

### Dietary Fermented Red Ginseng Promotes Healthy Aging by Modulating Gut Microbiota Composition in Aged Mice

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**Objectives:** Aging, a progressive decline of programmed cellular processes, is one of the common causes of dysbiosis leading to proinflammatory state in digestive tract. Fermented red ginseng (FRG) has immunomodulating effects which promote anti-aging, cancer prevention and metabolic disorders. However, whether FRG supplementation facilitates healthy gut microbiota composition by influencing the gut microbiome profile is not fully elucidated. Thus, the goal of this study is to determine the effects of FRG on the gut microbiome composition between FRG-treated and non-treated young and old mice.

**Methods:** Young (11-week-old) and old (20-month-old) male C57BL/6J mice were treated water or FRG extract dissolved in water via oral gavage injection for 31 days (n = 10 per each group). We collected fecal samples before (day 0) and after (day 31) FRG administration and analyzed the microbiome profiles by 16s rRNA sequencing. To examine

gut microbial community composition of each sample, we obtained Operational Taxonomic Units (OTUs) by clustering with 97% identity on the Effective Tags of all samples.

**Results:** Principal component analysis (PCA) revealed that FRG administration changed the gut microbiota composition gradually in old groups. It is shown that FRG diet restored the gut microbiome in old mice similar to young mice especially enriched *Alistipes* in genus level. This genus of bacteria is well-known as a protective role against liver and cardiovascular fibrotic disorder diseases. Also, FRG supplementation significantly increased *Akkermansia* in genus level and *Verrucomicrobia* in phylum level in old mice. It suggested that FRG supplementation might improve intestinal barrier function and modulate immune response.

**Conclusions:** Collectively, our results indicate that FRG supplementation has a potential to exert healthy aging by influencing the gut microbiome composition.

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