

Male Andropause

Hormonal & Neurotransmitter Imbalances in Midlife

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Men do not usually present at the doctor's office requesting an assessment for andropause, or "male menopause." The more common scenario is a fifty year old executive, slightly overweight, appearing exhausted and irritable, reluctantly showing up in the doctor's office for a consultation. It was his wife, enquiring into her menopausal status the week before, who had mentioned to the doctor, "You know, I think my husband should have a check-up. He hasn't been himself lately. He is grumpy. He lies down on the sofa any chance he can get. He complains of vague aches and pains, and I can't remember the last time we had sex!"

Upon closer enquiry, it appears that his symptoms were slower and more insidious in onset than his wife's but, nevertheless, just as dramatic in their consequences. Men traditionally tend to have a more stoic and fatalistic approach to encroaching signs and symptoms, but as hormone depletion typically affects a man's sexual performance first, this is often what propels him to seek medical attention. The danger of ignoring all the other signs and symptoms of declining hormones is that andropause is not necessarily a benign process. It is often accompanied by profound physiological and mental changes that, over the long term, can have a significant effect on silent disease processes. According to Dr Jerald Bain, testosterone is much more than just a male sex hormone. It is an important contributor to the robust metabolic functioning of multiple bodily systems.¹ Men with low testosterone die earlier than those with normal levels.² Andropause can thus be considered a lethal disease. There is a 41 % decrease in the chance of dying with a testosterone level of 20 nmol/l compared to 12 nmol/l (average level 12-35 nmol/l).³ For this reason, it is imperative that male andropause enters into consensual reality as forcefully and as well publicized as female menopause, lest we have a whole generation of men developing life threatening disease that may have been prevented with much earlier interventions.

It has been estimated that among men more than 45-50 years old, the prevalence of low testosterone is at least 20-30 %.⁴ Some of the more common and somewhat insidious presenting features of andropause include:

- Loss of drive or competitive edge in business,
- Various aches and pains in muscles and joints,
- Loss of memory, a decreasing level of fitness,
- Endurance and effectiveness in workouts,
- Loss of muscle mass and increased abdominal obesity,⁵
- Fatigue,
- Depression,
- Negative mood,⁶
- Irritability

¹ Bain J. The many faces of testosterone Clin Interv Aging. 2007; 2(4):567-76

² Shores MM et al, Low serum testosterone and mortality in male veterans. Arch Intern Med. 2006 Aug 14-28; 166 (15):1660-5

³ Ibid.

⁴ Goepf J, Life Extension June 2010 pg 84

⁵ Harman SM, et al, Longitudinal effects of aging on serum total and free testosterone levels in healthy men. J Clin Endocrin Metab, 2001 Feb;86 (2):724-31

⁶ Zitzmann M. Testosterone and the brain. Aging Male. 2006 Dec; 9 (4):567-76

- Most importantly, decreased libido and erection frequency, endurance and strength, as well as unsatisfying orgasms. Sex on a nightly basis turns into sex on a weekly basis as the desire and ability to perform decrease, while general fatigue increases. Increasing loss of graying hair seems to be the final insult to an already distressing situation. However, this is just the tip of the iceberg. In addition, there may be many other subtle clues as to a declining sense of wellbeing. (See table 1)

If some of these symptoms and signs start to appear in your life or in the lives of your 40-50 year old male loved ones, be very suspicious of the insidious onset of what has been termed male andropause.

What is male menopause (also known as viropause or andropause)?

Male menopause is generally recognized as a gradual shift in hormonal, physiological and chemical changes that occur in all men between the ages of 40 and 45, although it can occur as low as 35 and as late as 65.⁷ The term “hormone” is derived from the Greek word, *hormo*, which means to set in motion. This is precisely what hormones do. Hormones are involved in almost every biological process, including sexual reproduction, growth, metabolism, and immune function. They stimulate, regulate and control the function of various tissues and organs and are manufactured by specialized groups of cells within structures called glands.

These glands, including the hypothalamus, pituitary, thyroid, adrenals, ovaries and testes, release various hormones into the body as needed. The hormones that decline as a man ages are Testosterone, Growth Hormone, Melatonin, DHEA, Progesterone, Pregnenolone and Oxytocin. (See table 2) Hormone levels that usually go up with andropause are estrogen (the female sex hormone), insulin (the hormone responsible for sugar metabolism and the metabolic syndrome) and the stress hormone, cortisol. Testosterone, the main hormone responsible for andropause,⁸ seems to peak in a man at approximately 30 years of age and then begins its gradual decline.⁹

The changes experienced by men during andropause can affect every aspect of a man’s life. These changes create not only

• Table 1: • Other Signs and Symptoms of Andropause	
<ul style="list-style-type: none"> • Headache • Tinnitus (ringing in the ears) • Aging facial appearance with increased wrinkles • Quickly out of breath with physical activity • Unexplained numbness and tingling • Constipation • Hypochondriasis • Lack of interest in sports • Disturbed sleep with less than eight hours of uninterrupted sleep as trips to the bathroom increase due to prostate swelling as well a slower levels of melatonin • Hot flushes and sweating spells (mostly head and upper chest) • Prostate infections • Rreduction in ejaculate • Gynecomastia (fat accumulation in the breasts) 	<ul style="list-style-type: none"> • Longitudinal lines on nails • Hemorrhoids • Cellulite • Loss of hair on legs, especially the external sides • Nervousness and irritability • Poor concentration • Poor memory • Voice developing a higher anxious tone • Messy clothing (due to the depressive tendency and lack of the desire to be sexually attractive) • Becoming shorter in height, dry, thin (atrophic) skin • Dry glans penis (tip of penis) • Small, flaccid, atrophied penis • Peyronie’s disease (skew penis) • Lax testicles with reduction in size • Male pattern baldness (androgenic alopecia) • Dry eyes • Decreased axillary and pubic hair

⁷ Jed Diamond Male Menopause Sourcebook INC. Naperville, IL 1998, 1v

^{8, 8} Rosick E. Male Menopause. Life Extension. Oct 2003, pg 65

⁹ Anawalt BD, Merriam G | R. Neuroendocrine aging in men. Endo and Met Clinics 2001 Sep; 30 (3): 647-69

serious, life threatening health effects, but often they are harbingers of a deeper social and spiritual transition. These changes signal the beginning of the end of the first part of a man's life and herald in a new phase of his evolution, whereby the male may reexamine his life by asking sometimes frightening and often liberating questions.¹⁰ If this transition is well managed medically, it may turn out to be the most productive and purposeful time of a man's life.

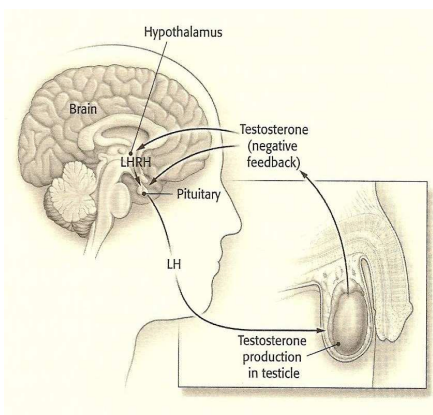
This transition for men has been hotly debated for some time as to whether or not it was a real or imagined phenomenon. While the female menopause is often abrupt and life changing, signaling within a few months the change from her reproductive years to post reproductive reality, the male transition is often more gradual and not defined by reproductive incapacity. Many people have long believed that levels decline as a natural consequence of advancing age, and thus there is nothing we can or should do about them.¹¹ Dr Morgentaler, associate professor at Harvard Medical School and author of *Testosterone for Life* (McGraw Hill, 2008), explains, "That's like telling a middle-aged person that since vision typically deteriorates with age, there's no point in prescribing glasses- or that we shouldn't treat atherosclerosis to prevent heart attacks, because it too is an age-related phenomenon. It just doesn't make sense!"¹²

If one compares the physiological changes between men and women during this period of transition, there are striking similarities. For both sexes, as their hormones undergo this transition, body fat increases; well-being decreases; and sexual function decreases. Incidences of cardiovascular disease (heart attacks, hypertension, high cholesterol), type 2 diabetes, depression, obesity, Alzheimer's and osteoporosis increase. Muscle wasting increases, and both prostate and breast cancer increase (as both cancers arise from similar embryological tissue).

