Section 1: Studies indicating that supplementation with growth hormone (GH) results in decreased body fat, increased lean muscle, decreased heart disease, and an increase in quality of life.

1. “The overall deterioration of the body that comes with growing old is not inevitable...We now realize that some aspects of it can be prevented or reversed.” Effects of 10-20 years of aging on lean body mass and adipose tissue reversed in 6 months with testosterone and hgh.


2. Life with low growth hormone (GH) is poor, both in quantity and quality.

“GH peaks at puberty and begins to decrease at 21.”

“At age 60, most adults have total 24-hour secretion rates indistinguishable from those of hypopituitary patients with organic lesions in the pituitary gland.”

Almost all adults 40 years of older have a growth hormone (IGF-1) deficit.


3. GH decreased body fat in men and women by 14% and increased lean muscle in both men and women - synergistic with testosterone (decreased body fat 17-18%).

GH resulted in substantial increase in aerobic capacity, decreased total and LDL (bad) cholesterol, improved cholesterol coronary risk ratio, and GH lowered PSA.

Mark Blackman of Johns Hopkins University and National Institute on Aging (Due to be published).

4. “The fall in GH secretion seen with aging coincides with changes in body composition and lipid metabolism that are similar to those seen in adults with GH deficiency.”

Their results (Blackman) showed positive effects of GH on lean body mass, central fat, low-density lipoprotein cholesterol and aerobic capacity.


5. Low IGF-1 (measurement of low growth hormone) in older women results in poor muscle strength, slow walking speed, and difficulty with mobility tasks.


6. Aging and adult growth hormone deficiency both have:

- Increased cardiovascular morbidity & mortality
- Decreased muscle mass and bone mass
- Total and visceral fat increased
- LDL (bad cholesterol) increased

With GH supplementation body composition changes:

- Reduction in total and visceral fat and increase in lean body mass
- Improvement in cardiovascular function and lipids
- Reverse atherosclerotic changes in carotids
- Quality of life improves
- Bone mineral density increases


7. GH deficiency results in abnormal body fat and distribution and insulin resistance. GH replacement results in increased lean body mass, decreased abdominal fat by up to 50%, and increased insulin sensitivity (prevents diabetes).


8. GH secretion impaired in obesity

Growth Hormone References

- GH decreases adiposity
- Inhibits lipoprotein lipase
- Enhances lipolysis
- Improves dyslipidemia


9. Middle-age men with low GH and abdominal obesity with nine months of GH treatment (9.5 microg/kg/day)

- Decreased fat, abdominal visceral 18% and subcutaneous 6%
- Improved insulin sensitivity (prevents diabetes)
- Total cholesterol, LDL, triglycerides decreased
- Diastolic BP decreased


10. Five years GH Replacement

- Significant increase in lean body mass
- Bone mineral density
- HDL-C (good cholesterol)
- Significant decrease in total cholesterol
- LDL-C (bad cholesterol)
- Triglycerides
- Hemoglobin A1C (lower glucose levels and diabetes preventative)
- “5 year GH substitution is safe and well tolerated”


11. GH +/- Sex Steroids and Subcutaneous and Visceral Fat

HRT=Estraderm + Provera
T=Testosterone Enanthate 100mg q 2 weeks (“Testosterone Lite”)
GH=20 micrograms/kg 3 x a week for 70 kg 20 x 70=1400 micrograms=1.4 mg=4.2 mg=12.6 IU/week
IGF-1 increases dendritic formation of cortical neurons (improved mental function).


2. IGF-1 reverses age-related D2 (Dopamine) receptor deficits and improve age related impairment in learning and memory.


3. IGF-1 correlated with cognitive function in men average age 69. GH deficiency correlated with poor emotional and psychosocial functioning.


