Velvet and Chinese Pharmacology

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ABSTRACT

Velvet antler has formed an important part of the Traditional Medicine Pharmacopoeia in China for at least 2000 years. Western medicine has largely eclipsed Traditional Chinese Medicine (TCM) until recently when revived interest has spurred scientific research. This has demonstrated the human health benefits of traditional medicine. Velvet antler is unique in the animal kingdom in that it regenerates annually at a very rapid rate. A hypothesis is developed in the paper which might explain why human health benefits could arise from velvet. Velvet antler has been used in TCM to cure exhaustion, improve resistance to cold, improve cardiovascular function, improve strength, increase red and white blood cell numbers, hasten wound healing, improve immune function and act as an anti-ageing treatment. There is good scientific evidence from Russia and Chinese literature that velvet can improve athletic performance and mental performance, increase growth and immune function, cure anaemia and reduce cholesterol. Many of these effects are consistent with a function for velvet as a restorative and growth promotant - concepts supported by the uniqueness of the regeneration process.

KEYWORDS

Antler, velvet, benefits, pharmacology

INTRODUCTION

Velvet is the term given to deer antlers during growth. Velvet has formed part of the Traditional Medicine Pharmacopoeia for at least the last 2000 years of recorded history. In a Western Culture which is familiar with plant herbal medicine, the concept of medicinal animals appears strange. Yet the traditional cultures of North Asia, China, North America and even Europe made use of animal products as medicines. The best example from Europe is the use of bee venom for long term pain relief from arthritis.

In modern times the use of animal products, and indeed plant products as well, in Traditional medicines has been lost except in Asia, particularly China and Korea. The fact that the use of Traditional medicines has persisted and even prospered in Asia, often alongside and complementary with science based Western medicine, is of great relevance. Several conclusions can be drawn, among them, that Traditional medicines are effective and their benefits maybe additive to those of Western medicine. In fact scientific studies of Traditional medicines have revealed measurable therapeutic effects. This is hardly surprising when, for example, all users of aspirin essentially consume a synthetic substance originally purified from willow bark. Hence Western medicine has built on Traditional medicine. This may

have led some people to believe that Western medicine is superior - perhaps in some way purer - than Traditional medicine, and thus facilitated its demise. In the last years of the 20th century the time is right to re-evaluate Traditional medicines and position them appropriately for the benefit of a modern society.

The medicinal use of velvet antler comes at the forefront of this re-evaluation. Once the concept that medicinal plants and animals are equally regarded in Traditional medicine and differentiated for functional rather than taxonomic reasons, it becomes easier to accept velvet antler as a medicinal. The Western culture demands proof of effectiveness, and scientific evidence from Russia, China, Korea, Japan and New Zealand has supplied this for velvet antler. The aim of this presentation is to briefly develop a frame of reference in which to evaluate the medicinal use of velvet, to explore the history of velvet antler consumption and to present supportive data for medicinal effects. The paper concludes with a conceptual framework with which to explain medicinal effects of velvet antler and also predict future uses.

What is Velvet Antler?

The precise definition of velvet antler differs depending on the circumstances. For example, many think of "velvet" as being the soft, hair-covered skin that is shed each year as antlers harden. For the purpose of this paper, however, we can use a broad description - 'the whole of actively growing antlers of deer. Antlers are grown on the heads of all male deer. Throughout ungulate evolution there must have been a strong selection pressure to develop a display or fighting structure on the head. Dinosaurs, for example *Triceratops,* had horns, elephants have tusks, sheep and cattle have horns, rhinoceros have a different kind of horn and horses and camels have large canine teeth. Only deer have antlers. It is as if groups of animals have evolved a different response to the selection pressure to develop structures on the head. Deer antlers are, on the one hand, simply the solution evolved by Cervidae but, on the other hand, they are of particular interest because they are a unique solution. Whereas tusks and horns last for the life of the animal and (neglecting the pronghorn) grow continuously. Antlers have evolved to a stage where the tissues become lifeless and hence must drop off and then regenerate every year. This capacity for full regeneration of an organ is unique in the animal kingdom. It confers the advantage that annual variations in reproduction fitness can be communicated accurately and equally to potential mates and rivals. The fact that antlers become larger and more complex each year is evidence that this potential is in full use by stags! The 'reason' for the evolution of a lifeless step can only be speculated upon but scientists consider that antlers evolved first as velvet covered structures. These structures were fragile and prone to freezing damage due to the superficial nature of the arteries and nerves. Regeneration, possibly evolved to permit the annual replacement of the delicate growing organs. Deer species have now evolved characteristic antler patterns from simple spikes to full palmation.

