Impaired Bone Repair
- " Thyroid Dysfunction
- " Depressed Immune System
- " Impaired Sleep Quality
- " Poor Skin Regeneration
- " Impaired Growth Hormone Uptake

#### What Research Shows PhytoSterols Can Do For You

##### Prostate Health

Research has shown that beta-sitosterol can reduce the urinary tract symptoms that suggest benign prostatic obstruction, and works just as well as drugs. There are numerous studies that show the beneficial effects of phytosterols on prostate malfunctions, such as frequent urination, abdominal heaviness, residual urine, voiding volume, prostate volume, and peak flow. (Goepelm (1999), Wilt (1999), Kobayashi (1998), Klingeberg (1981))

Odds are 2 to 1 that a man will have prostate problems by the time he is 60. By age 65 most men have enlarged prostates. The first signs are night urination and difficult urination. Literally 97% of all men will be affected with prostate problems during their lifetime. Phytosterols can help!

##### Fat Loss

Many of us have tried to lose weight with diets and/or diet products. We yo-yo on the diets and get jittery, nervous, or addicted to weight loss products. Scientists have searched for products that do not produce these side effects. The use of DHEA as an aid to fat reduction has recently come into the forefront as a substance that does none of the damage caused by many diet aids which overtax the adrenals through constant stimulation. It also appears that DHEA works with the pituitary gland to control the burning of fat so that calories are burned rather than stored. At the same time it helps the body to produce lean muscle tissue.

Numerous articles in the medical literature connect obesity with DHEA levels. One of these articles, in *The New England Journal of Medicine* (Barrett-Conner, 1986), linked the assimilation of new fat into the system to an enzyme in the body called G6PD. Research indicates that DHEA blocks this enzyme. Scientists now know that increased levels of DHEA can be used to block the uptake of fat in the system.

##### Cancer

a recent study (Zava, 1997) compared the effects of varying types of estrogens and their bioavailability compared with the xenoestrogens that we are all exposed to. [Xenoestrogens, you remember, are created as the result of petrochemical pollutants, and are hypothesized to be responsible for the earlier onset of menses in North American women, increased cancer rates, etc.] They found that eating foods rich in phytoestrogens increases the levels of phytoestrogens in the saliva and inhibits the binding of xenoestrogens, so that they have less of a damaging effect on the body.

DHEA's involvement in breast cancer was documented by a research study conducted on the Isle of Guernsey over a 20 year period (Bulbrook 1971). This study was conducted to evaluate varying factors in women's health. They found that 100% of the women in the study (5,186 women) who developed breast cancer had a significant drop in DHEA levels up to 9 years earlier. Another study showed that men and women with high blood levels of DHEA appeared to have a decreased risk for the development of bladder cancer (Gordon 1991).

#### Cardiovascular Disease

DHEA also affects the cardiovascular system. One study done by Dr. Elizabeth Barrett-Conner, from UCSD tracked the blood DHEA levels of 242 men, aged 20 to 79, for 12 years (Barret-Conner 1986). She found that men with high levels of DHEA were 48% less likely to die from heart disease. Another study, done in 1988 at Johns-Hopkins, showed that natural DHEA effected an almost 50% reduction in arterial plaque (Moore 1994).

#### Memory and Thinking

Memory loss affects about 15% of people aged 65 to 85 and 20% in those age 85 or older (Nestler 1988). A recent study showed that DHEA levels were 48% lower in patients with Alzheimer's than other patients the same age without the disease (MacEwen, et al 1991). According to Dr. Ward Dean in Smart Drugs and Nutrients, "DHEA protects the brain cells from Alzheimer's disease and other senility-associated degenerative conditions." Researchers have also found that pregnenolone significantly enhances both memory and thinking ability in rats.

Studies also show that there is a relationship between DHEA and pregnenolone. It is possible that the decline in DHEA as we age is because of a drop in the production of an enzyme that is needed to break down pregnenolone into DHEA. Rather than trying to deal with these hormones directly, it is much better to supplement with phytosterols.

#### Immune Modulation

A recent study reported in the Alternative Medicine Review, (Bouic, et al. 1999) showed that phytosterols seem to target specific T-helper cells and natural killer cells. They also have a 'dampening effect on overactive antibody responses,' [so cells aren't attacking the Self] as well as normalization of the DHEA:cortisol ratio, which has an impact on such conditions as chronic viral infections, tuberculosis, rheumatoid arthritis, allergies, cancer, and auto-immune diseases.

