A potentially potent panacea?

Animal studies reveal wide range of effects through use of velvet and velvet antler

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WIDE INTEREST is now developing in the pharmacological activity of velvet antler, with the traditional indications for the use of velvet providing a guide for researchers.

There is good evidence that velvet and velvet antler do have potent pharmacological effects. This is not surprising considering the extraordinarily rapid growth rate and differentiation of the tissue during antlerogenesis.

Consequently there is wide scope for investigations into aspects of the growth and differentiation phenomena leading to an understanding of the pharmacology and vice versa. With the increased interest from the general public and within the medical profession in traditional Oriental medicine, there is also some pressure for investigations of the claims made for traditional medicines such as velvet.

The growing velvet antler comprises a number of cell types including fibroblasts, chondroblasts, chondrocytes, osteoblasts and osteocytes. The growing antler tip under the epidermal/dermal layer is composed of a few millimetres of undifferentiated mesenchymal cells which start to differentiate very quickly into cartilaginous tissue.

Subsequently the cartilage is replaced by bone, under the influence of testosterone and its metabolites, and the velvet is shed — leaving the mature, hard, bony antler. Consequently when velvet antler is harvested at the appropriate stage for use in traditional Oriental medicines, it is an actively growing cartilage type tissue and not uniform.

The compositional changes from the tip to the base are reflected in the Chinese and Korean systems of classifying the parts of velvet (Figure 1). The calcium and phosphorus contents of a typical velvet antler are given in Table 1. The maturation of the antler in terms of calcification is clearly evident. Overall A grade velvet antler has a dry matter (DM) content of about 28 to 33 per cent and calcium and phosphorus contents of 7-9 and 4-5 per cent of the dry weight.

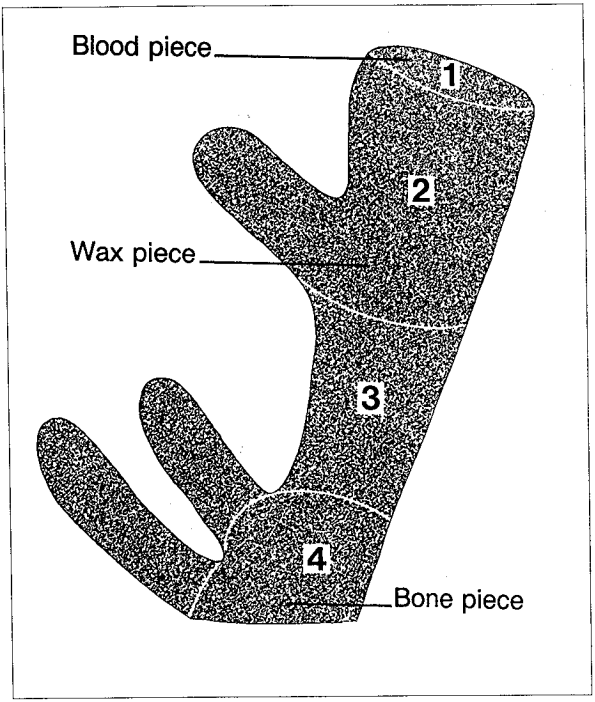

Figure 1: The Oriental system for classifying velvet antler into sections
The different sections are regarded as having specific pharmacological features

A feature of the mineral analyses is the relatively high concentrations of selenium in the antler tip regions of the main beam and trez tine; in samples analysed at Invermay they range from about 0.3 to 0.6 mg/kg DM compared with an overall concentration of about 0.06 mg/kg DM — equivalent to a 5 to 10-fold concentration in the growing tip. On an undried tissue basis, the concentrations in the tip (0.06 to 0.12 mg/kg tissue) are higher than normal levels of blood selenium (greater than 0.01 mg/litre of blood).

As a medicinal product, velvet antler is dried and prepared in a variety of ways, many of these based on tradition. For example, the blood may be extracted or the skin removed before drying; this seems to have been one of the traditional methods which protected against spoilage during the slow drying process. Velvet antler may also be immersed in boiling water and then kiln-dried, oven-dried or dried in hot air or under natural conditions.

