



Human Growth hormone is made up of 191 amino acids. It is a normal occurring hormone that reaches levels often exceeding 1000 mcg during your teenage years and early twenties. These levels continue to decrease as we age. I believe we age because our hormone levels decrease, not that these levels fall because of aging.

Can we extend life by continuing to keep hormone levels optimal? Claiming that Human Growth Hormone is the "fountain of youth" is not a fair statement; however, the lack of HGH results in the deterioration of numerous bodily functions resulting in the aging process. I believe the name Human Growth Hormone, is a misnomer in adults. Certainly when we were 12 to 16 years of age and our levels were 1200, we were definitely growing. Now as we approach our twenties, the levels drop into the 900's, and growth is occurring at a much slower rate, and when the levels reach in the 300-400's when we are in our thirties essentially growth has stopped. Now why is growth hormone so important in our thirties and forties? It is because now it effectively repairs injury. It is a repair hormone, any function that requires protein synthesis, will require HGH, and if it is absent then the system progressively deteriorates. Patients repeatedly comment on improvement in skin tone and texture, as well as increase hair growth. The reason is that our body is repairing, and one of the most viciously attacked and damaged part of our body is our first line of defense....the skin. I believe one of the most critical functions that HGH supports is sleep. That is maintenance of REM sleep or rapid eye movement sleep. REM sleep is synonymous with quality, repairing sleep. When you dream, you are in REM sleep. Not dreaming means you are not attaining that restful critical part of sleep that you absolutely require. HGH guides you into REM sleep and promotes the maintenance of it. Patients with low HGH levels, often described their sleep pattern as waking up numerous times throughout the night, often unable to go back to sleep. Patients on growth hormone often describe this restful dreaming sleep that when they awake they feel refreshed even if they only sleep 4 hours.

It is a fact that we are going to grow old. In fact, with the "baby boomer" generation approaching their mid 50's, the number of aging elderly Americans is substantially increasing. Then, why does it have to remain a fact that we will grow old in exactly the very same way our forefathers did before us: frail, confused,

weak, fatigued, depressed, afraid to walk outdoors for fear of falling on the pavement, living in nursing homes consuming large amounts of pills? You know we seem to spend the first fifty years of our life sacrificing our health to make money, so that we can spend the next fifty years spending our money so that we can gain health.

There is an old adage that states that.....

Youth is wasted on the young.

If this is true, why should it follow that experience and financial security are 'wasted on the old' because they have lost the energy and enthusiasm to enjoy the 'golden years?'

This does not have to be the case. I believe that we age because our hormones decline, so why can't we restore our diminishing hormones to levels that were so kind to us when we were in our thirties? We can, because we have come to learn that old age is simply a state of hormonal deficiency, a state of lacking the previously bountiful hormones of youth. Then it follows that, these symptoms of 'old age' are actually symptoms that can be reversed.

Where is Growth Hormone produced? Human Growth Hormone is produced in the anterior part of the Pituitary. The pituitary is located behind the nose, inside of the brain. It is the command center for numerous hormonally controlled critical functions. When patients are born with poor HGH output, they are referred to as pituitary dwarves. Unfortunately, for these patients, their stature is not the only function affected by this lack of HGH. These patients do not live a normal life, aging more quickly, having higher incidence of cardiovascular disease, recurrent illnesses, healing problems, and deteriorating bone structure. Other patients develop loss of HGH production after surgery or pituitary irradiation, developing significant changes in body composition, metabolism, lipid abnormalities, increased cardiovascular disease, and bone density abnormalities. Patients develop rapidly diminishing levels of growth hormone associated with aging, and though this may be construed as "normal", the progressive development of life-shortening conditions including cardiovascular disease, obesity, Metabolic Syndrome, the decline in memory and thought processes, and the deterioration of physical activity are to be reckoned with, and are real health issues. Human Growth is produced usually around 1:00 to 2:00 in the morning, and having a very short half-life of approximately 12 minutes, disappears within one hour. Its production is associated with something called the Arcadian rhythm, or a sleep rhythm. Do you wonder why you wake up at 1:00 in the morning? Growth hormone is produced then and helps one maintain the critical REM sleep. If it is not adequately produced, REM sleep is not obtained and one sleeps too lightly awakening very easily. The appropriate timing of replacement of HGH will help the patient reach and maintain the restful quality REM sleep.