#### Diabetes

One of the important factors in understanding diabetes is that it is characterized by the cell's loss of sensitivity to insulin as we age. Several recent studies have shown that natural DHEA improves a cell's sensitivity to insulin (Coleman 1990; Buffington et al., 1993; Cleary 1988; Mohan et al 1990).

#### Cholesterol

Beta sitosterol has been shown-both alone and combined with other phytosterols, to reduce blood levels of cholesterol. A study reported in the American Journal of Clinical Nutrition (Jones 1999) showed that men who were on a cholesterol reducing diet and phytosterols reduced their cholesterol levels more than those on a cholesterol reducing diet alone.

#### Arthritis and Inflammation

A study in the International Journal of Sports Medicine (Bouic, 1999) showed that marathon runners who ingested beta sitosterol reduced their cortisol: DHEA ratio after running a marathon. This demonstrated that they had less of an inflammatory response and were less immune suppressed than the control group during the post recovery period.

#### Fibromyalgia

A study done on the effects of nutritional supplements on fibromyalgia and chronic fatigue syndrome (Dykman, 1998) showed reduced levels of muscle aches, joint aches/pains, and muscle stiffness, among others, when the subjects ingested a phytosterol supplement along with a glyconutritional supplement.

#### I See That I Need Phytosterols. What Can I Do?

As we have seen from the biochemical pathway, phytosterols provide the 'food' for first pregnenolone, then progesterone and DHEA. Although there are probably 1000 plants that contain phytosterols, dioscorea is the best plant source that the body can utilize to create pro-hormones. Dioscorea is the scientific name for yam. However, if you decide to eat a lot of yams, you won't increase your DHEA or progesterone levels. You need Dioscorea villosa or Mexican Wild Yam. But even if you buy the right Dioscorea, you still need to have a standardized quantity of sterols for the body to convert. Eating dioscorea villosa by itself is about as good as eating oregano; you'll just digest it. As you can see, it is also important to have a beta sitosterol supplement. It's best to find both in the same pill!

I recommend that you find a product that is standardized to provide consistent levels of concentrated phytosterols. The product I take is also combined with glyconutrients, which work synergistically with vitamins, minerals, and foods to make them more bioavailable [better able to be used by the body]. You can get off the roller coaster, too. Talk to the person that gave you this booklet to get the right product for you. It will change your life!

#### References

- Barrett-Conner, E., Khaw, K.T., Yen, S.S. (1986). "A Prospective Study of DHEA Sulfate, Mortality, and Cardiovascular Disease." *New England Journal of Medicine*. 315: 1519-1524.
- Bouic PJ, Clark, A, Lamprecht J (1999) "Plant sterols and sterolins: A review of their immunomodulating properties" *Alternative Medicine Review*. 4(3):170-177
- Bouic PJ, Clark, A, Lamprecht J, Freestone M, Pool EJ, Liebenberg RW, Kotze D, van Jaarsveld PP (1999) "The effects of B-sitosterol (BSS) and B-sitosterol glucoside (BSSG) mixture on selected immune parameters of marathon runners: inhibition of post marathon immune suppression and inflammation" *International Journal of Sports Medicine*; 20(4):258-62
- Buffington, C.K., Pourmotabbed, G., Kitabchi, A.E., (1993) "Case Report: Amelioration of Insulin Resistance in Diabetes with Dehydroepiandrosterone." *Am J. Of Medical Science*. 306:320-324.
- Bulbrook, R.D., Hayward, J.L., Spicer, C.C. (1971). "Relations Between Urinary Androgen and

Corticoid Excretion and Subsequent Breast Cancer." *Lancet*. 2:395-398.

Cleary, M.P., Zabel, T., and Sartin, J.L. (1988). "Effects of Short Term Dehydroepiandrosterone Treatment on Serum and Pancreatic Insulin in Zucker Rats." *Journal of Nutrition*. 118:382-387.

Coleman, D.L. (1990) "Dehydroepiandrosterone (DHEA) and Diabetic Syndromes in Mice. In *The Biologic Role of (DHEA)*. Kalimi, M., and Regelson, W., Editors. New York: Walter De Gruyter. pp.: 179-188.

Dean, W., and Morgenthaler, J. (1993). *Smart Drugs and Nutrients*. Santa Cruz, CA: B & J Pub.

