

## DHEA: Surviving and Thriving

DHEA, which stands for *dehydroepiandrosterone*, is the most abundant hormone produced by the adrenal glands, and its production greatly exceeds that of all the other steroid hormones. The body produces DHEA in the early morning hours and then it declines fairly rapidly throughout the day, as it is quickly cleared by the kidneys. Small amounts of DHEA are also secreted by the ovaries and testes and, in fact, DHEA is a precursor to the production of both testosterone and the estrogen hormones.

Even before birth, DHEA is secreted by the human fetus. During childhood, usually at about ages 6-7 years old, substantial production of DHEA by the adrenals first begins, peaking at about age 20. Between the ages of 25 and 70 years, DHEA production steadily declines, and this is known to be the steepest decline of all the hormones in the endocrine system. The decline of DHEA is linear with increased age, leading some to regard the DHEA level as a biomarker for aging.

During pregnancy, the mother's estriol levels rise as a result of the increased amount of DHEA from the fetus, a precursor to the mother's estrogen production. As such, clinicians sometimes monitor estriol levels during the course of pregnancy to verify the status and continual growth and well-being of the fetus.

In general, the adrenal androgens (these are hormones that include DHEA and its derivatives) are of primary importance for testosterone status in women. In normal menstruating women, about 40 percent of their testosterone arises from the ovaries, while the remaining 60 percent comes from conversion of DHEA produced in the adrenal glands. DHEA is also estimated to contribute 70 percent of estrogens before menopause and nearly 100 percent after menopause.

In men, on the other hand, where testosterone is the most important androgen, about 95 percent of their testosterone is produced in the testes; the remaining five percent is supplied by conversion of adrenal DHEA to testosterone.

### DHEA: A "Superstar" Hormone

DHEA has many important roles in our general health, which is why Dr. William Regelson refers to DHEA as a "superstar" hormone in his book *The Super Hormone Promise*. DHEA offers the following benefits to our well-being:

- Tames stress
- Prevents heart disease
- Increases energy levels
- Rejuvenates the immune system
- Enhances libido
- Treats menopausal symptoms
- Restores memory
- Helps erase fine wrinkles
- Reduces body fat
- Helps dry eyes
- Fights cancer
- Offers new hope for lupus sufferers
- Heals burns

## Important DHEA Distinctions

When DHEA is metabolized, a sulfur group is added to the molecule and it is designated DHEA-S for *DHEA sulfate*.

Over 90 percent of circulating DHEA is present in the sulfate form. DHEA-S is cleared from the body more slowly than DHEA, so blood levels of DHEA-S are fairly stable throughout the day. Because of the greater quantities of DHEA-S in the blood and the molecule's relative stability, it is frequently recommended that the DHEA-S form be tested in the blood. However, this practice is not agreed upon by all clinicians and scientists studying DHEA.

Dr. Norman Shealy, author of the book *DHEA: The Youth and Health Hormone*, cautions that there may not be adequate conversion to active DHEA from DHEA-S when it is needed. This concern was validated by a study reported on in *The Journal of Clinical Endocrinology & Metabolism*, where the authors concluded that serum DHEA-S "is unlikely to reflect bioavailable DHEA." Dr. Shealy recommends direct measurement of DHEA, which he believes is the most effective and fully active form of the hormone.

## The DHEA-Cortisol Connection

It is now well established that chronic stress leads to an outpouring of cortisol, and with

that, a gradual depletion of DHEA. Over time, this hormonal imbalance can lead to hardening of the arteries, thinning bones, increasing waistline girth, and impaired functioning of the immune system.

High cortisol levels also lead to an increase in blood sugar. In response, more insulin needs to be secreted from the pancreas to clear the sugar from the blood and shepherd it into the cells. In chronic situations, alternating high and low blood sugar levels ensues, and eventually the body becomes less sensitive to insulin.

This phenomenon is commonly known as *Metabolic Syndrome* or *Syndrome X*. Several detrimental effects of this syndrome include weight gain and obesity, increases in cholesterol and triglyceride levels, and a rise in blood pressure. Adult onset diabetes also can result.

Chronic high levels of cortisol can also impair the immune response. The inability to fight infections leads to a higher susceptibility to colds and flu.