Why Does Velvet Have Medicinal Effects?

Having accepted the concept that medicinal animals - and animal parts - are integral parts of Traditional medicines and have intrinsic effectiveness, it may be useful to consider why. In Western medicine we typically know the source, composition and purity of the active ingredient for a drug and usually know the physiological and biochemical pathways through which it exerts its effect. Such knowledge is rare for a Traditional medicine. Instead we rely on measurements of the effects of extracts or other preparations of the raw material.

To understand velvet antler's medicinal actions, without a knowledge of active ingredients, we first require consideration of what velvet is and the type of tissues which are found in its matrix.

Regenerating velvet grows extremely rapidly - at up to 2cm/day in the largest deer species. In contrast to horns, which grow from the base, antlers grow from the tip. That is, active growth precedes differentiation. Each day cells are proliferating, differentiating and dying at a rapid rate. These cells are mainly the progenitors of cartilage and bone. However the development of cartilage and bone needs the support of nerves and blood vessels. The velvet skin itself is covered with hair with associated sebaceous glands. Lymphatic tissue is present, but there is no muscle nor development of fat deposits. It is highly probable that many growth factors and regulators of differentiation are found in velvet at high abundance in order to support the high rate of growth of the regenerating tissue.

The Development of a Velvet Using Culture

Prehistoric man must have used his observational and experimental skills to explore the properties of the natural world. Observation, trial and error would presumably lead to the development of a pharmacopoeia based on what was available and what was effective. Conceivably upon killing a deer in velvet a hunter would consume all edible portions and would link some health benefit to eating the velvet. As plant herbs were probably preserved by drying, so perhaps was velvet antler. Medicinal practice became the province of the shaman who blended herbal medicines with magic. Cultures such as these extended throughout northern latitudes in the millennia before Christ.

The Effects of Velvet

A silk scroll dated 168 BC found in a tomb in Hunan Province, PRC clearly blends herbal medicine and magic. Medicinal information from the scroll included a use for velvet antler in treating snake bites. Deer are a familiar figure in Chinese mythology and often accompany illustrations of the God of Longevity as a symbol of medicinal values. In the late Han Dynasty (25-220 AD) the "Divine Husbandmen's Classic of the Materia Medica" was written. This document clearly separates medicine from magic. Of the 67 Zoological entries velvet is one of those included. The link between Oriental Medicine Theory and herbal medicine was not made until the Tang Dynasty some 400 years later. One of the most important TCM texts was the "Grand Materia Medica (Ben Cao Gang Mu)" written by Li Shi-Zhen (1596 AD). This book lists the medicinal properties of 1892 substances of which 444 are from medicinal animals. Li Shi-Zhen described velvet as a herb which tonified the Yang and listed the following functions:

- increase vital forces
- boost the will
- strengthen the muscles and bones
- cure general debility
- reduce the effects of rheumatism
- present osteomylitis
- stop uterine haemorrhage
- delay senility
- prevent male impotence

Li also quoted the following poem:
"If you never curbed the passions
And squandered the ocean
The magic potion of nine metamorphoses
By concentrating slowly, will offer you heaven
The spotted dragon
A pearl on his brow
Will restore the lower cave
The portals of the jasper palace"

'Curbing the passion' refers to excessive sexual intercourse, the spotted dragon is the sika deer and the organ to be restored is probably self explanatory! This is probably where the myth of velvet being an aphrodisiac comes from. It was clear from his writings that Li Shi-Zhen himself didn't take this too seriously.

The current uses of velvet antler in the TCM pharmacopoeia are listed as follows:

- as a cure for systematic exhaustion via effects on
  - adrenal cortex function
  - energy metabolism
  - growth
  - disease resistance
- to increase resistance to cold
- to increase cardiovascular function
- to improve strength and decrease fatigue
- to increase red and white blood cell numbers
- to aid in wound healing
- to improve immune function
- as a diuretic
- as an anti ageing treatment

This list seems to be rather broad and perhaps overly exhaustive and excessive. From a Western concept of specific drugs and specific functions it seems to be impossible. But curing exhaustion, strengthen resistance to disease, improving strength and possibly improving wound healing could be explained by active substances in the velvet associated with rapid growth and its control. Wound healing and haematological effects could be due to the substances associated with regeneration. Factors in the antler responsible for rapid nerve and blood vessel development might explain the cardiovascular and cold resistance functions. Finally the anti-ageing effects could be due to substances involved in ensuring that the rapid processing of cell division occurs in an orderly pattern, given that a major effect of ageing is a break down in cellular metabolism leading to poor tissue maintenance and 'mistakes' in cell division. Thus it may be possible to group velvet antler effects into restoration/regeneration, neuro-vascular and anti ageing functions. The restoration/regeneration category can be sub-divided further into subcategories of healing (return to a normal state) and performance enhancement (improvement of the existing state).

