



**Australian Government**  

---

**Rural Industries Research and  
Development Corporation**

# **Velvet Antler**

**a summary  
of the literature on  
health benefits**

**A report for the  
Rural Industries  
Research and Development  
Corporation**

By Chris Tuckwell

November 2003

RIRDC Publication No  
RIRDC Project No DIP-10A

© 2003 Rural Industries Research and Development Corporation.  
All rights reserved.

ISBN 0642 58651 9  
ISSN 1440-6845

***Velvet antler – a summary of the literature on health benefits***

*Publication No. 03/084*

*Project No. DIP-10A*

The views expressed and the conclusions reached in this publication are those of the author and not necessarily those of persons consulted. RIRDC shall not be responsible in any way whatsoever to any person who relies in whole or in part on the contents of this report.

This publication is copyright. However, RIRDC encourages wide dissemination of its research, providing the Corporation is clearly acknowledged. For any other enquiries concerning reproduction, contact the Publications Manager on phone 02 6272 3186.

**Researcher Contact Details**

Chris Tuckwell  
Rural Industry Developments  
PO Box 1105  
GAWLER SA 5118  
Phone: (08) 8523 3500  
Fax: (08) 8523 3301  
Email: [cdtuckwell@bigpond.com](mailto:cdtuckwell@bigpond.com)

In submitting this report, the researcher has agreed to RIRDC publishing this material in its edited form.

**RIRDC Contact Details**

Rural Industries Research and Development Corporation  
Level 1, AMA House  
42 Macquarie Street  
BARTON ACT 2600

PO Box 4776  
KINGSTON ACT 2604

Phone: 02 6272 4539  
Fax: 02 6272 5877  
Email: [rirdc@rirdc.gov.au](mailto:rirdc@rirdc.gov.au)  
Internet: <http://www.rirdc.gov.au>

Published in November 2003  
Printed on environmentally friendly paper by Canprint

# Foreword

RIRDC continues to support research and development projects linked to velvet antler production and marketing as well as many other projects that influence the development of the Australian Deer industry.

The Corporation agreed to fund the development and production of an information pamphlet about deer velvet antler during 2002/03. The aim of the pamphlet is to provide objective information about the use of velvet antler for human health.

An integral part of the project to develop the pamphlet was to undertake a review of health benefits described by available literature that the Deer Industry Research and Development Advisory Committee believed should be published to maintain an up-to-date perspective on this issue.

This project is funded from industry revenue that is matched by funds provided by the Australian Government.

This report, a new addition to RIRDC's diverse range of over 1000 research publications, forms part of our Deer R&D program, which aims to foster an Australian deer industry as a profitable and efficient mainstream agricultural enterprise.

Most of our publications are available for viewing, downloading or purchasing online through our website:

- downloads at [www.rirdc.gov.au/reports/Index.htm](http://www.rirdc.gov.au/reports/Index.htm)
- purchases at [www.rirdc.gov.au/eshop](http://www.rirdc.gov.au/eshop)

**Simon Hearn**  
**Managing Director**  
**Rural Industries Research and Development Corporation**

# Contents

- Foreword ..... iii
- Contents ..... iv
- Executive Summary..... v
- 1. Introduction..... 1
- 2. Objectives..... 2
- 3. Methodology ..... 3
- 4. Results..... 4
  - Health Benefits .....4
  - Traditional Chinese Medicine (TCM) .....4
  - TCM and Velvet Antler.....5
  - Composition and Active Ingredients .....5
  - Health Benefits Supported by Western Research .....7
  - Health Benefits for Animals .....9
  - Dose Rates and Safety .....9
  - Processing Considerations .....9
- 5. Discussion ..... 12
- 6. Communications Strategy..... 13
- 7. References for this Summary ..... 14
- 8. Velvet Research Reference List ..... 15
- Appendix 1: Australian Deer Velvet Pamphlet ..... 29

# Executive Summary

Deer velvet is a universal term used to describe immature antlers of male deer. The term originates from the covering of soft velvet-like hair that persists on growing antlers until they mature.

On commercial deer farms velvet antlers (immature antlers) are removed annually to:

- Protect all deer on the farm from injury
- Ensure a safe working environment for staff
- Harvest a valuable product used in Traditional Chinese Medicine (TCM)

In Australia, antler is only removed using anaesthetic by registered veterinary surgeons or people accredited by the National Velvet Accreditation Scheme (NVAS).

Historic literature records the long association of TCM (more than 2000 years) and the significant associations of the Russian and Roman cultures with deer velvet. Summary benefits described by TCM include a broad range of therapeutic effects as well benefits in promoting health and well being.

Despite long held differences in philosophy of TCM and Western Medicine, there is a slow but increasing interest in TCM by western communities. This is particularly evident as more people look to therapies and treatments that are natural (non chemical) non prescriptive, relieve symptoms and balance body functions to allow healthy lifestyles.

Available data clearly shows the significant research on deer antler that continues to be undertaken around the world, including Australia, and provides strong support to the growing acceptance that deer antler cartilage is a substance with significant future medical application potential.

An important concept that is a common theme of many research papers is that the combination of all components of velvet antler provides a synergistic effect that is greater than the total effect that would be achieved by the separate use of each of its individual constituents. That means that if velvet is broken down into its constituents that are used separately, their combined effect is significantly less than the effect realised when the nutrients are provided in the naturally combined form of velvet antler. In summary, *the effect of the complete product is greater than the summed effect of all components.*

Literature reviews related to the use of velvet antler products considered for this summary provide persuasive, credible evidence to support the claim that compounds in velvet antler may provide effective and long-lasting relief of the symptoms of osteoarthritis.

Reviews also support suggestions of additional benefits such as relief of some conditions associated with aging, stimulation of the immune system, assistance with growth and strength training and the absence of side effects.

# 1. Introduction

This document is not intended as a scientific literature review, rather it is a summary of benefits described by various reviews with some comments of caution provided by researchers about results of their own and other research.

There are many references to the historic use of deer velvet in TCM and it has been included in the *Chinese medical pharmacopoeia* since 168BC. Medicinal uses for deer velvet are also contained in the book, first published in the sixteenth century, called *Ben Cao Gang Mu* that is said to have been referred to by Charles Darwin as 'The Chinese Encyclopaedia.

The uses for deer velvet and deer co products are also included in *The Great Dictionary of Traditional Chinese Medicine*.

Although the successful Chinese and Korean approach to human health has been practiced for in excess of two thousand years, only in recent times are Western people beginning to accept that there are reasonable alternatives to Western approaches to human health. Increasingly people look to therapies and treatments that are natural (non chemical) non prescriptive, relieve symptoms and balance body functions to allow healthy lifestyles.

Deer were introduced into Australia during the Nineteenth Century. The animals dispersed and established wild populations at various locations across Australia mostly depending upon their points of release into the wild, and formed the basis for the deer industry in Australia today.

Since its beginnings in the 1970's, the Deer industry in Australia has continued to expand although it is still significantly smaller (one tenth) than the New Zealand deer industry. During its short history, the Australian velvet industry has relied almost exclusively on international demand for its product and has generally targeted Korean and Chinese markets competitively supplied by the world's biggest producer of farmed velvet, New Zealand. Most velvet has been exported to Asia as frozen (unprocessed) velvet antler.

Tourism data shows a continual increase in Asian tourists to Australia who may be familiar with and interested in purchasing velvet antler products while anecdotal information suggests a growing increase in interest of these products by Asian living in Australia. There are also a growing number of people looking for alternatives to Western medicine and their potentially dangerous side effects [14].

As the Australian deer industry matures, processing of Australian velvet antler is increasingly undertaken in Australia or New Zealand and often with Asian experts contributing to business and product development. Sophisticated processing facilities prepare velvet for direct consumption in Asian and domestic markets.

As a significant number of Australian people and their pets suffer from arthritic conditions of bones and joints (osteoarthritis, joint injuries, joint inflammation, etc), commercial opportunities for development of domestic markets for velvet antler products clearly exist.

## 2. Objectives

1. To review and summarise information reported in available recent literature reviews related to deer velvet antler deer with particular consideration of its benefits for human and animal health.
2. To produce an educational pamphlet for public use that outlines the composition, product forms and medicinal benefits of processed deer antler. The pamphlet will also contain a list of references for those wishing to do further investigation

### 3. Methodology

Project methodology included:

1. A review of current information available on the Internet and in other scientific literature relating to the chemical composition, safety, product types and consumer benefits of deer antler products.
2. Production of 5000 copies of a pamphlet containing details of consumer benefits, product types (powder, slice etc) common chemical analyses, safety etc as well as a list of references for further reading

Text for the pamphlet was reviewed by leaders of the velvet antler industry in Australia and one of the world's foremost researchers with deer antler, Dr Jimmie Suttie from New Zealand.

3. Distribution of copies of the pamphlet to Industry organisations and commercial companies

# 4. Results

## Health Benefits

Generally, deer velvet products available to people in Western societies is sourced from deer that are managed on farms according to strictly controlled quality assurance guidelines than ensure requirements for animal welfare and husbandry are maintained at acceptable standards.

Either veterinarians or people accredited by the National Velvet Accreditation Scheme (NVAS) remove velvet antler from male animals each year. The NVAS ensures consumers of deer velvet and the wider community that:

- Acceptable standards of animal welfare are maintained
- Deer Industry QA Programs product traceability requirements are supported
- Occupational Health & Safety requirements for personnel involved in velvet removal are maintained
- QA, residue and animal welfare expectations of international and domestic communities and clients are maintained
- As velvet is a health food it is handled and stored in a hygienic manner

## Traditional Chinese Medicine (TCM)

Documented literature relating to Traditional Chinese Medicine (TCM), that dates to well before the birth of Christ, reports and acclaims the health promoting properties of velvet antler (immature antlers of male deer).

Some of the main concepts [10] of TCM include:

- The idea of pairs or opposites in balance expressed as Yin and Yang (Yin is the rest phase where energy or Qi is replenished while Yang is the active phase that uses up Qi)
- Qi, the vital energy or life force that flows around the body (Qi is both energy and matter)
- Although the concept (name and location) of most body organs is similar in TCM and Western medicine, in TCM they may be thought to have a different function
- Disease may be caused by external factors (wind, cold, fire, damp, summer heat and dryness) or internal factors (joy, anger, anxiety, thought, sorrow, fear and fright)

Principals of TCM involve supplementation of factors [collectively called the Yin and Yang] in nature that restores the body to a natural balance and allows the natural defence mechanisms of the body to effect healing more or less on its own.