Table 2: Hormones & Neurotransmitters Depleted in Andropause
<ul style="list-style-type: none"> • Testosterone. • Growth hormone • Melatonin • DHEA • Pregnenolone • Progesterone • Thyroid hormone • Oxytocin • Dopamine • Acetylcholine • Gaba • Serotonin

Testosterone- Basic Physiology

Testosterone plays an essential role in the development of the normal male and in the maintenance of many male characteristics, including muscle mass and strength, bone mass, libido, potency and sperm production. Testosterone is also important in synthesizing proteins. It affects many metabolic activities such as the production of blood cells in the bone marrow, formation of bone, lipid and carbohydrate metabolism, and growth of the prostate gland. Testosterone production begins in the part of the brain known as the hypothalamus, which secretes gonadotropin-releasing hormone (GnRH). This hormone then signals the pituitary gland to make either follicular-stimulating hormone (FSH) or luteinizing hormone (LH). FSH helps to stimulate the testes to produce sperm, while LH stimulates the production of testosterone via the Leydig cells of the testes. Like the declining levels of eggs in a woman's



¹⁰ Hollis J. *The Middle Passage. From Misery to Meaning in Midlife*. Inner City Books Toronto Canada 1993 pg 7
¹¹ Goep J..*Testosterone Therapy for Life*. Life Extension June 2010 pg 83
¹² *Ibid*, pg 84

ovary as she ages, it has been estimated that men are born with 700 million Leydig cells and begin to lose six millions of these cells yearly after his twentieth birthday.¹³

After testosterone is released from the testes, some testosterone is tightly bound to sex hormone binding globulin (SHBG) as well as loosely bound to albumin, a protein. Together, these are measured in the blood stream as total testosterone. Free testosterone is unbound to sex hormone binding globulin or albumin, and it is this hormone which exerts its powerful anabolic effects on the body (approx 2-3% of testosterone). Bioavailable testosterone is also measurable – it is the sum of the unbound and the loosely bound portion to albumin. It is believed that the bioavailable measurement is the most accurate for assessing the amount of the most active hormone exerting its effect on the tissues.

As men grow older, not only do their bodies produce less testosterone, but the levels of another hormone called sex binding hormone globulin (SHBG) begin to increase. Levels of this hormone increase due to the aging process, increased alcohol use, increased obesity and estrogen levels, and decreased growth hormone and progesterone levels. As SHBG increases, bioavailable or free testosterone levels plummet.

As we age, testosterone is furthermore converted via an enzyme called 5-alpha reductase into dihydrotestosterone (DHT), a hormone responsible not only for aspects of a man's libido but also most importantly, for hair distribution, heralding in the usually most unwelcome signs of male pattern baldness. Testosterone can also be converted via an enzyme called aromatase to estrogen, a vital hormone in men for bone health and cognitive well being.¹⁴ Too much estrogen production in men, a common event seen in obesity as well as seen more frequently in injectable testosterone replacement therapy. This excess of estrogen increases a male's risk of breast and prostate cancer.

Lab Testing for Testosterone

When measuring testosterone levels, it is best to ask your doctor for total testosterone, free as well as bioavailable testosterone. One can measure levels in the serum and the saliva as well as through 24 hour urine collection. The benefit of saliva testing is that it is the only way to measure whether one has therapeutic levels of testosterone once transdermal creams have been initiated. It is absolutely useless to assess serum levels to measure the efficacy of transdermal creams or patches because it will require toxic doses of the transdermal creams to raise the serum levels to therapeutic serum levels. The reason for this is that, when applied transdermally, testosterone stays in the serum for a total of three seconds before being sequestered into the tissues where it exerts its effect. In order to raise serum levels, the tissue levels have to be super-saturated before the excess spills back into the serum. By this time, toxic tissue levels have been achieved. However, if testosterone is given via intramuscular injection, then serum levels are the standard way of measuring therapeutic efficacy.

¹³ Morales A, Tenover JL. Androgen deficiency in the aging male. *Urological Clinics North America* 2002; 29 (4): 975- 82

¹⁴ Nelson LR, Bulun SE. Estrogen production and action. *Journal of Amer Acad Derm* 2001 Sep; 45 (3): 116-24.

The average range of male total testosterone levels and one that is considered “normal” by the US based FDA is between 12.15-35.76 nmol/l. However, no single number should be used as an absolute level. It is a man’s symptoms combined with his serum levels that should guide therapy. If a man’s symptoms are consistent with low testosterone and his serum levels are at the low range of normal, that man deserves a trial of testosterone therapy.

Once testosterone therapy is begun, it is advised to test the following blood levels every 3 to 6 months in the first year and then twice a year thereafter: Hemoglobin, hematocrit, total, free and bioavailable testosterone, estrogen, progesterone, pregnenolone, dihydrotestosterone as well as PSA. Blood testing should be accompanied by a yearly digital rectal examination (DRE).

Testosterone declines with age

Free testosterone declines at a rate of 1% per yr or 10% per decade.¹⁵ As our total testosterone levels only range from approx 12-35 nmol/l, (extremely small amounts), one can deduce that, in 20 years, significant inroads may be made into one’s total testosterone stores. In various studies, testosterone measures correlated with strength, bone mineral density, body composition and fat mass.¹⁶ As our levels decrease, so do these parameters of health.¹⁷ Half of healthy men between the ages of 50 to 70 will have a bioavailable testosterone level below the lowest level seen in healthy men who are 20 to 40 years of age.¹⁸

One of the reasons why men are not diagnosed as being hormone deficient is that the levels of the hormones that appear on standard lab tests are age adjusted for an aging population with an anticipated reduction in hormone levels. In anti-aging medicine, we aim to restore hormone levels to a healthy youthful range of a healthy 25-35 year old.

With declining levels of free testosterone as we age, the following health effects have been well documented.

Cardiovascular Disease:

Men with coronary artery disease had significantly lower levels of total testosterone as well as free and bioavailable testosterone than the men in the control group.¹⁹ Furthermore, exercise-induced myocardial ischemia (reduced blood flow to the heart) improved with the use of testosterone, showing significant improvements in pain perception with no negative alterations in cholesterol levels or blood clotting capacity.²⁰ This effect is thought to be due to a direct

¹⁵ Decreased bioavailable testosterone in aging normal and impotent men. Nankin HR et al. J Clin.Endocrinol Metab. 1986 Dec; 63(6):1418-20.

¹⁶ Measures of Bioavailable Serum Testosterone and Estradiol and Their Relationships with Muscle Strength, Bone Density, and Body Composition in Elderly Men. Annewieke W et al. The Journal of Clinical Endocrinology & Metabolism Vol. 85, No. 9 3276-3282, 2000

¹⁷ Morley J. Longitudinal changes in testosterone, luteinizing hormone, and follicle-stimulating hormone in healthy older men. *Metabolism* 1997 Apr;46(4):410-3

¹⁸ Korenman SG, Morley JE, Mooradian AD, et al. 1990 Secondary hypogonadism in older men: its relationship to impotence. J Clin Endocrinol Metab. 71:963-969.