In the case of cancer, high cortisol levels interfere with the body's capacity to fight cancer, and an increased likelihood of metastases may occur. Dramatic results have been obtained in animal studies when scientists have used DHEA against skin, lung, colon, breast, prostate, and lymphatic cancers.

The link between cortisol production and DHEA is an important one because, with long periods of chronically

high cortisol levels, the ability to produce DHEA diminishes. For example, there is a link between a diminished circulating concentration of DHEA and the progression of immunosuppression and muscle loss in persons with AIDS. These patients also exhibit high cortisol levels.

One of the most significant effects of restoring DHEA seems to be the restoration of the normal balance between DHEA and cortisol. As DHEA levels increase, the propensity to overproduce cortisol is dampened—along with the spiral of symptoms induced by high cortisol. In many of the health issues described in the following sections, you'll note an important connection between DHEA and cortisol.

## Aging

In humans, blood levels of DHEA are known to decline with age. Not surprisingly, low DHEA is associated with the development of various problems typical of aging, including decreased immune function, increased infections and incidence of certain cancers, atherosclerosis, diabetes mellitus, and osteoporosis. Such observations have led to studies investigating whether DHEA can be used to achieve healthier aging or even to prolong life.

In their book *Stopping the Clock*, co-authors Dr. Ronald Klatz and Dr. Robert Goldman write, "It would seem logical that restoring DHEA levels would help to restore a biological condition of youth."

*Continued on Page 3*

## **Metabolism**

Another function of DHEA relates to metabolism. The hormone has been shown to speed up the body's metabolism, so that the body uses and burns up more energy from food than is diverted and stored as fat. Some scientists believe that DHEA

inhibits the production of fatty acids—a key step in the process of fat deposition. Other studies have demonstrated that DHEA also has the effect of suppressing appetite. Correcting the imbalance between cortisol and DHEA may resolve food cravings that often result when blood sugar drops.

### ***A Relative of DHEA: 7-keto-DHEA***

Another form of DHEA that is produced when the hormone is metabolized is 7-keto-DHEA. This metabolite has emerged as a hormone with interesting possibilities for clinical practice. It was first identified in the 1950s by Dr. Henry Lardy at the University of Wisconsin, but only in the past two decades has it received much attention.

Dr. Lardy found that DHEA increases the activity of two thermogenic (heat producing) enzymes produced by the liver. He was then able to evaluate other DHEA derivatives and found that 7-keto-DHEA was approximately 2.5 times stronger than DHEA in this respect. Because 7-keto-DHEA, unlike DHEA itself, is not a precursor to estrogens and testosterone, there may be situations in which 7-keto-DHEA would be the preferred form of DHEA supplementation.

In the March 2006 issue of the *Journal of Clinical Psychiatry*, Dr. Sarah Sageman and Dr. Richard Brown describe the successful improvement in five patients with post-traumatic stress syndrome after receiving 7-keto-DHEA. Patients reported more energy, better socializing, better sleep, relief from anxiety, and improvements in memory and concentration. These patients had not improved with any other treatments.

Another interesting application of 7-keto-DHEA is its cosmetic use for treating UV radiation skin damage, controlling wrinkles, and increasing skin tone and firmness. Patented in 2003, cosmetic treatments with the hormone continue to be investigated. This use of 7-keto-DHEA is preferred by some because it does not alter the levels of sex hormones.

## **Glucocorticoid Treatments**

Glucocorticoids are a family of hormones that include cortisol from the adrenal cortex and various synthetic derivatives of cortisol. These substances are generally used for their anti-inflammatory activity.

Patients with Addison's disease (characterized by dysfunctional adrenal glands) are usually treated with long-term prednisone (a synthetic form of cortisol). Other diseases with an autoimmune component, such as lupus and arthritis, are also often treated with prednisone.

When tested, patients suffering from any of these diseases are highly likely to have low levels of DHEA. In a study of patients with Addison's disease, treatment with DHEA along with prednisone improved the patients' self esteem and well-being, and lessened their fatigue. In lupus patients who received 200 mg doses of DHEA, the results showed that patients not only felt better but had significantly less autoimmune activity. These same patients were also able to lower their doses of prednisone.

