

Health benefits of deer and elk velvet antler supplements: a systematic review of randomised controlled studies

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Abstract

Aims The aim of this systematic review was to evaluate the evidence from RCTs of velvet antler supplements for any condition, using the QUOROM statement as a guiding framework.

Methods Four electronic databases (PubMed, Medline, Web of Science and Academic search premier, via the bibliographical platform, Endnote) and two review articles were searched for all randomised clinical trials of velvet antler supplements. Retrieved trials were evaluated according to standardised criteria.

Results Seven RCTs were identified as satisfying all inclusion criteria and examined the effectiveness of velvet antler for rheumatoid arthritis (2), osteoarthritis (1), sexual function (1), and sporting performance enhancement (3). Their methodological quality ranged from 3–5, as measured on the Jadad scale. Two RCTs reported some positive effects of velvet antler supplements, but neither were convincing while the remaining five RCTs found no effect of velvet antler supplements.

Conclusions Claims made for velvet antler supplements do not appear to be based upon rigorous research from human trials, although for osteoarthritis the findings may have some promise.

Velvet antler (VA) is a dietary supplement made from the antlers of deer or elk that have been surgically removed from a live animal under anaesthetic. It is valued for its medicinal purposes for a wide range of health-based and performance issues.

For example, it is claimed that (www.deervelvet.org)¹ deer velvet antler:

- Improves immune system functioning;
- Improves athletic performance and strength;
- Improves muscle recovery after exercise;
- Reduces negative effects of stress;
- Enhances sexual functioning for both men and women;
- Promotes rapid recovery from illness;
- Has anti-cancer and anti-inflammatory properties.

VA is typically available powdered and capsulated, or as an extract in liquid form, and it is marketed as a food supplement, although it is described as an important part of Traditional Chinese Medicine.² Deer velvet antler (DVA) is chemically synonymous to elk velvet antler (EVA) and is utilised commercially for identical purposes.³

Like many supplements based upon Traditional Chinese Medicine, the scientific rationale for why benefits of velvet antler (VA) might accrue is somewhat unclear, at

least when interpreted from a western perspective. However, the rationale is quite likely related to the belief that the properties inherent in a substance (e.g., VA is the only mammalian organ with the ability to regenerate itself) will, if ingested, confer similar benefits on its user. This argument is known as the principle of correspondence.⁴

It is currently estimated that New Zealand will produce 430 tonnes of DVA,⁵ around one-third of the global production. At a price of between \$86–106/kg, this would equate to a value between \$36.98m–\$45.58m,⁶ although the price of DVA is somewhat volatile (e.g., in NZ the value of the raw product fell from \$250 per kilogram to \$45 in 2004–5 and rebounded to \$160 in 2006–7).

In 2011, New Zealand's exports were predominantly to China (~\$14m) and Korea (~\$12m). An indication of the value added price of the final product can be found by examining websites selling VA products. One such example, 100 × 250mg capsules for NZ\$52,⁷ would equate to ~\$2000 per kilogram of raw VA. No data appears to be available for the number of users in New Zealand or, indeed, elsewhere in the world.

The aim of this systematic review was to critically evaluate randomised controlled studies (RCTs) for the effectiveness of VA supplements for any condition, using the QOURAM statement as a guiding framework.⁸

Method

Systematic literature searches were performed to identify all RCTs of DVA or EVA for any condition, using the search terms [velvet] AND [antler]. Computerised searches were conducted using PubMed, Medline, Web of Science and Academic search premier, via the bibliographical platform, Endnote. Manual literature searches for further relevant RCTs were conducted on the bibliographies of all retrieved full text articles and two reviews of velvet antler.^{2,3} No language restrictions were imposed. Only studies described as double-blind, placebo controlled RCTs of DVA or EVA supplements were included. Non-human, in-vitro and studies only investigating safety or adverse reactions were excluded. The methodological quality of each study was assessed by both authors using the Jadad scale⁹ and assigned a rating of 0–5. Disagreements were resolved by discussion.

