Mulberry Leaf Polyphenols and Fiber Induce Synergistic Antiobesity and Display a Modulation Effect on Gut Microbiota and Metabolites

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Objectives: In this study we compared the antiobesity effects of mulberry leaf powder, dietary fiber, polyphenols, and a fiber/polyphenols mixture. Combining intestinal community modulation and metabolite analysis, we investigated the antiobesity effects and mechanisms of mulberry leaf components, detecting the interaction between mulberry leaf dietary fiber and polyphenol.

Methods: An obesity model was established by feeding rats with a high-calorie diet. Rats were divided into seven groups: the obesity model control (MC), positive control (PC), mulberry leaf powder (MLP), mulberry leaf fiber (MLF), mulberry leaf polyphenols (MLPS), mulberry leaf fiber and polyphenols mixture (MLM), and normal control (NC), and fed daily for 6 consecutive weeks. The 16S rRNA gene was sequenced using Illumina MiSeq, UPLC Triple TOF MS/MS system, and Agilent 6890 N GC-MS were used to profile the urinary/fecal metabolites.

Results: The synergistic interaction between mulberry dietary fiber and polyphenols (MLM) in antiobesity was reported for the first time. The content of Firmicutes in the MC group was increased significantly. Except for the MLPS group, other test groups regulated the Firmicutes content to a normal level. Our study demonstrated that different components of mulberry leaves might achieve weight loss by reducing the amount of Lachnespiraceae. At the same time, the reduction Lactobacillus vaginalis and Lactobacillus gasseri species was closely related to the improvement of lipid metabolism profiles. In addition, the high energy diet induced feces and urine metabolic disorders in MC group with significant difference. The amino acid and oligopeptide metabolites were regulated to the NC level under the regulation of mulberry leaf components.

Conclusions: MLM group had the best efficiency on weight loss, indicating synergistic interactions between MLPS and MLF. The reduction of Firmicutes abundance, and the downstream Clostridiales, Lachnespiraceae, was a key pathway for the antiobesity effects. The increased abundances of Lactobacillus vaginalis and Lactobacillus gasseri might result in lipid metabolism disorder. The test groups regulated the amino acid and oligopeptides metabolic disorder tents to normal levels compared with the MC and NC groups.

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