4. GH increases connexin-43(improved mental function)
   - In cerebral cortex
   - In hypothalamus
   - IGF-1 does not increase connexin-43
   - Connexin-43 forms gap junctions that mediate intercellular communication and improved mental function
   - Increased neuronal communication


5. GH exerts profound effects on CNS and improves:
   - Cognitive capabilities
   - Memory
   - Alertness
   - Motivation, work capacity
   - GH receptors present in the brain
   - Hypothalamus, choroid plexus, hippocampus
   - GH crosses BBB


Section 2: Growth Hormone and the Brain

1. Adult nerve cells are targets of IGF-1.

Growth Hormone References

6. GF-I exerts cytoprotection against a beta-amyloid induced neuronal cell death (prevents Alzheimer’s disease)


Section 3: Growth Hormone and Bone

1. GH Deficiency causes reduced bone density. GH Replacement reverses osteoporosis.


2. Bone density significantly improved with GH therapy
   - Increases formation and strength of cortical bone
   - Synergistic effect with exercise
   - Lower growth hormone levels are found in patients with bone fractures


Colao A. Bone loss is correlated to the severity of growth hormone deficiency in adult patients with hypopituitarism. J Clin Endocrinol Metab 1999 Jun;84 (6):1919-24.


3. Effect of GH on body composition and bone turnover in women with osteoporosis
   - Increase in handgrip strength
   - Decrease in waist/hip ratio
   - Increased bone formation
   - Decreased osteoporosis


4. Growth hormone replacement in men (18 month study)
   - Increase bone density and lean body mass
   - Body fat decreased
   - Low incidence of side effects

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Growth Hormone References

1. Connection between neuroendocrine, immune, and GH/IGF-1
   - IGF-1 needed for lymphocyte maturation and function
   - IGF-1 restores age-related thymic involution in rodents
   - IGF-1 restores damaged immune system
   - Decline in T and B cells are restored by GH

2. GH and Atherosclerosis
   - GH normalized intima media thickness (IMT) of carotid artery in 3 months and improvement continued 18 months of study.
   - IMT negatively correlated with IGF-1
   - No significant change in lipids
   - Direct effect on arterial wall via nitric oxide?

3. Growth hormone improves cardiac performance
   - Improves cardiac function in dilated cardiomyopathy


4. Growth hormone treatment in heart failure patient increased ejection fraction 13% to 28% (doubled heart function).
   - Heart medications able to be discontinued


5. Cardiac performance impaired in GH deficiency
   - Reduction of LV mass
   - Reduction of ejection fraction
   - Reversed after GH replacement


6. GH decreases coronary inflammation and prevents heart attacks.
   - GH deficient adults have increased CV mortality
   - Inflammatory markers are predictive of CV events
   - C-Reactive protein increased in GH deficiency
   - With GH Replacement therapy
   - C Reactive protein decreased
   - Visceral and subcutaneous fat decreased
   - Lipoprotein (a) decreased
   - No change in cholesterol, HDL


7. IGF-1 and the heart
   - Improves cardiac contractility, cardiac output, stroke volume, ejection fraction
   - Improves cardiac function after myocardial infarction by stimulating contractility and promoting tissue remodeling

8. GH increases coronary blood flow and capillary density (rats).
   - Decline in GH leads to decline in tissue growth, maintenance and repair in older animals (and humans)
   - Deterioration of cardiovascular function contributes to decline of physical function and quality of life
   - Decreased coronary flow and capillary density with aging reversed by GH


Section 5: Growth Hormone and Immune System

1. Significant improvement in patients treated with GH

Section 7: GH and Chronic Fatigue & Fibromyalgia (See CFIDS and Fibromyalgia page)

- GH deficiency mimics fibromyalgia
- Low GH secretion, IGF-1, and IGFBP3 in fibromyalgia
- Rx with HGH or GHRH produced increases in IGF-1 and IGFBP3
- Can be significant improvement with GH replacement


2. Growth hormone deficiency more common in fibromyalgia patients. Supplementation with HGH can result in improvement in symptoms.


3. Growth hormone supplementation results in significant improvement in symptoms.

“Women with fibromyalgia and low IGF-1 levels experienced an improvement in their overall symptomatology and number of tender points after 9 months of daily growth hormone therapy. This suggests that a secondary growth hormone deficiency may be responsible for some of the symptoms of fibromyalgia.”


Other references


