

Lactobacillus rhamnosus can interfere with *Candida albicans* Pathogenicity

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Based on previous studies, which demonstrated that the consumption of probiotics was able to reduce the prevalence and amounts of *Candida* in the oral cavity of young and elderly individuals, we have been studying the effects of *Lactobacillus rhamnosus* on the pathogenicity of *Candida albicans*.

Aiming to investigate the influence of *Lactobacillus rhamnosus* intake on the development of candidiasis and cytokines release, *in vivo* experiments were performed. *Candida* suspensions were inoculated into the oral cavity of experimentally immunosuppressed mice for candidiasis induction. The animals were divided into experimental groups: candidiasis with no probiotic intake (F), candidiasis with probiotic intake during *Candida* inoculation (FP) and candidiasis with probiotic intake 14 days before inoculation with *Candida* (FPP); and control groups: (C), (CP) and (CPP) without inducing candidiasis with probiotic intake in the same manner as groups F, FP and FPP, respectively. After these periods, samples were collected from the oral cavity for yeast counts and, after euthanasia; the tongues of the animals were removed for histological analysis. Sera samples were also collected for analysis of IL-1 beta, TNF-alpha, INF-gamma, IL-12, IL-4, and IL-10. FP group showed lower *Candida* counts in the oral cavity, and the presence of *Candida* was almost not detected in FPP group. In tissues, the counts of fungi were significantly lower in FPP group, followed by FP. Groups that consumed probiotics also had lower histological and inflammatory infiltrates compared to F. Cytokines analysis demonstrated low concentrations of TNF- α , IL-12, IL-4 and IL-10 in all the groups, and no statistical difference between them. The production of IL-6 could be better detected and the experimental groups that consumed the probiotic showed significant lower levels of this cytokine.

Other experiments investigated, *in vitro*, whether the interaction with *Lactobacillus rhamnosus* could interfere with the expression of virulence factors by *Candida albicans*. Therefore, these microorganisms were grown in biofilms, *Candida* strains were isolated and the expressions of the major virulence factors were investigated. The production of phospholipase, protease and hemolysin were observed in appropriate media; filamentation, after growth in serum and observation of germ tubes formation; biofilm formation, after growth in microtiter plates and reading in spectrophotometer; and hydrophobicity, by the use of xylene. The strains were also tested for antifungal sensitivity to amphotericin B, fluconazole and ketoconazole. The results were compared with strains of *Candida* grown in the absence of lactobacilli (control group). It was observed that *Candida* cells which interacted with *L. rhamnosus* (test group) showed significantly lower proteinase and hemolysin activity, when compared with control group. The germ tube formation and biofilm formation capacity also decreased significantly in tested groups, which also demonstrated alterations in susceptibility to antifungal drugs.

These results suggest that *L. rhamnosus* intake, especially preventively, may avoid or decrease the development of candidiasis, probably by interfering with the virulence factors of *C. albicans* and reducing its pathogenicity.