

# Understanding your Hormone System

[ Written by the Cenegenics Medical Institute <http://www.cenegenics.com/113/> ]

Our hormone system is best understood if you think of it as a cascade (Figure 1), with the brain at the top followed by the pituitary gland, then target organs (i.e., ovaries, thyroid, testicles), and finally physical and mental functions (i.e., skin thickness, menstrual periods, sex characteristics, aggression, hair distribution, etc.).

## Brain

The hypothalamus is the part of the brain where hormone release originates, starting off the cascade by secreting "releasing hormones" which turn on the pituitary.

## Pituitary

The pituitary is known as our "master gland." It sits at the base of our brain and communicates directly with the hypothalamus by special nerves and blood vessels. Releasing hormones travel from the hypothalamus to the pituitary and stimulate the formation and release of pituitary hormones into our circulatory system. The pituitary hormones exert their effects on many of our organs, such as the thyroid, adrenal glands, testicles, ovaries, and breasts.

- There are five basic pituitary hormones in which we are interested:
- Thyroid Stimulating Hormone (TSH)
- Adrenocorticotrophic Hormone (ACTH)
- Follicle Stimulating Hormone (FSH)
- Luteinizing Hormone (LH)
- Human Growth Hormone (hGH) for adult deficiency

The pituitary hormones are released into the general circulation and have effects on specific target organs, which, in turn, release hormones of their own. Thus, the pituitary hormones act like air traffic controllers—surveying the scene, determining what is needed, and then telling the organs when to release their hormones.

## AN OVERVIEW: SOME OF THE MOST IMPORTANT HORMONES

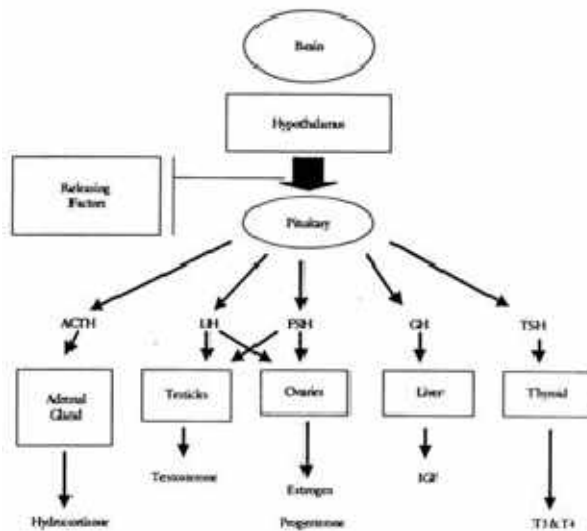


Fig. 1

## Thyroid

Thyroid hormone greatly affects our metabolic rate and therefore our body temperature. Without out thyroid hormone, we cannot survive. Low thyroid levels cause decreased body temperature, increased cholesterol, and increased body fat. Often undetected in traditional medical practices, low thyroid levels can make it fiendishly difficult to lose weight. They can contribute to a subjective feeling of sluggishness and low energy as well as depression. As we age, our thyroid levels sometimes decrease and our body temperature and metabolism dip below normal. Supplementation of thyroid hormone is easy and inexpensive. The goal is to restore T3 and T4 to their natural ratio and blood concentrations.

## Thymic Protein

The thymus gland shrinks with age; by 40 we may have only a small portion of our thymus still intact. It is considered highly likely that this is a contributory reason to age-related decreased immunity and increased risk of cancer.

Thymic Protein ATM (Biopro™) is useful for increasing immunity and resistance to cancer cells and infections. This protein programs T-4 "helper cells," to seek out invaders such as viruses, bacteria and cancer cells. The helper cells then send out T-8 "killer cells" to find the invaders and destroy them. Studies have shown that Thymic Protein ATM stimulates immunity and suppresses HIV. This is the same protein that is produced by the human thymus gland. It is classified as a nutritional supplement and taken orally. The maintenance dose is one packet per day under the tongue, and it is very effective.

