VELVET ANTLER: 2000 YEARS OF SCIENTIFIC TRADITION

Abstract

Scientists are now proving what oriental tradition has known for more than 2000 years, deer velvet antler is good for you. Velvet antler has been one of the most prized health tonics in traditional oriental medicine for over 2000 years. Today, in addition to its FDA supported use for arthritis treatment and its' proven enhancement of athletic performance, velvet antler's bioactivity probably has undiscovered medical potential for humans with regards to boosting immunity, preventing illness, and propagating longevity.

Pharmacological efficacy

Velvet antler is named for the soft growing antler tissue which is cast off and re-grown every year by Cervus or deer. Because of its' rapid growth rate, velvet antler is a complex substance with unique bioactive properties. Chinese and Korean historical literature describes the efficacy of velvet antler as a preventative medicine in the quest for health; velvet antler figures prominently as a holistic medicine which has tonic effects on health and well-being of men, women, and children (Brekhman 1980).

Since the earliest velvet antler research, in Russia in the 1930s, scientists and pharmacists have attempted to provide sound scientific reasoning for it’s purported therapeutic effects. As a result, over 250 articles have been published on the biochemical composition and pharmacological effects of velvet antler. Today, scientific theory, empirical evidence and clinical research supports the notion that velvet antler may amplify the body’s metabolism in general, assist immune and phagocytic functions, preserve and renew tissues (accelerating growth and healing), ameliorate both gonadotropic and thyroid function and have positive cardiovascular benefits (Church, 1999).

This pharmacological activity is highly correlated with several of velvet antler's bioactive components. Velvet antler is composed of an aggregate of distinct cell types including fibroblasts, chondroblasts, chondrocytes, and osteocytes (Banks and Newberry 1982). In fact, velvet antler is an extraordinary storehouse of nutrients our bodies need including collagen consisting of glycine, alanine, proline and hydroxyproline; proteins including branched-chain amino acids isoleucine, leucine and valine; plus, alanine, arginine, cysteine, glutamic acid, glycine, histidine, lysine, methionine, phenylalanine, proline, serine, spartic acid, threonine, tryptophan and tyrosine; proteoglycans; glucosaminoglycans including N-Acetyl-glucosamine, chondroitin sulfate A, dermatan sulfate, keratin sulfate and hyaluronic acid; androgens; estrogens; growth hormones IGF-1, IGF-2, & TGF (Transforming Growth Factor); polyamines; mucopolysaccharides; phospholipids including omega-6 fatty acid; prostaglandins; nucleotides; monoamine-

oxidase inhibitors, hematopoietin; ectosaponins; erythropoietin; gangliosides; and high in minerals Ca, P, Fe, Mg and Zn (Sunwoo 1996).

Reported pharmacological effects

- stimulating and tonic effects
- accelerated cell recovery and renewal
- growth-stimulating effects
- androgenic/gonadotropic effects
- anti-inflammation effects
- anti-arthritis effects
- anti-stress effects
- anti-tumor effects
- cardiovascular effects (anti-cholesterol, haemotopoietic, hypotensive)

Reported biochemical composition

- lipids (omega-6 fatty acid)
- polysaccharides
- polyamines
- all essential amino acids
- high in Ca, P, Fe, Mg and Zn
- collagen I, II, IIB and X
- proteoglycans
- glycosaminoglycans (GAGs)
- prostaglandins
- growth factors IGF-1, IGF-2, TGF
- nucleotides
- gangliosides
- monoamine-oxidase inhibitors

While the therapeutic claims for velvet antler in traditional medicine are extraordinarily wide ranging, the fact that velvet antler is still in use today, after 2000 years, is a testimony in itself - velvet antler works! Certainly, a more scientific understanding of the bioactive components of velvet antler is necessary to define the nature of their effects. But, with over 70 years of research, new insights and more studies, velvet antler is "poised to be one of the most versatile multipurpose natural remedies to arrive in the West" (Life Extension Magazine). As the New Zealand Game Industry Board stated: "With the results expected from new scientific research, it is likely that velvet will become as accepted in western countries as vitamins and minerals." Obviously, with past proven effects and future forecasted results, the potential applications of velvet antler in Western natural medicine and health care are, in fact, scientifically significant...

