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Cordyceps sinensis protects against liver and heart injuries in a rat model of chronic kidney disease: a metabolomic analysis

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Abstract

Aim: To test the hypothesis that the traditional Chinese medicine Cordyceps sinensis could improve the metabolic function of extrarenal organs to achieve its anti-chronic kidney disease (CKD) effects.

Methods: Male SD rats were divided into CKD rats (with 5/6-nephrectomy), CKD rats treated with Cordyceps sinensis (4 mg•kg⁻¹•d⁻¹, po), and sham-operated rats. After an 8-week treatment, metabolites were extracted from the hearts and livers of the rats, and then subjected to (1)H-NMR-based metabolomic analysis.

Results: Oxidative stress, energy metabolism, amino acid and protein metabolism and choline metabolism were considered as links between CKD and extrarenal organ dysfunction. Within the experimental period of 8 weeks, the metabolic disorders in the liver were more pronounced than in the heart, suggesting that CKD-related extrarenal organ dysfunctions occurred sequentially rather than simultaneously. Oral administration of Cordyceps sinensis exerted statistically significant rescue effects on the liver and heart by reversely regulating levels of those metabolites that are typically perturbed in CKD.

Conclusion: Oral administration of Cordyceps sinensis significantly attenuates the liver and heart injuries in CKD rats. The (1)H NMR-based metabolomic approach has provided a systematic view for understanding of CKD and the drug treatment, which can also be used to elucidate the mechanisms of action of other traditional Chinese medicines.

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Figures

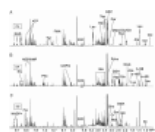


Figure 1 Representative 500-MHz ^1H NMR...

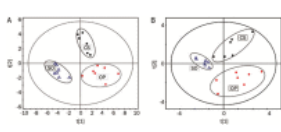


Figure 2 PLS-DA score plots of ^1H ...

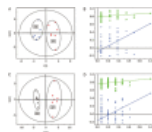


Figure 3 The score plots (left) and...



Figure 4 Potential metabolic pathways disturbed in...

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