

# The effects of probiotics on gut microbiota and immunomodulatory effects against influenza virus

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## Outline

1. Introduction
2. *Lactiplantibacillus plantarum* 0111 protects against influenza virus by modulating intestinal microbial-mediated immune responses
3. *Akkermansia muciniphila* improves host defense against influenza virus infection
4. Conclusion

## Abstract

Influenza is an acute viral respiratory disease that often causes lung damage such as cell infiltration and alveolar incompleteness during the infection process, while some studies have found that probiotics and their metabolites are beneficial to the symptoms.

During the period of mice being infected by influenza virus, the phenomenon of dysbiosis occurs frequently. Through 16S rRNA sequencing analysis,  $\alpha$  diversity and  $\beta$  diversity was determined via chao1, OTUs, shannon indices and NMDS, PCoA plots, the results showed that infected group had the better relative abundance than normal groups. However, the composition of microbiota of each sample seemed to be dispersed, revealed the imbalance of gut microbiota caused by influenza virus infection.

Oral administration of *Lactiplantibacillus plantarum* 0111 and *Akkermansia muciniphila* were found to alleviate the lung damage caused by influenza virus and reduce virus load. In addition, proinflammatory cytokines such as IL-6 and TNF- $\alpha$  tend to be inhibited and stimulated the production of type I interferon (IFN- $\beta$ ) which could induce moderate antiviral responses.

In brief, with the treatment of *L. plantarum* and 0111 *A. muciniphila* could help to ameliorate gut microbiota imbalance and against the invasion of influenza virus.

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