Results

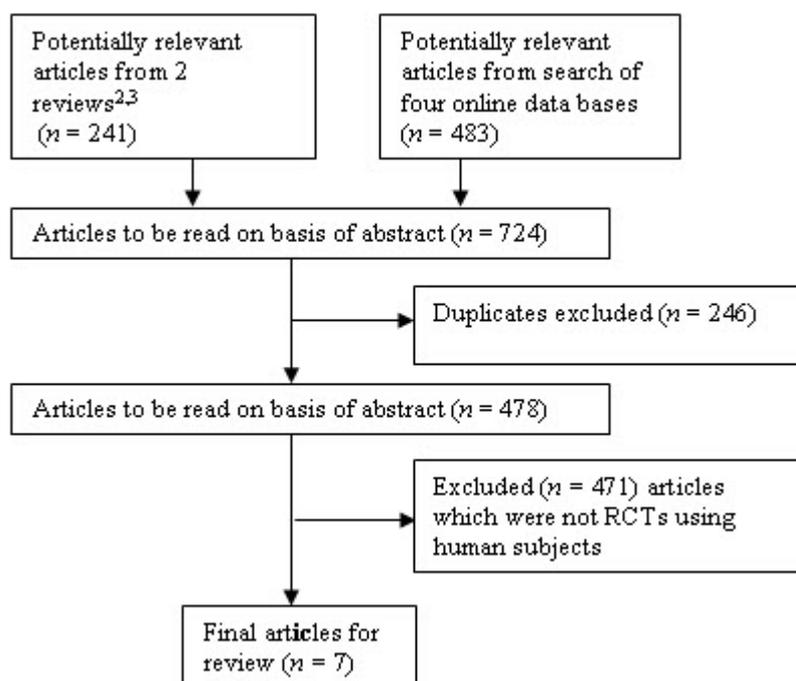
A computerised literature search conducted in July 2011 returned 483 articles. Two reviews of velvet antler research returned a further 241 articles.^{2,3} Of the 724 articles potentially of interest, 246 duplicates were excluded. The remaining articles (478) were read first on the basis of the title and abstract. Of these, 7 articles were found to meet all inclusion criteria and were reviewed in full by both authors. A flowchart of study selection may be inspected in Figure 1.

The included RCTs scored between 3 and 5 points on the Jadad scale and investigated the effectiveness of velvet antler supplements for: rheumatoid arthritis (2), osteoarthritis (1), sexual function (1), and sport performance enhancement (3). Key characteristics of the included RCTs are presented in Table 1.

Two studies by Allen et al (2002; 2008)^{10,11} investigated the effect of EVA on rheumatoid arthritis (RA) and both concluded that there was no effect (although the earlier study was underpowered). Allen et al. (2008) noted that non-significant improvements tended to be in the experimental group and also that none of the participants who indicated that they felt 'markedly better' were in the placebo group.

Although there were a lack of significant findings, Allen et al (2008) concluded that, on the basis of promising animal research, further human research is warranted. Although claims about the effect of velvet antler supplements on rheumatic conditions are not supported by evidence from RCTs, it may hold some promise.

Figure 1. Flow chart of study selection.



Three RCTs explored the effect of velvet antler on sport performance.^{12,15,16} Broeder et al (2004)¹² tested the effect of DVA on body composition, strength and maximal aerobic and anaerobic performance. It was concluded that DVA may be effective on the basis that some within-subject tests for DVA were significant, while similar within-subject tests for the placebo were not. However, to test this comparison one must actually examine the interaction term for a factorial test of both within- and between-subject factors to determine whether there is a statistically significant difference between the two arms of the trial.

No *a priori* power analysis was conducted and the study was certainly underpowered on completion, by which time 44% of participants had dropped-out. Due to flaws in this study, it fails to provide convincing support for the use of velvet antler supplements to enhance sport performance.

Sleivert et al (2003)¹⁵ reported that there was an increase in isokinetic strength and muscular endurance in the DVA powder group compared to the placebo. However, a similar effect was not observed in the DVA extract group, which might reasonably have been expected, and there were also no concomitant changes in the hormonal mechanisms hypothesised to underlie such changes.

Table 1. Summary of included RCTs

(**In Allen et al (2002)¹⁰ the reason for no *a priori* power calculations was that this study would be used to investigate effect sizes for a power analysis in a follow-up study.¹¹)