TCM treatment is based on the restoration and maintenance of energy balances with the human body, emphasizing the organic or functional relationship between the health of each part of the body and the whole body, a holistic approach to health.

Consistent with the holistic approach of TCM, velvet has long been used to treat a variety of health problems and as a general tonic to restore balance, strengthen the body and promote overall wellness. A TCM practitioner traditionally prescribes velvet. TCM practitioners usually cut thin slices of velvet from a stick of dried velvet and combine the slices with other natural medicine products. Patients usually prepare a soup from the prescription that is consumed.

## TCM and Velvet Antler

There are many studies related to velvet antler reported in the scientific literature, however many of the older papers produced in Asia were not controlled by the same standards of reporting required by Western Medicine and some of the concepts of TCM like 'well being' are difficult for Western Medicine to measure.

In recent times there have been significant additions to the scientific literature on deer velvet from researchers, particularly those in New Zealand, Korea, China, Canada, USA, Australia and Russia.

Available literature reviews generally suggest that some benefits of consumption of deer velvet have been identified although more research is needed. It is important to note that TCM does not encourage uninformed use of velvet antler (or any of its other remedies).

### Health Benefits Claimed by TCM for Velvet Antler

TCM claims for the use of deer velvet are much broader than the range of effects suggested by completed western research. They include:

- Systematic exhaustion
- Depression
- Cold
- Lower back pain
- Weak pulse
- Impotence
- Spermatorrhea
- Low white cell counts
- Regulate the adrenal cortex
- Regulate energy metabolism
- Promote sexual function
- Promote growth
- Strengthen resistance

### Composition and Active Ingredients

Research has reported the chemical composition of whole velvet antler sticks and sections (tip, upper, mid and base) of a stick.

Although Western research, particularly in New Zealand [\[13\]](#) has reported the composition of velvet antler, it is important to remain aware that antler is the only mammalian organ that regenerates and that it grows extremely rapidly. The rapid growth of antler suggests that its chemical composition will vary during its growth until it becomes naturally calcified (table 1).

It is reasonable to say that broadly, velvet antler is composed of proteins, amino acids, minerals, lipids and water. Specific key compounds that have been identified in deer antler include collagen, glucosamine sulphate, chondrin sulphate and growth factors that aid in cartilage cell development.

Most researchers suggest that although ingredients in velvet antler are generally known, it is likely that combinations of ingredients in the antler contribute significantly to the activity of velvet antler products. This means that properties of processed products are likely to vary in a direct relationship to the portion of the antler used in the product's manufacture.

Generally from the tip of the antler toward the base the ash content increases, lipid content decreases and protein content decreases. As antler matures, the ash and some mineral contents increase and moisture content decreases.

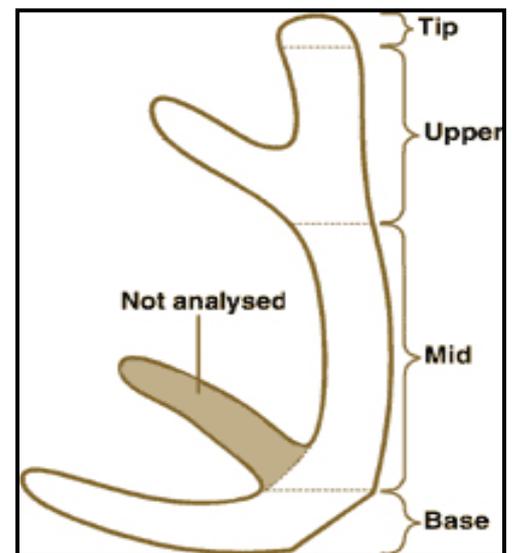
## Lipid and Mineral Composition of Velvet Antler

Table 1 - Composition of Adult Red Deer Velvet Antler [13]

Composition of adult New Zealand red deer velvet. Data are mean values (n=17) with the standard deviation for the components in each of the four main sections of the antler and the combined total. The four sections analysed are shown.

Mean value	Antler Section				Complete
	Tip	Upper	Mid	Base	
% of total antler dry weight in section	2.7	35.3	29.8	32.5	100
<b>Components (as % of dry matter ± standard deviation)</b>					
Ash	6.6 ± 0.8	28.4 ± 2.4	37.8 ± 2.6	38.8 ± 2.3	34.0 ± 2.0
Lipid	5.6 ± 1.3	2.7 ± 0.7	2.0 ± 0.5	2.6 ± 0.7	2.5 ± 0.6
Nitrogen (N)	12.2 ± 0.6	9.1 ± 0.5	8.1 ± 0.6	7.6 ± 0.6	8.4 ± 0.5
Calcium (Ca)	0.3 ± 0.2	9.3 ± 1.0	13.5 ± 1.2	14.7 ± 1.8	12.1 ± 1.1
Phosphorus (P)	0.6 ± 0.1	5.0 ± 0.8	6.3 ± 0.5	6.5 ± 0.4	5.8 ± 0.3
Sulphur (S)	0.85 ± 0.11	0.54 ± 0.03	0.35 ± 0.03	0.34 ± 0.04	0.43 ± 0.03
Magnesium (Mg)	0.05 ± 0.01	0.21 ± 0.02	0.27 ± 0.02	0.28 ± 0.02	0.25 ± 0.02
Sodium (Na)	1.09 ± 0.15	0.90 ± 0.08	0.80 ± 0.04	0.77 ± 0.05	0.83 ± 0.04
Potassium (K)	0.91 ± 0.12	0.59 ± 0.06	0.33 ± 0.06	0.29 ± 0.04	0.42 ± 0.04
<b>Trace mineral components (as mg per kg of dry matter ± standard deviation)</b>					
Manganese (Mn)	2.6 ± 1.4	3.2 ± 0.8	3.4 ± 0.6	3.5 ± 0.8	3.4 ± 0.4
Zinc (Zn)	46 ± 8	72 ± 9	67 ± 10	68 ± 12	69 ± 9
Copper (Cu)	5.2 ± 1.1	5.1 ± 0.7	5.6 ± 0.8	5.3 ± 0.8	5.3 ± 0.5
Iron (Fe)	462 ± 227	472 ± 92	288 ± 100	179 ± 53	319 ± 69
Selenium (Se)	0.35 ± 0.12	0.25 ± 0.09	0.14 ± 0.06	0.13 ± 0.05	0.18 ± 0.07
Cobalt (Co)	0.05 ± 0.05	0.04 ± 0.06	0.03 ± 0.03	0.03 ± 0.03	0.04 ± 0.03

Figure 1 - Portions analysed [13]



## Proteins Identified in Velvet Antler

Proteins compounds identified in velvet antler by research include:

- Collagen - a major structural protein present in bone, tendons, ligaments, other connective tissue and articular cartilage
- Amino Acids - velvet is reported to contain eight essential and fifteen non essential amino acids, the precursors for all protein production

## Growth Hormones and Growth Factor Identified in Velvet Antler

Research has shown several growth factors exist in velvet antler including:

- Insulin-like Growth Factor (IGF-1)- a precursor for the production of growth hormone
- Epidermal Growth Factor (EGF) - growth factors that aid development of cartilage cells

## **Glycosaminoglycans (GAG's) Identified in Velvet Antler**

Glycosaminoglycans are complex carbohydrates. Research has shown GAG's exist in velvet antler including:

- Chondroitin Sulphate - a carbohydrate that helps protect and rebuild degenerating cartilage and is regarded as a potent anti-inflammatory agent
- Erythropoietin - a hormone produced by specialised kidney cells to stimulate red blood cell production
- Glycosphingolipids - are compounds involved with growth and metabolism of cells and with memory and learning
- Glucosamine sulphate - is a component of Chondrin Sulphate and is a major component of cartilage and synovial fluid
- Hyaluronic acid - a substance that binds cartilage cells together and lubricates joints
- Prostaglandins - hormone like substances that produce a wide range of effects, including anti-inflammatory effects, within the body
- Phospholipids - the major structural lipid of most cell membranes

## **Other Compounds Identified in Velvet Antler**

There are many other compounds shown by research to exist in velvet antler including

- Monoamine- oxidase inhibitors - an enzyme that inhibits the oxidation of neurotransmitters and so promotes a feeling of well being

## **Health Benefits Supported by Western Research**

Generally researchers agree that velvet antler restores, strengthens and protects normal bodily functions but is not in itself curative. Preliminary results of modern research suggest that deer velvet may have beneficial effects related to:

- Stimulation of the body's immune system to assist protection against infection and disease
- The anti-inflammatory agents it contains that may assist in reducing the pain and inflammation of a variety of degenerative diseases
- The anabolic or growth stimulating properties it provides
- The prevention or repair of muscle damage following exercise
- Its ability to increase muscular strength and endurance
- Its ability to significantly reduce the damaging side effects of chemotherapy drugs, while at the same time increasing their effectiveness

Specific health benefits shown by western research and summarised in the literature reviews cited at the end of this document include:

### **Anaemia**

New Zealand research has shown clear evidence that velvet antler can alleviate experimentally induced anaemia.

### **Anti-aging**

Research on mice suggests that velvet antler supplements inhibited the activity of some enzymes associated with aging while increasing the synthesis of liver and kidney protein by promoting activity of other specific enzymes.

Reviews report that this research is strong evidence of the anti-aging influence of deer velvet.

## **Anti-cancer activity**

Although there does not appear to be any evidence that velvet antler can cure cancers, research has demonstrated that velvet may extracts have some anti-tumor (cytotoxic) effects against some forms of cancer cells.

## **Anti-inflammatory effects**

New Zealand research [12] reports that although the mechanism is unknown velvet antler shows strong anti-inflammatory effects.

## **Blood Pressure Control**

Research has shown that extracts of deer velvet have a strong ability to lower blood pressure in people with normal blood pressure and to stabilise abnormal blood pressure. However Suttie et al [13] advises extreme caution of use of velvet by those with extremely high or low blood pressure.

## **Bone and Joint Health**

It is proposed by researchers that therapies used for the treatment of human bone and joint problems should include the use of glycosaminoglycan-peptides, particularly chondroitin sulphate [1]. Several studies have shown the glycosaminoglycan (GAG) content of velvet antler and in particular the relatively high level of chondroitin sulphate.

Most research suggests that as velvet antler contains significant quantities of chondroitin sulphate, it is worthy of consideration as a treatment for joint and bone inflammation conditions.

## **Growth Stimulation**

Research has identified various natural hormones (growth factors) in velvet antler including IGF-1 (insulin –like Growth Factor-1) and EGF (Epidermal Growth Factor).