## **Infertility**

The effects of DHEA on female infertility have also been examined. In one study in which women received 80 mg per day of DHEA, the hormone helped some women ovulate and become pregnant. The study investigators hypothesized that DHEA worked to restore fertility because of its

*Continued on Page 4*

---

ability to metabolize into the sex hormones estrogen and testosterone.

### **Libido**

Because testosterone is the major circulating androgen in men (as described previously), the impact of DHEA on the male libido may not be very important.

In women, however, DHEA is a major source of both estrogens and testosterone and might be expected to have a bigger influence on libido. The results of a 12-week study involving postmenopausal women who were given daily doses of DHEA intravaginally showed rapid and efficient improvements in sexual function and vaginal atrophy, without changes in their serum sex steroid levels.

### **Menopause**

Given the link between DHEA and sex hormones, the role that DHEA plays in menopause and its many symptoms has been examined, with interesting results. In one study of twenty postmenopausal women who took 25 mg DHEA daily for twelve months, the results were significant. These women showed progressive increases in their levels of testosterone, estradiol, estrone, progesterone, and growth hormone with corresponding improvements in symptoms.

Another study involving postmenopausal women,

---

*“It would seem logical that restoring DHEA levels would help to restore a biological condition of youth.”*

---

but with administration to the skin, demonstrated a tendency to create more androgen than estrogens from DHEA, with the transformation effects diminishing with age.

While more study clearly is required, Dr. Alan Gaby and others suggest that DHEA may be an effective treatment for the undesirable symptoms associated with menopause.

### **Osteoporosis**

Deterioration and thinning of the bones is a hallmark of osteoporosis. A major cause of bone thinning may be the unrelenting levels of high cortisol induced by stress—perhaps because it depletes DHEA. By restoring balance between cortisol and DHEA, this detrimental effect on bones may be forestalled. Additionally, as a precursor to both testosterone and estrogens, DHEA can help supply the hormones needed to both stimulate new bone cell formation and break down old bone. A 15-year study suggests that bone mineral density may be directly related to circulating DHEA levels.

### **Cardiac Health**

Because declining DHEA levels seem to correlate with an increased incidence of heart disease, scientists are interested in determining how DHEA might be cardioprotective. For instance, DHEA supplementation seems to decrease the rate of platelet aggregation (formation of blood clots), which could lead to fewer cases of stroke.

Heart disease is also linked in part to increased inflammation, which involves numerous molecules called cytokines. DHEA lowers two of the cytokines that stimulate the inflammatory process, sometimes even to the point of attacking healthy tissue. It also appears that DHEA has an antioxidant effect and may lower LDL cholesterol, thereby protecting the arteries.

### **Aging Skin**

As we age, our skin thins and is more inclined to wrinkle and crease. The aging process is also characterized by the production of skin enzymes that break down collagen. Collagen is critical for the normal support

*Continued on Page 5*

---

of the skin's structure, and it appears that DHEA helps maintain collagen levels. Supplementation of DHEA greatly increases color, tone, thickness, and hydration of the skin.

### **Dry Eye Syndrome**

Another downside of aging is the increased incidence of dry eye syndrome, a condition that causes irritated, red, and itchy eyes. The syndrome seems to be more prevalent in women, especially once they start perimenopause.

One antidote for dry eyes is the use of over-the-counter or prescription eye drops designed to lubricate eyes. However, these artificial tears often fail to provide relief because they lack some of the natural lipids produced by specialized sebaceous glands in the eye. Because DHEA has been shown to stimulate sebaceous glands, an eye drop containing DHEA was developed and used to treat women suffering from dry eye syndrome. These women reported less eye irritation and the improved production of natural tears.

### **Depression**

DHEA is also believed to significantly improve mood and emotional stability. In his book, Dr. Shealy remarks "We have never seen a depressed patient with optimal levels of DHEA. And no one

---

*"We have never seen a depressed patient with optimal levels of DHEA. And no one we've seen with optimal levels of DHEA is depressed."*

---

we've seen with optimal levels of DHEA is depressed."

A study in England confirmed his observation by demonstrating that the lower the levels of DHEA in a group of depressed patients, the more severe their depression. The patients with low DHEA levels also exhibited high cortisol levels.