VELVET ANTLER AND THE NEXT 2000 YEARS

In a new millennium of supplement trends and designer foods fads, another "brand new", "next best" and "must have" nutriceutical may justly receive some skepticism. Perhaps

there is some validity to a 2000 year old "brand new, next best, must have" completely natural, prized health tonics of traditional oriental medicine.

Seemingly, velvet antler acts as an adaptogen in the body; it adapts to the bodies deficiencies to provide the raw material for the body to attain optimum health: a nontoxic, non-habit forming nutrient. Research so far supports a therapeutic role for velvet antler in a number of conditions. The FDA has supported velvet antler use for arthritis treatment, numerous experiments have shown it enhances athletic performance and research suggests significant clinical implications to the entire system including the immune system, the cardiovascular system, and the nervous system. Dr. David Gerrard, sports physician associated with Otago University, the New Zealand Game Industry Board (NAGIB) and Velvet Antler Research New Zealand (VARNZ) Ltd., believes "early velvet antler experimental results are a good start, and warrant more research having just scratched the surface of the subject." For example, new studies are showing many interim responses to velvet antler such as wound healing effects, decreasing body fat effects and anti-aging effects. Although, more scientific understanding is necessary to define that nature of velvet antler's bioactive components and their independent and synergistic effects in animal systems. The research, though considerably complex, is likely to be very rewarding: velvet antler's rejuvenative and tonic actions may benefit athletes, the elderly and disease patients alike. If it is true that "time will tell", velvet antler speaks volumes from the past that echo into the future.

CARTILAGE, JOINT AND ARTHRITIC BENEFITS OF VELVET ANTLER

In 1999, velvet antler was scientifically substantiated, by research and clinical studies, in compliance with FDA regulations, "to support healthy joint structure and function". In fact, velvet antler, as treatment for arthritic conditions, is of increasing interest to physicians and pharmacists. The bioactive substances contained in velvet antler, namely collagen, glycosaminoglycans (GAGs), prostaglandins and pantocrin seem to work synergistically and dependantly with other velvet antler cofactors to produce arthritic relief beyond that seen with any individual substance. Velvet antler is a case of the whole being greater than the parts.

Collagen

Velvet antler is antler in its cartilaginous stage. Collagen is a primary component of cartilage, responsible for about half of the dry weight of cartilage. (Yasui and Nimni, 1988.) Type II collagen primarily forms cartilaginous velvet antler. Type II collagen seemingly assists T-cell production of T-helper cell- inhibiting cytokines to decrease inflammation of joints (Kalden and Sieper, 1998). Particular cartilaginous degenerative conditions such as osteoarthritis (OA) and rheumatoid arthritis (RA) are attributed to alterations in collagen type II synthesis. As an auto-antigen, type II collagen exerts

significant effects when given to RA patients (Trentham et al., 1994). Type II collagen is also significant in the treatment of juvenile rheumatoid arthritis (JVA): after 3 months of therapy, 8 of 10 patients given oral type II collagen had less pain, less swelling and stiffness, with increased grip strength and ambulatory endurance (Barnett et al., 1996).