Velvet antler may be a natural source of natural hormones for athletes and others who seek a natural aid to muscle growth and development.

## **Performance Enhancement**

Although the mechanisms are yet to be clearly identified, research and anecdotal evidence suggests that velvet antler has a positive effect on athletic performance. Although not all reports are positive, most indicate that the effect is likely to be either prevention or rapid repair (or both) of muscle damage associated with exercise.

## **Stimulation of the Immune System**

Research in Korea, New Zealand and China has shown that velvet antler can stimulate the immune system. Extracts of velvet antler were variously shown to increase macrophage activity, stimulate the production of lymphocytes and increase the number of red and white blood cells.

Each of these effects may directly complement the body's ability to resist or fight disease and so promote and maintain health and an associated feeling of well being.

## **Tonic Effects**

The immune stimulation effects shown by research gives support to claims of TCM that velvet antler can have a revitalising effect, especially for people who are immuno-compromised people (those weakened by illness or other stress).

## Health Benefits for Animals

Research and anecdotal reports also suggest promising health benefits from supplementation with deer velvet for animals with inflammation related health problems

Future prospects for velvet use for pet health look extremely bright as pet owners increasingly seek natural alternatives to drug treatments for health problems of their pets (eg arthritis).

Balok [2] reported positive effects of velvet on animals include:

- Relief from clinical arthritis
- General feeling of well being
- Improved hair coat
- Improved kidney function
- Increased reproductive performance
- Accelerated wound healing

## Dose Rates and Safety

There appears to be no definitive information on dose rate available from research although the prolonged historic use of velvet antler by Asian communities suggests a reasonable degree of safety.

However it is generally considered that one or two 250-350 mg capsules per day is sufficient to maintain health and alleviate minor fatigue while higher doses are used for healing or performance enhancement.

Like most natural health supplements, effects of velvet antler tend to be cumulative. Typically, significant benefits are seen after 8 to 12 weeks of consistent use.

Some minor side effects (headaches and nose bleeds) have been observed at higher dose levels. General cautions often suggest that people with an enlarged prostate, those who take anticoagulant or blood pressure medications should seek advice before consuming velvet antler.

Velvet antler should only be used as part of an overall health plan. It should not replace prescription medication or proper nutrition. As is the case with all dietary supplements people should consult a suitably qualified physician before consumption of velvet antler supplements.

## Processing Considerations

A range of factors influences the chemical composition of processed velvet antler products. They include:

- The portion of the antler processed
- The age of the antler when harvested
- Quality assurance practices associated with harvesting, storage and transport
- Length of time product is stored before processing
- Processing techniques

Although the actual technique employed by different factories may vary considerably, factories that process deer antler have idiosyncratic specialisations to produce velvet products that meet client and marketing requirements, the principal processing techniques and objectives are similar.

Poor processing technique, particularly inappropriate use of heat, can also influence the beneficial properties of velvet antler.

Laughlin [9] suggests that velvet antler processed in whole form appears to provide the widest selection of chemical compounds associated with the benefits claimed in the research cited.

Future Western market development for velvet antler products will require development and implementation of product standards that ensure product uniformity and encourage consumer confidence in the products.

## **Processing Techniques**

The primary aim of all velvet antler drying is simply to remove water from velvet (New Zealand Ministry of Agriculture and Fisheries specifications for dried velvet antler indicate that dried velvet must contain 85% total solids).

Factories that process deer antler have idiosyncratic specialisations to produce products that meet client and marketing requirements, the principal processing techniques and objectives are similar, although the actual technique employed by different factories varies considerably.

Generally, vacuum drying is not considered appropriate for product intended for slicing (it crumbles as the product becomes too dry) however product produced by vacuum drying generally has lower bacterial counts than product dried in other ways.

Low bacterial counts are particularly important where the velvet is to be used in capsules as the powder is the end use product and unlike other forms of dried antler, it will not receive any further treatment that can assist bacterial control.

Broad guides to the principles of velvet antler processing are [14]:

### *Factory Drying*

- Purchased frozen velvet arrives at the factory
- The velvet is graded, (mostly according to size and so the need for differential cooking time), the cut end of the velvet is sealed and velvet is placed in the freezer
- It is placed on temporary racks and allowed to thaw overnight
- The next morning and the velvet sticks are placed on racks for water bath cooking
- Each stick of velvet is dipped in the water cooker several times. After appropriate dipping sticks are ready for the dryer
- The velvet is placed back on oven racks and allowed to cool
- The racks are placed in the oven and the velvet is cooked
- The internal temperature of the velvet is tracked during cooking to ensure pasteurisation
- After cooking the velvet is allowed to cool
- After cooling racks are returned to the drying room where the velvet stays until it is dried
- Prior to slicing the hair is removed.

### *Air Drying*

- Velvet is bought frozen
- Before processing it is thawed in the open air and then washed with water and detergent using a soft brush
- The cut end of the velvet is sealed (cauterised) on a hot plate.

### Option A

- The whole stick of velvet is dipped in boiling water for a few minutes (if it remains in the water for too long the velvet will split)
- The velvet is cooled to room temperature

- Steps 4.1 and 4.2 are repeated a several times (until the protein is fixed).

Option B

- The velvet is then placed in a hot oven for several hours. The time in the oven is dependent on the degree of calcification of velvet sticks
- The velvet is dried at room temperature
- Steps 5 and 6 are repeated several times (four to five times) depending on the weather (drying) and size of each velvet stick.

*Vacuum drying*

- Frozen velvet is removed from the freezer
- Velvet is placed (tied) on racks with the cut end up to minimise blood loss during cooking and thawed overnight
- After thawing racks holding the velvet are placed in drying rooms where the cooling system is reversed and set to heat to thaw it
- Then the temperature is reduced and the velvet is held it in the drying room until it is semi dried
- After an appropriate time the velvet is placed in a vacuum dryer until it completely dry.

## 5. Discussion

Although Chinese literature reports the successful use of deer velvet products as a medicinal product for more than 2000 years, Western medicine has been reluctant to accept many of the products and practices used in TCM.

One of the main differences in the philosophy of medicine is that TCM is concerned with restoring and maintaining the natural balance of all factors that contribute to a person's health and well being while Western medicine is generally concerned with overcoming specific infectious, physical or psychological causes of ill health.

Differences in philosophy have resulted in a general lack of acceptance of the others practices by each group. For example the Western medicine approach often has difficulty in understanding and measuring concepts like 'well being' that are used in TCM and in accepting the often broad indications given for a particular medicine.

Jette [6] summarises the significant difference as described by:

- Kaptchuk (1983) 'Chinese diagnostic does not come up with a specific disease entity or a precise cause, but gives a description of a specific "pattern of disharmony" in the whole person. The question of cause and effect is always secondary to this pattern'
- Porkert (1988) 'Western studies on the claims of deer antler are biased because they are based on the premises that "science" is necessarily synonymous with "causal-analytic science" (as if no other variety existed), along with its corollary, that inductive-synthetic medical science is strictly "empirical" and at best a "prescientific" form of thought'

However, Western science research of deer antler continues and although the work is ongoing, there is increasing evidence of the health benefits of velvet antler and of the safety of this natural product.

Research evidence supports claims that velvet antler use can enhance joint structure and function, and may provide additional benefits however, benefits appear dependent upon the quality of antler used as well as methods employed during processing of velvet antler products

## **6. Communications Strategy**

Pamphlets produced by this project have been provided to all branches of the DIAA, all those who receive the RIRDC deer newsletter and major Australian deer velvet processors.

The completion of the project has been reported in the RIRDC Deer Industry Newsletter and in the Australian Deer Farming Magazine.

## 7. References for this Summary

- [1] Batchelder, HJ. 2000. Velvet Antler: A Literature Review.  
<http://www.wapiti.net/news/default2.cfm?articleID=37>
- [2] Balok, C. 2000. Can I give this product to my pets.  
<http://www.naelk.org/epb/index.cfm?URLmap=5&articleID=194>
- [3] Burgio, P.A. A Literature Review of Velvet Antler: The Global Market, Chemical Composition, Health Benefits and Factors Affecting Growth. *Elk Research Council*
- [4] Church, J.S. 1999. Velvet Antler: Its historical medical use, performance enhancing effects and pharmacology. Elk Tech International Research Centre, Calgary Canada
- [5] Cooney, A. 2001. A review of the scientific literature on the health benefits of velvet antler.  
<http://www.usask.ca/agriculture/agec/publications/Eva%20Electronic.pdf>
- [6] Jette, E. The Ying-Yang of deer antler or east and west use of deer antler in medicine.  
<http://www.usask.ca/wcvm/herdmed/specialiststock/antlers>
- [7] Kamen, B. and Kamen, P. 1999. The Remarkable Healing Power of Velvet Antler. Nutrition Encounter, Novato, California. ISBN 0 944501 13 3
- [8] Laughlin, ML. 1999. A summary of research on velvet antler dietary supplements. Natraflex Brands, Castle Rock, Colorado, USA
- [9] Laughlin, ML. 2001. A summary of research on velvet antler dietary supplements.  
<http://www.vitaminsinamerica.com/news/velvet.htm>
- [10] Maclean, D. and Shane, A. 1999. Traditional Chinese Medicine (TCM). The Canadian College of Naturopathic Medicine.  
<http://www.catie.ca/facts.nsf/9a83231f2055bda9852566b90004b064/f59de1590d37e37b8525677500609c26?OpenDocument>
- [11] Marshall, L.A. 2000. Natural Remedies: Velvet antler under the microscope. *Nutrition Science News*.  
[http://www.healthwellexchange.com/nutritionsciencenews/NSN\\_backs/Mar\\_00/velvet.cfm](http://www.healthwellexchange.com/nutritionsciencenews/NSN_backs/Mar_00/velvet.cfm)
- [12] New Zealand Game Industry Board. 2000 Velvet Manual.  
<http://www.velvet.co.nz/manual/manualtoc.html>
- [13] Suttie, J.M., and S. Harris. Clinical Properties of Deer Velvet.  
<http://www.positivehealth.com/permit/Articles/Nutrition/sut54.htm>
- [14] Tuckwell, C.D. 2001. Australian Velvet Antler and Deer Co Products – Developing Domestic Markets – Part A. Rural Industries Research and Development Corporation. Publication No. 01/085. ISBN 0 642 58307 2

## 8. Velvet Research Reference List

This reference list is compiled from references provided by researchers who have previously reviewed velvet antler use.

