



# **M.H.R.**

**MUSCLE, HEALTH, RECOVERY**

## Research Manual



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# An Introduction to Velvet Antler

Velvet antler has been used for over two thousand years in ancient Eastern medicine and is only second to ginseng in importance for the mainstay of Traditional Chinese Medicine. It is considered one of the world's oldest raw super foods because of its nutritional density and lack of caloric impact. Velvet antler has uses ranging from safe anti-aging solutions to enhancing the performance of many elite athletes. Thousands of papers have been published on the composition and biochemical effects of velvet antler and its constituents. This research has consistently revealed a host of health benefits to enhance immune and neurological health as well as metabolic efficiency.

Velvet antler provides a more extensive collection of nutritional components than any other single source used to provide raw materials for dietary supplements. The biochemical matrix found in the live, growing velvet antler contains a complete range of beneficial growth factors, saturated fatty acid molecules, phospholipids, minerals, glycosaminoglycans, extracellular matrix components and the complete array of amino acids.

Velvet antler supplementation may improve:

- Hormonal balance
- Metabolism
- Recovery time from injury and training
- Muscle mass, strength, and body composition
- Immune system function
- Endurance capacity
- Mental alertness, cognition, mood, and memory
- Sleep quality

Research supporting these benefits can be found on page 15.

## Why antlers?

Antlers are the only mammalian appendages capable of continuous regeneration. Antlers grow at an amount of one inch or more per day, representing the fastest rate of organ growth in the animal kingdom. They can reach over six feet in diameter and weigh several hundred pounds. Antlers transform each year from cartilage to a state of calcification before naturally falling off and regenerating. During the cartilaginous state antlers are harvested and procured into an extract. The antlers in this state are nutrient rich in IGF-1, growth factors and other protein based structures.

# Velvet Antler Constituent Summary

Velvet antler is not synthetically derived IGF-1. The active ingredients found in velvet antler include growth factors, minerals, trace mineral elements, proteins, collagen, lipids, and glycosaminoglycans.

## Growth Factors

- Bone morphogenetic proteins (BMPs)
- Epidermal growth factor (EGF)
- Erythropoietin (EPO)
- Fibroblast growth factor (FGF)
- Growth differentiation factor-9 (GDF9)
- Insulin-like growth factor (IGF) I
- Insulin-like growth factor (IGF) II
- Interleukins
- Nerve growth factor (NGF) and other neurotrophins
- Platelet-derived growth factor (PDGF)
- Transforming growth factor alpha (TGF- $\alpha$ )
- Transforming growth factor beta (TGF- $\beta$ )
- Vascular endothelial growth factor

## Amino Acids (Essential & Non-Essential)

- Alanine
- Arginine
- Asparagine
- Aspartic acid
- Cysteine
- Glutamic acid
- Glutamine
- Glycine
- Histidine
- Isoleucine
- Leucine
- Lysine
- Methionine
- Phenylalanine
- Proline
- Serine
- Threonine
- Tryptophan
- Tyrosine
- Valine

## Free Form Amino Acids

- Amino acid decarboxylase
- Amino adipic acid
- Amino-N-butyric acid
- Aspartic acid
- B-aminoisobutyric acid
- Beta-alanine
- Beta-amino acid
- Carnitine
- Citrulline
- Dihydroxy-L-phenylalanine (DOPA)
- Gamma-aminobutyric acid (GABA)
- Hydroxylysine
- Ornithine
- Phosphoethanolamine
- Phosphoserine
- Sacrosine
- Taurine
- $\gamma$ -Aminobutyric acid
- 1-Methylhistidine
- 3-Methylhistidine

## Glycosaminoglycans

- Chondroitin sulfate
- Dermatan sulfate
- Proteoglycan decorin
- Hyaluronic acid
- Keratan sulfate
- 15epi PGE
- PGE1
- PGE2
- PGF1a
- PGF1b

## Phospholipids & Sphingolipids

- Cephalin
- Ceramides
- Lecithin
- Lysocephalin
- Lysolecithins
- Lysophosphatidylcholine
- Phosphatidylinositol
- Sphingomyelin

## Wound healing

Velvet antler contains high concentrations of growth factors such as insulin-like growth factor 1 (IGF-1), transforming growth factor- $\beta$  (TGF- $\beta$ ), and epidermal growth factor (EGF) that are crucial for restoring damaged tissues. Numerous studies have demonstrated the enhanced wound healing effects that velvet antler has on tissue injuries. Research has shown significantly increased expression of growth factors in skin treated with velvet antler versus the controls. Additionally, researchers found faster wound healing, thicker skin, stimulated hair growth, and enhanced fibroblast activity with the use of velvet antler.