Name/year	Design/ Intervention(s)	Area	n	Participant characteristics	Main outcome measure(s)	Jadad score	Study conclusion(s)	<i>A priori</i> power analysis?	Potential sources of bias	Comments
Allen, Oberle et al. 2002 ¹⁰	RCT 4 Arms (2, 4, or 6 EVA capsules/placebo)	Rheumatoid Arthritis	40	Adults with stage II RA and taking medication (e.g., NSAIDS)	Adverse events and health status (AIMS2)	3	No effect	no**	Blinding and randomisation procedures not fully described.	Underpowered and potential for bias
Allen, Oberle et al. 2008 ¹¹	RCT 2 Arms (EVA/placebo)	Rheumatoid Arthritis	168	115 females, 55 males. RA for 15yrs	Arthritis Impact measurement scale, HAQ, VAS	5	No effect	yes	none	Well designed trial
Broeder, Percival et al. 2004 ¹²	RCT 2 Arms (DVA/Placebo)	Body Composition, strength, & maximal aerobic & anaerobic performance	32	32 males, ages 18-35, with at least 4yrs weight lifting experience	Body composition, strength, aerobic power, maximal power output	3	May have positive effect on body Composition, strength, & maximal aerobic & anaerobic performance	no	Blinding and randomisation procedures not fully described.	Underpowered, inappropriate statistical tests, and potential for bias makes these findings unconvincing
Conaglen, H.M., Suttie, J.M. et al (2003) ¹³	RCT (DVA/placebo)	Sexual function	34	34 males (and their partners), ages 45-65, in a stable relationship and healthy.	Index of erectile dysfunction (males) brief index of sexual function (women)	5	No effect	no	None (Although velvet antler supplied by industry)	Well designed, but underpowered
Edelman et al (2000) ¹⁴	RCT 2 Arms (DVA/placebo)	Osteoarthritis	54	33 females, 21 males with OA in knee for >6mths	Visual Analogue scales and WOMAC questionnaire	3	Symptomatic relief in OA	no	Blinding and randomisation procedures not fully described. (Velvet antler supplied by industry)	Underpowered. Bias means findings are not convincing, although they are potentially promising
Sleivert, Burke et al. 2003 ¹⁵	RCT 3 Arms (DVA extract or powder/ placebo)	Aerobic power, erythropoiesis, & muscular strength and endurance	38	38 males, ages 19-24 yrs, no strength training for >3mths, no dietary supplements	Weight, height, skinfolds, squat exercise, knee extensions, maximal aerobic power (Vo _{2max}), endocrine response (EPO, IGF-1, TT)	3	No effect (any observed differences were likely due to <i>Type I</i> error)	no	Blinding and randomisation procedures not described	Underpowered and potential for bias
Syrotuik, MacFadyen et al. 2005 ¹⁶	RCT 2 Arms (EVA/placebo)	Hormonal response to acute and chronic exercise in rowers	46	25 males, 21 females, mean age 25yrs, all healthy rowers	Resting or exercise stimulated hormonal response	3	No effect	no	Blinding and randomisation procedures not fully described. (Velvet antler supplied by industry)	Underpowered and potential for bias

On the balance of evidence, in particular the lack of convergent validity, the authors concluded that the findings were most likely explained by *type I* error.

Syrotuik et al (2005)¹⁶ found no effect on either strength or hormonal changes after 10 weeks of EVA supplements on the performance of rowers when compared to placebo, although low experimental power may conceivably have caused *type II* errors. It is also possible that benefits do accrue, but not within the first 10 weeks of supplementation (e.g., one RCT¹⁵ suggested that there may be an effect of DVA supplements on osteoarthritis after 3 and 6 months, but not after 1 month).

The first and only study to have investigated the effect of velvet antler supplements on sexual functioning, Conaglen et al (2003),¹³ found no effects on the sexual functioning of either 32 male participants or their partners. However, this study was again somewhat underpowered and therefore, like six of the seven reviewed RCTs, may have been prey to *type II* error. Although underpowered, this study was judged to be of high methodological quality. The authors concluded that there was “no advantage in taking deer velvet to enhance sexual function”.

Finally, Edelman et al (2000)¹⁴ reported that participants with osteoarthritis treated with DVA showed improvement over baseline, relative to those treated with placebo. While the results are promising, it is important to note that there was a significant difference in duration of symptoms at baseline, with the placebo group having experienced symptoms for more than 50% longer duration. Furthermore, the lack of details of blinding and randomisation precludes any firm conclusions from being drawn. The findings therefore appear to offer some promise, but unless replicated are somewhat unconvincing.

Discussion

Overall, seven RCTs were found to fulfil the inclusion criteria for this systematic review. Five were of moderate methodological quality and two of high quality. In contrast to the numerous claims that there are benefits of velvet antler supplements, this systematic review of RCTs of velvet antler supplements found no convincing evidence of effectiveness when compared to placebo. However, it is possible that the lack of significant findings may be false negatives due to low experimental power, although the one trial with adequate power reported no effect of EVA on RA.¹¹ There were some potentially promising findings for treating osteoarthritis,¹⁴ but these would require replication.

Given the size of the velvet antler industry^(e.g.-6) and the plethora of claims made, the velvet antler industry could fund trials to test the claims being made. A further source of funding may also be available from the National Center for Complementary and Alternative Medicine (NCCAM). There are at least two university based departments with interests in deer velvet (AgResearch, Invermay, NZ, and the University of Alberta, Edmonton), who may also be able to trial velvet antler supplements as part of their own research program.

Future trials should ensure that there is sufficient experimental power to have a reasonable chance of detecting meaningful effects. Blinding and randomisation techniques should also be fully reported so that readers can draw informed opinions as to the validity of the trial.

This systematic review is not without limitations. The quality of the studies varied, although none were deemed to be of low quality. All except one of the included RCTs were underpowered and therefore the possibility of *type II* error cannot be ruled out. It is possible that trials with positive findings have not been published, although we are not aware that publication bias has ever discriminated on the basis of positive trials.

Despite a dearth of good quality positive human trials on the effectiveness of velvet antler supplements, numerous suppliers of velvet antler products make or imply claims about its use for a number of conditions.

Claims that velvet antler supplements have beneficial effects for any human condition are not currently supported by sound clinical data from human trials.

Competing interests: Nil.

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