1. **Adams, J. L.** 1979. Innervation and blood supply of the antler pedicle of the Red deer. *N Z Vet J.* 27: 200-201.
2. **Agren H.**1975. New approach to Chinese traditional medicine. *American Journal of Chinese medicine*, 3(3): 207-212.
3. **Ahn, D.K., Kim, Ho Cheol and Choi Ho Young.** 1994. Effects of the Cervi Parvum Cornu on the aged ovariectomized rat model of post-menopausal osteoporosis. International Symposium on Cervi Parvum Cornu, Seoul, Korea. *The Korean Society of Pharmacognosy*, pp 65.
4. **Ahn, B.H.** 1994. Study on the nutritive value of velvet antler by major producing districts. *Kor. J. An. Nutr.* 18(3), 173-178
5. **Albov, N.A., Borovskaya, V.A. and Kofanav, I.F.** 1969a. Clinical observations on the influence of Pantocrine on cardiac patients. In S.M. Pavlenko (editor) *Pantocrine. A Publication of Articles on Studies of the Curative Properties in Pantocrine.* Sojuzchimexport, Moscow, USSR, 21-26
6. **Albov, N.A. and Krupernikov, L.F.** 1969b. The influence of Pantocrine on menopause. In S.M. Pavlenko (editor) *Pantocrine. A Publication of Articles on Studies of the Curative Properties of in Pantocrine.* Sojuzchimexport, Moscow, USSR, 26-40.
7. **Anderson, D.** 1998. Velvet Boost for Athletes. *Rural News.* In: *The New Zealand Game Industry Board Media Statement*, Feb 18, 1998
8. **Arapov, N.A.** Date Unknown. Some Data on Using Pantocrin in Surgical Practice. In: *Pantocrin: A Publication of Articles on Studies of Curative Properties of Pantocrin.* Pavlenko, S.M. (ed). Moscow: V/O Medexport,.
9. **Archer, R. H., and P J. Palfreyman.** 1983. Properties of New Zealand Deer Velvet, Part I: Search of the Literature Vol I. Massey University and Wrightson NMA Ltd.
10. **Bae, D. S.** 1975. Study on the effects of velvet on growth of animals. I. Effect of different levels on weight gain, feed efficiency and development of organs of chicken. *Korean J Anim Sci* 17: 571-576.
11. **Bae, D. S.** 1976. Study on the effects of velvet on growth of animals. II. Effect of velvet on the growth of internal organs and blood picture of chicken. *Korean J Anim Sci* 18: 342-348.
12. **Bae, D. S.** 1977. Study on the effects of velvet on growth of animals. III. Effect of antler on the ability of spermatogenesis of cocks fertilization. *Korean J Anim Sci* 19: 407-412.
13. **Banks, W. J. and J. W. Newberry.** 1981 Light microscope studies of the ossification process in developing antlers. In *Antler Development in Cervidae.* ed. R. D. Boone. Caesar Kleberg Wildlife Research Institute. Kingsville Texas. pp 231-260.

14. **Barnett, M.L., Gombitchi, D. and Trentham, D.E.** 1996. A pilot trial of oral type II collagen in the treatment of juvenile rheumatoid arthritis. *Arthritis & Rheumatism*, 39 (4): 623-628.
15. **Batchelder, HJ.** 2000. Velvet Antler: A Literature Review. <http://www.wapiti.net/news/default2.cfm?articleID=37>
16. **Brechman, I.I.** Undated. Pantocrine. *Medexport, Moscow, USSR.*
17. **Breckhman, J. T.** 1980. Man and biologically active substances: *The effects of drugs, diet and pollution on health.* Translated by J. H. Appleby. Pargamon Press, Oxford.
18. **Breckhman, J. T., Dubryakov, Y.L. and Taneyeva, A.L.** 1969. The biological activity of the antlers of deer and other deer species. *Ivestio Sibirskogo Ordelemia Akalemi Nank SISR.* Biological Series No. 10 (2):112-115
19. **Bubenik, G.A., Schams, D., White, R.J., Rowell, J., Blake, J. and Bartos, L.** 1997. Seasonal levels of reproductive hormones and their relationship to the antler cycle of male and female reindeer (Rangifer tarandus). *Comp Biochem Physiol B Biochem Mol Biol* 1997 Feb;116(2):269-277 Department of Zoology, University of Guelph, Ontario, Canada.
20. **Bubenik, G. A., Bubenik, A.B.** 1986. Phylogeny and ontogeny of antlers and neuro-endocrine regulation of the antler cycle - a review. *Saeugetierk. Mitt.* 33(2/3): 97-123.
21. **Buchan, G.** Effects of Various Velvet Extracts on the Immune System. *Research Report on AgResearch Contract No. 4109*
22. **Burgio, P.A.** A Literature Review of Velvet Antler: The Global Market, Chemical Composition, Health Benefits and Factors Affecting Growth. *Elk Research Council*
23. **Burgio, PA.** 1988. The medicinal effects of the velvet antler: an anti-inflammatory agent. *Vital Health News*, 2(1):1-3.
24. **Chen, X., Jia, Y. and Wang, B. X.** 1992. Inhibitory effect of the extract of pilose antler on monoamine oxidase of aged mice. *Chung Kuo Chung Yao Tsa Chih*, 17(2): 107-110.
25. **Chen, X., Wang, B.X. and Wu, Y.D.** 1990. Inhibitory effect of total lipids of pilose antler on monoamine oxidase activity. *Chinese Traditional and Herbal Drugs*, 21: 501-504.
26. **Cho, H.J. and Jhon, G.J.** 1994. Changes of gangliosides metabolism in treptozotocin-induced diabetic rats and effect of deer antler. *Journal of Applied Pharmacology*, 2: 223-228.
27. **Choe, P.N. and Kim, K.H.** 1987. Effects of Cervi cornu on depression of immune response induced by methotrexate in mice. *Kyung Hee University Oriental Medicine Journal*, 10: 589-604
28. **Choi, D.Y., Shin, M.K., Lee, H.I. and Kim, W.H.** 1979. A study on the effect of Cervi cornu against CCl4 – induced liver damage in rats. *Kyung Hee University Oriental Medicine Journal*, 2: 43-51.
29. **Chung Kuo.** 1999. VAP accelerated bone fracture healing by stimulating the proliferation of chondrocytes and osteoblast precursors *Yao Li Hsueh Po (China)*, 20(3) p279-82
30. **Church, J.S.** 1999. Velvet Antler: Its historical medical use, performance enhancing effects and pharmacology. *Elk Tech*

- International Research Centre,  
Calgary Canada.
31. **Clifford, D. H., Lee, M. O., Kim, C.Y. and Lee, D.C.** 1979. Can an extract of deer antlers alter cardiovascular dynamics? *American Journal of Chinese Medicine*, 7(4): 345-350.
  32. **Conte, A., de Bernardi, M., Palmieri, L., Lualdi, P., Mautone, G. and Ronca, G.** 1991. Metabolic fate of exogenous chondroitin sulfate in man. *Arzneim-Forsch./Drug Res* 41(11): 76~77 I.
  33. **Cooney, A.** 2001. A review of the scientific literature on the health benefits of velvet antler. <http://www.usask.ca/agriculture/agec/publications/Eva%20Electronic.pdf>
  34. **De'Ambrosio, E., B. Casa, R. Bompasi, et al.** 1981. Glucosamine Sulphate: A Controlled Clinical Investigation in Arthritis. *Pharmatherapeutica* 2:504-508
  35. **Duan C, Li S.** 1993. Studies on the biochemical composition of reindeer antlers in China. In: Proceedings of the International Symposium on Deer of China. Shanghai, China, 21-23 November 1992, Ohtaishi, N., and Sheng, H.I. 1993. (Editors). *Developments in Animal and Veterinary Sciences*, No. 26. New York and Tokyo: Elsevier Publishers.
  36. **Edelman, J., Hanrahan, I. And Ghosh** 2000. Deer Antler Cartilage in the treatment of Arthritis: Results of a 6 month Placebo-controlled Double-blind study with Cervusen ® in 54 Patients with Ostoarthritis. *APLAS Journal of Rheumatology*, 4 (2): 95-100.
  37. **Eisenberg, D. and Wright, T.L.** 1986. Encounters with Qi. London: *Jonathan Cape Publishers*, 254 p.
  38. **Elliott, J.L., Oldham, J.M., Ambler, G.R., Bass, J.J., Spencer, G.S., Hodgkinson, S.C., Breier, B.H., Gluckman, P.D., and Suttie, J.M.** 1992. Presence of insulin-like growth factor-I receptors and absence of growth hormone receptors in the antler tip. *Endocrinology*, 130(5):2513-2520
  39. **Elliott, J.L., Oldham, J.M., Ambler, G.R., Bass, J.J., Spencer, G.S., Hodgkinson, S.C., Breier, B.H., Gluckman, P.D., Suttie, J.M. and Bass, J.J.** 1993. Receptors for insulin-like growth factor-II in the growing tip of the deer antler. *J Endocrinol* ,138(2):233-242
  40. **Fenessey, P.F.** 1989. Pharmacology of velvet. In: *Proceedings of a Deer Course for Veterinarians. Queenstown, New Zealand.* The Deer Branch of the New Zealand Veterinary Association No. 6: 96-103.
  41. **Fenessey, P.F.** 1991. Velvet antler: The product and pharmacology. In: *Proceedings of a Deer Course for Veterinarians. Sydney, Australia.* The deer Branch of the New Zealand Veterinary Association No. 8: 169-180.
  42. **Feng, J.Q., Chen, D., Esparza, J., Harris, M.A., Mundy, G.R. and Harris, S.E.** 1995. Deer antler tissue contains two types of bone morphogenetic protein 4 mRNA transcripts. *Biochim Biophys Acta* 1263(2):163-168
  43. **Feng, J.Q., Chen, D., Ghost-Choudhury, N., Esparza, J., Mundy, G.R. and Harris, S.E.** 1977. Bone morphogenetic protein 2 transcripts in rapidly developing deer antler tissue contain an extended 5' non-coding region arising from a distal promoter. *Biochim Biophys Acta* 1350(1):47-52

