

LACTOBACILLUS RHAMNOSUS GG ENHANCES INTESTINAL MUCUS BARRIER UPON ESCHERICHIA COLI INFECTION

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Introduction:

Foodborne infection is a major food safety issue in both developing and developed countries. The use of probiotics has been emerging as a tool for the control of foodborne infections and gastrointestinal disorders such as diarrhea. Our study aims to investigate potential protective effects of probiotics on intestinal epithelial cells against invasion of foodborne pathogens and to elucidate the mechanisms of such effects. We hypothesize that *Lactobacillus rhamnosus* GG (LGG) can either be used as prevention against or as an antagonist of foodborne pathogens, and such protective effects can be conferred through the upregulation of mucins in the intestinal epithelial cells.

Methods:

Two strains of *Escherichia coli* (*E coli*), including an enteroinvasive strain and a control strain, were used. The direct inhibitory effect of LGG on the growth of *E coli* was studied using inhibition assay. LGG and *E coli* were mixed and incubated for 2 hours. In order to test the protective ability of LGG against foodborne pathogens in the intestine, HT29-MTX cells, a human colon cell line well-characterized for the production of secretory mucins (e.g. MUC5AC and MUC5B), was used as an in vitro model. HT29-MTX cells were pre-treated with LGG for 1 hour followed by the addition of *E coli* for another hour. In another set of experiment where LGG was used as an antagonist, LGG and *E coli* were incubated simultaneously with HT29-MTX cells for 2 hours.

Results:

The presence of LGG inhibited the growth of both strains of *E coli* at LGG:*E coli* ratio of 10:1 to 1:10. LGG showed stronger inhibitory effect on enteroinvasive *E coli* than the control strain. The addition of LGG, either as a prevention or as an antagonist of both strains of *E coli*, upregulated the expression of MUC5AC and MUC5B genes of HT29-MTX cells. Such effect was observed when LGG was present at multiplicity of infection (MOI) from the range of 1000:1 to 10:1. LGG induced higher level of MUC5AC gene expression when added as an antagonist than as a prevention. In simultaneous incubation of LGG and *E coli*, level of MUC5B gene expression upon infection of enteroinvasive strain was higher than that of control strain.

Discussion:

The inhibitory effect of LGG on *E coli* showed the potential of probiotics as a way to control the growth of pathogenic bacteria in food. The upregulation of MUC5AC and MUC5B genes when LGG and *E coli* were added at different conditions further demonstrate the protective effect of LGG on HT29-MTX cells, possibly through bacterial-cell interactions. These results would lead us to further investigations of effects of probiotics on strengthening of intestinal mucus barrier against foodborne pathogens, and possibly the development of preventive measures of foodborne infections.

Keywords: Intestinal Mucus Barrier, Mucin, Probiotics, Foodborne infection, Intestinal integrity, *Lactobacillus rhamnosus* GG, *Escherichia coli*

References:

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