¹⁹ English K et al. Men with coronary artery disease have lower levels of androgens than men with normal coronary angiograms. *Eur Heart J* 2000 Jun;21(11):890-4

²⁰ English KM et al. Low-dose transdermal testosterone therapy improves angina threshold in men with chronic stable angina: *Circulation* 2000 Oct 17;102(16):1906-11

coronary artery relaxing effect.²¹ The many cardiac benefits of adequate levels of testosterone include assisting in the heart beating stronger, widening the coronary artery lumen, increasing blood supply to the heart, reducing serum cholesterol, minimizing atherosclerosis, reducing hypertension by vasodilatation, and making blood more fluid by increasing fibrinolytic (breaking down of clots) activity and thus reducing blood clots. Of note, very high doses of testosterone may suppress the protective high density cholesterol whereas low levels of testosterone are associated with increased levels of total cholesterol. As cardiovascular disease is by far the leading cause of death in the aging population in developed countries,²² it behooves our health practitioners to be extremely diligent in measuring and managing this highly preventable risk factor.

Memory and cognitive function:

Multiple studies have proven that men with optimal testosterone levels as they age have fewer symptoms of senility compared to men with lower levels of testosterone. Testosterone supplementation increases working memory in men.²³ It has also been shown to improve visual and verbal memory and visuospatial functioning as well as reduce the rate of decline in visual memory.²⁴ Testosterone levels correlate with cognitive function; as testosterone levels are replaced to therapeutic levels, memory and cognition improved accordingly.²⁵

Mood:

Numerous studies have shown testosterone replacement therapy is effective when psychiatric drugs do not work in with men with depression.²⁶ In this study, testosterone therapy improved both natural and spontaneous erections as well as mood.²⁷ Low testosterone was shown to be associated with fatigue, and testosterone therapy produces a sense of well being.²⁸ Men with low levels of testosterone are more prone to depression²⁹ as well as dramatic mood swings.³⁰

Mortality Risk:

Testosterone deficiency can be seen as a lethal disease as individuals who had the lowest levels of testosterone had the greatest mortality rates. In this study, during an average 11.8 year follow-up, 538 deaths occurred. Men whose total testosterone levels were in the lowest quartile

²¹ Rosano GM et al. Acute anti-ischemic effect of testosterone in men with coronary artery disease. *Circulation* 1999 Apr 6;99(13):1666-70

²² World Health Organization (2004). "Annex Table 2: Deaths by cause, sex and mortality stratum in WHO regions, estimates for 2002" (pdf). *The world health report 2004 - changing history*.
http://www.who.int/entity/whr/2004/annex/topic/en/annex_2_en.pdf.

²³ Janowsky J et al. Sex steroids modify working memory. *J Cogn Neurosci* 2000 May;12(3):407-14

²⁴ Moffat SD, et al. Longitudinal assessment of free testosterone concentration predicts memory performance and cognitive status in elderly men. *J Clin Endocrinol Metab* 2002 Nov; 87 (11): 5001-7

²⁵ Alexander GM, Swerdloff RS, Wang C, et al. Androgen-behavior correlations in hypogonadal men and eugonadal men. II. Cognitive abilities. *Hormones and Behavior* 1998; 33(2):85-94

²⁶ Cooper MA. Testosterone Replacement Therapy for Anxiety *Am J Psychiatry* 157:1884, November 2000

²⁷ Burris A et al. A long-term, prospective study of the physiologic and behavioral effects of hormone replacement in untreated hypogonadal men. *J Androl* 1992 Jul-Aug;13(4):297-304

²⁸ Margolese HC et al. The male menopause and mood: testosterone decline and depression in the aging male--is there a link? *J Geriatr Psychiatry Neurol* 2000 Summer;13(2):93-101

²⁹ Pope HG, Jr et al, Testosterone gel supplementation for men with refractory depression: a randomized, placebo controlled trial. *Am J Psychiatry*, 2003 Jan; 160 (1): 105-11

³⁰ Goep J. Testosterone Therapy for Life. *Life Extension* June 2010 pg 86

were 40% more likely to die than those with higher levels, independent of age, adiposity and lifestyle.³¹

Alzheimer's disease:

Testosterone replacement therapy prevents the production of beta amyloid precursor protein in men,³² thus reducing the risk for Alzheimer's disease. In established Alzheimer's disease, treatment with testosterone improved the patient's cognition over 1 year, whereas the control group deteriorated.³³

Strength and Muscle Mass:

Testosterone is a major predictor of skeletal mass, synergistic with growth hormone. In this same study, significantly improved strength was demonstrated with testosterone use even without exercise.³⁴ There was a more marked improvement when exercise was added to the program. With the increase in muscle mass, increased performances were noted in muscle power, strength and endurance, with a resultant improvement in physical function, athletic performance and overall improved health related outcomes.³⁵

Osteoporosis:

A study of 403 healthy men aged 73-94 years proved that muscle strength and bone mass were at optimal levels in men with the highest levels of free testosterone.³⁶ This led the researchers to conclude that "a number of clinical problems present in older men may be related to testosterone deficiency, including reduced muscle mass, changes in body composition and loss of bone mass density." Furthermore, using testosterone has been demonstrated to increase the bone mass of the lumbar spine in elderly men.³⁷

Diabetes and Metabolic Syndrome:

Testosterone therapy has been shown to reduce LDL cholesterol, blood sugar, glycated hemoglobin (a marker of long term blood sugar control) and insulin resistance.

³¹ Gail A. Low serum testosterone and mortality in older men. *J of Clin Endocrin and Metab.* Vol. 93, No. 1, 68-75

³² Gouras GK et al. Testosterone reduces neuronal secretion of Alzheimer's beta-amyloid peptides *Proc Natl Acad Sci U S A* 2000 Feb 1; 97(3):1202-5.

³³ Tan RS. A pilot study on the effects of testosterone in hypogonadal aging male patients with Alzheimer's disease. *Aging male.* 2003 Mar 6 (1): 13-7

³⁴ Bhasin S. The dose-dependent effects of testosterone on sexual function and on muscle mass and function. *Mayo Clin Proc.* 2000 Jan;75 Suppl: 70-5

³⁵ Ibid.

³⁶ Van Den Beld AW, et al. Measures of bioavailable serum testosterone and estradiol and their relationships with muscle strength, bone density and body composition in elderly men. *J Clin Endocrinol Metab* 32000 Sep; 85 (9): 3276-82

³⁷ Snyder PJ et al. Effects of testosterone treatment on bone mineral density in men over the 65 years old. *J Clin Endo Metab* 1999; 84:1966-72

Testosterone replacement therapy

Most men choose to use bioidentical testosterone replacement therapy when they realize that many of their symptoms may be due to low levels of this hormone. The most obvious symptom that is desirous of being restored is loss of peak sexual functioning. Numerous studies now show the benefit of testosterone replacement in improving both libido and erection capability.^{38 39 40} The preferred route of administration is via a transdermal cream, applied to the skin or to the anal mucosal tissue. Anecdotal evidence suggests that some of the transdermal cream be applied to the glans (head) penis if erection strength is a dominant symptom. Some men prefer to have a weekly injection or to apply a hormone patch. Other routes of administration are via a subcutaneous pellet insertion under the skin every three months or via oral administration. The oral route is never used when replacing low levels due to significant potential for liver toxicity. There are also testosterone gels commercially available. A long lasting injectable form of testosterone called testosterone undecanoate may soon be available. It lasts for 2.5 months.