44. **Fennessy, P. F.** and J. M. Suttie. 1985. Antler growth: Nutritional and endocrine factors. In: *Biology of Deer Production*. Wellington, Royal Soc. NZ.
45. **Fisher, B.D.**, Gilpin, M. and Wiles, D. 1988. Strength training parameters in Edmonton police recruits following supplementation with elk velvet antler (EVA). *University of Alberta*. I 998.
46. **Francis, S.M.** and Suttie, J.M. 1988. Detection of growth factors and proto-oncogene mRNA in the growing tip of red deer (Cervus elaphus) antler using reverse-transcriptase polymerase chain reaction (RT-PCR). *The Journal of Experimental Zoology* 281: 6-42.
47. **Fulder, S.** 1980a. The hammer and the pestle. *New Scientist*. 87 (1209): 120-123
48. **Fulder, S.** 1980b. The drug that builds Russians. *New Scientist* 87 (1215): 516-519.
49. **Garcia, R.L.**, Sadighi, M., Francis, S.M., Suttie, J.M. and Fleming, J.S. 1977. Expression of neurotrophin-3 in the growing velvet antler of the red deer Cervus elaphus. *Journal of Molecular Endocrinology* 19: 173-182.
50. **Gavrilenk, V.S.** Pantocrin in Combined Treatment of Patients with Tubercular Lungs. In: *Pantocrin: A Publication of Articles on Studies of Curative Properties of Pantocrin*. Pavlenko, S.M. (ed). Moscow: V/O Medexport
51. **Gerrard, D.F.**, Sleivert, G.G, Goulding, A., Haines, S.R. and Suttie, J.M. Clinical evaluation of New Zealand deer velvet antler on muscle strength and endurance in healthy male university athletes.
52. **Ghosh, P.**, Roubin, R. and Smith, M.M. Rationale for the use of Antler Cartilage Products and Genes Obtained from their Cells to Treat Arthritis and Repair Cartilage Defects Following Joint Injury. Royal North Shore Hospital, Sydney, Australia.
53. **Goss, R.J.** 1995. Future directions in antler research. *Anat Rec*, 241(3):291-302
54. **Goss, R. J.** 1983. Deer antlers. Regeneration, Function, and evolution. *Academic Press Inc., Orlando FL (ISBN 0-12-293080-0)*, 336p.
55. **Gotlib, YaG.** The Use of Pantocrin in Treating Some Sexual Disorders in Men. In: *Pantocrin: A Publication of Articles on Studies of Curative Properties of Pantocrin*. Pavlenko, S.M. (ed). Moscow: V/O Medexport
56. **Gray, C.**, Hukkanen, M., Konttinen, Y.T., Terenghi, G., Arnett, T.R., Jones, S.J., Burnstock, G. and Polak, J.M. 1992 Rapid neural growth: calcitonin gene-related peptide and substance P-containing nerves attain exceptional growth rates in regenerating deer antler. *Neuroscience* 50(4):953-963
57. **Gray, C. M.**, Taylor, M.L., Horton, M.A., Loudon, A.S.I., and Arnett, T.R. 1989. Studies with cells derived from growing deer antler, *J. Endocrinol.* 123: 91.
58. **Ha, H.**, S. H. Yoon, *et al.* 1990. Study for new hepatotropic agent from natural resources. I. Effect of antler and old antler on liver injury induced by benzopyrene in rats. *Proc. Japanese Soc. Food & Nutrition* 23: 9.
59. **Hammer, L.** 1990. Dragon rises, red bird flies: Psychology, energy and Chinese medicine. *New York: Station Hill Press*, 1990, 425 p.

60. **Han, S. H.** 1970. Influence of antler (deer horn) on the enterochromaffin cells in the gastrointestinal mucosa of rats exposed to starvation, heat, cold and electric shock. *J. Catholic Medical College* 19: 157-164.
61. **Hansen, T.J.** 1988. Claims for Velvet Antler and Chondroitin Sulfate. Watertown, MA: *North American Trade Experts*
62. **Hansen, T.J.** 1998. Claims for Velvet Antler. Watertown, MA: *North American Trade Experts*
63. **Hattori, M., X-W Yang, S. Kaneko, Y. Nomura & T. Namba.** 1989. Constituents of the pilose antler of Cervus nippon. *Shoyakugaku Zasshi* 43: 173-176.
64. **Hong Nan Doo, Kin Jong Woo, Kim Nam Jae and Kim Jin Sik.** 1992. Studies on combined usage of a combined preparation of crude drugs and anti-neoplastic drugs II. Alleviating affect of cis-Platin and mitomycin C through combined usage of Famioaebo-Tang. *Korean Journal of Pharmacology.* 23: 89-95.
65. **Holubitsky, J.** 1988. Science Takes a Serious Look at Ancient Oriental Tradition: Properties of Elk Antler Under Microscope. *The Edmonton Journal, In: North American Elk, Spring 1998, p. 49*
66. **Huang, S. L., Kakiuchi, N., Hattori, M. and Namba, T.** 1991. A new monitoring system of cultured myocardial cell motion effects of pilose antler extract and cardioactive agent on spontaneous beating of myocardial cell sheets. *Chemical and Pharmaceutical Bulletin (Tokyo)*, 39(2): 382-387.
67. **Huard P, Wong M.** 1968. Chinese medicine. World University Library, Toronto: *McGraw-Hill Book Company*, 253 p.
68. **Huo, Y., Schirf, V. R. and Winters W. D.** 1997. The differential expression of NGFS-like substance from fresh pilose antler of Cervus nippon Temminck. *Biomedical Sciences Instrumentation*, 33: 541-543.
69. **Ivankina, N.F., Isay, S.V., Busarova, N.G., Mischenko, T.** 1993. Prostaglandin-like activity, fatty acid and phospholipid composition of sika deer (Cervus nippon) antlers at different growth stages. *Comp Biochem Physiol [B]* ,106(1):159-162
70. **Jai, I.J.** 1964. The effects of deer horn on the liver and other organs of cholesterol administered rabbits. *Journal of the Pharmaceutical Society of Korea* 8: 12-29.
71. **Jette, E.** The Ying-Yang of deer antler or east and west use of deer antler in medicine. <http://www.usask.ca/wcvm/herdmed/specialiststock/antlers>
72. **Jhon, G.J. et.** 1999. Studies in the chemical structure of gangliosides in deer antler, Cervus Nippon. *Chemical and Pharmacological Bulletin (Tokyo).* 47 (1): 123-7
73. **Joosten LA, et al.** 1994. Accelerated onset of collagen-induced arthritis by remote inflammation. *Clin Exp Immunol*, 97(2):204-11.
74. **Josephson, D.** 1998. Concern raised about performance enhancing drugs in the US. *BMJ*, 3 17:702
75. **Kajihara, M. and Kokubu, N.** 1971. Effect of Pantui extract (Pantocrin) on several enzyme activities of spinal nerves of rats. *Pharmacometrics*, 5: 741-745.
76. **Kalden, J.R., and J. Sieper.** 1998. Oral collagen in the treatment of

- rheumatoid arthritis. *Arthritis and Rheumatism*, 41(2): 191-194.
77. **Kamen, B. & Kamen P.** 1999. The remarkable healing power of velvet antler. *Nutrition Encounter*, Novato, CA. 1999. 152 pg.
78. **Kang, W. S.** 1970. Influence of antler (deer horn) on the mesenteric mast cells of rats exposed to heat, cold or electric shock. *J. Cathol. Med. College* 19: 1-9.
79. **Kao, F.F., and Kao, J.J.** 1977. (Editors) Chinese medicine: New medicine. *Institute for Advanced Research in Asian Science and Medicine*, New York: Neale Watson Academic Publications Inc., 91 p.
80. **Kao, F.F.** 1974. Medicine in China: New discoveries, new concepts and new frontiers. *American Journal of Chinese Medicine*, 1974; 2(2): 171-180.
81. **Kaptchuk, T.J.** 1983. Chinese medicine. London: Rider and Co., 402 p.
82. **Kaptchuk, T. and M. Croucher.** 1987. The Healing Arts: Exploring the Medical Ways of the World. New York, Summit Books.
83. **Karelin, M.P.** The Use of Pantocrin for Treating Internal Disease. In: *Pantocrin: A Publication of Articles on Studies of Curative Properties of Pantocrin*. Pavlenko, S.M. (ed). Moscow: V/O Medexport
84. **Keys, J.D.** 1976. Chinese herbs: Their botany, chemistry, and pharmacodynamics. Rutland, Vermont: Charles E. Tuttle Company, 388 p.
85. **Kim, K.L., Shin, M.K., Lee, H.I., Kim, W.H. and Lee, S.I.** Undated. Effect of several kinds of antler (Cervi cornu) on the erythrocytic activity in experimentally induced anaemic rabbits. *Samwon Commercial Company*, Korea Trading Agents Associations, Seoul.
86. **Kim, D.H., Han, S.B., Yu, K.U., Kim, Y.S. and Han, M.J.** 1994. Antitumor activity of fermented antler on sarcoma 180 in mice. *Yakhak Hoeji*, 38 (6): 795-799.
87. **Kim, H. S and Lim, H.K.** 1999. Inhibitory effects of velvet antler water extract on morphine-induced conditioned place preference and DA receptor supersensitivity in mice. *Journal of Ethnopharmacology*, 66: 25-31.
88. **Kim, K.B. and Lee, S.I.** 1985. Effects of several kinds of antler upon endocrine functions in rats. *Kyung Hee University Oriental Medicine Journal*. 8: 91-110.
89. **Kim, K.W. and Park, S. W.,** 1982. A study on the hemopoietic action of deer horn extract. *Korean Biochemical Journal*, 15(2): 151-157.
90. **Kim, K.W., Lim, H. K and Park, W.K.** 1999. Antinarcotic effect of the velvet antler water extract on morphine in mice. *Journal of Ethnopharmacology*, 66: 41-49.
91. **Kim, Y. E. and K. J. Kim.** 1983. Biochemical studies on antler (Cervus nippon taiouanus). VI. Comparative study on the effect of lipid soluble fractions of antler sponges and velvet layers and pantocrin on the aldolase activity in the rat spinal nerves. *Yakhak Hoeji* 27: 235-243.
92. **Kim, Y. E. and Lim, K.D.** 1977. Biochemical studies on antler (Cervus nippon taiouanus) V: A study of glycolipids and phospholipids of antler velvet layer and pantocrin. *Korean Biochem. J.* 10: 153-164.

