Lactobacillus plantarum for improving the symptoms of type-2 diabetic neuropathy

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This study investigated the beneficial effects and mechanisms of *Lactobacillus plantarum* (*LP*) on neuropathy in type-2 diabetic mice. Twenty db/db mice were randomly assigned to either a control group (group C) or a treated group (group *LP*). Weekly blood glucose levels were measured using a glucose meter. Neuropathy was assessed through thermal sensation, Von Frey responses and sensory nerve conduction velocity. Tight junction protein expression in colorectal tissues was analysed via immunofluorescence. ELISA measured serum inflammatory factors, while faecal samples at the intervention's end assessed gut microbiota changes. Western blot analysed the JAK-STAT signalling pathway in mouse brain tissue.

Group *LP* showed significantly lower blood glucose levels and improved thermal nociceptive sensitivity in db/db mice compared to group C. Additionally, *LP* intervention increased the expression of the intestinal tight junction protein occludin and enhanced intestinal flora diversity, including higher levels of probiotics like *Akkermansia muciniphila*. In group *LP*, serum levels of the anti-inflammatory factor IL-10 increased significantly, while pro-inflammatory factors TNF-α, IL-6, IL-17A and LPS decreased. Additionally, the JAK-STAT signalling pathway was notably inhibited in the brain tissue of these mice.

***LP* may potentially alleviate neuropathy in type-2 diabetic mice by modulating the immune system, repairing the intestinal mucosal barrier, and balancing the gut microbiome.**

Keywords: Immune system, intestinal microecology, *Lactobacillus plantarum*, neuropathy, type-2 diabetes.

the onset of DN and abnormalities in neuronal apoptosis and repair, which can be attributed to glucose and lipid metabolism disorders, oxidative stress and abnormalities in the insulin signalling pathway. However, despite these findings, the precise pathogenesis of DN has not been completely elucidated[4,5]. The clinical treatment of DN primarily focuses on the regulation and prevention of disease progression, with a lack of therapeutic interventions capable of significantly improving the symptoms. Nevertheless, the pathogenesis of DN remains incompletely understood[4,5]. Clinical treatment of DN is mainly focused on controlling and preventing progression of the disease, and there is still a lack of therapeutic methods that can significantly improve symptoms[6].

Recently, the continuous development of sequencing technology has helped determine the critical role of intestinal flora in the development of diabetes, possibly through interactions with the human body and active participation in various physiological processes such as nutrition, metabolism, regulation of immune function and inflammatory response[7,8]. Experimental studies conducted on animals have demonstrated the promising ability of probiotics, including *Lactobacillus plantarum* (*LP*), in alleviating type-2 diabetes and ameliorating neurological complications such as cognitive dysfunction[9]. However, the mechanism has not yet been clarified. So in the present study, using db/db mice, we have examined the effects of *LP* on DN and its primary mechanism of action.

Materials and methods