Natural ways to raise testosterone:

If applying a cream or injections are not your preferred methods of treatment, there are some natural ways to improve testosterone function although, the truth be told, they are nowhere near as effective as getting a repeated dose of the real thing!

- Diets low in protein in elderly men (40-70 years old) may lead to elevated SHBG levels and decreased testosterone bioavailability.⁴¹ Eat a well-balanced diet, rich in protein and full of fresh organically grown fruit and vegetables so as to avoid estrogen producing chemicals. The estrogen mimicking chemical HPTe, a metabolite of a commonly used pesticide methoxychlor, causes a decrease in testosterone production from the Leydig cells.⁴² Avoid plastic bottles, laundry detergent and other cosmetics which are man-made mimics of estrogen.
- Increase cruciferous vegetable intake (cabbage, cauliflower, zucchini, brussel sprouts), or take DIM (di-indole methane). These foods and/or supplements help reduce the so-called bad estrogens (16-alpha-hydroxyestrones) and increase the "good" estrogens (2-hydroxyestrones), thus reducing prostate and breast cancer risk.⁴³
- Increase soy intake (fermented non-GMO varieties) as well as increase one's levels of omega three fatty acids. Soy appears to inhibit the aromatase enzyme thus lowering estrogen levels.⁴⁴ Essential fatty acids, found in non-mercury containing fish and supplements, decrease levels of SHBG thus making more free testosterone available.

³⁸ Morley JE, et al. Effects of testosterone replacement therapy in old hypogonadal males: a preliminary study. J Am Geriatr Soc 1993 Feb; 41 (2): 149-52

³⁹ Hajjar RR et al. Outcomes of long-term testosterone replacement therapy in older hypogonadal males. J Clin Endocrinol Metab 1997 Nov; 82 (11): 3793-96

⁴⁰ Wang C, et al. Transdermal testosterone gel improves sexual function, mood, muscle strength and body composition parameters in hypogonadal males. J Clin Endocrinol Metab 2000 Aug;85(8): 2839-53

⁴¹ Longscope C, et al. Diet and SHBG. J Clin Endocrinol Metab 2000 Jan; 85(1):293-96.

⁴² Kuipper GG, et al. Interaction of estrogenic chemicals and phytoestrogens with estrogen receptor beta. Endocrinology 1998 Oct; 139(10):4252-63

⁴³ Muti p et al. Urinary estrogen metabolites and prostate cancer; a case-control study in the united States. Cancer causes Control 2002 Dec ; 13 (10):947-55

⁴⁴ Nagata C, et al. Inverse association of soy product intake with serum androgen and estrogen concentrations in Japanese men. Nutr Cancer 2000; 36(1): 14-18

- Engage in daily exercise and keep one's weight as trim as possible. Strength training in middle aged men (44-48) causes an increase in free testosterone levels.⁴⁵
- The mushroom extract Cordyceps has been shown to increase sexual vitality in both men and women, particularly increasing male sexual performance. It appears to have a direct effect on the sexual center of the brain and the sex organs.⁴⁶
- Take Tribulus - 500 mg three times per day. Tribulus is a natural herb known for its testosterone raising properties in many different cultures. It is not a hormone but appears to exert its effect by raising the levels of LH, the hormone that stimulates testosterone production.
- Take Zinc -30 mg three times per day. This mineral is involved in multiple aspects of a male's sexuality, including testosterone production, sperm formation and sperm motility and is commonly used in male infertility. In one study, with the use of 60 mg of zinc, sperm counts rose from eight to twenty million.⁴⁷ Supplementation of this mineral may become very important for some men as it has been estimated that with every ejaculate, 0.5 mg of zinc is lost!
- Take Vit A- 50,000 IU a day for one month, then reduce the dose to 25,000 IU of a mycelized Vit A.
- Take Boron - 3 mg daily.
- Take Vitex agnus -1200 mg twice daily – this herb also stimulates the pituitary to make more LH.
- Sweating in an infrared sauna increases testosterone and nitric oxide synthase (dilating the vessels to the penis, similar in effect to Viagra) by 1400 % and more than over 30 saunas have been shown to reduce toxic burden by two thirds.
- The amino acid arginine, taken an hour before intercourse, has a milder but similar effect as Viagra. Use 2 grams twice daily or 4 -6 grams 1 hour before intercourse.
- Use propionyl and acetyl L carnitine- 1 gram of each twice a day.⁴⁸ In this study, the carnitine group had a better response than the group given testosterone 160 mg a week. It has been shown that carnitine can be used successfully in prostate cancer patients so as to restore sexual potency after a surgical nerve block. Carnitine and Viagra together seem to be the best combination.
- Lipoic acid 500 mg daily improves cognitive function as well as increasing libido.
- Eat enough calories and follow a Paleolithic diet.
- Use a mixed amino acid supplement or protein drink.
- Avoid alcohol, vinegar, caffeinated drinks, sugar, sweets, soft drinks, cookies, breads, milk, tobacco and marijuana.
- Avoid tight underwear and reduce weight.
- Avoid chronic stress and strenuous physical activities i.e. triathlon training.
- Reduce the use of anti-hypertensive beta -blockers as they reduce testosterone levels.

⁴⁵ Izquierdo M, et al. Effects of strength training on muscle power and serum hormones in middle-aged men. *J App Physiol* 2001; 90(40) 1497-1507

⁴⁶ Zhu J et al, Cordymax: A scientific product review. *Pharmanex Phytoscience Review Series*. 1997

⁴⁷ Netter A, et al. Effects of zinc administration on seminal zinc and fertility of oligospermic males. *Ind J Phys Pharm* 1987 Jan-Mar:31 (1) 30-34

⁴⁸ Cavallini G. *Urology*. 2004;63:641-646

If the serum free testosterone is low but the total testosterone is normal:

- Pygeum - 3- 4 caps daily or
- Urtica Dioscorea - 3 caps 2 times a day

If low testosterone with low LH- i.e. the pituitary is the problem:

- Human Chorionic Gonadotropin (HCG) - 200-500 IU daily. If this is not helpful within 4 weeks, it wont help and one needs to stop
- Vitex agnus - 1200 mg twice daily

It is important to realize that testosterone replacement therapy can take many months before symptom improvement is realized. Restoration to normal sexual functioning may take as long as six months. It is advised to go slow and measure levels from time to time (remember to use saliva if using transdermal creams and serum levels if using injectable testosterone). Measure total, free and bioavailable levels of testosterone. In addition, measure levels of hemoglobin, estrogen and prostate specific antigen (PSA), a biomarker for prostate cancer risk. DHEA, cortisol, pregnenolone and DHT should also be measured. Maintenance of a sugar and starch-free, as well as relatively alcohol-free, diet is recommended for maximum effect. Apply the hormone to large, hairless skin surfaces with high levels of penetration such as the forehead or inner thigh. Use a cream with a high concentration of testosterone and avoid areas of the skin with increased amounts of fat as fat tissue will have increased levels of aromatase and will easily convert the testosterone to unwanted levels of estrogen. Some individuals apply the cream to anal tissue to achieve a higher level of penetration.

Contraindications for testosterone therapy

An absolute contraindication is active breast or prostate cancer. A relative contraindication is active prostate infections or obstruction of urinary flow due to an enlarged prostate. Testosterone-replacement therapy has been associated with exacerbations of sleep apnea or with the development of sleep apnea in men treated with higher doses of testosterone who have other identifiable risk factors for sleep apnea.⁴⁹

Is testosterone therapy safe?

