

FORTIFEED® — Supporting Digestive and Immune Health in Dogs and Cats



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Pet food is affected by the same health and wellness trends that influence human food — including health claims as well as innovations in functionality. One of the most important aspects to address within pet nutrition is digestive health, as it is essential for a long and healthy life. The digestive system is crucial to maintain a strong immune system for both cats and dogs.

A dog's digestive system is responsible not only for breaking down food, absorbing the nutrients from the food and distributing them throughout the body, but also for preventing pathogens from entering the dog's system. Meanwhile, a cat's digestive problems are one of the most common reasons cats are brought to their veterinarian. Additionally, antibiotic treatments in dogs and cats can have negative effects on the health of their gut microflora and digestive system.

Sixty nine percent of pet food shoppers are interested in pet food with added health benefits while 79% of pet food shoppers agree that the quality of the pet food is as important as the quality of human food.* These attitudes will continue to drive companies to market pet food with digestive health claims that address the health of their pet.

The above statistic also parallels a big trend in the pet food industry — the humanization of pets. Consumers are treating pets, especially dog and cats, like extensions of their human selves. The companionship of pets has become much more valuable today. Pet owners continue to identify with their pets and treat them as important members of the family. If the pet owner purchases a certain brand of yogurt for its pro and prebiotic fiber benefits for digestive health, they will look for the same in their pet's food choices. Many ingredients, such as omega-3 fish oils, probiotics, CLA and prebiotic fibers, that are proven to benefit the health of consumers are now migrating over into food that can benefit the health of the pet.

One of the more recent ingredients to cross over from benefiting consumers to benefiting their pets is FORTIFEED® prebiotic fiber. FORTIFEED plays an important role in both the digestive and immune health of the pet. There is increasing evidence that this novel prebiotic fiber is important in maintaining the overall health of dogs and cats as the colonic microflora have a considerable impact on the host system, especially in the digestive and immune health aspects of the animals.



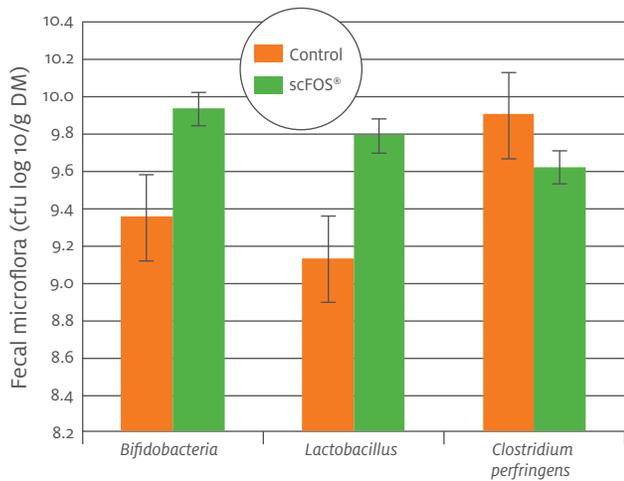
A prebiotic fiber is defined as “a selectively fermented ingredient that results in specific changes in the composition and/or activity of the gastrointestinal microbiota, thus conferring benefit(s) upon host health.”¹

FORTIFEED is an all-natural prebiotic fiber that selectively stimulates the growth and/or activity of beneficial microflora in the intestine of monogastric animals. It is derived from cane sugar utilizing a patented process, non-GMO ingredients and a traditional, natural enzymatic fermentation method. FORTIFEED has a clean, mildly sweet taste that can improve and enhance the palatability of the pet food or treat. It can successfully mask off-notes of a variety of feed inputs, which can positively impact feed acceptability. At 1.5 kcal/gram, FORTIFEED is ideal for reduced calorie formulations and can be used in calorie-modified products — all while providing low inclusion levels for the pet food manufacturer (based on the animal species, age and weight).