GAGs

GAGs are acidic polysaccharides composed of repeating units of amino sugar, primarily glucosamine and uronic acid. The most prominent GAG in velvet antler tissue is chondroitin sulfate with small amounts of keratin sulfate, dermatan sulfate and hyaluronic acid (Sunwoo et al. 1997). Research back in 1988 established that chondroitin sulfate is an extremely potent anti- inflammatory agent. Oral chondroitin sulfate has demonstrated gradual reduction in clinical symptoms of OA superior to those attained with traditional NSAIDs without associated side effects and having a lasting effect up to three months post termination of supplementation (Morreal et al., 1996). Chondroitin and glucosamine are used today by patients who have arthritis, with excellent results (Sim and Sun-woo, 1998). Hyaluronic acid also has anti-inflammatory and analgesic properties as well as promoting anabolic behaviour in chondrocytes. Hyaluronic acid decreases in the synovial fluid of OA patients where reversing this abnormality through supplementation provides relief and repair of damaged joint cartilage (McCarthy 1998).

Prostaglandins

Prostaglandins and pantocrin are substances with varying physiologic effects. Velvet antler prostaglandins and pantocrin can act as a natural anti-inflammatory and may assist its capacity to reduce the swelling associated with arthritis (Church, 1999).

In light of the collagen, GAG, prostaglandin and pantocrin research and their high concentrations in quality velvet antler, velvet antler has received scientific substantiation as dietary supplement for the support of healthy joint function. Even if you do not have arthritis measurable changes occur in joint cartilage by the age of thirty, worsening with age. As such, it makes sense to use velvet antler as a nutritive supplement for its wholistic and superior chondroprotecting and anti-inflammatory benefits: it's a simple case of an ounce of prevention!

IMMUNE SYSTEM BENEFITS OF VELVET ANTLER

Traditionally, velvet is used in Asia as a nourishing tonic before winter to prevent illness. There is extensive anecdotal evidence of velvet antler's effectiveness to prevent sickness, but recent scientific evidence is verifying its immune system benefits.

Immuno-stimulant

Velvet antler has been scientifically determined to have significant immune stimulant activity. Velvet antler supplementation in mice and rats reportedly increased monocytes, phagocytes, and leukocytes which serve to enhance immune function (Church, 1999). Mice given velvet antler pantocrin extract were shown to enhance phagocytosis and immunoglobulin levels resulting in significant immune stimulant benefits (Wang 1996). Velvet antler was also shown to increased production of human white blood cells; this response, or immunopotentiation, strengthens the body's own immune system mechanism to fight disease and infection (Suttie et al. 1996).

Immuno-compliment

There are many conditions, such as cancer or AIDS, where boosting the body's immune system would improve results of remedial treatments. Science strongly indicates that velvet antler's immunopotentiation supports other treatments of disease. For example, velvet antler extracts slow tumor growth and demonstrate anti-tumor activity against Bacillus P-92, a tumor cell line, in mice (Suttie et al., 1994). Also, fermented velvet antler increases the survival rate of mice that have tumors, from 25-40% (Church, 1999).

Presently, research is being undertaken in Korea showing velvet antler's effectiveness when used to build up the strength and resilience of patients undergoing cancer treatment. Although the mode of action is not entirely determined it is believed velvet antler not only enhances the immune system but also suppresses the cancerous growth in a manner similar to shark cartilage. It is suggested that velvet antler selectively destroys blood vessels of cancerous cells constraining cancerous propagation by limiting its nutrients. Secondly, it is suggested that velvet antler may limit the destruction of healthy tissue around cancerous cells constraining cancerous propagation by limiting the space in which it can grow.

Velvet antler is also undergoing studies as an immune enhancer for patients with HIV, at the Institute for Traditional Medicine in California, with positive preliminary findings.

Velvet antler is proving to be a preventative and supportive medical treatment. Even at the lowest dilution, immune enhancement effects of velvet antler were observed. (Suttie et al. 1996). Velvet antler has many positive effects on the body's immune system and in the treatment of a range of illnesses and conditions. Further research is required to confirm these preliminary findings, but seemingly, velvet antler is a booster shot of immunity!

ANTI-STRESS, ANTI-FATIGUE AND ANTI-DEPRESSION BENEFITS OF VELVET ANTLER

Velvet antler has been demonstrated to prevent or reduce many of the symptoms of a hectic lifestyle or chronic over-training including stress, fatigue, and depression.

