Enteric Microbial Diversity in Diabetic Cats

Andrew C. Bugbee, DVM, DACVIM
University of Georgia

In the Literature

Kieler IN, Osto M, Hugentobler L, et al. Diabetic cats have decreased gut microbial diversity and lack of butyrate producing bacteria. *Sci Rep.* 2019;9(1):4822.

FROM THE PAGE ...

Intestinal flora contributes to several protective and homeostatic mechanisms in the body; alterations to these microbial communities can contribute to systemic inflammation and disease.1 Diabetes mellitus is a common endocrinopathy in middle-aged to older cats, with a complex pathophysiology that often involves insulin resistance and β-cell dysfunction and injury, culminating in progressive loss of insulin-secreting ability.

In this study, the enteric microbial compositions of 82 cats (23 diabetic; 24 lean and 15 overweight, nondiabetic) were described and compared. The authors also assessed the impact of a 4-week, high-protein, diabetic-formulated diet change on microbial composition in a subset of these cats (11 diabetic; 12 lean and 13 overweight, nondiabetic).

Breed, age, and sex were not found to influence enteric microbial composition. Similarly, no differences in microbial composition were found between lean and obese cats. However, as compared with lean cats, diabetic cats were found to have reduced microbial richness (ie, number of gut microbial genes), gut microbial diversity, and bacteria able to produce the short-chain fatty acid butyrate, a known energy source for colonic epithelial cells and a factor in intestinal glucose and insulin regulation. Most differences found between these groups were caused by a relative reduction in enteric microbial communities, specifically in diabetic cats as compared with lean cats. In addition, following the 4-week diet trial, diabetic cats maintained a reduced microbial richness and diversity as compared with both lean and obese nondiabetic cats. Lower concentrations of various butyrate-producing bacteria were observed in diabetic cats both before and after the diet trial, with additional predictive models suggesting that the gut microbiota in diabetic cats may have an impaired ability to produce vitamin K. Although vitamin K is a known factor involved in hemostasis, the authors describe its potential additional role in regulating systemic insulin sensitivity.

Of several reported associations between serum chemistry or clinical parameters and enteric microbial composition, the most clinically relevant finding was that serum fructosamine concentrations were negatively correlated with high numbers of gut microbiota of the family Prevotellaceae, which have been associated with improved glucose tolerance, and positively correlated with high numbers of Enterobacteriaceae, a bacterial family associated with low-grade systemic inflammation.

... TO YOUR PATIENTS

Key pearls to put into practice:

1. Diabetic cats appear to have relative enteric dysbiosis as compared with healthy lean and obese cats, which could impact diabetes mellitus pathogenesis or, possibly, patient response to management.
2. Results of blood glucose testing, including serum fructosamine concentrations, may be influenced by a patient's enteric microbial composition.
3. High-protein, diabetic-formulated diets appear to increase enteric microbial diversity in nondiabetic cats but do not exert a similar influence in diabetic cats. Further study is needed to determine if other interventions (eg, probiotics) can assist in overcoming this dysbiosis.

Reference

1. O'Hara AM, Shanahan F. The gut flora as a forgotten organ. *EMBO Rep*. 2006;7(7):688-693.