93. **Kim, Y.H., Shin, M.K., Lee, S.I., Lee, H. I. and Kim, W.H.** 1979. Influence of the administration of Cervi cornu on the serum protein contents and prothrombin time in rats. *Kyung Hee University Oriental Medicine Journal*, 2: 61-68.
94. **Ko, K.M., Yip, T.T., Tsao, S. W., Kong, Y.C., Fennessy, P., Belew, M.C. and Porath, J.** 1986. Epidermal growth factor from deer (*Cervus elaphus*) submaxillary gland and velvet antler. *General and Comparative Endocrinology*, 63: 431-440.
95. **Kong, Y.C., But, P.P.H.** 1985. Deer: The ultimate medicinal animal (antler and deer parts in medicine). In: *Biology of Deer Production*, *The Royal Society of New Zealand Bulletin*, 1985; 22: 311-324.
96. **Kong, Y., K. Ko, et al.** 1987. Epidermal growth factor of the cervine velvet antler. *Acta. Zool. Sin.*, 33: 301-308
97. **Laughlin, ML.** 2001. A summary of research on velvet antler dietary supplements  
<http://www.vitaminsinamerica.com/news/velvet.htm>
98. **Ledbetter, W.B.** 1992. Cell matrix response in tendon injury. *Clin Sports Med*, 11(3):533-78.
99. **Lee, H. I.** 1980. Histochemical studies on the effect of deer horn water extract on rat liver. *Kyung Hee University Oriental Medicine Journal*, 3: 35-50.
100. **Lehninger, A., Nelson, D. and Cox, M.** 1993. Principles of Biochemistry, 2nd Edition, New York: Worth Publishers.
101. **Leslie C.** 1976. (Editor) Asian medical systems: A comparative study. Berkeley, Los Angeles, London: University of California Press, 1976, 419 p.
102. **Lewis, L.K. and Barrell, G.K.** 1994. Regional distribution of estradiol receptors in growing antlers. *Steroids*, 59(8):490-492
103. **Li, C., Waldrup, K.A., Corson, I.D., Littlejohn, R.P. and Suttie, J.M.** 1995. Histogenesis of antlerogenic tissues cultivated in diffusion chambers in vivo in red deer (*Cervus elaphus*). *J Exp Zool* 1;272(5):345-355.
104. **Marchenko, L.I. and Kats, M.A.** 1975. Anaphylactic shock as a response to subcutaneous administration of pantocrine. *Vrach Delo*, 8:135-136 Article in Russian.
105. **McNeary, P.S.** 2001. Velvet Antler: Science Substantiates New Hope for Arthritis Suffers  
<http://www.wapiti.net/news/default2.cfm?articleID=36>
106. **Miller, S.C., Bowman, B.M., Jee, W.S.** 1995. Available animal models of osteopenia--small and large. *Bone*, 17(4 Suppl):117S-123S
107. **Morreal, P; R. Manopulo; M. Galati; L. Boccanera; G. Saponati; L. Bocchi.** 1996. Comparison of the antiinflammatory efficacy of chondroitin sulfate and diclofenac sodium in patients with knee osteoarthritis. *J Rheumatol*, 23:1 385-I 391.
108. **Muir, P. D., Sykes, A.R., Barrell, G.K.** 1988. Changes in blood content and histology during growth of antlers in red deer, *Cervus elaphus*, and their relationship to plasma testosterone levels. *J. Anat.* 158: 31-42.
109. **Narimanov, A.A., Kuznetsova, S.M., Miakisheva, S.N.** 1990. The modifying action of the Japanese pagoda tree (*Sophora japonica*) and pantocrine in radiation lesions.

- Radiobiologia*,30(2):170-174  
[Article in Russian]
110. **New Zealand Game Industry Board** 1997. Reduction in Side-Effects of Anti-Cancer Treatments. *New Zealand Velvet Research.*
111. **New Zealand Game Industry Board** 1997. Research Confirms Centuries of Traditional Treatment. *NZGIB Velvet Research.*
112. **New Zealand Game Industry Board.** 2000 Velvet Manual.  
[http://wwwvelvet.co.nz/manual/man  
ualtoc.html](http://www.velvet.co.nz/manual/manualtoc.html)
113. **Palmieri, L., Conte, A., Giovannini, L., Lualdi, P. and Ronca. G.** 1990. Metabolic fate of exogenous chondroitin sulfate in the experimental animal. *Arzneim-Forsch Drug Res*, 40 (1):319-323.
114. **Palos, S.** 1971. The Chinese art of healing. *Bantam book, New York: Herder and Herder*, 116 p.
115. **Park, H. S., Jhon, G. J. and Choi, W.** 1998. Deer antler extract selectively suppresses hyphal growth in dimorphic fungus, *Candida albicans*. *Journal of Microbiology and Biotechnology*, 8(3): 291-294.
116. **Parlentio, S.M.** 1969. Pantocrine and its curative properties. *Collection of Scientific Works of the Scientific Research Laboratory for Breeding Deer with Non-Ossified Antlers, Altai Scientific Research Institute of Agriculture*, Pantocrine Part 2:73-85.
117. **Park, H.S., Jhon, G.J. and Choi, W.** 1998. Hyphal growth inhibition by deer antler extracts mimics the effect of chitin synthase deletion in *Candida albicans*. *Journal of Microbiology and Biotechnology*, 8(4): 422-425.
118. **Pavlenko, S.M. (ed).** 1988. Pantocrin: A Publication of Articles on Studies of Curative Properties of Pantocrin. *Moscow: V/O Medexport.*
119. **Pavlenko, S.M., A.B. Silayev, L.A. Filippova and V.S. Kiselyov.** 1988. Some Data on the Chemical Properties of Unossified Horns and Pantocrin. *In: Pantocrin: A Publication of Articles on Studies of Curative Properties of Pantocrin. Pavlenko, S.M. (ed). Moscow: V/O Medexport*
120. **Porkert M, Ullman C.** 1988. Chinese medicine. *New York: William Morrow and Company, Inc.*, 318 p.
121. **Price et al.** 1994. Cells cultured from the growing tip of red deer antler express alkaline phosphatase and proliferate in response to insulin-like growth factor-I. *Jour. End.* 143(2), 9-16.
122. **Price, J.S.; B.O. Oyajobi; A.M. Nalin, et al.** 1996. Chondrogenesis in the regenerating antler tip in red deer: expression of collagen types I, hA, IIB, and X demonstrated by in situ nucleic acid hybridization and immunocytochemistry. *Dev Dyn*, 205(3): 332-347.
123. **Putman, R.** 1998. The natural history of deer. *Cornell University Press, New York: Comstock Publishing Associates*, pp 158-159.
124. **Pyjalte, J.M., Llavore, E.P. and Ylescupidéz, F.R.** 1980. Double-Blind Clinical Evaluation of Oral Glucosamine Sulphate in the Basic Treatment of Osteoarthritis. *Curr Med Res Opin*, 7:110-114; 1980
125. **Quin, J.R.** 1974. China medicine as we saw it. *Department of Health, Education and Welfare, Publication No. 75-684, 1974, 430 p.*
126. **Rajarama, J.K.T. and Ramanathan, N.** 1980. Chemical constitution of the

- antler bone of spotted deer (Axis axis). *Indian Journal of Biochemistry and Biophysics*, 1980; 17(4): 382-387.
127. **Ramirez, V.** and Brown, R.D. 1988. A technique for the in vitro incubation of deer antler tissue. *Comp Biochem Physiol A* 1988;89(2):279-281
128. **Reichelt, A.,** Forster, K.K, Fischer, M. et al. 1994. Efficacy and Safety of Intramuscular Glucosamine Sulfate in Osteoarthritis of the Knee. A Randomised, Placebo-Controlled, Double-Blind Study. *Arzneim Forsch* 44:75-80.
129. **Rovati, L.C.** 1992. Clinical Research in Osteoarthritis: Design and Results of Short-term and Long-Term Trials with Disease-Modifying Drugs. *Int J Tissue React (Switzerland)* 14:243-251.
130. **Rucklidge, G.J.,** Milne, G., Bos, K.J., Farquharson, C. and Robins, S.P. 1997. Deer antler does not represent a typical endochondral growth system: immunoidentification of collagen type X but little collagen type II in growing antler tissue. *Comp Biochem Physiol B Biochem Mol Biol*, 118(2):303-308.
131. **Sadighi, M.,** Haines, S.R., Skottner, A., Harris, A.J. and Suttie, J.M. 1994. Effects of insulin-like growth factor-I (IGF-I) and IGF-II on the growth of antler cells in vitro. *J Endocrinol*, 143(3):461-469
132. **Sano, M.,** Imai, M., Tahara, N. and Takikawa, K. 1972. General pharmacological studies and antegenicity test of pantocrine extracts. *Pantocrine. Pharmacometrics* 6: 717-726
133. **Sahelian, R.** 1998. Glucosamine: Nature's Arthritis Remedy. <http://www.raysahelian.com/glucosamine.html>, Aug 10.
134. **Sempere, A.J.,** Grimberg, R., Silve, C., Tau, C. and Garabedian, M. 1989. Evidence for extrarenal production of 1,25-dihydroxyvitamin during physiological bone growth: in vivo and in vitro production by deer antler cells. *Endocrinology*, 125(5):2312-2319
135. **Setnikar, I.,** Giacchetti, C. and Zanolo, G. 1986. Pharmacokinetics of glucosamine in dog and in man. *Arzneim.-Forsch. Drug Res*; 36 (I): 729-735.
136. **Setnikar, I.,** Palumbo, R., Canali, S. and Zanolo, G. 1993. Pharmacokinetics of glucosamine in man. *Arzneim.-Forsch. Drug Res*; 43(I):1109-1113.
137. **Shim, S.D.** and Ahn, D.K. 1999. Effects of Cervi Cornu on the aged ovariectomized rat model of postmenopausal osteoporosis. *Korean Journal of Herbal Medicine* 14:153-166.
138. **Shin, K.H.,** Lee, E.B., Kim, J.H., Chung, M. S. and Cho, S.Y. 1989. Pharmacological studies on the powdered whole part of unossified antler. *Korean Journal of Pharmacognosy*, 20(3): 180-187.
139. **Shin, M. K.,** Lee, S.I., Kim, W.H. and Lee, H. I. 1979. Effect of deer horn on the iron bone marrow in experimentally induced anemic rat. *Kyung Hee University Oriental Medicine Journal*, 2: 69-72.
140. **Shmelyov, N.A.** 1988. On Using Pantocrin for Treating Tubercular Patients. In: *Pantocrin: A Publication of Articles on Studies of Curative Properties of Pantocrin*. Pavlenko, S.M. (ed). Moscow: V/O Medexport
141. **Silaev, A.B.** Rasmakhnini, V.E., Chel'tsora-Bebutova, G.V., Urinyuk, V.M. and Sukhareva-Nemkova, N.N. 1978. Amino acid and lipid composition of reindeer