Anti-stress

Velvet antler demonstrates an ability to prevent or reduce cardiovascular stress. A Japanese study in which 8 out of 10 patients received velvet antler pantocrin resulted in significant and transient reductions in arterial blood pressure. The researchers concluded that pantocrin acted directly on blood vessels and on the parasympathetic nervous system to lower arterial blood pressure (Fisher et al., 1998). In biochemical studies conducted at the Oriental Medicine Research Center of the Kitasato Institute in Tokyo, Japan, polysaccharides have been identified in velvet antler that increase HDL (desirable) cholesterol, thin the blood and reduce clotting contributing to improved circulation.

Velvet antler's positive effects on the cardiovascular system can aid in anemia, reduce arterial blood pressure, improve circulation, decrease risk of stroke, and decrease risk of cardiovascular disease and reduce cardiovascular stress in general (Fennessy 1991); (Fisher et al., I 998); (Zhao et al. 1992).

Anti-fatigue

For centuries velvet antler has been used for combating the symptoms of fatigue and revitalizing the entire system. Fulder (1980) proposed a general theory to explain the anti-fatigue effect of velvet antler. He suggested "anti- fatigue substances" which include pantocrin, have a biologically active component called glycosides. Fulder proposes that the primary site of action of the glycosides is the hypothalamus and the pituitary gland causing release of natural revitalizing substances.

Also the haematopoietic effects of velvet antler, demonstrated in numerous experiments, stimulate red blood cell synthesis and increase erythropoietic activity (Sim et al. 1995). Such erythropoietic activity may well be responsible for the stamina-improving, energizing effects of velvet antler as seen in endurance runners (Brekhman et al. 1969).

Anti-depression

Irritability or depression are believed to be caused by depressed levels of dopamine, seratonin, norepinephrine, acetylcholine, and other neurotransmitters in the brain. Studies report velvet antler prevents the breakdown of these neurotransmitters prolonging their availability to the brain (Chen et al. 1992). Much like the popular supplement St John's Wort, velvet antler has an inhibitory effect on monoamine-oxidase activity which prolongs the availability of beneficial neurotramitters resulting in enhanced mood, energy, and well being.

Stress, fatigue and depression are the anti-productive results of daily living and training. Velvet antler supplementation can be a pro-active defense against these health antagonists!

MUSCULAR, ATHLETIC AND PERFORMANCE BENEFITS OF VELVET ANTLER

Research has demonstrated that velvet antler has beneficial effects on muscle strength, muscle endurance, and muscle recovery. There is ample scientific evidence from a number of studies revealing such effects in both animals and humans. It has been suggested that velvet antler composition including insulin-like growth factor-I (IGF-l), growth hormone (GH) precursors, and pantocrin work individually and synergistically to enhance muscle composition, exertional stamina and training recovery time.

IGF-l

It has been postulated that velvet antler may be a valuable source of unrefined IGF-l that can improve muscular development (Fennessy, P F 1991). While these findings require further elucidation, the implications could have very important benefits indeed...

IGF-l levels decline steadily in humans from the age of 25, with detrimental effects on muscle tissue, muscle strength, and muscle function. Restoring IGF-1 levels has enormous anabolic potential limited only by amino acid supply within muscle cells (Fryburg DA, 1995 and Murphy MG, 1998) . Furthermore, from IGF-1 your body restores other hormones it is lacking such as DHEA, Melatonin, Testosterone, Estrogen and Progesterone to normal individual levels. Unfortunately, simply elevating serum levels of free-form IGF-1 has not proven to be anabolic nor practical in healthy individuals (Yarasheski KE, 1992 and 1993 and Deyssig R, 1998).

