

Probiotic Minas Frescal Cheese Shows Therapeutic Effects on the Attenuation of Ulcerative Colitis in a Murine Model

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Inflammatory bowel diseases (IBDs) constitute disturbances of the gastrointestinal tract that cause irreversible changes in the structure and function of tissues. Ulcerative colitis (UC), the most frequent IBD in the population, is characterized by prominent inflammation of the human colon. Functional foods containing probiotic bacteria have been studied as adjuvants to treating or preventing IBDs. Cheese is a adequate probiotic carrier with several effects on the health and presents technological advantages when compared to fermented milk. The selected probiotic strain *Lactococcus lactis* NCDO 2118 (*L. lactis* NCDO 2118) exhibits immunomodulatory effects, with promising results in the UC mouse model induced by dextran sodium sulfate (DSS). Additionally, Minas Frescal cheese is a typical Brazilian dairy food with high nutritional value, besides being a good delivery system that can be used to improve survival and enhance the therapeutic effects of probiotic bacteria in the host. Therefore, this work investigated the probiotic therapeutic effects of an experimental Minas Frescal cheese containing *L. lactis* NCDO 2118 in DSS-induced colitis in mice. Besides that, the gross composition and generation of bioactive compounds were evaluated. Adding *L. lactis* NCDO 2118 did not significantly affect ($p > 0.05$) the proximate composition and mineral content of Minas Frescal cheese, compared with conventional cheese. In addition, the generation of bioactive compounds, such as antioxidant potential (DPPH), ACE inhibitory activity (ACEI), α -amylase, and α -glucosidase on the probiotic cheese containing *L. lactis* NCDO 2118, presented increased values and were significantly different ($p < 0.05$) compared with conventional cheese. During colitis induction, mice that consumed the probiotic cheese exhibited reduced severity of colitis, with attenuated weight loss, lower disease activity index, limited shortening of the colon length, and reduced histopathological score. Moreover, probiotic cheese administration increased gene expression of tight junction proteins ZO-1, ZO-2, Occludin, and Claudin-1 in the colon and increased IL-10 release in the spleen and lymph nodes. Overall, Minas Frescal cheese containing the well-characterized probiotic bacteria *L. lactis* NCDO 2118 was able to alleviate the severity of DSS-induced colitis in a mice model, limiting histopathological damages, restoring intestinal barrier by increased expression of genes related to tight junction protein, and modulating the cytokine production in mice. Therefore, this study demonstrated that consumption of probiotic Minas Frescal cheese, containing *L. lactis* NCDO 2118, prevents the inflammatory process during DSS-induced colitis in mice, opening perspectives for the development of new probiotic functional foods for personalized nutrition in the context of IBD.

References

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