*Refer to references 1-5.*

## Skeletal system repair

Glycosaminoglycans such as chondroitin sulphate and glucosamine chondroitin, which have been established as natural remedies to reduce pain, stop joint space narrowing, and even alter the pathology of osteoarthritis, can be found in great abundance in velvet antler. Studies have demonstrated the effects that velvet antler has on arthritic joints and other skeletal system disorders. Velvet antler supplementation has been shown to reduce or eliminate joint swelling and distortion, inhibit the development of arthritis, significantly increase fracture healing rates, increase bone mineral density, and even increase bone width and osteoblast cells.

*Refer to references 6-11.*

## Immunoprotective properties

Recent research has demonstrated the ability of velvet antler to inhibit microbial and fungal growth by enhancing immunological function and suppressing inflammatory cytokines. Macrophage and splenocyte activity have been shown to improve with velvet antler supplementation.

*Refer to references 12-15.*

## Performance enhancing effects

Explosiveness, muscle recovery time, endurance capacity, strength and body composition can all be improved with the use of velvet antler. Velvet antler supplementation has been shown to reduce body fat and resting creatine kinase levels and increase strength, time to exhaustion, anaerobic performance, and VO2 max.

*Refer to references 16-17.*

## RNA synthesizing capabilities

For the past 25 years, Chinese scientists have been demonstrating that velvet antler can exert anti-aging actions by promoting the synthesis of protein and RNA. Supplementing with velvet antler has been shown to increase the weight of the liver, brain, and testis as well as enhancing the activity of RNA polymerase and protein synthesis in the liver and kidneys.

*Refer to references 18-22.*

## Memory

With Alzheimer's disease becoming so widespread, products that have the ability to inhibit the decline of cognitive function are of great interest. A recent study was conducted using velvet antler on memory-impaired mice. Results demonstrated that velvet antler might have the ability to increase the activity of antioxidant enzymes, ameliorate memory deficits, and improve long term memory.

*Refer to reference 23.*

## Stem cell findings

The annual regeneration of antlers is a phenomenon that has fascinated scientists for ages. Although the mechanism is not yet thoroughly understood, velvet antler polypeptides have been demonstrated to promote differentiation of neural, osteogenic, and adipogenic cell lines in vitro. These findings have led researchers to believe in the probability of using stem cells derived from velvet antler in regenerative medicine.

*Refer to references 24-29.*



# Natural IGF-1

One of the main components in velvet antler is IGF-1, essentially the end result of growth hormone. There has been considerable adverse publicity and misnomers about the effects this polypeptide allegedly has on the human body, notably that it may be a cancer-causing agent. On the contrary, many studies show that natural IGF-1 has a multitude of positive benefits for the treatment of several debilitating conditions. In fact, research actually concludes that increased natural IGF-1 levels have a protective and stimulatory effect on the immune system.

The negative side effects that can be attributed to IGF-1 isolates and HGH are directly related to sources that come solely from the synthetic versions of the compound that are developed in laboratories.

## Velvet antler and IGF-1

Velvet antler provides a natural source of bio-available IGF-1. The IGF-1 delivered in velvet antler is provided as it naturally occurs, with all of the bio-active constituents and the many other supporting molecules in balance. Because the nutrients provided in velvet antler are naturally derived and balanced, the nutrients your body does not use are passed through your urine and sweat to prevent overdosing.



# IGF-1 Research

Research has shown a multitude of benefits natural IGF-1 can have on the body. Benefits include: building muscle mass, improving metabolism, nerve regeneration, immune responses, blood sugar utilization, slowing the aging process and expanding longevity. Studies have consistently concluded the remarkable effects of natural IGF-1 for chronic conditions such as heart disease, fibromyalgia, multiple sclerosis and obesity.