- antlers. *Vestnik Moskovskoga Universiteta, Seriya 16 Biologiya*,3: 68-71
142. **Sim, J. S., Sunwoo, H. H. and Hudson, R. J.** 1995a. Cell growth promoting factors in water-soluble fraction of Canadian elk (Cervus elaphus) antler. *1st International Conference on East-West Perspectives on Functional Foods, Singapore page 111.*
143. **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. *3rd World congress of medicinal acupuncture and natural medicine.* Edmonton, Alberta, Canada, p. 68.
144. **Sim, J.S.** 1988. Designer Food Concept and Antler Research. *North American Elk, Spring 1998, pp. 50-54*
145. **Sim, J.S. and H.H. Sunwoo.** Canadian Scientists Study Velvet Antler for Arthritis Treatment. *North American Elk*, Fall 1998, pp. 123-125
146. **Song, S .K.** 1970. Influence of deer horn on erythropoietin activity and radioactive iron uptake in rabbits. *The Journal of Catholic Medical College*, 18: 51-63.
147. **Soshnianina, M.P.** 1974. Influence of extract of the pantui of Transbuikal wapiti on certain characteristics of lipid protein metabolism in the tissue of guinea pigs in normal conditions. *Materialy Vtoroi Nauchnoi Konferentsii Molodykh Vchenykh*, 49-52.
148. **Suh, J.S., Eun, J.S., So, J.N., Seo, J.I. and Jhon, G.J.** 1999. Phagocytic activity of ethyl alcohol fraction of deer antler in murine peritoneal macrophage. *Biological and Pharmaceutical Bulletin*, 22(9): 932-935.
149. **Sunwoo, H. H. and Sim, J. S.** 1996. Chemical and pharmacological characterization of Canadian elk (Cervus eoaphus) antler extracts. *96–World Federation Symposium of Korean Scientists and Engineers Association, Seoul Korea, WFKSEA Proceedings 96: 706-713.*
150. **Sunwoo, H. H. Nakano, T. Hudson, R. J. and Sim, J. S.** 1995. Chemical composition of antlers from wapiti (Cervus elaphus). *J. Agric. Food Chem.* 43: 2846-2849.
151. **Sunwoo, H. H., Nakano, T. and Sim, J. S.** 1997. Effect of water soluble extract from antlers of wapiti (Cervus elaphus) on the growth of fibroblasts. *Can. J. Anim. Sci.* 77:343-345.
152. **Sunwoo, H.H., Sim, L.Y.M, Nakano, T., Hudson, R.J., Sim, J.S.** 1977. Glycosaminoglycans from growing antlers of wapiti (Cervus elaphus). *Canadian Journal of Animal Science.* 77:715-21.
153. **Sunwoo, H.H., Sim, L.Y.M, Nakano, T., Hudson, R.J., Sim, J.S.** 1988. Isolation, characterization and localization of glycosamines in growing antlers of wapiti (Cervus elephus). *Comparative Biochemistry and Physiology Part B*, 273-283.
154. **Suttie, J. M., Fennessy, P. F., Haines, S. R., Sadighi, M., Kerr, D.R. and Issacs, C.** 1994. The New Zealand velvet antler industry: Background and research findings. *International symposium on Cervi Parvum Cornu. KSP Proceedings.* Seoul, Korea, pp 86-135.
155. **Suttie, J. M., Corson, I.D. et al.** 1991. Insulin-like growth factor 1, growth and body composition in red deer stags. *Anim. Prod.* 53: 237-242.
156. **Suttie, J. M., GLuckman, P.D. et al.** 1985. Insulin like growth factor 1:

- antler stimulating hormone?  
*Endocrinol.* 116: 846-848:
157. **Suttie, J. M., Fennessy, P.F. et al.** 1989. Pulsatile growth hormone, insulin-like growth factors and antler development in red deer (*Cervus elaphus scoticus*) stags. *J. Endocrinol.* 121: 351-360.
158. **Suttie, J. M., Fennessy, P.F. et al.** 1991. Antler growth in deer. *Proc. Deer Course for Veterinarians (Deer Branch, NZ Vet Assoc)* 8: 155-168.
159. **Suttie, J.M., and S. Haines.** 1996. Evaluation of Velvet Antler: The Effect of Aqueous Velvet Extracts on the Immune System. *Report to Varnz*
160. **Suttie, J.M., and S. Harris.** Clinical Properties of Deer Velvet. <http://www.positivehealth.com/permit/Articles/Nutrition/sut54.htm>
161. **Takikawa, K., Kokubu, N., Tahara, N. and Dohi, M.** 1972a. Studies of experimental whiplash injury. II. Evaluation of Pantui extract, Pantocrin as a remedy. *Folia Pharmacologica Japonica*, 68: 473-488.
162. **Takikawa, K., Kokubu, N, Kajihara, M. and Dohi, M.** 1972b. Studies of experimental whiplash injury. III. Changes in enzyme activity cervical cords and effect of Pantui extract, Pantocrin as a remedy. *Folia Pharmacologica Japonica*, 68: 489-493.
163. **Takikawa, K. and Imai, M.** 1977. General pharmacological properties of pantui extracts. *Pantocrine II.* Oyo Yakuri, 603-609.
164. **Tapadinhas M.J., Rivera, I.C. and Bignamini, A.A.** 1982. Oral Glucosamine Sulphate in The Management Arthrosis: Report on a Multi-Centre Open Investigation in Portugal. *Pharmatherapeutica* 3:J57-168.
165. **Tavy, A.S.** 1988. Experimental Data on the Pharmacological Activity of Pantocrin. In: *Pantocrin: A Publication of Articles on Studies of Curative Properties of Pantocrin.* Pavlenko, S.M. (ed). Moscow: V/O Medexport
166. **Tevi, A.S.** 1969. Effect of temperature factors on pharmacological activity of extracts from antlers. *Collection of Scientific Works of the Scientific Research Laboratory for Breeding Deer with Non-Ossified Antlers, Altai Scientific Research Institute of Agriculture.* Pantocrine Part 2:14-17.
167. **Tockev, A.** 1998. Deer Velvet 'Boosts Strength. *The Dominion*, In: *The New Zealand Game Industry Board Media Statement*, Feb 18, 1998.
168. **Trentham, D.E., Dynesius-Trentham, R.A., Orav, F.J., et al.** 1993. Effects of oral administration of type II collagen on rheumatoid arthritis. *Science* 261:1 727-1730.
169. **Tsujibo, H., Miyake, Y., Maruyama, K. and Inamori, Y.** 1987. Hypotensive compounds isolated from alcohol extract of unossified horn of *Cervus elaphus* L var. *xanthopygus* (Rokujo) 1. Isolation of lysophosphatidyl choline as a hypotensive principle and structure activity study of related compounds. *Chemical and Pharmaceutical Bulletin*, 35: 654.
170. **Unschuld, P.U.** 1985. Medicine in China: A history of ideas. Berkeley, Los Angeles, London: *University of California Press*, 423 p.
171. **Vajaradul Y.** 1981. Double-Blind Clinical Evaluation of Intra-Articular Glucosamine in Outpatients with Gonarthrosis. *Clin Ther* 3:336-343.

172. **Vaz, A.L.** 1982. Double-Blind Clinical Evaluation of the Relative Efficacy of Ibuprofen and Glucosamine Sulphate in the Management of Osteoarthritis of the Knee in Out-Patients. *Curr Med Res Opin* 8:145-149
173. **Wang, B.X.** and Zhou, Q.L. 1991. Advances in the chemical, pharmacological and clinical studies on pilose antler. *Yao Hsueh Hsueh ao*, 26(9):714-720 [Article in Chinese]
174. **Wang B.X.** 1996. Advances in the research of the chemistry, pharmacology and clinical application of pilose antler. *Proceedings of the International Symposium on Deer Products*, Changchun, People's Republic of China, 14-32.
175. **Wang, B. X.,** Zhao, X.H. *et al.* 1988. Inhibition of liquid peroxidation by deer antler (Rokujo) extract in vivo and in vitro. *J. Med. Pharm. Soc. for WAKAN-Yaku* 5: 123-128.
176. **Wang, B.X.,** Chen, X.G. and Zhang, W. 1990. Influence of the active compounds isolated from pilose antler on synthesis of protein and RNA in mouse liver. *Yao Hsueh Hsueh ao*, 25(5): 321-325.
177. **Wang, B.X.,** Liu, A.J., Cheng, X.J., Wang, Q.G., Wei, G.R., Cui, J.C. 1985. Antiulcer activity of the polysaccharides isolated from pilose antler. *Acta Pharmacologica Sinica*, 20(5): 321-325.
178. **Wang, B.X.,** Zhou, X.H., Qi, S. B., Kaneko, S., Hattori, M., Tsuneo, N. and Nomura, Y. 1988a. Effects of repeated administration deer antler extract on biochemical changes related to aging in senescence-accelerated mice. *Chemical and Pharmaceutical Bulletin*, 36(7): 2587-2592.
179. **Wang, B.X.,** Zhou, X.H., Qi, S. B., Kaneko, S., Hattori, M., Tsuneo, N. and Nomura, Y. 1988b. Stimulating effect of deer antler extract on protein synthesis in senescence-accelerated mice in vivo. *Chemical and Pharmaceutical Bulletin*, 36(7): 2593-2598.
180. **Wang, B.X.,** Zhou, X.H., Yang, X. W., Kaneko, S., Hattori, M., Tsuneo, N. and Nomura, Y. 1988c. Identification of the inhibitor for monoamine oxidase B in the extract from deer antler (Rokujo). *Journal of Medical and Pharmaceutical Society for WAKAN-YAKU*, 5:116-122.
181. **Wang, B.X.,** Chen H., Xu W., Zhang W and Zhang J. 1990. Effect of polyamines isolated from pilose antler on RNA polymerase activities in mouse liver. *Acta Pharmaceutica Sinica* 25: 652-657.
182. **Wang, B.X.,** Chen X. and Zhang W. 1990. Influence of the active compounds isolated from pilose antler on synthesis of protein and RNA in mouse liver. *Acta Pharmaceutica Sinica* 25: 321-325.
183. **Warriner, K.** 1988. Structure and Function Claims for Velvet Antler. *Tradeworks, Oct 29.*
184. **Whitehouse, M.W.,** Sun. D. and Ghosh, P. 1994. A deer cartilage preparation (cervusen) contains type II collagen and is orally active in the rat adjuvant arthritis model. *In: Proceedings from the Australian Rheumatology Association, 38th Annual Scientific Conference, Melbourne.*
185. **Won DO Hee** 1994. The review of the specifications and the composition of velvets. *In: Proceedings of an International Symposium on Cervi Parvum Cornu.* The Korean Society of Pharmacognosy, Seoul, Korea, 12-40.