There is sufficient information in the literature for several books on this subject. We have selected a number of functions to illustrate the diversity of effects which have been shown for velvet. The examples in the rest of the paper are drawn from Russian, Korean and Chinese literature.

PERFORMANCE ENHANCEMENT

The factors in velvet antler responsible for rapid growth and differentiation could play a crucial role in effects on physical and mental performance. In this section examples from the literature in which velvet antler used by healthy people and animals improved these functions are described.

Athletic Performance

Taneyeva (quoted by Brechman, undated) measured the time taken by 50 men, aged between 18 and 23 years, to run 3000m. The measurements were then repeated after each person was

given 20ml of pantocrine (an alcohol:water extract of velvet antler). Pantocrine treatment reduced the average time to complete the distance from 14.48 minutes to 14.04 minutes. In a second experiment the same dose of pantocrine was administered daily for 12 days. In a test race, run 24 hours after the final treatment, the majority of participants recorded a reduced time for the event. Consequently an alcohol extract of velvet antler was shown to improve athletic performance.

Mental Performance

Taneyeva (Quoted by Brechman, undated) studied the effect of pantocrine on the mental capacity of people.

The tests were carried out with a text for correction in which each participant received a printed sheet of paper with a set of letters. Their task was to cross out, within five minutes, as many as possible of two particular letters (for example, B and C), without crossing out the second letter (C) if it occurred in some definite combination (for example, before the letter H). In each test the participants "corrected" two sheets: one prior to, and the other one hour after, the administration of pantocrine. The change in the number of corrected letters in relation to the initial data before taking the preparation and the ratio of the number of errors on the second sheet as compared to that on the first, were calculated as percentages for each test. The difference in the number of letters corrected before and one hour after the administration of pantocrine provided a measure of the quantitative aspect of mental work: The quality of the work was indicated by variations in the percentage of errors made while "correcting" the text. Observations were carried out on men aged from 18 to 23, under similar experimental conditions. As Table 1 shows, pantocrine in both dose rates tested caused a distinct increase in the number of corrected letters and also reduced the percentage of errors.

Table 1: Effect of pantocrine on text correction results, Taneyeva, (1969). Data are mean ± standard error of the mean.

Preparation	Dose (ml)	Number of participants	Average increase in the number of corrected letters	Average decrease in percentage of errors
Control (50% alcohol)	10	9	90±13	0.2±0.05
Pantocrine	10	11	132±17	1.0±0.36
Pantocrine	20	11	141±16 (P<0.05)	0.8±0.26

Consequently mental performance was improved by pantocrine. This is interesting in view of the fact that many Chinese students consume velvet at times of examination stress (Chunyi Li, Personal Communication).

Growth

The effects of an alcohol extract of velvet on growth of chickens was studied by Bae (1975). He allocated 300 chickens, weighing an average of 41g at the start of the study, to groups (n=60) which were fed 0, 1, 2, 5 or 20mls of velvet antler extract each day for 56 days. The chickens were fed to appetite in groups. Treatment with velvet antler improved weight gain (Table 2) and increased food intake. Hence an anabolic action of velvet antler was confirmed.

Table 2: Performance of chicken fed experimental diets containing different levels of velvet during 0-8 weeks. Means with different subscripts differ significantly (P<0.05)

Measure	Dose of Velvet Antler Extract				
	0	1ml	2ml	5ml	20ml
Initial Body Weight (g)	41	41	41	41	41
Final Body Weight (g)	1.725	1.768	1.779	1.821	1.773
	(a)	(ab)	(bc)	(c)	(b)
Body Weight Gain (g)	30.07g/d	30.83	31.04	31.79	30.93
	(a)	(ab)	(bc)	(c)	(bc)
Feed Intake (g)	3.968	4.000	4.084	4.162	4.062

Immune Function

Wang Ben-Xiang et al (1996) treated normal mice intra-peritoneally with pantocrine and measured serum Immunoglobulin (IgG) levels. The results presented in Table 3 indicate the 1.25ml/kg dose of pantocrine for eight days significantly raised IgG levels above that of the control.

Table 3: Effect of daily treatment with pantocrine for eight days on serum IgG levels (X±SD) in mice.

