

**The Gut–Systemic Axis in Companion Animals:
Systemic Review of the Microbiome's Role in Metabolic and Behavioral Disease**

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INTRODUCTION & AIM

The gastrointestinal microbiome in companion animals is increasingly recognized as a complex, metabolically active organ with profound systemic influence. A functional imbalance, or dysbiosis, is now strongly implicated in a spectrum of extra-intestinal diseases. This review introduces and explores the concept of a unified "Gut–Systemic Axis", a comprehensive framework connecting the gut to distant organs, including the brain, liver, and adipose tissue. This axis is often mediated by shared mechanisms, including altered intestinal permeability, metabolic endotoxemia, and chronic systemic inflammation.

METHOD

This review synthesizes and critically evaluates the current body of scientific literature elucidating the role of the canine and feline gut microbiome in disease. We systematically examined the evidence linking gut microbiota alterations to the pathophysiology of major metabolic disorders

(obesity, diabetes mellitus, hepatobiliary disease) and behavioral/neurological conditions (anxiety, aggression, and Canine Cognitive Dysfunction Syndrome), with a focus on species-specific differences.

RESULTS & DISCUSSION

Our synthesis identifies distinct dysbiotic signatures associated with disease. Metabolic findings highlight a unique decreased Firmicutes/Bacteroidetes ratio in obese cats, in contrast to dogs and humans, and a profound depletion of butyrate-producing bacteria in feline Type 2-like diabetes. Behavioral findings link gut–brain axis disruption to anxiety and aggression, the latter associated with altered host serotonin metabolism. We also highlight evidence positioning Canine Cognitive Dysfunction Syndrome as a high-fidelity spontaneous model for human Alzheimer's disease, driven by a "leaky gut, leaky brain" inflammatory cascade.

CONCLUSION

The gut microbiome is a central and targetable factor in the pathophysiology of numerous canine and feline systemic diseases. The "Gut–Systemic Axis" provides a critical framework for diagnosis and treatment. The therapeutic strategies reviewed, including nutritional interventions, probiotics, and fecal microbiota transplantation (FMT), show significant promise for managing these complex conditions. This research also champions a "One Health" perspective, underscoring the interconnected microbial health of companion animals and their human cohabitants.

THE GUT–SYSTEMIC AXIS IN COMPANION ANIMALS: MICROBIOME'S ROLE IN DISEASE