But, feasibility studies using unrefined IGF-l show promising results. Unrefined IGF-l is bound to its binding protein-3 (BP3); BP3 appears to regulate the release of IGF-I to target tissue sites and to prevent IGF-1 from being cleared from the system. This IGFBP3 unit seems to be a necessary part of the existing anabolic system which uses the binding protein to release the IGF-1 when and where it is needed extending IGF-1's half-life and muscle building activity from minutes to hours.

These optimistic results suggest velvet antler biochemistry may contribute to restoring natural hormone levels as one ages; plus, boost muscle strength and growth without using synthetic steroids or other artificial chemicals.

GH precursors

The decline of GH with age is directly associated with many symptoms of aging, including wrinkling, gray hair, decreased energy and sexual function, increased body fat, osteoporosis and more. Clinical evidence demonstrates that by replacing GH these symptoms are reversed to restore hair color and growth, increase energy, significantly reduce body fat, regain bone tissue, plus a score of other health benefits. Natural

secretagogues (GH precursors) may be the best hope for raising growth hormone in an entirely physiologic manner.

Elk velvet antler contains significant concentrations of GH precursors (Fisher et al., 1998) which may stimulate the endocrine system to release natural growth hormone. Chemical analysis of velvet antler reveal notable GH secretagogues such as branched-chain amino acids (BCAA) isoleucine, leucine and valine; plus, glycine and several minerals including zinc and magnesium (Sunwoo 1996).

Amino acids have long been reported to produce significant increases in the circulating GH levels. BCAAs, considered the most important amino acids for sports performance, act as an anabolic (muscle-building) agent. A study in the International Journal of Sports Medicine, showed BCAAs potentiated GH levels and increase fat loss during dieting. Several other reports have indicated that even small amounts of glycine increased strength by stimulating the release of GH (Kasai et al. 1980). In one study 6.75 grams of glycine taken orally, increased GH levels four-fold. In another study, by Brakeman and Pfeiffer (1986), male subjects given 30 grams of glycine orally over a two week period increased GH levels by ten-fold.

In addition, studies indicate supplementing with zinc and magnesium can potentiate GH effect on tissue healing, tissue repair, and muscle growth (Fennessy 1991).

Considering the many pathways velvet antler may increase GH, velvet antler may be considered a natural "stacking" agent. That is, velvet antler may pack the right nutrients in the right proportions so to derive synergistic and optimal benefits- a true panacea for GH release.

Testosterone stimulators

Testosterone's muscle building effects are well known by scientists. In a study by Dr. Gilbert Forbes and colleagues (1992) normal subjects gained an average of 16.5 lbs of lean body mass in 12 weeks of testosterone supplementation. Velvet antler supplementation was shown to significantly increase (five to six times) blood plasma testosterone levels (Fisher et al. 1998). It is suggested the performance enhancement effects of velvet antler are partly the result of this gonadotropic effect (Church 1999).

Although there is considerable evidence for the gonadotropic effects of velvet antler (Fennessy 1991), it is not yet fully known how velvet antler causes increase in testosterone. Velvet antler may mimic or stimulate hormonal action in a number of different places. Firstly, velvet antler has a positive effect on the male hypothalamus resulting in a increase in natural testosterone. Secondly, it is postulated that velvet antler BCAAs may stimulate testosterone release in male Leydig cells in the testes (Fisher et al.

1998). Lastly, studies indicate zinc and magnesium, as found in velvet antler, prime natural testosterone production improving the gonadotropic effects of velvet antler.

The finding that velvet antler naturally boosts testosterone production in the body is a very exciting development. Velvet antler may become the next popular body building supplement akin to creatine monohydrate, tribulus terrestris, or prohormones; velvet antler may become the supplement of choice for both athletes and aging males to increase natural testosterone levels.

Pantocrin et al.

Pantocrin was observed in the late 1960s to have a positive effect on the endurance of laboratory animals. Pantocrin extracts increased the working capacity of mice (Brekhman et al., 1969), and these early findings led to experiments designed to study the effects of pantocrin on athletes.

