

Protodioscin from herbal plant *Tribulus terrestris* L improves the male sexual functions, probably via DHEA

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SUMMARY

An interesting correlation of dehydroepiandrosterone-sulphate (DHEA-S) level with the incident of low sex drive and higher occurrence of impotence was discovered in studies with patients diagnosed with diabetes mellitus. To test further the relationship between DHEA-S and erectile dysfunction (ED), we conducted a clinical trial of 30 non-diabetic men with ED, 30 non-diabetic men without ED and 15 diabetic men with ED. These men are given extract of *Tribulus terrestris* (Libilov) at 3 x 250 mg / day for 3 weeks. The DHEA-S levels, as well as other blood and liver parameters were evaluated.

We found a significant increase of DHEA-S levels in diabetic and non-diabetic subjects after treatment, and a significant increase in the frequency of successful intercourse by 60% in both the diabetic and non-diabetic groups with or without ED.

INTRODUCTION

Tribulus terrestris L (TTL) is a herbal plant native to Bulgaria and China that has a long history as a powerful aphrodisiac and as a traditional medicine for treating male infertility (1,6). Recently, a chemical compound isolated from TTL called protodioscin (2) has been identified, purified and standardized as a phytochemical agent. In a multi-center, placebo-controlled, randomized, double-blind clinical trial, protodioscin proved to be an effective form of treatment for male infertility (2,6,7).

It is known that sufficient dehydroepiandrosterone (DHEA) in the epididymis is necessary for the maturation process of spermatozoa (5). Furthermore, it has been speculated that in some idiopathic oligoasthenoteratozoospermia, male infertility is due to the low concentration of DHEA in the epididymis. In another clinical trial protodioscin is proved to increase the serum DHEA level of infertile men, without any change in the level of testosterone and other androgens. It is also shown that liver and kidney functions do not change significantly by protodioscin (1,2,6,7). The study concludes that protodioscin in TTL could be the precursor of DHEA in patients with low serum level of this hormone. As TTL has been known for its aphrodisiac quality, speculations have been made that its mechanism of action involves the conversion of protodioscin to DHEA. In turn, DHEA may increase cell membrane integrity and functions (3,4), thereby resulting in better sexual performance and the general feeling of well-being.

MATERIALS AND METHODS

The incident of erectile dysfunction (ED) is five times greater in patients diagnosed with diabetes mellitus as compared to non-diabetic patients. The correlation of lowered DHEA-sulphate (DHEA-S) in the diabetic patients and the increased frequency of ED in these patients suggests that improvement in DHEA-S level may constitute a treatment for ED.

This trial evaluated the DHEA-S levels of 30 non-diabetic male patients diagnosed with ED, 30 non-diabetic patients without ED, and 15 diabetic patients without ED. The group of non-diabetics with ED as well as the group of diabetics with ED were treated with TTL 3 times daily for 3 weeks (Libilov, 250 mg). The serum DHEA-S, testosterone, FSH, LH, prolactin, cholesterol, triglyceride, creatinine, Hb, and glucose levels, as well as liver and kidney functions were evaluated before and after treatment. These parameters were statistically tested (t-test for paired samples) to determine their statistical significance.

Finally, questionnaires were distributed to all men with ED to determine whether there was any improvement in their sexual functions

RESULTS

There was a significant difference ($p < 0.01$) in the serum DHEA-S levels in the non-diabetic men (101.5 ± 14.3) as compared to the diabetic patients without ED (77.5 ± 28.7). There was also a significant difference ($p < 0.01$) in the DHEA levels of non-diabetic men without ED with those with ED (41.8 ± 22.6). Furthermore, there was a significant difference in the serum DHEA-S levels of the diabetic patients without ED as compared to those with ED (32.2 ± 22.6). These data were summarized in Table I below.

Parameter	[DHEA-S] in $\mu\text{g/dl}$	
	without ED	with ED
Non-diabetics	101.5 ± 14.3	41.8 ± 22.6
Diabetics	77.5 ± 28.7	32.2 ± 24.8

Table I. [DHEA-S] concentration in $\mu\text{g/dl}$ of non-diabetics with and without ED, and diabetics with and without ED before treatment with TTL (Libilov).

After treatment with TTL (Libilov), there were significant increases in the serum DHEA-S levels in the diabetic patients with and without ED (Table II).

Parameter	[DHEA-S] in $\mu\text{g/dl}$	
	Before Treatment	After Treatment
Non-diabetics with ED	41.8 ± 22.6	77.6 ± 25.9
Diabetics with ED	32.2 ± 24.8	50.0 ± 32.0

Table II. [DHEA-S] concentration in $\mu\text{g/dl}$ of non-diabetics and diabetics with ED before and after treatment with TTL (Libilov).

There were no significant differences observed in the hormone (testosterone, FSH, LH and prolactine), cholesterol, triglycerides, and Hb levels, as well as in the liver (SGPT, SGOT, Gamma GT) and kidney (creatinine and urea) functions before and after TTL treatment in all ED patients.

During treatment, there was a significant increase in the frequency of successful sexual intercourse in 60% of the ED patients. This effect was reported from day 10 of treatment and onwards by both the diabetic and non-diabetic ED patients.

CONCLUSION

TTL improved the sexual drive in 60% of the ED cases. As this improvement in sexual function is accompanied by a significant improvement in the DHEA levels of these patients, we surmised that the improvement in the sex drive of these patients were linked to the conversion of protodioscin, the active ingredient of the TTL extract, into DHEA-S.

The role of DHEA-S in general health and sense of well-being was suggested by its varying levels in patients diagnosed with diabetes as compared to normal men. Further correlation of DHEA with sexual functions was shown by its decreased level in those also diagnosed with ED.

Increasing the serum DHEA-S level, thus, should improve the sexual functions in patients diagnosed with ED. This hypothesis was directly supported by our clinical trial: treatment with TTL extract (Libilov) resulted in improvement in the frequency of successful sexual intercourse in men (diabetics and non-diabetics alike) diagnosed with ED. This improvement in sexual function was accompanied by an increased level of serum DHEA-S in these ED patients.

The mechanism of DHEA-S in improving the sexual functions of the treated patients is hypothesized to include improvement of cell membrane integrity and function at the cellular level, to improvement of circulation, health and sense of well-being that indirectly result in improved sex drive. Further research into the direct mechanism of the action of DHEA-S is warranted.

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