Growth hormone is essential to growth and as we age it is critical to repairing. HGH levels fall steadily in everyone once they reach adulthood. Since we now realize that HGH is indispensable throughout life, it must be considered a vital hormone for maintenance of the adult body. Studies of its amazing effects in the elderly population supports its primary role in improved longevity and the betterment of the quality of one's life.

Growth Hormone is then metabolized in the liver into IGF-1, or insulin-like growth factor 1. This is the active form of growth hormone, benefiting sleep, cognition, body composition, heart function, heightened immune system, and improved skin quality, only to mention a few systems positively impacted by Human Growth Hormone. Aging correlates closely with the progressive decrease in IGF-1 production. Growth Hormone deficiency is characterized by progressive weight gain, primarily central, decreased lean body mass, and increased body fat. Studies have identified patients with growth hormone deficiency have at least a 7% increase in body fat, mostly central which results in an increased waist-hip ratio, which has been associated with a higher incidence of cardiovascular disease, and shortened life-span. A classic study performed at the Medical College of Wisconsin, and published in the New England Journal of Medicine by Dr. Daniel Rudman in the 90's identified the benefit of Human Growth Hormone supplementation in patients who were HGH deficient. Two groups identified as Growth Hormone deficient, and were told not to change their eating pattern or exercise regimen. One group was given salt water, a placebo, and the other group a low dose Human Growth Hormone. The two groups were re-examined after 6 months of therapy, and the group who had received Human Growth Hormone demonstrated a 9% increase in lean body mass, and a 16% decrease in total body fat. Without exercising, or eating properly! Imagine what could happen if proper diet, and exercise were incorporated into that therapy?

When one's IGF-1 level falls below the adult normal range, his/her muscle and bone strength and energy levels most likely will decrease. Tissue repair, cell repair, healing capacity, upkeep of vital organs, brain and memory function, enzyme production, and revitalization of hair, nails and skin will also diminish. While aging and decreasing growth hormone levels go 'hand-in-hand' those who lose their pituitary production of HGH due to surgery, infection or accident, instantly suffer many profound, ill effects. It is important to reiterate that HGH will decline in everyone as they age.

In those who have reduced pituitary function, there is a shift in body composition whereby body fat increases by 7-25% while lean body mass decreases similarly. Muscle strength and muscle mass are noticeably reduced. Bone density studies indicate long bone density and spinal bone density decrease as significantly as if the individual had aged 15 years. Pronounced weight gain of 30-50 pounds occur when HGH wanes. Furthermore, there are negative effects on cholesterol; triglyceride levels increase while high-density cholesterol (HDL), a 'good

cholesterol', decreases. Increased risk of cardiovascular disease may be related to vascular wall thickening and changes associated with decreased cardiac output. Such insufficiencies may contribute to these people reporting a rapid decline in exercise capacity and early deaths from heart disease. They also report an impaired sense of well-being and symptoms of fatigue, social isolation, depression and a lack of the ability to concentrate. A recent study reported in the Lancet described 900 patients with low growth hormone levels and demonstrated a 1 ½ -2 times increase in premature heart attacks with low levels of GH. A Finnish study with 333 patients with severe Growth Hormone deficiency secondary to surgery found that without correcting Growth Hormone there was a 50% increase in premature heart attacks.

Other benefits of Growth Hormone therapy include the impact on memory and cognition. The level of IGF-1 in the brain declines rapidly in the aging brain. This decline results in impairment in memory, the ability to learn, spatial memory, and delayed processing with response. IGF-1 has also been identified as important in neuronal and dendritic repair. The falls in IGF-1 and HGH have also been associated with neurodegenerative changes such as Alzheimer's, Parkinson's disease, and multiple sclerosis.

Patients who are Growth Hormone deficient appear to have memory issues and associated problems with concentration. Psychological well-being is also affected resulting in increased depression, loss of self-confidence and lack of motivation. Associated with this, patients with low growth hormone deficiency have higher rates of divorce, depression and higher rates of unemployment.

Numerous studies have identified the benefit of Growth Hormone replacement therapy and profound, impressive changes in body composition, with increased lean body mass, and decreased body fat. The improvement in lean body mass has been associated with increased protein synthesis, increased body mass, and exercise tolerance. The decrease in body fat is most significant as visceral fat, or the fat that is within your belly, and is very highly associated with cardiovascular disease. The loss of body fat truncally is most impressive, and often does not affect fat loss in the arms and legs. Then, the classic picture of a Growth Hormone deficient patient, especially males, is one with the large belly and the thin arms and legs. This pattern is probably genetic, but then the associated drop in HGH is also undoubtedly genetic!