In one study in Russia, subjects were given either pantocrin or rantocrine (reindeer antler). The control group exhibited 15kg/m of dynamic work potential, athletes given pantocrin exhibited 74kg/m dynamic work potential, and those given rantocrine exhibited 103kg/m dynamic work potential (Yudin and Dubryakov, 1974). In a like manner, the athletic performance in a 3000m run was enhanced following pantocrin administration (Breckhman et al. 1969).

Early theorists suggested pantocrin and other naturally occurring substances in velvet antler served to accelerate the body's natural restorative processes following physical, external, or biochemical challenge (Fulder, 1980). Today, it is suggested velvet antler's adaptogenic properties combined with its anti- inflammatory effects (Zhang 1992), haematopoietic or oxygen-carrying improvements (Kim et al. 1982), increased erythropoietic activity or red blood cell synthesis (Yoon 1989), and reported lactic acid removal efficiency contribute to enhance muscle composition, exertional stamina and recovery time. (Gerrard et al.)

A completely natural substance with no side effects, velvet antler is backed by a strength of studies demonstrating its positive effects on the muscular system. Pound for pound, velvet antler proves to be one powerful athletic supplement!

POTENT NEUROTROPIC BENEFITS OF VELVET ANTLER

Velvet antler is regarded as having muscle strengthing effects on the human body. Dr Arkady Koltun, one of the foremost Russian researchers testing velvet antler on the neuro-muscular system, found that velvet antler also has potent neurotropic properties or potent nerve strengthening effects (Fulder, 1980). These neurotropic properties not

only increase strength but may help in treating nerve injury or nerve-damaging disorders such as multiple sclerosis (MS) or Guillian-Barre syndrome.

Neural Strength Benefits

Velvet antler may fall into of a whole new class of athletic supplements called neurotransmitter enhancers which relate to muscle motor unit recruitment. It enables an athlete to recruit more of these motor units resulting in increased strength levels.

In the early '90s, European strength and power athletes started to experiment with this class of supplements. As a result they were be able to lift more weight, build more strength and improve athletic performance. Velvet antler has been shown to provide the same benefit of augmenting neural conductivity and motor unit recruitment for improved strength and performance.

Neural Injury Benefits

In Japanese experiments with rats and rabbits the pantocrin in velvet antler was shown to enable quicker recovery from induced whiplash-like injuries (Takikawa et al. 1972 a,b). There is also support for such effects from double- blind studies in humans suffering from cervical injuries, where velvet antler treatment aided recovery (Uelki et al. 1973) (Church, 1999). The effect is thought to be due to increases in glycolosis, which is a necessary process in the maintenance of healthy nerve tissue. Seemingly, pantocrine in velvet antler enhances neural glycolysis to speed healing of damaged nerve tissue.

Neural Disorder Benefits

Gangliosides are a new focus for nerve disease research. In the Proceedings of the National Academy of Science, scientists described an important piece in the puzzle in nerve-damaging disorders such a MS and Guillian-Barre syndrome. Researcher verified a previously suspected molecular bridge between nerve cells and their surroundings which, when broken, causes nerves to deteriorate. The team suggests gangliosides are crucial for maintaining this bridge and the integrity of nerve cells.

Gangliosides are a family of complex carbohydrate and lipid-based molecules and a hallmark of nerve cell membranes. Chemical analysis of velvet antler reveal the presence of these gangliosides (Sunwoo 1996). Velvet antler gangliosides, and their protective and beneficial effects on the central and peripheral nervous systems, may figure prominently in nerve disorder therapies of the future.

Conclusion

It is suggested velvet antler has many neurotropic benefits. Velvet antler was shown to have positive benefits on the neural recruitment of muscle motor units, to aid in neural

repair after injury, and to contain an important component of nerve cell membranes. Although more research is always needed, with the positive neurotropic results so far, one doesn't need nerves of steel to bet on velvet antler!