186. **Wong, K.C.,** Wu, L. 1932. The history of Chinese medicine. Tientsin, China: *The Tientsin Press Ltd.*, 706 p.
187. **Yasui, N.,** and M.E. Nimmi. 1998. Cartilage collagens. In: *Collagen, Volume I.* M.E. Nimmi, ed. Boca Raton: CRC Press. 225-24 I.
188. **Yong, J.I.** 1964. The effects of deer horn on the liver and other organs of cholesterol administered rabbits. *Journal of the Pharmaceutical Society of Korea*, 8: 12-29.
189. **Yoon, P.** 1989. The effect of deer horn on the experimental anemia of rabbits. *Journal Pharmacochemical Society Korea*. 8: 6-11.
190. **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. Far East Science Center. Vladivostock.
191. **Zhang et al.** 1994. Anti-inflammatory effects of pilose antler peptice. *Acta Phar. Sin.* 15(3), 282-284.
192. **Zhang, H.** and Wanwimolruk et al. 2000. Toxicological evaluation of New Zealand deer velvet powder. Part I: acute and subchronic oral toxicity studies in rats. *Food Chem Toxicol* 38(11):985-90
193. **Zhang, Z.Q.,** Zhang, Y., Wang, B.X., Zhou, H.O., Wang, Y, and Zhang, H. 1992. Purification and partial characterization of anti-inflammatory peptide from pilose antler of Cervus nippon Temminck. *Yao Hsueh Hsueh Pao* 27(5):321-324
194. **Zhang, Z.Q.,** Wang, Y., Zhang, H., Zhang, W. Zhang Y., Wang, B.X. 1994. Anti-inflammatory effects of pilose antler peptide. *Acta Pharmacologica Sinica*, 15(5): 282-284.
195. **Zhao, D.,** Zhang, X., Zhou, F., Wei, Z., Tian, H. and Chung Kuo. 1990. Relation of Fourier transform infrared spectroscopic characteristics of pilose antler and its traditional quality grade. *Chung Yao Tsa Chih* 15(1):37-39 [Article in Chinese]
196. **Zhao, Q.C.,** Kiyohara, H., Nagai, T. and Yamada, H. 1992. Structure of the complement-activating proteoglycan from the pilose antler of Cervus Nippon Temminck. *Carbohydrate Research*, 230: 361-372.
197. **Zheng, Z.** 1997. Analysis on the therapeutic effect of combined acupuncture and medication in 297 cases of male sterility. *Journal of Traditional Chinese Medicine*, 17(3): 190-193.
198. **Zhiliaev, E.V.,** Dobriakov, IuI. 1995. Experience in the use of rantarine in the treatment of internal diseases. *Klin Med (Mosk)*, 73(5):77-78 [Article in Russian]
199. **Zhou, Q.L.,** Guo, Y.J., Wang, Y and Liu, Y.Q. 1999. Velvet antler polypeptides promoted chondrocytes and osteoblast precursors and fracture healing. *Acta Pharmacologica Sinica*, 20(3): 279-282.
200. **Zioupou, P.,** Wang, X.T. and Currey, J.D. 1996. Experimental and theoretical quantification of the development of damage infatigue tests of bone and antler. *J Biomech*, (8):989-1002 Department of Biology, University of York, U.K.
201. **Zupanets I.A.,** Drogovoz, S.M., Bezdetko, N.V., et al. 1991. The Influence of Glucosamine on the Antiexudative Effect of Nonsteroidal Anti-Inflammatory

Agents. *Farmakol Toksikol* (USSR)  
54:61-3.

# Appendix 1: Australian Deer Velvet Pamphlet

## Australian Deer Velvet



A modern, natural health supplement supported by more than 2000 years of traditional oriental medicine use and modern western research

养鹿业

**References**

Batchelder, HJ. 2000. **Velvet Antler: A Literature Review.** [www.wspitl.net/news/default2.cfm?articleID=37](http://www.wspitl.net/news/default2.cfm?articleID=37)

Balok, C. **Can I Give This Product to My Pets?** [www.naorb.org/epb/index.cfm?url=map=5&articleID=194](http://www.naorb.org/epb/index.cfm?url=map=5&articleID=194)

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

Cooney, A. 2001. **A review of the scientific literature on the health benefits of velvet antler.** [www.usask.ca/agriculture/npcc/publications/Eur%20Electronic.pdf](http://www.usask.ca/agriculture/npcc/publications/Eur%20Electronic.pdf)

Jetts, E. **The Ying-Yang of deer antler or east and west use of deer antler in medicine.** [www.usask.ca/ncvm/ncvmed/specialiststock/antlers](http://www.usask.ca/ncvm/ncvmed/specialiststock/antlers)

Laughlin, ML. 2001. **A summary of research on velvet antler dietary supplements.** [www.vitamininamerica.com/news/velvet.htm](http://www.vitamininamerica.com/news/velvet.htm)

Marshall, L.A. 2000. **Natural Remedies: Velvet antler under the microscope.** *Nutrition Science News.* [www.healthwellnesschange.com/nutritionscience/news/NSN\\_backu/Mar\\_00/velvet.cfm](http://www.healthwellnesschange.com/nutritionscience/news/NSN_backu/Mar_00/velvet.cfm)

New Zealand Game Industry Board. **2000 Velvet Manual.** [www.velvet.co.nz/manual/manualtoc.html](http://www.velvet.co.nz/manual/manualtoc.html)

Suttie, J.M., and S. Haines. **Clinical Properties of Deer Velvet.** [www.positivehealth.com/permit/articles/nutrition/vat54.htm](http://www.positivehealth.com/permit/articles/nutrition/vat54.htm)

### 澳大利亚 养鹿业

© Deer Industry Company  
PO Box 37, Uismore Victoria 3324, Australia

**Dose Rates**  
Research reports that although there is no information on dose rate research available, it is generally considered that one or two 250-350 mg capsules per day is sufficient to maintain health and alleviate minor fatigue while higher doses are used for healing or performance enhancement.

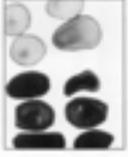
Like most natural health supplements, effects of velvet antler tend to be cumulative. Typically, significant benefits are seen after 8 to 12 weeks of consistent use.

Some minor side effects (headaches and nose bleeds) have been observed at higher dose levels.

Velvet antler should only be used as part of an overall health plan. It should not replace prescription medication or proper nutrition. As is the case with all dietary supplements people should consult a suitably qualified physician before consumption of velvet antler supplements.



Velvet Antler Powder



Velvet Antler Slices



Velvet Antler Capsules

**Quality Assurance**  
Velvet is handled and stored in a hygienic manner and as required by the National Velvet Accreditation Scheme (NVAS). The NVAS ensures consumers of deer velvet and the wider community that:

- Acceptable standards of animal welfare are maintained
- Deer Industry QA Programs product traceability requirements are supported
- Occupational Health & Safety requirements for personnel involved in velvet removal are maintained.
- QA, residue and animal welfare expectations of international and domestic communities and clients are maintained

### Traditional Chinese Medicine (TCM) and Velvet Antler

Documented literature relating to Traditional Chinese Medicine (TCM) that dates to well before the birth of Christ, reports and accolades the health promoting properties of velvet antler.

Principals of TCM involve supplementation of factors [collectively called the Yang] in nature that restores the body to a natural balance and allows the natural defence mechanisms of the body to effect healing more or less on its own. It emphasizes the organic or functional relationships between the health of each part of the body and the whole body, a holistic approach to health.

Consistent with the holistic approach of TCM, velvet has long been used to treat a variety of health problems and as a general tonic to restore balance, strengthen the body and promote overall wellness. A TCM practitioner who cuts thin slices of velvet from a stick of dried velvet and combines the slices with other natural medicine products traditionally prescribe velvet. Patients usually prepare a soup from the prescription tea it consumed.

There are many studies related to velvet antler reported in the scientific literature. However many of the older papers produced in Asia were not controlled by the same standards of reporting required by Western Medicine. Some of the concepts of TCM like 'well being' are difficult for Western Medicine to measure.

In recent times there have been significant additions to the scientific literature on deer velvet from researchers, particularly those in New Zealand, Korea, China, Canada, USA, Australia and Russia. Available literature reviews generally suggest that some benefits of consumption of deer velvet have been identified although more research is needed. It is important to note that TCM does not encourage uniform use of velvet antler (or any of its other remedies).

### Health Benefits Claimed by TCM

TCM claims for the use of deer velvet are much broader than the range of effects suggested by western research. They include:

- Systematic exhaustion
- Depression
- Cold
- Lower back pain
- Weak pulse
- Impotence
- Spermatosthea
- Low white cell counts
- Regulate the adrenal cortex
- Regulate energy metabolism
- Promote sexual function
- Promote growth
- Strengthen resistance



### Health Benefits Supported by Western Research

Generally researchers agree that velvet antler returns, strengthens and protects normal bodily functions but is not in itself curative. Preliminary results of modern research suggest that deer velvet may have beneficial effects related to:

- Stimulation of the body's immune system to assist protection against infection and disease
- The anti-inflammatory agents it contains that may assist in reducing the pain and inflammation of a variety of degenerative diseases
- The anabolic or growth stimulating properties it provides
- The prevention or repair of muscle damage following exercise



Its ability to increase muscular strength and endurance  
Its ability to significantly reduce the damaging side effects of chemotherapy drugs, while at the same time increasing their effectiveness

### Health Benefits for Animals

Research and anecdotal reports also suggest promising health benefits from supplementation with deer velvet for animals with inflammation related health problems.

Blalock reported that positive effects of velvet on animals include:

- Relief from clinical arthritis
- Improved kidney function
- General feeling of well being
- Increased reproductive performance
- Improved hair coat
- Accelerated wound healing



### Composition and Active Ingredients

Research has reported the chemical composition of whole velvet antler sticks and sections (tip, upper, mid and base) of a stick.

Broadly, velvet antler is composed of proteins, free amino acids, minerals, lipids and water. Specific key compounds that have been identified in deer antler include collagen, glucosamine sulphate, chondroitin sulphate and growth factors.

Most researchers suggest that although ingredients in velvet antler are generally known, it is likely that combinations of ingredients in the antler contribute significantly to the activity of velvet antler products.