New Hope for Growth Hormone Deficiency: F.D.A. Approves HGH for Adult Use. Recombinant human growth hormone has been approved by the Food and Drug Administration for adult men and women in the treatment of hypopituitarism and somatotropin deficiency. Based on the literature and our experience with HGH replacement, the positive changes noted may also apply to individuals with low growth hormone levels. The term used is somatotropin deficiency syndrome. I treat individuals with IGF-I levels below 200 ng/ml and with symptoms of Growth Hormone deficiency with recombinant HGH.

I have seen daily that combining 'global hormonal' replacement therapy from our life-pyramid with DHEA, thyroid, testosterone, estrogen, progesterone and when indicated with HGH, the dosage, costs and side-effects are minimized.

There have been numerous studies that identify the cardiovascular benefits of Human Growth Hormone. A meta-analysis was performed in 2004, this approach uses a way of looking at numerous studies all together and determining benefit of the growth hormone, not on one individual study, but on the results of numerous well designed studies that were randomized to patient selection, blinded to the researchers on what the patients were receiving, and compared to placebo or basically receiving an injection of salt water instead of growth hormone. This approach is the absolute best way to determine the benefit of a therapy, and the best statistically. Dr. Maison published this article in The Journal of Clinical Endocrinology in 2004(vol 89 pp 2192-2199). He found that the use of low dose human growth hormone will increase lean body, decrease percent body fat, decrease the total cholesterol and the "bad" LDL cholesterol, as well as decrease diastolic blood pressure. Another important study by Juul(Circulation 106(2002) 939-944) demonstrated that when comparing patients in the lower 25% of the reference range of IGF-1(growth hormone metabolite) to patients in the upper 25% of the reference range that there was a two fold higher risk of ischemic heart disease in the lower group. Prospective studies have repeatedly identified a higher risk of ischemic heart disease and congestive heart failure in the growth hormone deficient patients in the lower 50th percentile of normal.

The classic profile for a Growth Hormone deficient patient may include increased central obesity, increased body fat, decreased lean mass, decreased energy, and exercise performance, altered lipid profile with low HDL's(good type), high LDL's(bad type) high total cholesterol. In addition, these patients often show early diabetes with evidence of Insulin Resistance. Patients with compromised lung function also demonstrated improvement with therapy. These patients almost universally have higher risks of cardiovascular morbidity/mortality, poor quality of live with more depression/neurodegenerative diseases, and metabolic deterioration. Medicine is very aggressive to manage already existing diseases. If we know ahead of time that we can dramatically reduce these disease processes than I firmly believe that physicians should intervene with the progressive depletion of human growth hormone. It is not about being a taller person, but it is about being a healthier individual, and doing everything we can do to proactively protect ourselves, and thus improve the quality of our lives.

Changes with Growth Hormone Replacement

Body Composition

Growth hormone therapy may result in profound changes in body composition:

fat mass is reduced while lean body mass increases. Growth hormone, at the relatively low dose of 0.003mg/kg was shown to normalize lean body mass over 6 months in 24 adults with HGH deficiency(1). The improvement in lean body mass is associated with increased protein synthesis, muscle mass and muscle function. Total body fat also decreases after 6 months of HGH administration. The decline in fat mass is most significant in the lower abdomen and trunk, compared to the arms, neck and legs. This suggests that HGH replacement therapy may reverse the central abdominal fat mass associated with HGH deficiency and decrease an individual's cardiovascular risk(6).