REFERENCES

Banks, W. J. and J. W. Newberry. 1981 Light microscope studies of the ossification proccess in developing antlers. In Antler Development in Cervidae. ed. R. D. Boone. Caesar Kleberg Wildlife Research Institute. Kingsville Texas. pp 231-260.

Barnett, M.L.; D. Gombitchi; D.E. Trentham. A pilot trial of oral type II collagen in the treatment of juvenile rheumatoid arthritis. Arthritis & Rheumatism, 1996; 39 (4): 623-628.

Brekhman, J.T;Y.L. Dubryakov; A.L. Taneyeva. The biological activity of the antlers of deer and other deer species. lvestio Sibirskogo Orderlemia Akalemi Nank SISR, Biological Series No 10(2): 112-115.

Chen X, Jia Y, Wang B Chung Kuo Chung Yao Tsa Chih 1992 Feb;17(2):107- 110 Inhibitory effects of the extract of pilose antler on monoamine oxidase in aged mice. [Article in Chinese] Academy of Traditional Chinese Medicine and Materia Medica, Jilin Province, Changchun.

Church, J.S. Velvet Antler: Its historical medical use, performance enhancing effects and pharmacology. Elk Tech International Research Centre, Calgary Canada 1999.

Deer velvet boost to strength and recovery New Zealand Game Industry Board, February 18, 1998.

Deer Velvet Link with Athletes New Zealand Game Industry Board, February 18, 1998.

Deyssig, R., Frisch H., Blum WF., and Waldhor T. Effect of growth hormone treatment on hormonal parameters, body composition and strength in athletes. Act Endocrinol. 128:313-318, 1998.

Fennessy, P F 1991 Velvet antler: the product and pharmacology. Proc. Deer Course for Veterinarians (Deer Branch of the NZ Vet Assoc). 8 169-180

Fisher, B.D.; M. Gilpin; D. Wiles. Strength training parameters in Edmonton police recruits following supplementation with elk velvet antler (EVA). University of Alberta. 1998.

Fryburg DA, Jahn LA, Hill SA, Oliveras DM, Barrett EJ. Insulin and insulin-like growth factor-I enhance human skeletal muscle protein anabolism during hyperaminoacidemia by different mechanisms. J Clin Invest. 96(4):1722-9, 1995

Fulder, S. The drug that builds Russians. New Scientist 1980b;87 (1215):516- 519.

Gerrard, D.F; G.G. Sleivert; A. Goulding; S.R. Haines: J. M. Suttie. Clinical evaluation of New Zealand deer velvet antler on muscle strength and endurance in healthy male university athletes.

Josephson, D. Concern raised about performance enhancing drugs in the US. BMJ I 998;3 17:702 (12 September).

Kalden,J.R., and J. Sieper. Oral collagen in the treatment of rheumatoid arthritis.Arthritis and Rheumatism, 1998; 41(2): 191-194.

Kang, W. S. 1970. Influence of antler (deer horn) on the mesenteric mast cells of rates exposed to heat, cold or electric shock. J. Cathol. Med. College 19: 1- 9.

Kamen, B. Red Deer AntlerVelvet: Growth Hormone Connection, and More! Health Sciences Institute. 1998; 2(8): 1-2.

Kim, K. W. and S. W. Park. 1982. A study of the hemopoietic action of deer horn extract. Korean Biochem. J. 15: 151-157.

McCarthy, M.F. Enhanced synovial production of hyaluronic acid may explain rapid response to high dose glucosamine in osteo arthritis. Medical Hypothesis 1998 Jun;50:507-10

Morreal, P; R. Manopulo; M. Galati; L. Boccanera; G. Saponati; L. Bocchi. Comparison of the antiinflammatory efficacy of chondroitin sulfate and diclofenac sodium in patients with knee osteoarthritis. J Rheumatol 1996; 23:1 385-I 391.