## Some of the characteristics of IGF-1 deficiency include:

- Decreased hair and nail growth
- Decreased HDL cholesterol
- Depression
- Elevated LDL
- Emotional instability
- Increased abdominal and visceral fat
- Increased body fat percentage
- Insulin resistance, which can lead to type II diabetes
- Lack of connective tissue
- Poor memory
- Reduced exercise performance
- Reduced heart output and sweating
- Reduced sex drive and functions
- Reduced skeletal muscle strength and size
- Reduced thyroid function
- Thin skin

## Building muscle mass

There is tremendous amount of focus in the training of athletes today to get bigger, stronger and faster by any and all means possible. Unfortunately, this often involves the use of synthetic anabolic agents that have devastating long-term ramifications on the human body. Human growth hormone injections, steroids and other harmful agents have destructive effects on muscle tissues, the endocrine system, exocrine system and even DNA.

Natural IGF-1 is a safe alternative to building muscle mass and is more effective than growth hormone supplementation itself. In fact, the majority of increases in strength and muscle as well as the anti-aging effects of growth hormone are due to its ability to raise IGF-1 levels in the body. IGF-1 also acts as an anti catabolic and plays a role in preventing muscle atrophy, increasing muscle growth and increasing protein synthesis.

*Refer to references 30-33.*

## Improving muscle building

- Increases proliferation and growth of muscle cells without a corresponding rise in fat tissue
- Increases uptake of amino acids into muscle cells, helping to regenerate muscle tissue after exercise and assure that muscle protein synthesis takes place
- Increases uptake of glucose into muscle cells
- Improves utilization of fat for energy
- Decreases utilization of carbohydrates
- Reduces catabolism (muscle break down) after training and workouts

## Increasing human metabolism

- Improves white blood cell production
- Restores the immune-promoting lymphoid tissue
- Stimulates the proliferation of both B and T lymphocytes that help to kill viruses
- Increases the uptake and degradation of dangerous LDL cholesterol by macrophages
- Improves nitrogen retention (muscle preservation) and increase sodium excretion
- Improves parathyroid function vitamin D interaction to produce a dense bone matrix
- Reduces the urinary hydroxyproline excretion

## Losing fat

One of the major issues with losing weight and restricting calorie intake is the accompanying loss in muscle mass. Muscle mass has been directly proven to stimulate metabolism and fat loss. Studies have shown that individuals receiving human growth hormone experience a significant lipolysis effect. Growth hormone increases the fat burning mechanism intrinsic to IGF-1; therefore, preserving and increasing lean body mass. IGF-1 also reduces cortisol levels and improves and regulates hormonal levels, which can be affected by calorie-restricted diets.

Improving the preservation of muscle mass when fat loss is experienced also benefits the health of an individual during weight loss procedures. Studies have shown that the pituitary gland contains the same amount of growth hormone through an individual's lifetime. With age, however, the ability to release that growth hormone is blocked in the feedback loop between IGF-1 in the liver and the hypothalamus in the brain. Instead of reduced levels of IGF-1 signaling to the brain to direct the pituitary gland to make more growth hormone, this feedback loop is broken down with age. This is why supplementing with IGF-1 is not associated with a negative feedback loop.

*Refer to references 34-35.*

## Slowing the aging process

Growth hormone is the primary hormone of the endocrine system. As it pulsates out from the pituitary gland, it is quickly converted by the liver into IGF-1, the metabolite form of the hormone that is ready to be used by the body. Growth hormone and IGF-1 levels decrease significantly as humans get older, especially after the age of 40. The decline in growth hormone is directly associated with certain aging signs like wrinkling skin, graying hair, decreased energy, decreased sexual function, increased body fat, heart disease, and weak and brittle bones. All of these symptoms of aging can be slowed down and even reversed with administering natural IGF-1 to counteract the biological aging process.

In addition, research has shown that IGF-1 reverses the shrinking of the thymus, which is one of the most important immune modulation organs in the body. This research shows exciting benefits of IGF-1 for those looking to halt and reverse the aging process.

*Refer to references 36-38.*

## Increasing lifespan

IGF-1 has the potential to increase lifespan. The blueprint of life that determines age is DNA. The Department of Clinical Research at the Longevity Institute International has studied how natural sources of IGF-1 may soon be able to turn old cells into new ones. IGF-1 can help produce new healthy cells and keep them in a healthy state for as long as possible. The cells ability to function relies on the genetic material of DNA. This resides in the nucleus of the cell that codes for all proteins, hormones and enzymes that make the cell run. Oxygen radicals and other factors such as UV light are constantly damaging DNA. DNA has the ability to repair itself but this ability is dramatically reduced within the aging process. Certain antioxidants can reduce the damage to DNA, but none have been shown to be as effective as IGF-1.