GROWTH HORMONE DEFICIENCY causes

.EFFECT OF HGH ENHANCEMENT

*CARDIOVASCULAR DEATHS	**INCREASED CARDIAC FUNCTION
*ABNORMAL BODY FAT & DISTRIBUTION	**INCREASED LIPOLYSIS
*DEHYDRATION	**IMPROVED FLUID BALANCE
*REDUCED BONE DENSITY.	**REVERSAL OF OSTEOPOROSIS
*IMPAIRED PHYSICAL PERFORMANCE	**IMPROVED EXERCISE CAPACITY
*PSYCHOSOCIAL DEFECTS	**SENSE OF WELL BEING
*DEPRESSION & SOCIAL ISOLATION	**SOCIALIZATION
*INSOMNIA & POOR SLEEP PATTERNS	**RESTORES REM (deep) SLEEP
*SKIN THINNING, REDUCED HEALING	**SKIN REJUVENATION
*CHRONIC LUNG DISORDERS	**IMPROVED LUNG FUNCTION
*INCREASED NEUROLOGIC DISORDERS	**IMPROVED FUNCTION?
*INCREASED MENTAL CONFUSION.	**IMPROVED MENTATION
*DECREASED THYMUS GLAND FUNCTION	*IMPROVED IMMUNITY
*DECREASED IMMUNE SYSTEM FUNCTION	*MORE NATURAL KILLER CELLS
*VITAL ORGAN SHRINKAGE.	*REGROWTH OF VITAL ORGANS
	*SPEEDS POST-SURGICAL HEALING

Cardiovascular and Lipid Metabolism

HGH replacement in adults may have a beneficial effect on lipids. In a recent study, it was reported that short courses of HGH reduced LDL (bad) cholesterol(7) while it improved exercise capacity and cardiac function. Patients showed increased oxygen uptake and power output during cycling. HGH is associated with increased muscle mass and longer and stronger action on the treadmill.(8) Recent work by Fazio demonstrated an improvement in heart failure patients given high dose HGH replacement.(9)

Bone Density

One of HGH's most dramatic effects is on the connective tissue, muscle, and healing potential of the skeletal system. Fragile skin with ulcers, fractured bones that do not heal, and profound gains in muscle strength have been noted. Not only does the skin look younger with less wrinkles, some report a regrowth of hair on the head. For growth hormone, DHEA, and testosterone are clearly anabolic hormones: they build tissue. And with increased age, our bodies break down

tissue faster than we can repair them. This is called catabolism. Therefore, HGH tends to reverse the catabolic state.

The potential role of HGH in the maintenance of the skeleton is its ability to make and repair these tissues. HGH stimulates osteoblast (bone) and fibroblast (supporting tissue) proliferation[8]. In a recent study using the sensitive techniques of quantitative tomography and single photon absorptiometry, significant increases of 5% and 4% were demonstrated in spinal and cortical bone density over 12 months of therapy in HGH-deficient adults(4). It thus appears that HGH administration may act to improve skeletal repair of not only bone and skin but all organs as well.

Other anabolic effects include a gain of muscle and renewed appetite, better exercise capacity, increased lung capacity, and faster wound healing. Many report their 'old age spots', skin "senile keratosis" disappear within two months of HGH therapy.

Side Effects with Low Dose HGH Replacement

The dose of recombinant HGH is an important consideration in the therapy of acquired HGH-deficiency. Large, pharmacological doses of HGH are often associated with the clinical signs of HGH excess, including fluid retention, carpal tunnel, and hypertension. However, by incorporating smaller, physiological such symptoms are not noted. At a dose of 0.03mg/kg/week, Bengtsson et al. demonstrated only minor side effects including slight fluid retention and mild joint pain. There was only one reported incident of carpal tunnel syndrome(6). In all cases, further reduction of the HGH dosage resulted in the elimination of side effects. In another recent study in which a smaller dose of HGH was used, 0.01 mg/kg was administered three times per week without any reported side effects(8). Multiple studies support the conclusion that low dose HGH replacement is associated with minimal side-effects.

Positive Effects of HGH Replacement

1. **Get Lean:** Loss of fat and increase in muscle mass combine for up to 20 pound shift in body composition. This equates to a general feeling of physical well being, a stronger libido, and improved self image.
2. **Get Energetic:** Without a need for the afternoon food cravings of sweets, caffeine, stimulants or nicotine, HGH patients have more energy. This improves both their self control image and their general health state (because they exercise).
3. **Get Smart:** An interesting yet unproved side-effect of HGH has been the return of mental acuity and a "sharp" memory. Such HGH improves the vascular and intracellular nutrient support for cells; it is not surprising that many individuals have reported this.

Future Directions

Important issues remain as to the precise clinical definition and best treatment of partial vs. complete HGH deficiency. In addition, it is unclear whether some of the observed beneficial effects of HGH replacement will be seen with the low dose, combination therapies. Nevertheless, it is already apparent that even these small doses, unassociated with symptoms of HGH excess, may be enough to achieve desired metabolic results.

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Enjoy the Information,

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