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Immunoregulation mechanism and key technologies for high-value utilization of Major Royal Jelly Proteins

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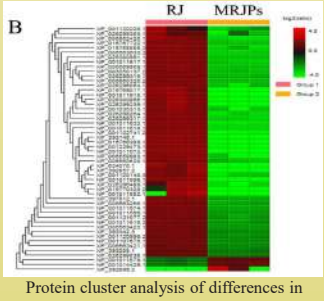
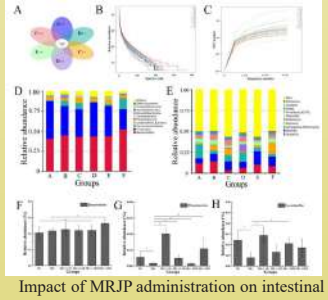
Abstract: China currently is the largest producer of royal jelly. Royal jelly major proteins (MRJPs) are the key active ingredients of royal jelly and have various health functions such as enhancing immunity. Our team had previously analyzed the architecture of the native MRJP1 oligomer, which provided a molecular basis for elucidating its physiological function, and subsequently demonstrated that royal jelly could regulate gut microbiota, and high-pressure processing effectively regulated the aggregation of royal jelly proteins. We have obtained the results as follows: (1) MRJPs could regulate the structure of the flora, taking the phylum level as an example, the abundance of *Bacteroidota* was increased and the abundance of *Proteobacteria* decreased with adding MRJPs, and MRJPs also increased the generation of short chain fatty acids (acetic acid and propionic acid), lowered the pH of the fermentation broth to improve the structure of the gut microbiota; (2) The development of the spleen and liver, the quantity of peripheral blood leukocytes, immunoglobulin content, immune factor level, and the proliferation ability of spleen lymphocytes were improved significantly by feeding MRJPs. 16S rRNA high-throughput sequencing technology analysis showed that the immunity of mice was enhanced by regulating the component and richness of the gut microbiota; (3) Royal jelly could decrease intestinal permeability and the expression of IL-6, increase the expression of IL-10 and sIgA, regulate the relative abundance of the intestinal flora to improve symptoms of DSS induced IBD in mice; (4) high-pressure processing treatment regulated the aggregation behavior mainly by affecting the higher-order structure (tertiary and quaternary structures) of MRJPs and the inter-chain hydrogen bonding and hydrophobic interactions. This study will provide a new perspective for the study of structure-activity relationship and biological activity mechanism of MRJPs and provide a scientific basis for the development and utilization of royal jelly, which has important theoretical and practical significance.

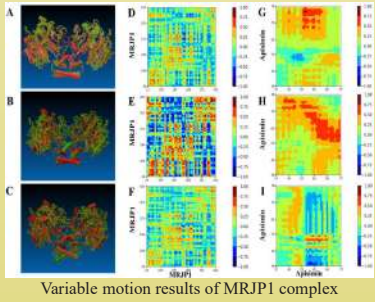
Keywords: major royal jelly proteins; immunoregulation mechanism; high-pressure processing; the aggregation behavior



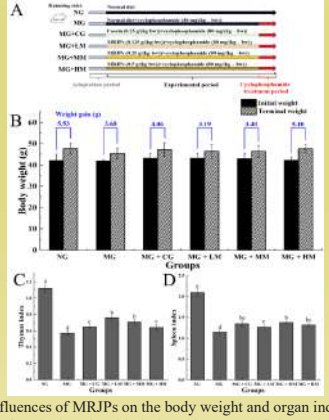
Protein cluster analysis of differences in content between royal jelly and MRJPs



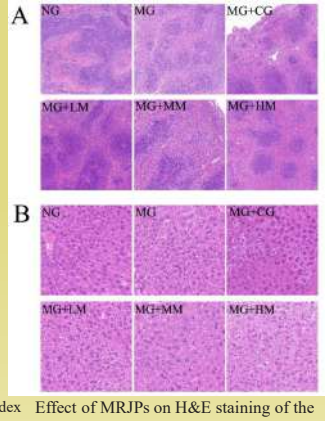
Impact of MRJP administration on intestinal microbiota in cyclophosphamide-induced mice



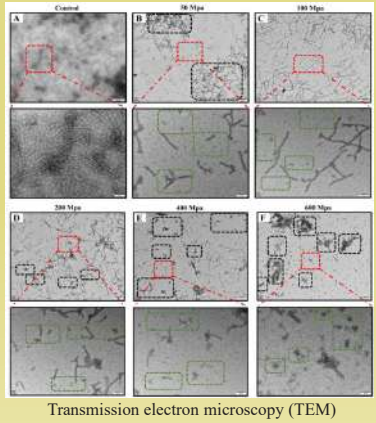
Variable motion results of MRJP1 complex under high-pressure conditions



Influences of MRJPs on the body weight and organ index of cyclophosphamide-induced immunodeficient mice



Effect of MRJPs on H&E staining of the spleen and liver



Transmission electron microscopy (TEM) results of MRJPs solution under HPP treatment

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