Fecal Microbiota Changes in Aging Dogs and Cats – Implications for Health and Longevity

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Alterations in digestive function are common in elderly people and pets. Elderly people can have increased sensitivity to dietary changes and susceptibility to gastrointestinal infections. Pet owners may notice that pets which had excellent fecal quality in their younger years now have days when their fecal quality is less than ideal. Nutrient digestibility can also be impaired. Decreased fat digestibility is common in elderly cats.[1]

Early research focused on differences in gut microbiota composition between young adults and elderly.[2-6] Decreased fecal concentrations of beneficial bacteria such as bifidobacteria and increased concentrations of potentially pathogenic bacteria such as enterobacteria have been reported in humans.[2,3] Similar changes in fecal microbiota have been reported in elderly dogs. Benno[4] reported decreased fecal concentrations of bifidobacteria and lactobacilli and increased *Clostridium perfringens* in elderly dogs. Simpson[5] also noted changes in fecal bacteria in aging dogs. When compared to young adult cats fed the same diet, elderly cats[6] had lower levels of fecal bifidobacteria. Alterations in fecal microbiota in elderly humans have been correlated with inflammation and frailness.[7] Elderly people also had less diverse microbiota[7] and more individual variability.[7,8] Studies on the effects of aging on the microbiome are often complicated by differences in lifestyle and diet between elderly and younger adults with at least some of the reported differences in fecal bacteria correlated with the use of antibiotics and dietary differences.[7,8]

While early studies focused on alterations in fecal bacteria during aging, more recent studies have focused on health effects of gut bacteria in the elderly. Inflammation and immunity have been correlated with aging and microbiota in humans[9-13] and dogs[14] and may have implications for inflammatory conditions common in the elderly.[15] Probiotic supplementation can have beneficial effects on age-related changes in immune function.[13] Recent research on the gut-brain axis has highlighted potential effects of the gut microbiome on age-related neurological conditions such as Alzheimer's disease.[16] More sophisticated metagenomic profiling has illustrated the functional effects of alterations in the aging microbiome.[17] In a study with centenarians,[17] over 100 microbial genes were significantly correlated with aging. There was a loss of genes for short-chain fatty acid production and changes in saccharolytic and proteolytic genes with aging.

While there have been many studies evaluating changes in the aging microbiome, few intervention studies have been published. Cupp and colleagues at Nestlé Purina conducted a long-term intervention study with elderly cats.[18,19] The composition of the nutrient blend was based on years of preliminary research on metabolic and digestive changes during aging in cats and effects of various prebiotics on gut microbiome. Cats were fed a nutritionally complete control diet or the same diet supplemented with either an antioxidant blend or the antioxidant blend plus a fatty acid blend and prebiotic. Cats fed the prebiotic/antioxidant/fatty acid-supplemented diet lived significantly longer than cats fed the other diets and had a slower decline in several indicators of health.

As we learn more about the functions of the bacteria that reside in the digestive tract and their interactions with the host, we will better understand the influence of gut bacteria on longevity and diseases of aging. In the future, nourishing and replenishing the gut microbiota will become a conventional approach to reduce the effects of aging.

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