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Erectogenic and Neurotrophic Effects of Icariin, a Purified Extract of Horny Goat Weed (*Epimedium* spp.) In Vitro and In Vivo

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ABSTRACT

Introduction. Epimedium species (aka horny goat weed) have been utilized for the treatment of erectile dysfunction in Traditional Chinese Medicine for many years. Icariin (ICA) is the active moiety of Epimedium species.

Aim. To evaluate the penile hemodynamic and tissue effects of ICA in cavernous nerve injured rats. We also studied the in vitro effects of ICA on cultured pelvic ganglia.

Methods. Rats were subjected to cavernous nerve injury and subsequently treated for 4 weeks with daily gavage feedings of a placebo solution of normal saline and Dimethyl sulfoxide (DMSO) vs. ICA dissolved in DMSO at doses of 1, 5, and 10 mg/kg. A separate group underwent a single dose of ICA 10 mg/kg 2 hours prior to functional testing. Functional testing with cavernous nerve stimulation and real-time assessment of intracavernous pressure (ICP) was performed at 4 weeks. After functional testing, penile tissue was procured for immunohistochemistry and molecular studies. In separate experiments, pelvic ganglia were excised from healthy rats and cultured in the presence of ICA, sildenafil, or placebo culture media.

Main Outcome Measure. Ratio of ICP and area under the curve (AUC) to mean arterial pressure (MAP) during cavernous nerve stimulation of subject rodents. We also assayed tissue expression of neuronal nitric oxide synthase (nNOS), eNOS: endothelial nitric oxide synthase (eNOS), calponin, and apoptosis via immunohistochemistry and Western blot.

Serum testosterone and luteinizing hormone (LH) were assayed using enzyme-linked immunosorbant assay (ELISA). Differential length of neurite outgrowth was assessed in cultured pelvic ganglia.

Results. Rats treated with low-dose ICA demonstrated significantly higher ICP/MAP and AUC/MAP ratios compared with control and single-dose ICA animals. Immunohistochemistry and Western blot were revealing of significantly greater positivity for nNOS and calponin in penile tissues of all rats treated with ICA. ICA led to significantly greater neurite length in cultured specimens of pelvic ganglia.

Conclusion. ICA may have neurotrophic effects in addition to known phosphodiesterase type 5 inhibiting effects. **Shindel AW, Xin Z-C, Lin G, Fandel TM, Huang YC, Banie L, Breyer BN, Garcia MM, Lin C-S, and Lue TF. Erectogenic and neurotrophic effects of icariin, a purified extract of horny goat weed (*Epimedium spp.*) in vitro and in vivo. J Sex Med 2010;7:1518–1528.**