Cats surrendered to shelters come from a variety of situations with many not having received adequate diets or general health care prior to their arrival at the shelters. These inadequacies, along with environmental stress triggered by the unfamiliar smells and sounds of shelter life, may contribute to lose stools often observed in shelter cats.

Research has shown probiotics to have beneficial effects on mammals, such as decreasing the risk of diseases and gastrointestinal disorders by improving the gastrointestinal microflora balance and immune system responses. Unfortunately, few studies have specifically investigated the effects of probiotics in shelter cat health. From those few studies, it has been observed that shelter cats fed Enterococcus faecium probiotic had fewer episodes of diarrhea when compared to their placebo controlled counterparts (Bybee et al., 2011). Probiotic supplemented to cats with chronic diarrhea contributed to an overall improvement in their fecal quality (Hart et al., 2012), and the addition of Lactobacillus acidophilus probiotics to healthy adult cats contributed to a significant increase in beneficial Lactobacillus species and reduction in Clostridium species and Enterococcus faecalis, thus providing a beneficial change and balance to gastrointestinal microflora (Marshall-Jones et al., 2006). However, to date, there have been no studies on the effect of probiotics on the influence of large intestine inflammation in shelter cats.

The hypothesis for this study was that probiotics will have a positive influence on fecal quality in shelter cats, and there will be less evidence of inflammation within the large intestine mucosa.

**Methods**

All animals and procedures used in this experiment were approved by the Lincoln Memorial University Institutional Animal Care and Use Committee (IACUC DR107-R15-12). Thirtyeight cats (17 male, 13 female) meeting study criteria were received from a local shelter in two groups of 15 cats for participation in a 28-day crossover study. Upon arrival, all cats underwent a 7-10 day adjustment period with monitoring for signs of distress, de-worming, and minor vaccinations. A timeline for periods of the study and data collection is illustrated in Figure 1.

All cats were fed a dry Purina ProPlan diet twice daily supplemented with 20 grams of canned food in the morning for delivery of Purina Fortiflora™ probiotic (1 gram packet with 1 x 10^9 CFU or Enterococcus faecium) during the probiotic period. Food amounts were calculated based on daily energy requirements for each cat.

Cats were weighed and body condition scored weekly and all feces scored daily using Purina’s fecal scoring chart on a scale of 1 (very hard and dry pellets with no residue) to 7 (very watery feces with no texture and present in flat puddles), noting consistency, shape, and any abnormalities such as color of feces or presence of blood or mucus.

During endoscopy, full sample biopsy samples were taken from the proximal, medial, and distal portions of the large intestine. Samples were sent for embedding and staining (AML labs, St. Augustine, FL). Samples were evaluated and scored for severity on a scale based on the number of inflammatory/immune cells and on the invasion of cell crypt linings by eosinophilic cells, as illustrated in Figure 2. Cell counts were performed in three separate sections of each biopsy sample; however, some samples were unable to be read due to the mass in the biopsy, the orientation, or the fixation process.

**Results**

**Figure 3.** Changes in fecal scores for shelter cats during the control and probiotic periods. There were no significant differences observed (P > 0.05).

**Figure 4.** Changes in fecal scores for shelter cats fed quality dry food for 2 weeks followed by probiotic supplementation for 2 weeks. In the graph, bars with different letters indicate significant differences (P < 0.05).

**Figure 5.** Mean values for inflammatory cell population counts for polymorphonuclear cell (A), plasma cell (B), and eosinophilic (C) found in the proximal, medial, and distal portions of feline large intestinal biopsies collected during endoscopies on days 1, 15, and 29 of the study. Significant differences were seen between days 1 and 2 (P ≤ 0.05).

**Figure 6.** Fixed slides of feline proximal intestine show the difference between IBS scores 1 (A) and 2 (B). Increased interstitium cellularity and goblet cell depletion are observed in Panel B as inflammation increases.

**Discussion/Future Directions**

While previous studies have shown probiotics to have beneficial effects to cats, the data collected for this study showed negligible benefits in supplementing probiotics to shelter cats compared to feeding high quality dry cat food and de-worming alone.

When comparing the average fecal scores during the probiotic period to the control period, there were no significant differences. However, when comparing the fecal scores between each week of the study, average fecal score increased between weeks 2 and 3 (P < 0.005), and decreased between weeks 3 and 4 (P = 0.02). The histological data collected in this study showed no changes in the quantification of inflammatory cells within the large intestine with the exception of plasma cells in the medial (P = 0.01) and proximal (P = 0.004) large intestine.

When comparing IBS scores for each section of large intestine throughout the study, no significant changes were seen.

Future recommendations for this study would be to extend the study for a longer period of time, investigate the benefits of other species of probiotics, and increase the sample size.

**References**


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