Velvet antler may be sliced, powdered or prepared as over-the-counter preparations in pill form or as an extract such as the Russian

product Pantocrin. However, it seems that much of the NZ product exported to Korea is purchased by the Oriental medical practitioner as whole dried antler. The different sections of the antler are regarded as having particular features helpful for the treatment of specific complaints or in specific situations.

Dr Peter Yoon (at this year's NZDFA conference) described his method of preparation of the dried velvet as follows: The hair is first burned off and then the velvet antler is cut into sections for easier slicing and placed in alcohol for about a day; following evaporation, the velvet antler is sliced thinly for use in prescriptions.

He prescribes velvet as part of a mixture along with herbs and other products and it is apparently seldom used on its own.

Pantocrin is derived from the velvet antler of Spotted (Sika) deer, Maral deer and Asiatic Wapiti, while Rantarin is an equivalent product from reindeer. Pantocrin is an alcoholic extract consisting mainly of lipid or other fatty substances, with the yield from dried antler being about 3 per cent. The comparative compositions of velvet antler and Pantocrin are given in Table 2.

Pantocrin liquid (as marketed) has been reported to contain 1.5 per cent DM plus 0.25 per cent preservative and 82 per cent lipids. About one third of the lipid fraction is phospholipids, the most important being choline and ethanolamine.

Different sections of the velvet antler are used largely according to tradition. For example, the upper part (1 and 2, Fig 1) is effective in children and young people as a preventative medicine; the middle part is used in the treatment of arthritis and osteomyelitis; while the lower part is used in old people lacking in calcium.

Dr Yoon notes that about 70 per cent of velvet antler users through his clinic are children but the actual quantity they consume is very small.

In traditional Oriental medicine, velvet antler is indicated for use in childbirth (to aid delivery), anaemia (particularly postnatal), arthritis, impotence and spermatorrhea and other complaints.

There are also some interesting developments, including the direct injection of velvet preparations into certain acupuncture points as treatment for specific complaints — a procedure known as 'aqua-acupuncture'. According to Yoon, this can be a very effective approach requiring much lower amounts of velvet than oral treatment. Pantocrin is also used clinically as an injection.

Pharmacology

BOTH THE stage of antler growth (and hence the overall composition) and the method of preparation can influence the pharmacological activity of the product. Table 3 shows the biological activity of Pantocrin prepared from antlers at seven growth stages. The gonadotrophic activity is based on the capacity of alcohol-free pantocrin to stimulate growth of the seminal vesicles and prostrate gland of the sexually immature male mouse.

The stimulating activity is an index of the effect of the same product on the duration of forced exercise by mice using an endless rope system. The data indicate marked changes in both gonadotrophic and stimulating activity with both indices being maximal at about stage three (equivalent to early trez tine of NZ Red deer or second tine in Spotted deer).

Researchers have noted that the evaluation of biological potency using the gonadotrophic and stimulating activity values is superior to that based on the hypotensive effect, but it is considered that the methods could be further improved.

Using the hypotensive effect in cats

TABLE 1.

Calcium, phosphorus and ash content of a velvet antler cut at the A grade stage classified according to Oriental description of the velvet antler sections.

Velvet antler section	Percentage of dried velvet antler weight	Composition (% of DM) CA	P	Ash
1	2.2	0.18	0.62	7
2	30	5.2	3.2	27
3 – main beam	24	8.3	4.9	32
3 – brow, bez	26	6.6	3.9	30
4	18	10.3	5.9	37
Total	100	7.1	4.2	30

TABLE 2.

Comparative composition of dried velvet antler and Pantocrin (Pavlenko et al. 1969).

Component	Composition Velvet Antler	(g/100 g DM) Pantocrin
Ash	39	2
Organic matter	61	98
Protein	49	6
Lipid	2.3	65
Amino acids, etc	6	20

and rabbits as an index of biological activity of velvet antler preparations, it has been shown that the preparation method can influence bioactivity (Table 4).

High temperature extraction was clearly superior in this case, which raises interesting questions about the nature of the factor involved (eg heat stability).

It is possible that the effect is due, at least in part, to the actions of choline/acetylcholine. At least part of the hypotensive activity has been shown to be due to lysophosphatidyl cholines (LPC), and in particular the LPC of both C14:0 and C16.0 fatty acids had very potent activities in an in vivo system using spontaneously hypotensive rats; the velvet antler extract contained very high levels of C14.10 LPC.

