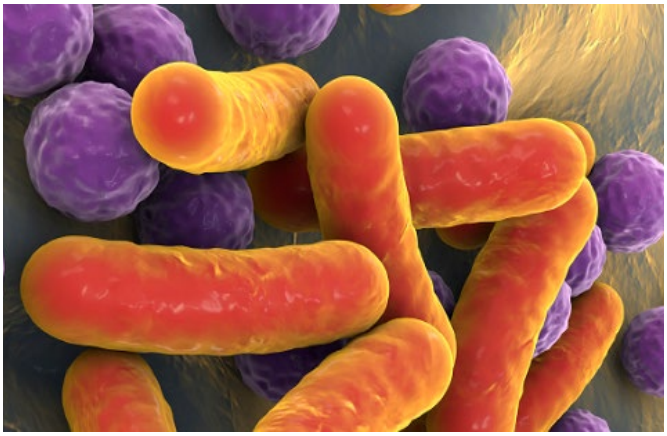
Microbiome

MANAGING THE GUT MICROBIOME



Advanced molecular microbiology techniques have found the gastrointestinal (GI) tract of dogs and cats harbors a diverse, dynamic, and complex microbial community.

The GI or gut microbiota is comprised of trillions of microorganisms including bacteria, archaea, fungi, protozoa and viruses (mostly bacteriophages) — there are at least as many microbial cells present in the gut as there are cells in the entire body.[1] Bacteria make up the largest segment, accounting for approximately 98% of the microbiota in dogs and cats,[2,3] and play key roles in host health. GI bacteria provide essential functions that contribute to metabolism, protect against potential intestinal pathogens, prime the immune system, and promote healthy intestinal structure.[4] As for the other microbial species present within the GI microbiome, scientists are just beginning to understand their roles and significance.

GI microbiota composition can be influenced — even profoundly altered — by a variety of factors, including diet, environment, age, host genetics, medications and diseases.[5–8] While some of these factors cannot be controlled, diet provides a daily opportunity to influence the gut microbiome and, ultimately, pet health.

Key Messages

- Food not only nourishes dogs and cats but also feeds the gut microbiota, influencing its composition and bacterial metabolite production.[9] Microbial metabolites can affect an animal's GI tract or be absorbed to impact the pet's health at locations beyond the GI tract.[9]
  - The microbiome may be affected by ingredients, macronutrient concentrations and digestibility, and processing procedures of the diet.[4,9–12] These factors influence nutrient digestion and absorption, and affect what substrates are available for microbial metabolism.[9,10]
- Nondigestible carbohydrates, including dietary fiber, are the preferred fuel of gut microbes. However, the microbiota can and does use protein and fat when available.[12,13]
  - Gut bacteria ferment nondigestible carbohydrates to produce short-chain fatty acids (SCFAs) such as acetate, propionate and butyrate. SCFAs are an important energy source for intestinal epithelial cells and for other bacteria, act as signaling molecules, promote epithelial barrier function, regulate intestinal motility, and exert an anti-inflammatory effect.

DID YOU KNOW?

The intestine of mammals is estimated to contain approximately 10^{10} to 10^{14} microorganisms.[17]

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Key Messages (continued)

- Dietary protein and amino acids that escape digestion and absorption in the small intestine can be fermented by the gut microbiota. Some metabolites produced from amino acid metabolism are beneficial, while others have been implicated in certain inflammatory diseases.[9]

- Other options for feeding and influencing the GI microbiome include probiotics and prebiotics.
  - Prebiotics, such as inulin, chicory root, wheat aleurone, psyllium and other oligosaccharides, are fermentable, nondigestible carbohydrates that selectively promote the growth or activity of potentially beneficial microorganisms without significantly altering food digestibility.[14]
  - Probiotics are live microorganisms that can provide benefits directly or indirectly by:[15]
    - stimulating growth of resident bacteria through metabolic interactions
    - reducing the abundance of potentially pathogenic bacteria
    - interacting with the intestinal epithelium and gut immune system
  - Synbiotics blend probiotics and prebiotics. A combination may be complementary, in which the prebiotic and probiotic have independent mechanisms and benefits, or synergistic, in which the prebiotic is the preferred substrate for the accompanying probiotic.[16]

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