P9

# Antimicrobial Activity of Lactobacillus reuteri SD 2112 against Major Food-Borne Pathogens and Bacillus anthracis Sterene 34F2

Nam Hoon Kwon[1], So Hyun Kim[1], W. K. Bae[1], J. Y. Kim[1], J. Y. Lim[1], K. M. Noh[1], J. M. Kim[1], J. S. Ahn[2], J. Hur[1], B. W. Yoo[3], J. S. Moon[2], H. J. Kang[4], D. S. Lee[4], I. B. Kwon[4] and Y. H. Park[1]

[1]Department of Microbiology, College of Veterinary Medicine and School of Agricultural Biotechnology, Seoul National University, Seodoon-Dong 103, Kwonsun-Gu, Suwon, Gyunggi, 441-744, KOREA

[2]National Veterinary Research and Quarantine Service, Anyang 6-Dong 480, Manan-Gu, Anyang, Gyunggi, 430-824, KOREA

[3]Agribrands Purina Korea, Inc., Shinan Building, 943-19, Daechi-Dong, Kangnam-Gu, Seoul, 135-280, KOREA

[4]Lotte R&D Center, Yangpyung-Dong 4-23, Youngdeungpo-Gu, 150-104, KOREA

## Introduction

*Lactobacillus reuteri* SD 2112, isolated from human maternal milk, is a new promising antibiotic. It produces some antimicrobial substances including acids, reutericidin 6, bacteriocin, reutericyclin, and reuterin. Reuterin, whose molecular weight is 148, is an aldehyde and it acts as an inhibitor of ribonucleotide reductase. The purpose of this study was to determine antimicrobial activity of *L. reuteri* SD 2112 against major food-borne pathogens and *Bacillus anthracis* vaccine strain based on the activity of reuterin. In addition, antimicrobial activity of reuterin was compared with other lactic acid bacteria under the conditions of pH change and proteolytic digestion.

## Materials and Methods

Antimicrobial activity of *Lactobacillus reuteri* SD 2112 was compared with other lactic acid bacteria such as *L. acidophillus, L. bulgaricus, L. casei* and *Bifidobacterium longum.* Tested food-borne pathogens were *S. enteritica* serova Enteritidis ATCC 13076, S. *enteritica* serova Typhimurium DT104, *S. typhimurium* bovine fecal isolate, *Staphylococcus aureus* MNEV, FRI 913, *Escherichia coli* O157:H7 ATCC 43890, ATCC 43894 and *Listeria monocytogenes* ATCC 11285. *Bacillus anthracis* Sterene 34F2 was also included. Five probiotics were incubated in 3 different growth conditions (MRS without

glycerol, MRS with 0.5 M glycerol and 0.25 M glycerol solution) to obtain supernatants. Minimum inhibitory concentration (MIC) and minimum bactericidal concentration (MBC) of each supernatant were determined against nine pathogens including vegetable *B. anthracis* and its spore and viable counts were performed as times went on. Supernatant of 0.25 M glycerol solution was analyzed using Nuclear Magnetic Resonance (NMR) at 500 MHz to detect the presence of reuterin. To examine any change of antimicrobial activity of these probiotics, each supernatant was treated with different pH conditions, pepsin, and trypsin digestion. Data were analyzed with Friedman two-way ANOVA by ranks in Statistical Analysis System Institute verson 8.

## Results and Discussion

The antimicrobial activity of *L. reuteri* in the first two conditions (MRS without glycerol and MRS with 0.5 M glycerol) was not better than the others' , but the activity was significantly higher than those of the others in 0.25 M glycerol solution. This prominent effect might be attributable to reuterin, produced by *L. reuteri* using glycerol. We could detect the presence of reuterin in the supernatant of 0.25 M glycerol solution with NMR at 500 MHz. Results of antimicrobial efficacy through MIC and MBC revealed that reuterin had pan-bactericidal effects against above pathogens. As the results of pH adjustment and proteolytic digestion, antimicrobial activity of reuterin was not entirely affected by any of these treatments, while the activities of the other probiotics were significantly decreased.

## Acknowledgements

The authors are grateful for funding provided by Brain Korea 21 Project.

## References

1. Bernet, M. F., D. Brassart, J. R. Neeser, and A. L. Servin: Adhesion of human bifidobacterial strains to cultured human intestinal epithelial cells and inhibition of enteropathogen-cell interactions. *Appl. Environ.Microbiol.* 59, 4121-4128 (1993).

2. Michael G. G., Alexandra H., *et al.*: Characterization of Reutericyclin Produced by *Lactobacillus reuteri* LTH2584. *Appl. Env. Microbiol.*, 66, 4325-4333 (2000).

3. Shornikova, A. V., I. A. Casas, H. Mykkanen, E. Salo, and T. Vesikari: Bacteriotherapy with *Lactobacillus reuteri* in rotavirus gastroenteritis. *Pediatr. Infect. Dis. J.*, 16, 1103-1107 (1997).

4. Talarico, T. L., and W. J. Dobrogosz: Chemical characterization of an antimicrobial substance produced by *Lactobacillus reuteri. Antimicrob. Agents Chemother.*, 33, 674-679 (1989).