Group	Dose (ml/kg)	n	IgG (mg/ml)	P
Normal mice				
Control		25	9.17±0.59	
Pantocrine	1.25	28	11.02±0.76	>0.05
	2.5	26	10.58±0.61	>0.05
	5.0	28	12.78±0.62	<0.001

Summary

The above studies were all carried out using an alcohol extract of velvet antler. This highlights a difficulty in drawing together conclusions from this field, that of variation in the form of the velvet being studied. Nevertheless in this review of benefits the reports are presented for evaluation. Taken together they reveal that several measurable benefits, which can broadly be described as strengthening the body, can be shown. The studies are in many respects preliminary and would benefit from further testing and confirmation.

RESTORATION

In the studies reported in this section the experimental subjects have been compromised in some way and the effect of antler extract on the resumption of normal function has been tested.

Anaemia

Kim et al (undated) studied the influence of water based extracts of velvet from elk, NZ red deer, reindeer and Chinese sika deer on erythrocyte numbers and blood haemoglobin (Hb) levels of rabbits with experimentally induced anaemia. The rabbits were allocated to treatment (n=5 per group) and injected with 20mg/kg phenylhydrazine. The worst anaemia was evidenced on day 4, and on that day and for the next 12 days 250mg/kg of antler extract

was administered to each rabbit. A group of control rabbits was made anaemic but received no further treatment. The data (Figures 1 and 2) are presented as percentage relative to day 4. Haemoglobin (Figure 1) improved in all groups, including the control. Rate of improvement was greatest for the groups receiving extracts of elk and NZ red deer velvet. Likewise percentage improvement of erythrocyte numbers was highest for the elk and red deer groups compared with the control. Interestingly the water extract of Chinese sika velvet performed poorly in both tests.

Figure 1:

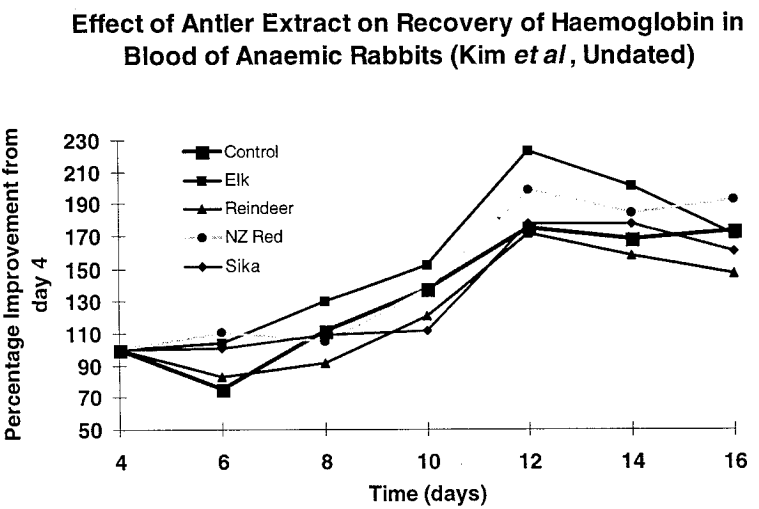
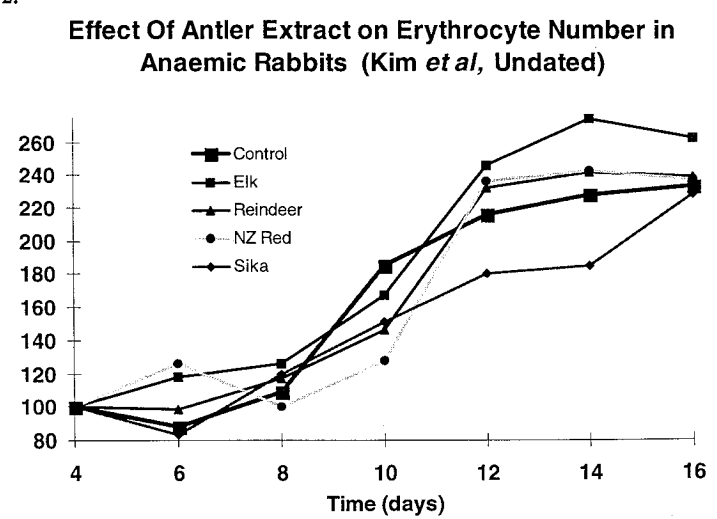


Figure 2:



These results show a strong anaemia alleviating effect. Although the factors responsible are unknown, there is clear evidence that a component in velvet antler can alleviate experimentally induced anaemia, thus clearly demonstrating a restorative function.

