The effect of short-term supraphysiological dehydroepiandrosterone supplementation on cardiac and skeletal muscle function.

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Introduction

The association between low plasma dehydroepiandrosterone (DHEA) levels and the increased risk of cardiovascular disease (CVD) is well known. However, DHEA's ergogenic influence is less well known. Supraphysiological dosages may be necessary for enhanced performance in young healthy adults. Subsequently, the current study examined the effects of short-term (21 day) DHEA supplementation on cardiac and skeletal muscle function.

Methods

Sixteen adult male Wistar rats (401 ± 8g) were randomly allocated to receive a daily, subcutaneous injection of placebo (sesame oil) or DHEA (50 ml·kg^{-1} in DMSO and sesame oil) for 21 days. Body mass, food and water consumption were recorded daily throughout the supplementation period. Following the supplementation period, animals were anaesthetised (CO_2) and a venous blood sample collected for serum DHEA analysis. Animals were killed by exsanguination and the soleus, extensor digitorum longus (EDL), left atrium (LA) and right atrium (RA) of the heart removed. The tissues were suspended in organ baths for the recording of force of contraction (FOC) and/or rate of contraction (ROC). Concentration response curves to isoprenaline (LA, RA) and calcium (LA) were determined. Maximum single twitch FOC, maximum tetanic FOC and fatigability were determined in both skeletal muscle tissues. Significant (P<0.05) differences between control and DHEA groups were determined by a Mann-Whitney U test due to the small sample size.

Results

DHEA supplementation resulted in a significantly greater serum DHEA level, significantly greater basal LA FOC, reduced RA ROC (p<0.074), significantly greater EDL single and tetanic maximum FOC, significantly greater EDL FOC at 50% fatigue and significantly reduced food consumption and body mass gain (Table 1).

Table 1: Hormone, cardiac and skeletal muscle function for the control and DHEA supplementation groups.

	control (n=8)	DHEA (n=8)
Serum DHEA (ng·mL^{-1})	0.9 ± 3.8	424.9 ± 3.8***
Basal LA FOC (mN)	3.23 ± 0.20	4.2 ± 0.3*
Basal RA ROC (bpm)	221 ± 5	204 ± 7$^{\#}$
EDL single max (mN)	86.9 ± 6.7	105.2 ± 6.7*
EDL tetanic max (mN)	358.9 ± 27.3	453.4 ± 33.5*
EDL at 50% fatigue (mN)	192.2 ± 11.1	248.3 ± 22.8*
Average daily food consumption (g)	36.1 ± 1.8	31.3 ± 0.8*
Body mass gain		
- absolute (g)	37.3 ± 3.8	9.1 ± 3.6**
- relative to initial mass (%)	9.3 ± 0.8	2.3 ± 0.8**

Mean ± SE; $^{\#}$ P<0.074, * P<0.05, ** P<0.01, *** P<0.001 vs Control

Discussion/Conclusion

The current results demonstrated that short-term, supraphysiological DHEA supplementation significantly reduced mass gain, significantly increased basal cardiac muscle function and significantly increased skeletal muscle (EDL) function. The cardioprotective nature of DHEA may result from its alteration in body mass possibly via altered lipid metabolism and improved cardiac contractility, while the possible ergogenic effects of DHEA may be mediated by increases in FOC for skeletal muscles predominantly of Type II fibres.