FORTIFEED prebiotic fiber is a short-chain fructooligosaccharide (scFOS®) that is not digested by salivary or digestive enzymes² but can be metabolized by enzymes secreted by microbes in the colon giving rise to digestive and immune health benefits. Additionally, simultaneous administration of a prebiotic, such as FORTIFEED, with probiotics may enhance the survivability, colonization and beneficial effects of the exogenous probiotic giving rise to synergistic beneficial effects.³

The prebiotic effects of FORTIFEED at varying low inclusion rates are supported by results of seven studies conducted in dogs and cats.⁴⁻¹⁰ The findings show increased growth

FIGURE 1: FECAL MICROBIAL POPULATIONS IN DOGS FED 4 G/D OF FORTIFEED®

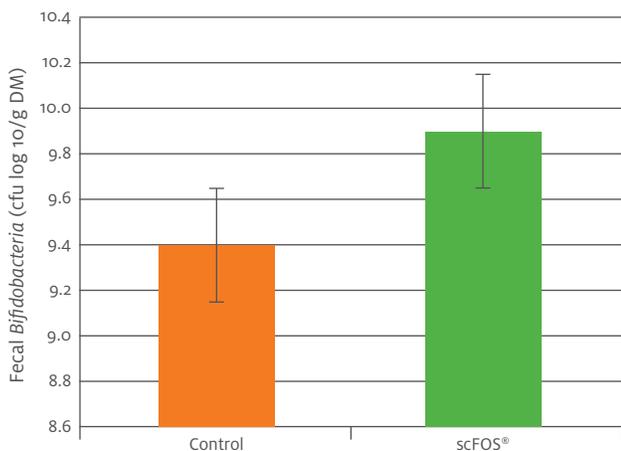


of beneficial microbial species such as *Bifidobacterium* and *Lactobacillus*. Additionally, evidence of reduced growth of pathogenic species, such as *E coli* and *C perfringens* was noted in some studies.

Dr. Kelly Swanson, an investigator in three studies in dogs, conducted at the University of Illinois at Urbana-Champaign, noted the consistency of the effects for FORTIFEED®.⁴⁻⁶ “These studies show remarkably consistent results. Adding FORTIFEED to the diets of cats and dogs not only altered their gut microbiota, but also changed the metabolites that were produced. Reduced production of harmful compounds, such as phenols and indoles, and increased production of the beneficial short-chain fatty acids, such as butyrate and lactate was found. These changes indicate improved digestive health of the animals.”

In one study by Dr. Swanson, published in the *Journal of Nutrition*, fecal buyrate was increased by 32% in 20 dogs

FIGURE 2: FECAL BIFIDOBACTERIA IN CATS FED 0.5% OF FORTIFEED®



fed 4 g of FORTIFEED per day.⁵ Several putrefactive compounds, such as isobutyrate and isovalerate were decreased as was the catabolite, indole. These positive changes were accompanied with increased counts of *Bifidobacterium* and *Lactobacillus* bacteria (~0.5 cfu log₁₀/g feces) (Figure 1). A similar increase in *Bifidobacterium* (0.5 cfu log₁₀/g feces) was seen in eight cats supplemented with FORTIFEED (Figure 2). The study, recently published in the *Journal of Animal Science*, was conducted by Kankupt et al. (2011) in Dr. George Fahey’s lab also at the University of Illinois.⁸ Figure 3 illustrates effects of FORTIFEED on exclusive competition of microflora in cats as demonstrated by Sparkes.⁹ Dietary supplementation with 0.75 % of FORTIFEED for 12 weeks increased lactobacilli (beneficial bacteria) and decreased potential pathogens such as *E coli* (~1.2 cfu log₁₀/g feces) and *Clostridium* (~ 1.7 cfu log₁₀/g feces) in cats.

The companion pet stool tells the story of their digestive tract. Harsh smelling or malodorous odors in the stool of

FIGURE 3: FECAL MICROFLORA IN CATS FED 0.75% OF FORTIFEED

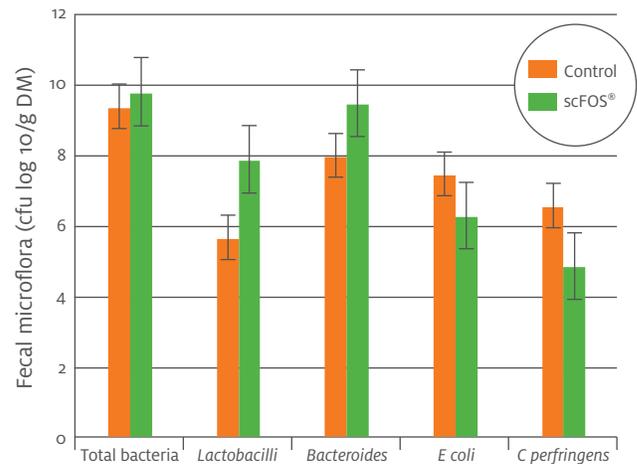
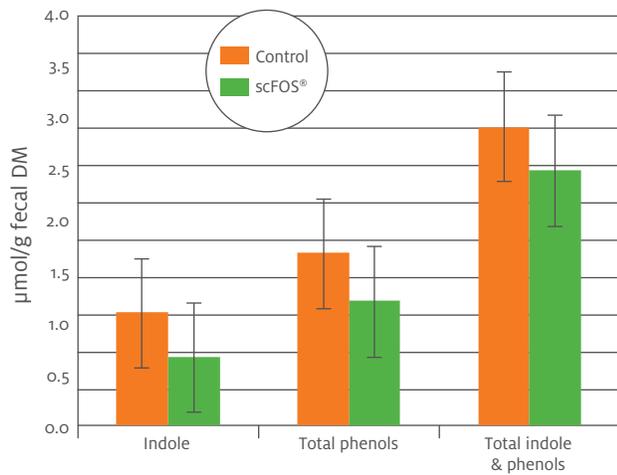