Cholesterol Reduction

Soshnianina (1974) studied the influence of pantocrine injections on tissue levels of cholesterol in guinea pigs. The authors found that pantocrine injections reduced total liver cholesterol from 2190mg/100g to 1610mg/100g. Spleen cholesterol was also reduced but kidney cholesterol was significantly raised from 1880mg/100g to 2190mg/100g. The author concluded that pantocrine was reducing cholesterol content of the liver and spleen and interpreted the raised kidney levels as evidence of separation of cholesterol from the blood for subsequent elimination in the urine.

These data are of real relevance to people with problems caused by higher cholesterol levels and merit serious research in humans.

Summary

Velvet antler has the potential to be used in cases in which normal bodily function is impaired. Other known applications not reviewed are wound-healing and anti-stress effects. Taken together these effects not only emphasise the power of velvet as a strength promoter but also a restorative to normal function.

NEURO-VASCULAR FUNCTION

In the Russian literature there are many studies in which neuro-physiological experiments have been carried out to determine the tissue responses to pantocrine. It is outside the scope of this review to detail these but the overwhelming conclusion is that there are active ingredients in velvet antler which act on peripheral nerve endings. These may well control the hypo- and hypertensive effects and be responsible for the vaso-dilation which causes the nose bleed and "warming" side effects of velvet antler that are often reported.

Blood Pressure

The Russian clinical literature contains apparently paradoxical references to the use of pantocrine for both the reduction and raising of blood pressure i.e. hypo- and hypertensive functions. Although active components are unknown we consider this paradox is evidence, in part, for a homeostatic restorative function. Albov et al (1969) studied 32 patients with high blood pressure (hypertension) caused by cardiac disease, early onset menopause or obesity. They were treated with pantocrine either orally or by injection for 20 or 30 days respectively and then examined by a physician. Twenty six of the patients (81%) had measurably lower blood pressure and reported an improvement in condition. Those reporting no improvement had had high blood pressure for an extended period of 9-10 years.

The same authors also studied the effects of pantocrine on 13 patients with hypotension caused mainly by disorders of heart muscle activity. The patients were given 20 daily injections of pantocrine and were examined 10 days after the final treatment. Eleven of the patients (84%) showed an improvement.

Dose levels in both studies were one ampoule/day (2ml) by injection, or 30 drops (about 4.5ml) orally three times a day. Mainly female patients were studied but successful treatment of some men was also reported. In the women treated for premature menopause, menses resumed in most. On balance it must be stated that data from untreated control people were

not presented. Consequently no scientific evaluation of this finding is possible and the results are presented for information only.

How can pantocrine apparently have opposite effects at the same time? Arguably there are different active ingredients, but an alternative is that velvet 'treats' the abnormality and 'returns' it to the normal level, thereby raising or lowering blood pressure.

Summary

The neuro-vascular effects of velvet are enigmatic in the extreme but the overall consensus is for an effective product which acts to normalise the cardio-vascular system.

ANTI-AGEING

Wang Ben-Xiang et al (1988a, b) used a special breed of mouse which had been selected for its propensity to exhibit early senility to study the effects of velvet antler extracts on the ageing process. They showed that velvet antler increased testosterone in male mice, and decreased the activity of enzymes associated with the ageing process. In addition velvet antler extract raised levels of liver superoxide dismutase, a free radical scavenging enzyme. Velvet antler extract also increased liver and kidney protein synthesis by enhancing enzyme activity. Taken together the data are powerful evidence of an anti-ageing effect of velvet.

We consider that these diverse effects of velvet antler extract on the ageing process could, in part, be due to substances produced in the velvet during growth which act to maintain the integrity of cell multiplication. While velvet is growing rapidly, errors of cell division, and possibly protein synthesis, may occur frequently. Unless some system is in place to control and minimise the potentially deleterious consequences of such errors. We present this speculation as a theory to explain the anti-ageing phenomenon.

WHAT DOES VELVET ANTLER NOT DO?

There is no evidence for a specific anti-microbial or anti-viral function for velvet. There is evidence that velvet antler hastens the recovery of patients suffering from gastro-intestinal disease, but the most likely reason for this is a build up of strength rather than an anti-microbial effect.

FUTURE APPLICATIONS OF VELVET

Drawing from the above examples and viewing them in the context of a strengthener, restorer and stimulator of nerves and blood vessels, we can forecast likely uses for velvet antler products. The word 'tonic' frequently is used to describe velvet antler; 'tonic', is defined in the dictionary as 'a medium to improve the health condition of the body'. Tonics are unusual in western medicine relying as it does on scientific purity and experimentation, but the TCM system of measuring effects leads to a conclusion that velvet truly is a tonic.

Consider velvet antler as a restorer, supporter and enhancer. It is not a 'cure' in its own right, and may not operate successfully for all human users, but applications consistent with the properties described above should have widespread benefits for consumers of velvet.

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