### **Memory & Cognition**

It is well accepted that cognitive function—which includes memory, reaction time, and learning ability—may progressively decline as we age. This decline is linked to high cortisol levels, which damage neural cells in the brain. DHEA shows great promise as it appears to protect the brain from the damage induced by high cortisol levels.

### **Conclusion**

Given what we now know, we may want to start paying more attention to DHEA levels because they relate to so many aspects of our overall health.

For starters, reducing stress in our lives can improve DHEA levels naturally. Drinking a cup of coffee each morning may boost DHEA levels because of a link between caffeine and DHEA.

On the other hand, taking oral contraceptives lowers DHEA levels; so alternative forms of birth control may be a consideration.

Finally, as with other bio-identical hormone therapies, DHEA levels can be improved by supplementation. However, it is important to check with a healthcare practitioner for evaluation and guidance for adequate dosing before trying any DHEA supplementation.

This amazing hormone has proven to be highly versatile and intimately involved with our ability to thrive and survive. With ongoing research, and medical practitioners continuing to use and monitor DHEA in their patient practices, we will continue to learn more about the role of DHEA and its potential effects on our health.

## References

- *Health Promotion and Aging: The role of dehydroepiandrosterone (DHEA)*, Ed. Ronald R. Watson, PhD, Harwood Academic Publishers; Amsterdam, The Netherlands; 1999.
- *The Superhormone Promise* by William Regelson, MD and Carol Colman; Pocket Books (a division of Simon and Schuster); New York, NY; 1996.
- “No Evidence for Hepatic Conversion of Dehydroepiandrosterone (DHEA) Sulfate to DHEA: *In Vivo* and *in Vitro* Studies” by F. Hammer, et al; *The Journal of Clinical Endocrinology & Metabolism*; March 2005.
- *DHEA: The Youth and Health Hormone* by C. Norman Shealy, MD, PhD; Keats Publishing; New Canaan, CT; 1999.
- “DHEA: Anti-Aging Hormone” by Ivy Greenwell; *Life Extension Magazine*; August 2001.
- *Stopping the Clock* by Dr. Ronald Klatz and Dr. Robert Goldman; Keats Publishing, Inc.; New Canaan, CT; 1996.
- “3-Acetyl-7-Oxo-Dehydroepiandrosterone for Healing Treatment Resistant Post-traumatic Stress Disorder in Women: Five Case Reports” by Dr. Sarah Sagemen and Dr. Richard Brown; *Journal of Clinical Psychiatry*; March 2006.
- “Serum steroid levels during 12-week intravaginal dehydroepiandrosterone administration” by F. Labrie, et al; *Menopause: The Journal of The North American Menopause Society*, Vol. 16, No. 5, pp. 897/906; 2009.
- “Metabolism of DHEA in postmenopausal women following percutaneous administration” by F. Labrie, et al; *Journal of Steroid Biochemistry & Molecular Biology*, 103, pp.178–188; 2007.
- *Preventing and Reversing Osteoporosis* by Alan R. Gaby, MD; Prima Publishing; Roseville, CA; 1994.

**Connections** is a publication of **Women’s International Pharmacy**, which is dedicated to the education and management of PMS, menopause, infertility, postpartum depression, and other hormone-related conditions and therapies.

*This publication is distributed with the understanding that it does not constitute medical advice for individual problems. Although material is intended to be accurate, please seek proper medical advice from a competent healthcare professional.*

**Publisher:** Constance Kindschi Hegerfeld, Executive VP, Women’s International Pharmacy

**Co-Editors:** Julie Johnson and Carol Petersen, RPh, CNP; Women’s International Pharmacy

**Writer:** Kathleen McCormick, McCormick Communications **Illustrator:** Amelia Janes, Midwest Educational Graphics

**Copyright © March 2012, Women’s International Pharmacy.** *This newsletter may not be reproduced or distributed without the permission of Women’s International Pharmacy.*



For more information, please visit [www.womensinternational.com](http://www.womensinternational.com) or call (800) 279-5708.

Women’s International Pharmacy | Madison, WI 53718 | Youngtown, AZ 85363