## Gonadal Steroids

These hormones are essential for normal reproductive function and the secondary sexual characteristics. They include testosterone, estrogen, and progesterone.

## Adrenal Steroids

The adrenal glands release hydrocortisone (cortisol) and other hormones known as adrenal steroids. They are essential for life and are very important in our response to physical and emotional stress. In general, they do not decline with age, as do most of our other hormones.

All the adrenal and gonadal steroids are derived from the basic cholesterol molecule. Through several biosynthetic pathways, cholesterol is transformed into different steroid hormone molecules before it becomes estrogen, progesterone or testosterone.

Please keep in mind that when we take pregnenolone, DHEA (dehydroepiandrosterone) or androstenedione, we may influence the levels of their end products: testosterone, estrogen and progesterone. Therefore, it is important to monitor levels of both the administered hormone and its end products.

Figure 2 shows the progression from the cholesterol molecule to the gonadal and adrenal steroids.

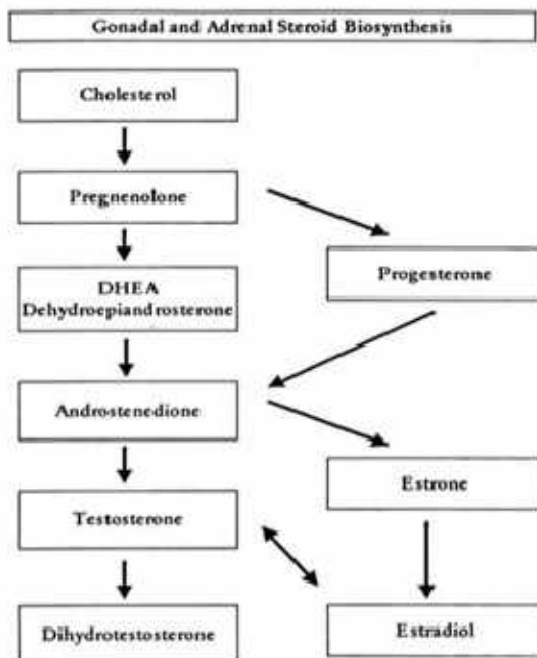


Fig. 2

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## **Human Growth Hormone (hGH)**

Human Growth Hormone has more than one target organ but its primary target is the liver, where it causes the formation and release of insulin-like growth factor (IGF, a.k.a. Somatomedin C).

Of hGH's many metabolic effects, the most predominant is protein synthesis. Also, hGH is released in bursts, most of which occur during certain stages of sleep.

In our youth, hGH is essential for bone and organ growth. Having too little causes dwarfism; too much causes gigantism. After we stop growing and become adults, there is a significant decrease in the amount of hGH we produce.

Although hGH is no longer needed for growth after reaching adulthood, hGH is essential for many other vital functions. Significantly lowered levels in proven adult-deficiencies may result in various symptoms, from diminished energy to weight gain (fat) and decreased muscle mass.

IGF is a by-product of hGH and thought to be responsible for most of the anabolic (building) effects of the hormone. Natural levels of hGH and IGF<sub>1</sub> decline rapidly sometime after 15-20 years old.

Many experts agree measuring the level of IGF<sub>1</sub>—which is more easily measured in the blood than growth hormone—to be a valid and acceptable tool in assessing the amount of circulating growth hormone in the body.

At Cenegenics, we use this measurement, basing our analysis on multiple, controlled studies in peer-reviewed journals to identify patients with an adult hGH deficiency, restoring levels to the upper end of the normal range for their age. (Of our 12,000 plus patients, only 7% demonstrate a valid adult hGH deficiency.) We concur with the authors of studies who validate IGF<sub>1</sub> measurement for setting therapeutic goals, “study reinforces the current practice of many clinicians of aiming for the upper half or quartile of the IGF<sub>1</sub> normal range as an initial target for patients treated for both acromegaly and adult onset growth hormone deficiency.”

