Preventative Effects of Probiotic Bacteria on Intestinal Inflammation in a Mouse Model of *Clostridium difficile* Infection

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Abstract

*Clostridium difficile* is the most common hospital-acquired infection in the United States. Infection with *C. difficile* causes an array of serious inflammatory bowel disorders (IBDs). Susceptibility to *C. difficile* infection is caused partly by disruption of the composition of the normal intestinal microbiota. Previous studies have demonstrated that several individual species of probiotic bacteria may reduce the severity of intestinal inflammation in mice infected with *C. difficile*; however, no information is available regarding the effectiveness of over-the-counter probiotic preparations in the prevention of *C. difficile* infection and associated-IBDs. We hypothesize that an over-the-counter probiotic formulation will reduce intestinal inflammation during *C. difficile* infection. To test this, mice will be administered tap water supplemented with an over-the-counter probiotic (*Kyodophilus*®) for one week, prior to infection with *C. difficile*. During this time, overall health of the mice will be measured daily by monitoring water consumption and body weight. After one week, intestinal inflammation will be quantified by measuring tissue edema and inflammatory cell infiltration into the intestine. We expect that mice receiving over-the-counter probiotics will exhibit reduced markers of intestinal inflammation in response to *C. difficile* infection.

Introduction

- *Clostridium difficile* is one of the most common hospital acquired infections in the United States (1).
- *C. difficile* causes a range of diseases varying from mild diarrheal illness to severe colitis (2, 3).
- Previous studies have demonstrated that several species of probiotics can reduce the severity of intestinal inflammation in mice infected with *C. difficile* when administered individually (4).
- There have been no previous studies that indicate the effectiveness of over-the-counter probiotics in reducing the severity of intestinal inflammation. This study will assess this.

Hypothesis

- An over-the-counter probiotic formulation will reduce intestinal inflammation in mice during *Clostridium difficile* infection.

Methods

**Figure 1: Summary of Experimental Design.** Groups of mice received either tap water alone (A and C) or tap water supplemented with 15mg/100mL *Kyodophilus®* probiotic bacteria (B and D) for 7 days prior to oral administration of 1x10⁵ cfu *C. difficile* (C and D) or media alone (A and B).

- **A** Day:0  Tap water  7  14  Administer placebo  Euthanize mice
- **B** Day:0  Tap water + 15mg/100mL probiotic  7  14  Administer placebo  Euthanize mice
- **C** Day:0  Tap water  7  14  Administer *C. difficile*  Euthanize mice
- **D** Day:0  Tap water + 15mg/100mL probiotic  7  14  Administer *C. difficile*  Euthanize mice

**Results**

**Figure 2: Probiotic Bacteria have no Effect on Measures of Animal Health.** Change in the average (A) animal weight, and (B) water consumption was measured daily.

- Administration of over-the-counter *Kyodophilus®* probiotics has no effect on marker of animal health, such as water consumption and animal weight.

Future Work

- Quantifying the amount of intestinal inflammation present in the groups of mice.
- To do this, tissue edema will be measured by taking the tissue wet: dry ratio. Inflammatory cell infiltration into the intestine will be measured using Myeloperoxidase using a colorimetric assay.

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References