In this respect, acetylcholine given intravenously at very low doses to cats lowers the blood pressure due to a direct dilatory action on the walls of certain peripheral blood vessels.

When larger doses are injected, there is a considerable fall in blood pressure which is largely due to a vagus effect on the heart — that is, a slowing and decreased contraction. Both effects are abolished by atropine, an inhibitor of acetylcholine action.

In animal studies, velvet antler or antler preparations have been shown to have a number of effects including the following:

- gonadotrophic effects
- haematopoietic effects
- protection against shock/stress
- recovery from liver damage
- stimulation of growth
- retardation of ageing
- recovery from injury.

The effect of velvet or antler preparations on the growth of the prostate and seminal vesicles in the immature rat or mouse is an example of the gonadotrophic effect. There is also evidence of a stimulation of spermatogenesis in chickens.

The haematopoietic effect is well known, with velvet preparations stimulating red blood cell synthesis and increasing erythropoietic activity in both intact and anaemic rabbits and rats.

There is some evidence that treatment with velvet or antler preparations can protect against later shock or stress. For example, one researcher reported that antler pretreatment reduced mast cell degranulation in rats subject to heat stress, cold stress or electric shock. Also relevant is a report which claimed the polysaccharide content was responsible for the anti-ulcer effect of a velvet antler preparation.

Russian studies show that pretreatment of patients awaiting surgery for gastrointestinal tumours with Rantarin resulted in significant reduction in plasma 17 oxysteriods, an indication of a reduced stress response.

Velvet antler treatment of rats has also been shown to protect against carbon tetrachloride-induced liver damage.

The feeding of velvet antler to broiler chickens has been found to result in a small but significant increase in growth rate and food conversion efficiency over an eight week period.

Interestingly the weight of the testes was significantly increased while thyroid weight was decreased. Being an extremely fast growing tissue, it could be expected that velvet antler would be a rich source of growth factor activities, and in this respect epidermal growth factor-like activity has been isolated from the velvet (epidermal-dermal) layer of growing antler.

Recent studies from Japan have shown velvet antler preparations have marked effects on biochemical parameters related to ageing in senescence accelerated mice. The hot water extract of velvet antler was administered for eight days; treated mice showed significant improvements in parameters normally associated with senility, including an increase in plasma testosterone. The effects were generally observed only in the senescence accelerated strain and not in the control strain of mice, suggesting that velvet preparations may exert an anti-ageing effect in male senile animals.

Further studies revealed a direct effect on the rate of protein synthesis apparently mediated by an increase in RNA polymerase activity (RNA polymerase regulates RNA transcription from nuclear DNA).

Japanese workers have also investigated the effects of Pantocrin treatment on the recovery of rats and rabbits from an induced whiplash-type injury. Pantocrin treatment enhanced glycolysis in nervous tissue, an effect actually specific to neural tissue. There is also support for such effects from a double-blind study in humans suffering from cervical injuries, where Pantocrin treatment aided recovery. □

This article is an adaptation of a paper presented by Peter Fennessy at the NZVA deer branch conference at Queenstown.

TABLE 3.

Comparative biological activity of spotted deer antlers (pantui) according to the stage of growth (Brechman et al. 1969).

Antler development stage	(Biological activity units/g) Gonadotrophic activity	Stimulating activity
1 d 20-25	376	84
2 d 35-45	447	103
3 d 40-50	798	126
4 d 55-70	556	80
5 d 60-80	381	72
6 full velvet	212	52
7 hard antler	208	25

The stages of antler development are estimated as days from casting from the description provided; stage 3 is about equivalent to a NZ Red deer T grade and stage 4 NZ Red deer A grade.

TABLE 4.

Effect of method of preparation of velvet antler on biological activity assayed by its hypotensive effect in cars and rabbits (Tevi 1969).

Method of preparation	Decline in blood pressure (mm Hg) Cats	Rabbits	Time (secs) for blood pressure to return to normal Cats	Rabbits
Hot alcohol (112-120°C) plus boiling water evaporation	20	23	126	123
Alcohol (38-40°C) plus vacuum evaporation (38°C)	18	6	17	15