

Can the use of probiotics reduce the incidence of nosocomial *Clostridium difficile* infection in 60 years or older patients?

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Abstract:

Background: Antibiotic-associated diarrhea (AAD) is a common side effect of antibiotic use. The pathogenesis of AAD may be mediated by disruption of the host's normal flora resulting in overgrowth of pathogens. One of these pathogens is *Clostridium difficile*. Probiotics may help reestablish the disrupted intestinal flora and help clear the pathogen and its toxins from the host. Although numerous studies have been conducted, results are variable due to study design, type of probiotic, differing dose of probiotic, and duration of treatment. Our study aims to assess the efficacy and safety of the probiotics *Lactobacillus* GG and *Saccharomyces boulardii* for the prevention of *C. difficile* associated diarrhea.

Methods: Study data were collected from two community hospitals in Kansas City over a period of 5 months. All patients in the study were initiated on antibiotics and were then given probiotics. This study was controlled and not blinded.

Results: In data from two community hospitals, 816 patients who were being treated with antibiotics prior to the investigation served as a control; 14 (1.72%) had *C. difficile* infections. During the study using probiotic administration, 803 patients also being treated with antibiotics prior to the investigation were followed and in this population; five patients (0.62%) contracted a *C. difficile* infection.

Keywords: antibiotics, clostridium, probiotics, diarrhea, nosocomial, infection

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Introduction

Antibiotic-associated diarrhea (AAD) is a common side effect of antibiotic use and occurs in 5–35% of patients taking antibiotic therapy.¹ The pathogenesis of AAD may be mediated by disruption of the host's normal flora resulting in dysbiosis of normal colonic flora and harmful pathogens. These outbreaks of AAD are usually caused by *Clostridium difficile* infections. Risk factors for *C. difficile* infections include the class of antibiotic taken, the health of the patient, and exposure to nosocomial pathogens.^{1,2} One role of the intestinal microbiota is to act as protection against intestinal pathogens.³ With the protection decreased by antibiotics, patients are susceptible to *C. difficile* infections. In Canada, *C. difficile* infections resulted in 260 million dollars

in hospital costs⁴ in 2012. Proposed strategies to reduce the incidence of AAD have included restricting the use of broad-spectrum antibiotics and discontinuing unnecessary antibiotics during hospital stays. Recent strategies have also included the use of probiotics in decreasing the incidence of *C. difficile* associated diarrhea. Probiotics may help reestablish the disrupted intestinal flora, and help clear the pathogen and its toxins from the host.^{5,6} Although numerous studies have been conducted, results are variable due to study design, type of probiotic, differing dose of probiotic, and duration of treatment. Our study aims to assess the efficacy and safety of the probiotics *Lactobacillus* GG and *Saccharomyces boulardii* for the prevention of *C. difficile* associated diarrhea.

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Table 1. Patients with *C. difficile* infections before and after probiotic administration.

	Total patients	Patients with <i>Clostridium difficile</i> infections	Percentage of patients with <i>C. difficile</i> infections
No probiotics control	816	14	1.7%
Probiotics	803	5	0.6%

Methods

Study data were collected from two community hospitals in Kansas City over a period of 5 months during index hospitalization. All patients in the study were inpatients and were initiated on IV or oral antibiotics and were then given probiotics. The probiotic was given by mouth within 2 days of the first antibiotic dose. Patients who were unable to take probiotics orally, on H2 blockers, or other acid reducing agents were not included in the study data. All patients were age 60 or older as part of the inclusion criteria for the study. This age group is considered a high-risk population for *C. difficile* infections.⁷ Hospitals had different probiotics on their formulary but the preparation needed to include *Lactobacillus* GG plus *Saccharomyces boulardii* in order to be included in the study. No placebo was given to the patients.

Results

This study was controlled and not blinded. In data from two community hospitals, 816 patient who were being treated with antibiotics prior to the investigation served as a control where 14 (1.7%) had *C. difficile* infections. During the study using probiotic administration, 803 patients also being treated with antibiotics prior to the investigation were followed and in this population, five patients (0.6%) contracted a *C. difficile* infection. After Chi-squared analysis, the *p* value was calculated to be 0.04.

Conclusion

The data in this study were significant to correlate that the use of probiotics does reduce the incidence of nosocomial *C. difficile* infection in 60 years or older patients.

Future plans

After the results of this study, it can be beneficial to recommend that all patients on antibiotics have a probiotics supplement as well. Further studies are necessary to investigate the patient populations

and the specific antibiotic classes that probiotic administration would be the most effective. In addition to the 60 years or older age group studied in this investigation, other age groups may be studied to determine effectiveness of probiotic administration. After this study, the investigators plan to further investigate different probiotic strains that may be more efficacious than *Lactobacillus* GG and *Saccharomyces boulardii* (Table 1).

Conflict of interest statement

The authors declare no conflicts of interest in preparing this article.

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