European researchers have shown that IGF-1 is capable of doing what other antioxidants cannot; IGF-1 initiates the transportation of nucleic acids into the nucleus of the cell where DNA resides. It provides the raw materials necessary to repair damage to DNA and initiate cell division, helping to slow the aging process.

*Refer to references 39-40.*

## Improving blood sugar utilization

Synthetic human growth hormone injections can cause insulin resistance and further complicate the conditions of type II diabetics. On the other hand, natural IGF-1 actually has similar properties to insulin and helps improve the blood sugar profiles in these individuals. Studies were conducted by researchers at the Nemours Children's Clinic in Jacksonville, Florida, on three groups of individuals with insulin resistance. They concluded that patients treated with IGF-1 had less muscle loss, improved outcomes from surgery and normalized blood sugar levels, even when administered with conflicting pharmaceuticals that are known to cause insulin resistance.

*Refer to reference 41-42.*

## Diabetic neuropathy

Peripheral neuropathy is a debilitating nervous system complication experienced by both type I and type II diabetics. IGF-1 expression in tissue is impaired by diabetic conditions leading to sensory and motor neuron damage. Studies have shown that restoring serum IGF-1 levels can improve motor neuron function and prevent nerve demyelization. These findings have shown that the restoration of IGF-1 levels may be an effective treatment for diabetic neuropathy.

*Refer to references 43-44.*

## Improving heart functions

IGF-1 has been shown to improve the cardiac functions of patients with congestive heart failure. In a randomized double-blind study conducted at the University Hospital of Zurich, the administration of IGF-1 to patients was associated with a 27% rise in the cardiac index and a 21% boost in the stroke volume index. The heart improved in strength and pumped more blood. This was also accompanied by a reduction in systemic vascular resistance, a 25% decline in pulmonary artery pressure and a 33% decrease in the right arterial pressure, while the placebo group experienced no such improvements.

*Refer to references 45-46.*

## Repairing nerve damage

IGF-1 has been shown to repair and reconnect severed nerve endings up to a distance of six millimeters. According to scientists at the Institute of Neurobiology at the University of Gothenburg, IGF-1 by itself or in combination with other growth factors can stimulate nerve regeneration. IGF-1 has been shown to have a remarkable growth effect on spinal cord motor neurons by increasing neural activity in the spinal culture by 150-270%. It has also been shown to significantly decrease the preprogrammed cell death in embryos and has shown a tenfold increase on the intramuscular nerve sprouting in laboratory mice.

Researchers at the University of Michigan have also demonstrated that IGF-1 can stimulate the protective covering around the nerves, the myelin sheath. In debilitating diseases like multiple sclerosis and ALS (Lou Gehrig's disease), damage around the myelin sheath prevents signals between the brain and the nerves from being transmitted. IGF-1 and other growth factors have been shown to re-grow this protective sheath. IGF-1 was the most effective of the growth factors in inducing the growth of the myelin sheath and neuron cell and also helps the nerves remain normal and re-grow even when diabetic conditions were present.

The results of these studies are tremendous for individuals with MS and ALS who experience a loss of cortical motor neurons and for victims of other diseases that affect the peripheral nerves.

*Refer to references 47-48.*

## Relieving fibromyalgia

Individuals with fibromyalgia are growth hormone and IGF-1 deficient. They experience muscle weakness, a reduced exercise capacity and chronic fatigue syndrome. A recent study found that 40% of fibromyalgia patients had lower IGF-1 levels when compared to normally healthy adults in their age and gender group. The study then looked at fifty of these same individuals and found that over 82% of them lacked the ability to properly secrete growth hormone.

Research has shown that IGF-1, the metabolite of growth hormone, can improve muscular endurance, strength and immune response. Directly administering a natural IGF-1 substitute in lieu of this lack of proper growth hormone secretion could prove to be an ideal natural alternative for individuals suffering from fibromyalgia.

*Refer to references 49-50.*

## Reducing prostate-specific antigens

In a study conducted at the Medical College of Wisconsin, IGF-1 levels were found to be unassociated with heightened prostate specific antigen (PSA) levels. The findings, published in the International Journal of Anti-Aging Medicine, indicate that prostate cancer incidences rise as men increase in age, whereas the blood levels of IGF-1 significantly decrease over the same timeframe at a rate of about 14% per decade after the age of thirty. In fact, IGF-1 may reduce PSA readings that are greater than four. The study also found that in over 3,000 patients, no increase in prostate cancer or any other malignancy was found in long-term treatment.

