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Metabolic response promotes systematically the anti-inflammatory effect of ginsenosides

He M.[1]*, Sun Q.[1], Dou J.[1], Yu M.[1], Li Y.[2], Sun M.[1]**

[1] *Changchun University of Chinese Medicine, Changchun, China*

[2] *Changchun Sino-Russian Science and Technology Park Co., Ltd., Changchun, China*

** heminccucm@hotmail.com; **sunm2000@hotmail.com*

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Motivation and Aim: The use of bioactive compounds to induce metabolic reprogramming is emerging as a novel adjuvant strategy for clinical immunotherapy. Gingseng ginsenosides, exists in ginseng roots, have shown anti-inflammatory activity by functioning as a glucocorticoid receptor agonist, but without glucocorticoid-like side effect to inhibit wound healing. Considering the systematic influence of glucocorticoid to the body, understanding the relationship between the anti-inflammatory functions and metabolic effects of Gingseng ginsenosides, which may differ from glucocorticoids, may help understand more biological mechanism details of Gingseng ginsenosides, as well as identify metabolic biomarkers associated with anti-inflammation. Therefore, we aim to investigate the endogenous metabolic response of Gingseng ginsenosides underlying the anti-inflammatory response in zebrafish model, providing a rationale for incorporating Ginseng into immune-modulating nutraceuticals.

Methods and Algorithms: The anti-inflammatory effect of Gingseng ginsenosides was examined by analyzing neutrophil cell counts under a fluorescent microscope and measuring inflammatory cytokine gene expression using q-PCR techniques in zebrafish larvae under inflammatory induction. The metabolic impact of Gingseng ginsenosides, particularly on primary metabolites, was assessed using high performance liquid chromatography coupled with mass spectrometry, and metabolic pathways were analyzed using the KEGG pathway database.

Results: Amputation induced the infiltration of neutrophils and macrophages towards the amputated edges, accompanied by upregulation of gene expression associated with pro-inflammatory cytokines. Gingseng ginsenosides were equally effective in alleviating inflammatory responses in injured zebrafish as beclomethasone, but with different metabolic responses, particularly in fatty acid metabolism and downstream aromatic amino acids in the TCA cycle.

Conclusion: Gingseng ginsenosides shows promise as a drug candidate for treating inflammatory responses and as a valuable supplement for enhancing immune regulation.

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