Dykman, KD, Tone C, Ford C, Dykman RA (1998) "The effects of nutritional supplements on the symptoms of fibromyalgia and chronic fatigue syndrome." *Integrated Physiology and Behavioral Sciences*; 33 (1):61-71

Goepelm, Hecker U, Krege S, Rubben H, Michel MC (1999) "Saw palmetto extracts potently and noncompetitively inhibit human alpha-adrenoceptors in vitro" *Prostate* 38(3):208-15.

Gordon G, Healsouer K, Comstock G (1991) "Serum levels of dehydroepiandrosterone and its sulfate and the risk of developing bladder cancer." *Cancer Research*. 51(5):1366-9.

Hall, G.M., Perry, L.A., Spector, T.S., (1993). "Depressed Levels of Dehydroepiandrosterone Sulfate in Postmenopausal Women with Rheumatoid Arthritis But No Relation with Axial Bone Density." *Annals of the Rheumatic Diseases*. pp 211-214.

Herrington, D.M., Gordon, G.B., Achuff, S.C., et al (1990) "Plasma Dehydroepiandrosterone and Dehydroepiandrosterone Sulfate in Patients Undergoing Diagnostic Coronary Angiography." *J of American College of Cardiology*. 16: 863-870.

Jones PJ, Ntanos FY, Raeini-Sarjaz M, Vanstone CA (1999) "Cholesterol-lowering efficacy of a sitostanol-containing phytosterol mixture with a prudent diet in hyperlipidemic men" *American Journal of Clinical Nutrition* 69(6):1144-50

Klingenberg J (1981) "Measurement of urinary flow in general practice. Efficacy of beta-sitosterine" *ZFA (Stuttgart)* 57(28):1634-7

Kobayashi Y, Sugaya Y, Tokue A (1998) "Clinical effects of beta-sitosterol (phytosterol) on benign prostatic hyperplasia: preliminary study" *Hinyokika Kyo* 44(12):865-8.

Lee, John R. (1993). *Natural Progesterone: The Multiple Roles of a Remarkable Hormone*. Sebastopol: BLL Publishing.

MacEwen, E., Gregory, and Kurzman, I.D., (1991). "Obesity in the Dog: Role of the Adrenal Steroid Dehydroepiandrosterone (DHEA)." *Journal of Nutrition*. 121:S51-S55.

Mohan, P.F., Ihnen, J.S., Levin, B.E., and Cleary, M.P. (1990). "Effects of Dehydroepiandrosterone and Clofibrilic Acid Treatments in Obese Zucker Rats." *Journal of Nutrition*. 119:496-501.

Moore, N. (1994) *Bountiful Health, Boundless Energy, Brilliant Youth: The Facts About DHEA*. Dallas: Charis Pub. pp.: 29-30, 37, 83, 116, 146

Nestler, J.E., Barlascini, C.O., Clore, J.N., and Balckard, W.G. (1988). "Dehydroepiandrosterone Reduces Serum Low Density Lipoprotein Levels and Body Fat but Does Not Alter Insulin Sensitivity in Normal Men." *Journal of Clinical Endocrinology and Metabolism*. 6:3073-3075.

Nestler, J.E., Clore, J.N., Blackard, W.G. (1992). "Dehydroepiandrosterone: the 'Missing Link' Between Hyperinsulinemia and Atherosclerosis?" *FASEB* 6:3073-3075.

Nyholt, D. (1993) *The Complete Natural Health Encyclopedia*. Alberta, Canada: Global Health Pub.

Roberts, E., Fauble, T.J. (1990). "Oral Dehydroepiandrosterone in Multiple Sclerosis: Results of a Phase One, Open Study." In *The Biologic Role of (DHEA)*. Kalimi, M., and Regelson, W., Editors. New York: Walter De Gruyter. pp.: 157-177.

Schwartz AG (1988) "Novel dehydroepiandrosterone analogues with enhanced biological activity and reduced side effects in mice and rats" *Cancer Research* 48(17): 4817-22

Wilt, TJ, MacDonald R, Ishani A (1999) "Beta-sitosterol for treatment of benign prostatic hyperplasia" *BJU Internist* 83(9):976-983.

Zava, DT, Blen M, Dawe G (1997) "Estrogenic activity of natural and synthetic estrogens in human breast cancer cells in culture." *Environmental Health Perspectives*. April; 105 Supplement 3:637