In another study, Dr. Ronald Klatz, President of the American Academy of Anti-Aging Medicine, found that there were no reported cases of cancer among 800 treated patients, demonstrating that increased IGF-1 levels may have a protective and stimulating effect on the immune system. Further studies have shown that alternative therapies in treating prostate cancer with direct supplementation of endocrine hormones have actually significantly reduced PSA levels above fifty down to normal ranges of zero to four. This is attributed to the natural production of killer immune cells that were able to destroy the cancer cells.

*Refer to reference 51-52.*

## Improving immune system responses

There is an interesting relationship between IGF-1 and the immune system. The activity between all major immune cell types such as T-cells, B-cells, natural killer cells and macrophages is altered with increased IGF-1 levels. This is because increased IGF-1 levels are involved in the production of lymphocytes, and in turn, can actually produce more IGF-1. This provides an alternate source of IGF-1 production other than the liver and a baseline for cellular communication between the immune system and the neuro-endocrine system.

*Refer to references 53-54.*

## Bone fracture, density and osteoporosis

Bone related complications and illness are one of the leading concerns of the aging population today. Bone is a dynamic tissue that is constantly reabsorbing and renewing itself by principal cells that mediate this process. The three main cells involved are osteoblasts, osteoclasts, and osteocytes. IGF-1 plays a critical role in bone growth, bone mass and strength by stimulating the production and function of these cells. Studies have consistently shown that IGF-1 may have an implication in treating bone fractures and bone complications like osteoporosis.

*Refer to references 55-57.*



## Arthritic complications

In spite of IGF-1 expression being increased in patients with osteoarthritis and rheumatoid arthritis, there may actually be less bioavailability of IGF-1 in the body's tissues. This is linked to the increased expression of insulin-like growth factor – binding protein (IGFBP), especially IGFBP-3 & 5, which may limit the bioavailability and affect IGF-1 has as an anabolic, anti-inflammatory, and tissue regenerating mechanism. Furthermore there is some exciting research on IGF-1 suspended in topical carriers increasing cartilage and subchondral bone repair in osteoarthritis. On the other hand patients with chronic arthritic conditions have been shown to not only have a decreased expression of IGF-1, but also a decreased expression of other hormones like growth hormone and testosterone as well.

*Refer to references 58-59.*

## Additional Growth Factor Research

### Cosmetic and topical applications of growth factors

Photo damaged skin is the consequence of life long exposure to the sun. In fact, most changes in our aging skin are accelerated by the sun's rays. These changes come in forms of wrinkles, dark spots, skin cancer, broken vessels, yellowing of skin tone, and leathery skin. Researches have noticed that photo damaged skin correlates with certain aspects of acute and chronic wound healing. Growth factors have demonstrated positive cosmetic and clinical outcomes of topical applications for photo damaged skin. Growth factors can initiate wound healing, promote new skin cell proliferation, increase collagen formation, stimulate formation of capillaries under the skin for oxygen delivery and participate in tissue rejuvenation on multiple levels of the skin. Growth factors may hold the key to reducing signs of skin aging and repairing photo damage.

*Refer to references 60-63.*



## **Tendon, ligament, bone and connective tissue healing**

Growth factors (bone morphogenetic protein, transforming growth factor  $\beta$ , fibroblast growth factor, vascular endothelial, platelet derived growth factor, epidermal growth factor and insulin-like growth factor) can enhance fracture-healing rates in bones, ligaments, tendons and open wounds. Many growth factors in velvet antler initiate the tissue rebuilding process, while reducing inflammation and stimulating collagen production. Additionally, growth factors are present in multiple stages of the healing process and play a role in shortening and improving the recovery from tissue laceration, ruptures, tears and inflammation.

*Refer to references 64-68.*

## **Nerve regenerating properties**

Neurotropic factors isolated in velvet antler are polypeptides that support the growth, differentiation and survival of neurons. These neuro-regenerative factors increase motor neuron activity and support catecholamine production that enhances neurotransmitters and nerve transmission. There is a belief that these growth factors could be used to treat mood disorders and even more severe complications of the peripheral nervous system like neurodegenerative diseases.

*Refer to references 69-71.*

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