Probiotic *Bacillus subtilis* alleviates DSS-Induced colitis in mice through modulation of inflammation and metabolic pathways

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Outline

1. Introduction
2. Probiotic *Bacillus cereus* Alleviates Dextran Sulfate Sodium-Induced Colitis in Mice through Improvement of the Intestinal Barrier Function, Anti-Inflammation, and Gut Microbiota Modulation
3. Probiotic *Bacillus cereus* regulates metabolic disorders and activates the cholic acid-FXR axis to alleviate DSS-induced colitis
4. Conclusion

Abstract

Ulcerative colitis is associated with impaired intestinal barrier integrity, immune dysregulation, and metabolic disturbances, highlighting the need for safer and more effective therapeutic strategies. *Bacillus cereus* has been proposed as a probiotic candidate due to its stability and regulatory effects on gut homeostasis. Therefore, this research aimed to evaluate its protective role in dextran sulfate sodium (DSS)-induced colitis. In murine models, *B. cereus* was orally administered during DSS exposure, and disease severity was assessed through body weight changes, disease activity index, colon morphology, histopathological evaluation, cytokine profiling, and molecular analysis of epithelial barrier and inflammatory signaling pathways. The results demonstrated that *B. cereus* alleviated colitis symptoms, preserved goblet cell abundance, and restored tight junction proteins (ZO-1, Occludin, Claudin-1), thereby

protecting epithelial barrier integrity. Moreover, *B. cereus* suppressed pro-inflammatory cytokines and inhibited TLR4–NF-κB–NLRP3 inflammasome activation, while promoting macrophage polarization toward the M2 phenotype. Metabolomic analysis further revealed activation of the bile acid–FXR axis and modulation of metabolic pathways, contributing to inflammation resolution. Collectively, *B. cereus* exerts multi-level protective effects through epithelial barrier restoration, immune regulation, and metabolic reprogramming, supporting its potential application as a therapeutic or functional probiotic for colitis management.

Reference

Sheng, Z., Jiang, S., Zhang, Y., Deng, X., Wei, C., & Wang, H. (2021). Probiotic *Bacillus cereus* alleviates dextran sulfate sodium-induced colitis in mice through improvement of the intestinal barrier function, anti-inflammation, and gut microbiota modulation. *Journal of Agricultural and Food Chemistry*, 69(35), 10420–10434.

Liao, Y., Wu, S., Zhou, G., Mei, S., Ou, B., Wen, M., Yang, Y., & Wen, G. (2025). Probiotic *Bacillus cereus* regulates metabolic disorders and activates the cholic acid–FXR axis to alleviate DSS-induced colitis. *Journal of Proteomics*, 312, 105360.