FIGURE 4: EFFECT OF FORTIFEED® ON FECAL PUTREFACTIVE COMPOUNDS IN DOGS



the pet can indicate a health issue. Ammonia, indoles, and volatile sulfur containing compounds are considered as putrefactive compounds. A healthy bacterial ecosystem in the gut, fortified with prebiotic fiber such as FORTIFEED® helps to support good digestive function, thereby reducing smelly, odorous stools with pets.

In a study conducted by Dr. Swanson, healthy dogs (5 pointers per group) were supplemented with 4 g of scFOS® for 28 days.⁵ FORTIFEED reduced fecal concentration of putrefactive compounds such as indoles (40%), total phenols (28%) and total phenols + indoles (14%) in dogs (Figure 4).

FORTIFEED prebiotic fiber has been scientifically shown to support digestive and immune health as well as reduce fecal odor claims. It adds value to nutritional programs for companion animals, which pet owners are seeking. These health benefits are easily obtained even with very small quantities of FORTIFEED prebiotic fiber, providing a cost effective way to add consumer-friendly label claims on companion animal products such as:

- Prebiotic
- Improved microflora balance
- Encourages healthy digestive function
- Helps support the immune system
- Helps reduce odors



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References

1. Roberfroid M, Gibson GR, et al. Prebiotic effects: metabolic and health benefits. 2010. *British Journal of Nutrition*. 104 S2: S1-63.
2. McKellar R, Modler H, Mullin J. Characterization of growth and inulinase production by *Bifidobacterium* spp. on fructooligosaccharides. *Bifidobacteria Microflora*. 1993;12(2):75-86.
3. Garcia M, et al. Effect of a multi-species synbiotic formulation on fecal bacterial microbiota of healthy cats and dogs as evaluated by pyrosequencing. *FEMS Microbiology Ecology*. 2011 ;78(3):542-554.
4. Barry KA, et al. Low-level fructan supplementation of dogs enhances nutrient digestion and modifies stool metabolite concentrations, but does not alter fecal microbiota populations. *Journal of Animal Science*. 2009;87(10):p3244-3252.
5. Swanson KS, et al. Fructooligosaccharides and *Lactobacillus acidophilus* Modify Gut Microbial Populations, Total Tract Nutrient Digestibilities and Fecal Protein Catabolite Concentrations in Healthy Adult Dogs. *The Journal of Nutrition*, 2002;132(12):3721-3731.
6. Swanson KS, et al. Supplemental Fructooligosaccharides and Mannanooligosaccharides Influence Immune Function, Ileal and Total Tract Nutrient Digestibilities, Microbial Populations and Concentrations of Protein Catabolites in the Large Bowel of Dogs. *The Journal of Nutrition*. 2002;132(5):980-989.
7. Howard, et al., Blood flow and epithelial cell proliferation of the canine colon are altered by source of dietary fiber. *Veterinary Clinical Nutrition*. 1999;6(2):9-15.
8. Kanakupt K, et al. Effects of short-chain fructooligosaccharides and galactooligosaccharides, individually and in combination, on nutrient digestibility, fecal fermentative metabolite concentrations, and large bowel microbial ecology of healthy adult cats. *Journal of Animal Science*. 2011;89(5):1376-1384.
9. Sparkes, et al. Effect of dietary supplementation with fructooligosaccharides on fecal flora of healthy cats. *American Journal of Veterinary Research*. 1998;59(4):436-440.
10. Ogata. Use of neosugar in pets. Abstract presented at 3rd Neosugar conference: 1986;p116; Tokyo, Japan.

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