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Probiotic Bifidobacteria Protect Mice from Lethal Infection with Shiga Toxin-Producing *Escherichia coli* O157:H7



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ABSTRACT

The anti-infectious activity of probiotic Bifidobacteria against Shiga toxin-producing *Escherichia coli* (STEC) O157:H7 was examined in a fatal mouse STEC infection model. Stable colonization of the murine intestines was achieved by the oral administration of *Bifidobacterium breve* strain Yakult (naturally resistant to streptomycin sulfate) as long as the mice were treated with streptomycin in their drinking water (5 mg/ml). The pathogenicity of STEC infection, characterized by marked body weight loss and subsequent death, observed in the infected controls was dramatically inhibited in the *B. breve*-colonized group. Moreover, Stx production by STEC cells in the intestine was almost completely inhibited in the *B. breve*-colonized group. A comparison of anti-STEC activity among several *Bifidobacterium* strains with natural resistance to streptomycin revealed that strains such as *Bifidobacterium bifidum* ATCC 15696 and *Bifidobacterium catenulatum* ATCC 27539^T did not confer an anti-infectious activity, despite achieving high population levels similar to those of effective strains, such as *B. breve* strain Yakult and *Bifidobacterium pseudocatenulatum* DSM 20439. The effective

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strains produced a high concentration of acetic acid (56 mM) and lowered the pH of the intestine (to pH 6.75) compared to the infected control group (acetic acid concentration, 28 mM; pH, 7.15); these effects were thought to be related to the anti-infectious activity of these strains because the combination of a high concentration of acetic acid and a low pH was found to inhibit Stx production during STEC growth in vitro.

FOOTNOTES

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