One of the most common questions asked of anti-aging physicians is, “Does testosterone replacement therapy cause cancer “? It appears that, at present, only about 5 % of men with low testosterone levels are being treated.⁵⁰ It appears that it is the fear of getting prostate cancer that prevents a more proactive approach. Upon review of the relevant literature, the evidence is absolutely conclusive. Testosterone replacement therapy in physiological doses DOES NOT increase the risk of either benign prostatic hypertrophy (swollen prostate gland) or prostatic cancer.⁵¹ In one study, not only was there no correlation between testosterone and increased levels of prostate specific antigen (a prostate cancer biomarker), prostatic volume,

⁴⁹ Schneider BK, Pickett CK, Zwillich CW, et al. Influence of testosterone on breathing during sleep. J Appl Physiol 1986;61: 618-23.

⁵⁰ Rhoden EI, Morgentaler A. Risks of testosterone-replacement therapy and recommendations for monitoring. N Engl J Med. 2004 Jan 29; 350(5):482-92

⁵¹ Morley JE. Testosterone replacement and the physiologic aspects of aging in men. Mayo Clin Proc. 2000 Jan; 75 Suppl: S83-7.

percent of positive cancer biopsies, biopsy Gleason score⁵² or clinical staging of prostate cancer,⁵³ it was shown that, on the contrary, low free testosterone correlated with positive prostatic cancer biopsies and with a higher Gleason score (more serious staging of cancer). In another study, intramuscular testosterone injections at a dose of 100 mg, 250 mg or 500 mg a week (these last two doses are considered excessive and will exceed normal physiological levels) showed increased levels of serum testosterone with no change in either prostate volume or serum prostate specific antigen.

The *Journal of the National Cancer Institute* reviewed the work of dozens of world class researchers in the *Endogenous Hormones, Prostate Cancer Collaborative Group* who pooled all their data. Eighteen prospective studies that included 3,886 men with prostate cancer and 6,438 control subjects⁵⁴ concluded that serum concentrations of sex hormones were not associated with the risk of prostate cancer.

Another study showed that levels of dihydrotestosterone and testosterone were in fact lower than the controls in men with prostate cancer. In fact, with more advanced prostate cancer tumors, the same low levels of dihydrotestosterone held true.⁵⁵ It appears that it is not testosterone that is the culprit in the induction of prostate cancer, but that it is more closely linked to levels of estrogen in males, along with a poor western based diet.⁵⁶ An article in the *World Journal of Urology* summarized the current understanding by stating: "Estrogenic stimulation through estrogen receptor alpha in a milieu of decreasing androgens (testosterone, DHT and DHEA), contributes significantly to the genesis of benign prostatic hyperplasia, prostate dysplasia and prostate cancer."⁵⁷

Most interestingly, many experts are beginning to provide testosterone replacement therapy to men who have had prostate cancer,⁵⁸ an approach that was considered strict heresy just a few years ago. This approach is not, however, considered a main stream approach as many oncologists and urologists are still concerned that testosterone therapy may increase the risk of cancer recurrence.⁵⁹

The other hormones involved in Andropause

Andropause is primarily due to decreasing levels of testosterone, but many other hormones and neurotransmitters may be similarly affected.

⁵² Gleason score refers to the microscopic appearance of prostatic cancer which together with other parameters, is incorporated into a strategy of prostate cancer staging which predicts prognosis and helps guide therapy. Cancers with a higher Gleason score are more aggressive and have a worse prognosis

⁵³ Hoffman MA. Is low serum free testosterone a marker for high grade prostate cancer? *J Urol* 2000 Mar;163(3):824-7

⁵⁴ Roddam Aw et al. Endogenous sex hormones and prostate cancer: a collaborative analysis of 18 prospective studies. *J Natl Cancer Inst.* 2008 Feb 6; 100 (3): 170-83

⁵⁵ Gustafsson et al. Dihydrotestosterone and testosterone levels in men screened for prostate cancer: a study of a randomized population. *Br J Urol* 1996 Mar;77(3):433-40

⁵⁶ Coffey DS. Similarities of prostate and breast cancer: Evolution, diet, and estrogens. *Urology* 2001 Apr;57(4 Suppl 1):31-8

⁵⁷ Steiner Ms, Raghov S. Antiestrogens and selective estrogen receptor modulators reduce prostate cancer risk. *World J Urol* 2003 May; 21 (1): 31-67

⁵⁸ Morgentaler A. Testosterone therapy for men at risk for or with a history of prostate cancer. *Curr Treat Options Oncol.* 2006 Sep;7(5):363-9

⁵⁹ Goep J. Testosterone Therapy for Life. *Life Extension* June 2010 pg 89.

DHEA

DHEA is a steroid hormone secreted by the adrenal glands, gonads, brain and skin in both men and women, which also declines with advancing age. By the time we are 70-80 years of age, peak levels of DHEA are only 10-20 % of those in young adults.⁶⁰ As DHEA is the dominant and most abundant steroid hormone in the body and the precursor of all other sex steroid hormones, DHEA has extraordinary restorative effects on multiple aspects of one's functioning. Low levels of DHEA are associated with aging and most diseases of aging. Specifically, a deficiency of DHEA has been found to correlate negatively with immune dysfunction, inflammation, greater risks of certain cancers, heart disease in men and osteoporosis.⁶¹

DHEA and Cardiovascular Disease

Studies have shown that the dramatic age-related drop in DHEA levels is accompanied by an equally dramatic rise in cardiovascular disease. The mechanism of action is that it appears DHEA is incorporated into both high and low density cholesterol, protecting it from oxidation. As we age, the cholesterol-bound levels of DHEA become infinitesimal, thus the cholesterol molecules are much more susceptible to oxidation than in younger individuals.

In the *Massachusetts Male Aging Study*, following 1700 men between the ages of 40 and 70 for 9 years, authors found that men in the lowest quartile of serum DHEA at baseline were 60% more likely to develop ischemic heart disease than controls. Low serum levels of DHEA were also a significant predictor.

In a study done at the *University of Wroclaw, Poland*, it was found that DHEA decreased the level of serum lipid peroxides in rabbits fed a normal diet but not in rabbits with induced severe hypercholesterolemia. DHEA was able to increase the activity of the platelet superoxide dismutase (SOD), a crucial antioxidant enzyme. This increase in superoxide dismutase's activity may partly explain DHEA's antioxidant effects.⁶²

DHEA and Brain Health

It is well known that cortisol, the hormone resulting from chronic prolonged stress has harmful effects on the brain.⁶³ DHEA, due to its action in suppressing cortisol, appears to protect the brain from these damaging effects. Furthermore, a Canadian study found that rats implanted with a high dose of DHEA showed significantly less hippocampus (an area of the brain associated with memory) damage after stroke was experimentally induced. There were 60% injured neurons (brain cells) as compared to 88% in the control group.^{64 65}

⁶⁰ Genazzani Ad, et al. Might DHEA be considered a beneficial replacement therapy in the elderly? *Drugs Aging*. 2007; 24(3):173-85

⁶¹ Greenwell I. *Life Extension*. August 2001; pg25.

⁶² Bednarek-Tupikowska G et al. Influence of DHEA on platelet aggregation, superoxide dismutase activity and serum lipid peroxide concentration in rabbits with induced hypercholesterolemia. *Med Sci Monit* 2000; 6:40-45.