Murphy MG, Plunkett LM, Gertz BJ, He W, Wittreich J, Polvino WM, Clemmons DR. MK-677, an orally active growth hormone secretagogue, reverses diet- induced catabolism. J Clin Endocrinol Metab. 83(2):320-5, 1998

Sim, J. S., Sunwoo, H. H., Hudson R. J. and Kurylo, S. L. 1995b. Chemical and pharmacological characterization of Canadian elk (Cervus elaphus) antler extracts. page 68, 3rd World congress of medicinal acupuncture and natural medicine, Edmonton, Alberta, Canada, August 10-12-1995.

Sim, J.S., and H. H. Sunwoo. Canadian scientists study velvet antler for arthritis treatment. Canadian Elk & Deer Farmer, Winter 1999 39-40. Sunwoo, H.H.; L.YM. Sim; T. Nakano; R.J. Hudson; J.S. Sim. Glycosaminoglycans from growing antlers of wapiti (Cervus elaphus). Canadian Journal of Animal Science. 1997; 77:7l5-21.

Sunwoo, H. H. and Sim, J. S. 1996. Chemical and pharmacological characterization of Canadian elk (Cervus eoaphus) antler extracts. 96ñWorld Federation Symposium of Korean Scientists and Engineers Association, June 28 ñ July 4, 1996, Seoul Korea, WFKSEA Prodeedings 96: 706-

713.

Suttie,J.M., and S. Haines. 1996. G.I.B. component of velvet antler programme: evaluation of velvet antler. New Zealand: VARNz Ltd.

Takikawa, K., N. Kokubu, et al. 1972. Studies on experimental whiplash injury. III. Changes in enzyme activiation of cervicxal cords and effect of Pantui extracts, Pantocrin as a remedy. Folia Pharmacol Japon. 68: 489-493.

Trentham, D.E.; RA. Dynesius-Trentham; F.J. Orav; et al. Effects of oral administration of type II collagen on rheumatoid arthritis. Science 1993; 261:1 727-1730.

Yarasheski KE., Campbell JA., Smith K., et al: Effect of growth hormone and resistance exercise on muscle growth in young men. Am. J Physiol. 262 (Endocrinol. Metab. 25):E261-E267, 1992.

Yarasheski KE., Zachwieja JJ., Angelopolous TJ., and Bier DM. Short term growth hormone treatment does not increase muscle protein synthesis in experienced weight lifters. J. Appl. Physiol. 74:3073-3076, 1993.

Yasui, N., and M.E. Nimni. 1998. Cartilage collagens. In: Collagen, Volume I. M.E. Nimmi, ed. Boca Raton: CRC Press. 225-24.

Yoon, P. 1989. The effect of deer horn on the experimental anemia of rabbits. Journal Pharmaochemical Society Korea. 8: 6-11.

Yudin, A. M. and Y L. Dubryakov 1974.A guide for the preparation and storage of uncalcified male antlers as a medicinal raw material. In: Reindeer Antlers, Academy of Sciences of the USSR. Vladivostock: Far East Science Center.

Wang, B. Advances in research of chemistry, pharmacology and clinical application of pilose antler. Proceedings of the 1996 International Symposium on Deer Science and Deer Products. 1996; I4-31.

Wang, B. X., X. H. Zhao, et al. 1988. Stimulating effect of deer antler extract on protein synthesis in senescence-accelerated mice in vivo. Chem. Pharm. Bull. 36: 2593-2598.

Zhang ZQ, Zhang Y, Wang BX, Zhou HO, Wang Y, Zhang H Yao Hsueh Hsueh Pao 1992;27(5):321-324 Purification and partial characterization of anti- inflammatory peptide from pilose antler of Cervus nippon Temminck. Department of Pharmacology, Academy of Traditional Chinese Medicine and Materia Medica of Jilin Province, Changchun