In the past, if a pituitary gland was removed or destroyed due to a tumor in an adult, hGH was not replaced—even though the more "essential" hormones, such as thyroid, hydrocortisone, and testosterone or estrogen/progesterone were replaced. It wasn't until the work of Dr. B. Bengtsson and Dr. Daniel Rudman that the value of Growth Hormone in hGH-deficient adults was recognized.

It was found that adult hGH-deficient patients had almost 50% higher rate of death from heart disease than expected (Figure 4). Dr. Bengtsson replaced Growth Hormone in pituitary deficient patients and achieved excellent results. In a 1990 *New England Journal of Medicine* article, Dr. Rudman reported on his pioneering experiments with the use of hGH in elderly veterans. He discovered that their body fat decreased

and lean muscle mass, strength, skin thickness, and bone density increased. In other words, he was able to slow down the usual progression of aging by bringing these hGH-deficient patient's blood IGF levels up to those equivalent to a younger age group.

In 1999, the National Institute on Aging completed another landmark study that was designed to either refute or substantiate the results of Dr. Rudman and also to extend his study by measuring other parameters. This was a double-blind, placebo-controlled, multi-center trial in both men and women with a large number of patients. This study involved not only hGH, but gonadal (sex) steroids. It confirmed the benefits of hGH as Dr. Rudman had asserted and also demonstrated how the addition of gonadal steroids improved the effectiveness of hGH for adult deficient men and women.

Although the NIA study showed that hGH alone did not increase muscle strength, it did substantially increase lean muscle and aerobic capacity. The addition of testosterone to hGH did, however, increase muscle strength substantially. (The findings of this study are available upon request.)

### **The Safety of Human Growth Hormone (hGH) for Adult Deficiency**

Prescribing hGH for adult deficiency takes judicious evaluation. Unlike other hormones, hGH falls under the watchful eye of the FDA.. The manner in which hGH for adult deficiency can be prescribed, manufactured, dispensed, distributed and sold is defined by strict regulation. The FDA requires that hGH manufacturers be registered, licensed and verify production methods and their product, regarding its uniformity, bioavailability, safety and stated efficacy.

As such, hGH should **only** be prescribed for adults with a proven growth hormone deficiency, as evidenced through comprehensive, scientific testing. Those patients will fall in the minority, not the majority. As stated earlier, at Cenegenics, only 7% of our 12,000 plus patients have demonstrated an adult hGH deficiency, requiring hGH therapy. All of our prescribing protocols for any hormonal therapy center on evidence-based medicine, where adult deficiencies are demonstrated. Our synergistic approach encompasses exercise, nutrition, nutraceutical supplementation and endocrine balance.

The only method hGH may be administered is via injection by prescription under the supervision of a licensed physician through a licensed clinic or pharmacy. Since the FDA oversees the manufacturing and licensing of hGH, adult deficient patients must be sure they are using legitimate hGH, from an FDA-approved pharmaceutical laboratory. Also, several companies exist, who promote “hGH” pills, elixirs, sprays, or creams—products claiming to be used by the body via topical, oral, sublingual or nasal administration. One should be skeptical of such claims, as none of the published benefits of injected hGH have been objectively measured with oral tablets, capsules, or sprays. **Beware: Counterfeit brand name products or alleged hGH sprays, pills, creams and elixirs fall outside of FDA approval and guidelines.**

**hGH and studies.** For patients with a proven adult growth hormone deficiency, undergoing hGH therapy raises IGF<sub>1</sub> levels in the blood. It is the higher IGF<sub>1</sub> that mediates all the effects attributed to hGH.

Most of the studies about the use of hGH for adult deficiency and in children fail to show any risk of cancer related to the use of Growth Hormone or higher levels of IGF<sub>1</sub>. In fact, in a review article published in the *New England Journal of Medicine* on October 14, 1999, authored by Mary Lee Vance, M.D. and Nellie Mauras, M.D., after an exhaustive literature search, concluded that "there is at present no evidence that Growth Hormone modulation affects the risk of cancer".