⁶³ Canning MO et al. Opposing effects of DHEA and dexamethasone on the generation of monocyte-derived dendritic cells. *Eur J Endocrinol* 2000; 143:685-95.

⁶⁴ Aragno M et al. Oxidative derangement in rat synaptosomes induced by hyperglycemia: restorative effect of DHEA treatment. *Biochem Pharmacol* 2000; 60:389-95.

DHEA and Infection/Immune Health

DHEA has also been shown to not only enhance the immune response but also fight infection. Several studies have confirmed its usefulness in combating bacterial, parasitic and viral infections including HIV. DHEA has been shown to lower the levels of IL-6, a proinflammatory cytokine (a chemical messenger used by the immune system).⁶⁶ Furthermore, it lowers the production of another inflammatory cytokine, tumor necrosis factor alpha (TNF Alpha). As we age, both of these levels rise, which indicates immune dysfunction and an increasing inflammatory state. The ability to lower the levels of these inflammatory mediators may be an important part of the neuroprotective mechanism of DHEA.⁶⁷ Thus, the decline in DHEA levels is closely tied to immunosenescence.⁶⁸ It can thus be shown that maintaining youthful levels of DHEA means less chronic inflammation. It has been shown repeatedly that many of the diseases of aging, i.e., heart disease, Alzheimer's, certain cancers, diabetes, osteoporosis are all linked to the inflammatory process. It thus becomes imperative to maintain youthful levels of DHEA so that we harbor less inflammation as we age.

DHEA and Sexuality

DHEA's role in sexual physiology of both men and women is that of a mood modulator.⁶⁹ One study showed that supplementing with 50 mg of DHEA every night for six months in both males and females, aged 40-70, improved energy levels, quality of sleep, mood and the ability to handle stress.⁷⁰ In another study of men with advanced age (90-103), those who had the highest levels of DHEA had the highest levels of normal daily activities.⁷¹

The average dose for men is 25 to 100 mg and for women, anywhere from 1 to 25 mg. Testing blood levels for optimal levels is indicated. Too much DHEA in women will cause either acne or increased hair growth. This can be avoided by using a form of DHEA called 7-Keto-DHEA.

Natural ways to raise DHEA

1. Diet

A low calorie ketogenic diet using less than 40 gm of carbohydrates per day (8:57) in rheumatoid arthritis patients resulted in a 34% rise in DHEA within a week.⁷² In primates, calorie restriction has indeed been found to preserve higher DHEA levels indicating a

⁶⁵ Aragno M et al. DHEA prevents oxidative injury induced by transient ischemia/reperfusion in the brain of diabetic rats. *Diabetes* 2000; 40:1924-31.

⁶⁶ Greenwell I. *Life Extension*. August 2001; 26.

⁶⁷ Cardounel A et al. DHEA protects hippocampal neurons against neurotoxin-induced cell death: mechanism of action. *Proc Soc Exp Biol Medicine* 1999; 222:145-49.

⁶⁸ Greenwell I. *Life Extension*. August 2001; 26.

⁶⁹ Cameron Dr, Braunstein GD. The use of dehydroepiandrosterone therapy in clinical practice. *Treat Endocrinol*. 2005; 4 (2): 95-114

⁷⁰ Morales AJ, et al. Effects of replacement doses of DHEA in men and women of advanced age. *J Clin Endo Metab* 1994 Jan; 78(6):1360-67

⁷¹ Ravaglia G, et al. The relationship between DHEA-S to endocrine metabolic parameters and functional status in the oldest-old. *J Clin Endo Metab* 1996; 81(3):1173-78

⁷² Cutolo M. Sex hormone adjuvant therapy in rheumatoid arthritis. *Rheum Dis Clin North Am* 2000; 26: 881-95

slower rate of aging. Fasting has also been shown to raise DHEA levels in men and women. Anorexic and bulimic individuals likewise show higher serum DHEA.⁷³

2. Exercise and meditation

Exercise and meditation have been shown to raise DHEA in some individuals.⁷⁴

3. Drum Circles

Participation in drum circles⁷⁵ has also been shown to increase DHEA confirming the hypothesis that stress reduction in general boosts DHEA production probably through a shift of adrenal steroidogenesis from cortisol to DHEA.⁷⁶

Growth Hormone

Growth hormone (GH) deficiency in aging males can have a dramatic effect on one's sense of well being. GH is considered the master hormone with multiple protective roles. It is growth hormone which is responsible for our major growth spurt during puberty, without which we would all be dwarves.⁷⁷ In adulthood, GH maintains skin, muscle and bone health. With a deficiency of this hormone, signs of aging are quickly accelerated.

Skin wrinkles and sags; fat soon replaces muscle. Growth hormone also helps maintain and repair the health of various organs, including the heart, lungs, liver kidneys joints, nerves as well as the brain. As growth hormone activates the calming, regenerative parasympathetic nervous system, a deficiency may result in increased tension, anxiety, depression and an increasing inability to cope with stress. From the age of thirty onwards, growth hormone levels decline fairly rapidly, about 1-3 % per year. This loss is quickly accelerated in the presence of obesity.

The most efficient way to replace growth hormone is through subcutaneous daily injection, similar to a diabetic insulin injection. Some companies make precursor amino acid preparations (arginine, lysine, glutamine and ornithine) which have a variable effect on raising GH. Most anti-aging doctors will not treat GH in the first year of restoring optimal hormone levels as a protein rich diet, adequate sleep and exercise program, and replacing testosterone, progesterone, melatonin and thyroid levels, may increase GH levels by as much as 20-30 %. (See table 3)

Table 3 Natural ways to raise Growth Hormone:
<ul style="list-style-type: none">• Take Amino acid supplement• Exercise daily• Replace all deficient hormones• Eat a protein rich diet• Avoid alcohol, sugar, sweets, breads and pasta• Reduce weight• Avoid milk products• Avoid sleep deprivation• Avoid prolonged stress.

Progesterone

The subject of progesterone replacement therapy in men was well covered in this magazine, Edition 3, 2010.⁷⁸ Men typically produce between 1.5 to 3 mg per day, and as men age, progesterone levels fall exponentially. From a biochemical point of view, progesterone is used in the production of cortisol (the stress hormone). Thus, if a man leads a

Table 4: Natural ways to increase progesterone:
<ul style="list-style-type: none">• Eat a diet rich in protein and cholesterol, a precursor of progesterone synthesis• Manage stress daily with stress reduction techniques• Herbs and nutraceuticals such as Rhodiola, Siberian Ginseng, and Liquorice root extract, Ashwagandha, Vitamins B 5 and C

⁷³ Montelone P et al. Plasma levels of Neuroactive steroids are increased in untreated women with anorexia nervosa or bulimia nervosa. Psychosom Medicine 2001; 63: 62-8

⁷⁴ Boudou P. et al. Effects of a single bout of exercise and exercise training on steroid levels in middle-aged type 2 diabetic men: relationship to abdominal adipose tissue distribution and metabolic status. Diabetes Metab 2000; 26:450-57.

⁷⁵ Bittman BB et al. Composite effects of group drumming music therapy on modulation of neuroendocrine-immune parameters in normal subjects. Alternative Ther Health Medicine 2001; 7:38-47.

⁷⁶ Greenwell I. Life Extension. August 2001; 27.

