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The therapeutic efficacy of water soluble coenzyme Q10 in experimental model of tacrolimus induced diabetes mellitus.

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Objectives: Coenzyme Q_{10} has a central role in the generation of cellular bioenergy and its regulation, but its use is limited due to poor absorption profiles. We have developed a natural product based micelle formulation of CoQ_{10} (CoQ_{10}-M), which appears water soluble and contains CoQ_{10}. In this study, we tested its effect in experimental model of tacrolimus (TAC)-induced diabetes mellitus (DM).

Methods: Rats were daily treated with TAC (1.5mg/kg, subcutaneous), oil-soluble CoQ_{10} (20mg/kg, P.O., CoQ_{10}) and water-soluble CoQ_{10} (20mg/kg, P.O.) under 0.01% salt diet for 4weeks.

Results: After four weeks, there is no significant difference in body weight, water intake and 24hr-urine volume between the vehicle and another group. CoQ_{10} micelle treatment group further ameliorate hyperglycemia. IPGTT revealed that fasting blood sugar level was increased in TAC-treated groups, but it was reduced by CoQ_{10}-M. TAC induced increased blood sugar level was also reduced by CoQ_{10}-M in 30min, and this increase was persisted until 120min. CoQ_{10}-M decreased the TAC-induced AUCg increasement. However, CoQ_{10} has no same effect. In addition, CoQ_{10}-M further restored TAC-induced impaired islet than CoQ_{10}. TAC-induced oxidative stress and apoptosis were also better inhibited by CoQ_{10} micelle compared with CoQ_{10}. CoQ_{10}-M decreased TAC-induced oxidative stress. In serum 8-OHdG ELISA, TAC treatment group was significantly increased 8-OHdG expression compared with VH group. The CoQ_{10}-M group was obviously reduced the 8-OHdG expression. Furthermore, CoQ_{10}-M decreased the apoptosis induced by tacrolimus. The number of positive cells in TUNEL staining in CoQ_{10}-M group is less than TAC group. At the subcellular level, in TAC treatment group, number and the average size of mitochondria was decreased. CoQ_{10} -M increased the number and average size of mitochondria more than CoQ_{10}.

Conclusions: Water-soluble CoQ_{10} has a better effect on TAC-induced DM compared to oil-soluble CoQ10.