All adult deficient patients should be aware, however, that there are other reports that do indicate there may be a risk. In 1998, two published studies claimed a higher incidence of prostate cancer among men who had higher IGF<sub>1</sub> levels years before the onset of the cancer; but a number of experts agree that these studies are inconclusive and may be flawed. Problems cited with these studies include the method of statistical analysis, the several year interval between the drawing of the blood and the onset of cancer, and the absence of any IGF measurement at the time of diagnosis of the cancer. Several other studies show no difference in IGF<sub>1</sub> levels between normal healthy men and those with prostate cancer at the time of diagnosis and beyond.

Another recent study points to a higher incidence of breast cancer in pre-menopausal women (but not post-menopausal) who had higher IGF<sub>1</sub> levels one to five years prior to the onset of breast cancer. In this study, the blood was also drawn prior to diagnosis and was not analyzed for several years, making the conclusions reached somewhat suspect.

Although the majority of studies overwhelmingly point toward the safety of hGH for adult deficiency, there is, as in virtually any area of medical science, some conflicting data among studies that confuses the issue. This is true because of the complex nature of the human body and its physiology -- and the truism that medicine is not an exact science.

As in all aspects of medical therapeutics, each of us must evaluate the information that is available, along with our needs and desires and measure these against the potential risk, if any.

Your Cenegenics physician can help you understand and evaluate all the information available with as little prejudice as possible. Obviously we feel that for most adult deficient patients the benefit of hGH therapy far outweighs the risk, otherwise we would not be including it in our synergistic protocol. Only you however, can make the decision for yourself.

To put it into context, similar controversy has surrounded the use of estrogen in post-menopausal women for the past 30 years. We now know that estrogen replacement in women may increase the risk of breast and endometrial cancer in some women with family histories of breast cancer, and other risk factors. However, because of estrogen's proven protective effects against many other diseases (Alzheimer's disease,

heart disease, osteoporosis and colon cancer), overall mortality is lower in women who take estrogen than in those who do not.

It will be many years before we have as much data on hGH for adult deficiency as we do on estrogen, but we feel that for most adult deficient patients, the benefits of taking hGH outweigh the risks. Those benefits studied and published include:

- Increase in libido
- Decrease in body fat
- Increase in lean muscle
- Increase in bone density
- Increase in skin thickness
- Decrease in skin wrinkling
- Improved cholesterol profile
- Faster wound healing with lower infection rate
- Decrease in hospitalization rate by 50%
- Decrease in sick days from work
- Increase in exercise capacity
- Decrease in diastolic blood pressure
- Decrease in waist/hip ratio
- Increase in renal blood flow
- Increase in feeling of well being/improved socialization
- Strengthened immune system

Anecdotally claimed benefits include:

- Improved memory
- Improved cognitive function
- Hair re-growth
- Reduced spider veins

## **SUMMING IT UP**

Our hormone system is a cascade: the brain, followed by the pituitary gland, then target organs and finally physical and mental functions. Five main hormones were discussed, including thyroid, thymic protein, gonadal steroid, adrenal steroid and human growth hormone (hGH) for adult deficiency.

The latter, hGH, falls under strict FDA regulations. Cenegenics Medical Institute only prescribes hGH if a comprehensive evaluation reveals an adult hormone growth

deficiency. Our prescribing protocols and analyses are based on multiple, controlled studies in peer-reviewed journals, in adherence with FDA regulations.

Overall, hGH has had a controversial history. Yet, we believe that for most adult deficient patients, the benefits of a monitored, synergistic program of hGH outweigh the risks.

Cenegenics uses bioidentical hormone modulation to help patients regain and maintain metabolic and endocrine functions at the upper end of their normal range—**for their age**—creating the best opportunity for a healthier and more vigorous life. Our synergistic approach incorporates exercise, nutrition, nutraceutical supplementation and endocrine balance, helping adult hGH deficient patients substantially improve the quality of their lives

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