⁷⁷ Hertoghe T. The Hormone Handbook . International Medical Publications. U.K. pg 54

⁷⁸ Arthur D, Wessels M. Men and the forgotten hormone. Health Intelligence, 2010 Edition 3, pg 20

particularly stressful life, it is highly likely he will have depleted levels of progesterone. Progesterone is vital in keeping the higher levels of estrogen in aging men in check and thus minimizing the risk of heart attacks, prostate enlargement and prostate cancer. A typical dose of progesterone may lower estradiol levels by up to 30 %.⁷⁹ Progesterone also lowers DHT, thus preventing or attenuating male pattern baldness.⁸⁰ Progesterone also blocks aldosterone receptors, thereby reducing excessive fluid retention and possibly high blood pressure caused by increased aldosterone production⁸¹. (See table 4)

Melatonin

Melatonin is another hormone that declines with advancing age. Symptoms suggestive of melatonin deficiency include a superficial, agitated sleep with many anxious thoughts, easy waking during the night, difficulty falling asleep and falling back asleep once awake, poor dream or dream recall, anxiety especially at night, depression (especially seasonal affective disorder) excessive emotionality and irritability, and restless leg syndrome with increased muscle spasms. Intestinal spasms or cramps may also dominate. A positive result of melatonin is the so-called regenerative or anabolic effect that it has on the parasympathetic nervous system, the part of our autonomic nervous system that is involved in rest and relaxation. Melatonin has a positive effect on the parasympathetic nervous system, that part of our autonomic nervous system that is involved in rest, relaxation- a so-called regenerative or anabolic effect. Without adequate levels of melatonin, the sympathetic nervous system dominates, leading to a heightened fight/flight response with an overall degenerative or catabolic effect.⁸² Melatonin may improve sexual performance, enhancing serenity and relaxation after sex.⁸³

Human and animal studies have linked a melatonin deficiency to hypertension, coronary artery disease, cardiac arrhythmias, obesity, diabetes, osteoporosis, lowered immunity with recurrent infections, breast and prostate cancer, and neurological diseases such as Parkinson’s and Alzheimer’s disease. The antioxidant effect of melatonin is responsible for its positive effect in cancer patients. Some labs now offer a 24 hour saliva melatonin assay.

Table 5: Natural ways to increase Melatonin:
<ul style="list-style-type: none"> • Increase morning daylight (a sunlamp may be used) • Make the room pitch black at night, use an eye mask • Avoid alcohol and caffeinated drinks, • Avoid stressful activities • Avoid electromagnetic exposures at night such as cell phones, electrical clocks and radios • Wear turquoise colored glasses 30 minutes before bed.

Treatment involves the use of either an oral or sublingual dosing. It is best to use the sublingual dosing for immediate, sleep inducing effect, while using the oral route is best to assist in maintaining a restful sleep. Melatonin is best utilized when given in conjunction with vitamin B6 and serotonin precursors such as tryptophan or 5-hydroxytryptophan, which in the presence of the B6, convert to melatonin. High levels of melatonin may suppress cortisol, so use with caution if one desires an active immune system to suppress inflammation. Low levels of cortisol can produce many undesirable side effects, not the least of which is fatigue, headaches and low blood pressure. There are natural ways to raise melatonin.(See Table 5)

⁷⁹ Hertoghe T. The Hormone Handbook. International Medical Publications. U.K. pg 246

⁸⁰ Ibid.

⁸¹ Ibid, pg 247

⁸² Ibid, pg 47

⁸³ Drago F, Busa L. Acute low doses of melatonin restore full sexual activity in impotent male rats. Brain Res 2000 Sep 29;878 (1-2):98-104

Some asthmatics may react negatively to melatonin as one study showed possible increased inflammation with nocturnal asthmatic exacerbations.⁸⁴

Pregnenolone

Pregnenolone is the forerunner of many of our major hormones. It is made from cholesterol and, once made, results in a series of metabolic reactions that lead to the production of other sex hormones such as DHEA, testosterone, estradiol, progesterone, cortisol and aldosterone.⁸⁵ In addition to functioning as a hormone, it also functions as a neurotransmitter in specific areas of the brain responsible for memory. Pregnenolone regulates the flow of calcium ions through the cell membrane, and calcium ion exchange determines how memory is encoded by neurons. In addition, pregnenolone increases the neurotransmitter acetylcholine, the neurotransmitter responsible for memory, as well as increasing neurogenesis in the hippocampus, the main part of the brain that stores memory.⁸⁶ The most common complaints of individuals with pregnenolone deficiency include memory loss and arthritic pains as well as dry skin and fatigue. Replacement doses are typically 30 mg twice a day for memory loss. In addition, one may choose to use other cognitive enhancing nutraceuticals such as:

- Acetyl-L -Carnitine
- Vinpocetine
- Phosphatidyl Serine, combined with omega three fatty acids
- Phosphatidyl choline
- DMAE
- G6PC
- Huperizine
- Vitamin D
- Blueberries

Oxytocin

Oxytocin, a hormone known to improve social bonding, is secreted from the posterior lobe of the pituitary gland. In women with newborn babies, it starts to flow in abundance at the first attachment of the baby to the nipple and aids in mother-child bonding. According to researcher Dr Joan Borysenko, author of *A Woman's Book of Life*, oxytocin helps a woman to become totally infatuated with her newborn, doting on every movement and every look.⁸⁷ Men and women both have endogenous levels of oxytocin naturally created by the body — it likely helps them fall in love, spurs parenting instincts and makes orgasms, well, more orgasmic.⁸⁸ It might also help women be so adept at reading social cues.

⁸⁴ Sutherland E, et al Elevated serum melatonin is associated with the nocturnal worsening of asthma. *Jour Allergy Clin Immunol* 2003; 112: 513-17

⁸⁵ Hertoghe T. *The Hormone Handbook*. International Medical Publications. U.K. pg 144

⁸⁶ Schumacher M. Neurosteroids in the Hippocampus: Neuronal Plasticity and memory. *Stress* 1997 Oct; 2 (1): 65-78

⁸⁷ Diamond J. *Male Menopause*. Sourcebooks, Inc. Naperville, IL 1998 pg. 211

Researchers in the *Journal of Neuroscience*, after giving men oxytocin through a nasal mist, write “emotional empathy responses in men were raised to levels similar to those found in untreated women.” Not only were the men more affected by emotional scenes, but they also were better at learning tasks that required social cues. The effects didn't last long though. The men needed another squirt two hours later. Oxytocin is presently being used by a few select practitioners to mainly enhance sexual arousal and bonding in men.

Neurotransmitters

In order for a man to feel at his best, there are multiple, interconnected physiological systems that need optimization to achieve this effect. For healthy sexual functioning this requires not only adequate hormone levels but also requires a healthy vascular system as well as psychological health. The “molecules of emotion” that link a man’s subjective sense of wellbeing to his biochemical pathways are called neurotransmitters and have a dramatic role to play in optimizing mood, sleep, pain, attention, relaxation as well as sexual function. Sexuality in humans can be broken down into four components: desire, arousal, orgasm and resolution. Each phase is governed by a corresponding neurotransmitter as well as a contributing hormone.⁸⁹

Dopamine

Dopamine is a neurotransmitter that we all seek out in abundance. It is involved in creating pleasure and a sense of joyful exuberance. Most people with any type of addiction, be it food, sex, drugs, alcohol or thrill seeking, is self medicating in order to raise their levels of dopamine. Low levels of dopamine result in loss of desire for sex as well as reduced arousal, interest and energy for sex.⁹⁰ Dopamine levels can be raised by using the antidepressant Wellbutrin, the prescription drug L-dopa as well as naturally with tyrosine, phenylalanine, macuna bean extracts, ginkgo biloba and guarana.

Acetylcholine

Acetylcholine is the main neurotransmitter involved in arousal and has significant effects on cognitive function, especially memory attention and creativity.^{91 92} A loss of acetylcholine particularly effects sexual arousal⁹³ as well as regulating internal moisture.⁹⁴ Lower moisture levels can adversely affect semen volume in men. The supplements used to boost acetylcholine naturally are Huperizine, acetyl- l- carnitine, phosphatidylserine, glycerophosphocholine and ginkgo biloba.

⁸⁹ Bravermann E. Life Extension October 2008 pg 77

⁹⁰ Ben Z, Tessler R, Cohen L et al, Polymorphisms in the dopamine D4 receptor gene (DRD4) contribute to individual differences in human sexual behavior, desire, arousal and sexual function. Mol Psychiatry. 2006 Aug; 11 (8): 782-6

⁹¹ Braverman ER. Younger you: unlock the hidden power of your brain to look and feel 15 years younger. New York, NY: McGraw-Hill; 2007.

⁹² Amenta F, Tayebati SK. Pathways of acetylcholine synthesis, transport and release as targets for treatment of adult-onset cognitive dysfunction. Curr Med Chem. 2008;15(5):488-98.

⁹³ Andersson KE. Neurotransmitters: central and peripheral mechanisms. Int J Impot Res. 2000 Oct;12 Suppl 4:S26-33.

⁹⁴ Braverman ER. Younger you: unlock the hidden power of your brain to look and feel 15 years younger. New York, NY: McGraw-Hill; 2007.

Gaba

Gaba is the main inhibitory neurotransmitter that downregulates anxiety in chronically distressed individuals. Chronic anxiety often leads to loss of sexual interest and sexual dysfunction in men, particularly with loss of erections. Gaba has been shown to be responsible for enhancing orgasms. When Gaba becomes depleted, it is difficult to relax and let go of fear, anxiety and negative thoughts, thus inhibiting orgasms. Gaba enhancing compounds also increase dopamine which, therefore, enhances sexual satisfaction. Supplements which increase gaba are taurine, glycine, inositol and gaba itself. A medical drug called Gabapentin has a similar effect.

Serotonin

Serotonin is one of our most powerful neurotransmitters and is responsible for modulating sleep, pain, mood and gastrointestinal function.⁹⁵ Low serotonin levels can result in negative thinking, a lack of joy and decreased feelings of intimacy. Serotonin may also play a role in premature ejaculation, a condition which affects 20-30% of men.⁹⁶ The commonly prescribed SSRI drugs, Paxil or Prozac, delay serotonin's re-uptake into nerve cells and may increase ejaculatory control and delay ejaculation in men with premature ejaculation.⁹⁷ Supplements which are helpful to raise serotonin are tryptophan and 5-hydroxytryptophan which readily cross the blood-brain barrier to exert their effect. Other supplements that are needed to increase serotonin are magnesium and vitamin B6.

Summary

Although a male andropause workup is not yet standard practice amongst primary care physicians, Dr Morgentaler,⁹⁸ believes that within 5-10 years, "individuals will know their testosterone levels just like they know their cholesterol and PSA levels today."⁹⁹ If all men (and their loved ones) were aware of a treatment that not only improved one's sex drive, mental focus and energy levels but also reduced their risk of the number one killer, heart disease and associated metabolic syndrome, reduced the risk of all age related diseases while also having the potential to increase the quality of one's life while increasing longevity, it is highly likely that this treatment would be the number one subject on everyone's lips at the next cocktail party and/or braaivleis!

Furthermore, as a man approaches this phase of his life, it is time to take stock of multiple factors that may be preventing him from living at his maximum potential. This article has focused on only a small percentage of possible factors (hormones and neurotransmitters) that may be preventing him from living at the full capacity of his genetic potential. Other factors are infinite in their scope and include issues such as environmental toxicities, mold and chronic infectious exposures, dental cavitations and root canal toxicity, nutritional deficiencies, structural imbalances, unresolved emotional conflicts and deep seated toxic belief systems,

⁹⁵ Mohammad-Zadeh LF, Moses L, Gwaltney-Brant SM. Serotonin: a review. *J Vet Pharmacol Ther.* 2008 Jun;31(3):187-99.

⁹⁶ Ali ME, Abdel-Hafez HZ, Mahran AM, et al. Erectile dysfunction in chronic renal failure patients undergoing hemodialysis in Egypt. *Int J Impot Res.* 2005 Mar;17(2):180-5.

⁹⁷ Arafa M, Shamloul R. A randomized study examining the effect of 3 SSRI on premature ejaculation using a validated questionnaire. *Ther Clin Risk Manag.* 2007 Aug;3(4):527-31.

⁹⁸ Morgentaler A. *Testosterone for Life* McGraw Hill, 2008

⁹⁹ Goep J. Testosterone therapy for Life. *Life Extension* June 2010 pg 86

family systems that block a healing resolution as well as a lack of a deep relationship to something other than one's sole ego-based activities.

Our present generation tends to believe that, if something is not feeling quite right, it must be only a physical reason that is causing this sense of malaise. We run to doctors to get a traditional allopathic diagnosis and breathe a huge sigh of relief if there is no definable disease process. We also demand of our doctors that they provide a simple, drug based solution that is effective almost immediately, does not take any time out of our busy schedules, requires very little effort by us and preferably is at very low cost, lest it interfere with our holiday trip to Majorca or our cosmetic surgery bill. My answer is, "try showing up one day in your life without your brain or your body. " The fact that health concerns are seldom the number one priority in terms of individual's value systems is a matter for grave concern in this emergent toxic, nutritionally depleted and stressed world we find ourselves in.

Our bodies and our minds are our greatest assets and must not be taken for granted! Our health and wellness should be guarded on a daily basis with the utmost dedication and the discipline to act wisely in a preventative manner, decades before disease manifests itself. Dr Myron Wentz, owner of the Usana line of nutraceuticals, makes the following profound comment, "Most of us spend our lives working hard to save enough money to enjoy the golden years, only to discover that we are going to have to spend a great deal of money and effort to regain the health we sacrificed in our harried pursuit of material comfort. Many of us think of health care after the fact, as a high tech cure or series of treatments from a private practitioner or government agency, funded by insurance. We seldom view it as an individual responsibility."¹⁰⁰

In order to move away from this adolescent fantasy of someone else who is going to "fix us", we have to become part of the solution. We all need to raise health as a dominant value in our lives, or at least define our highest values (it may be running a business or a large family) and link our health practices to this value. We need to ask ourselves, "how by staying fit and healthy and working within a wellness, preventative model of health care, will I be even more effective at what I love to do?"

Every day we should devote time, energy and money to the preservation of our greatest assets, our minds and our bodies, and develop a health team to assist us in this process. After all, the best way to avoid disease is to maintain health, not to get a disease and then treat it. Ask yourself "where do I fit on the health/illness continuum?" Are you experiencing a high level of wellness with education, discipline, regular assessments and functional medicine¹⁰¹ (not disease based) lab testing, or are you in the illness mode, experiencing signs, symptoms and continued disabilities? It is my suggestion that if this is the case, that you act immediately as you may be heading down a slippery slope towards full blown illness, or at worst, a premature death.

¹⁰⁰ Wentz M. "Invisible Miracles". Rosarito Beach, Baja California:Medicis, S.C.;2002

¹⁰¹ Functional Medicine looks at optimizing biochemical pathways so that maximum efficiency is attained in key systems i.e. liver detoxification, food sensitivities and gut health, immune balance and inflammation, nutrition, neurotransmitter and hormonal harmonization, structural alignment and mind/body health. This is not standard allopathic practice.