

### WHAT IS THE MICROBIOME?

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Recently, there has been considerable buzz about the microbiome and how it affects poultry production. But, what is the microbiome and how can the microbiome be used to improve health and performance?



The microbiome encompasses all the bacteria, viruses, protozoa, and fungi that live in and on poultry. Scientists are particularly interested in the bacteria that reside in the gastrointestinal tract (GIT) because evidence suggests that these bacteria can be influenced by the environment, diet, and age (Oakely et al., FEMS Microbiology Letters, 2014). Not only are the GIT bacteria affected by various external stimuli, but they also interact with the host to modulate immunity and inflammation (Broom and Kogut, Veterinary immunology and immunopathology, 2018). Together, this information highlights the possibility that the composition of the microbiome can be altered to improve the health and performance of poultry.

Recent research indicates that there are high levels of variability within the microbiome of young birds when compared to older birds (Johnson et al., Applied and Environmental Microbiology, 2018 and Huang et al., Microbiome 2018). As the birds continue to mature, the bacteria populations normalize and become more homogenous between individuals. This appears to be an important factor contributing to the development of pathogen resistance and explains why older birds tend to be less susceptible to enteric infections. Additionally, performance has been correlated to the microbiome profile of commercial birds and confirms the idea that specific groups of bacteria may be beneficial or harmful to performance (Johnson et al., Applied and Environmental Microbiology, 2018). These two findings indicate that by making targeted changes to the GIT bacteria there could be both health and performance benefits. Other evidence seems to support this notion. For example, antibiotic growth promoters have been used for decades to improve performance, but we have also now confirmed that they influence the GIT flora (Costa et al. PLOS ONE, 2017). Similarly, probiotics, prebiotics, and plant extracts have also been shown to change the microbiome and improve performance (Gadde et al., Animal Health Research Reviews, 2017). As we continue to investigate the role various feed additives play in modifying the microbiome, this research will ultimately lead to development of products to support optimal bacterial populations.

Foreseeably, recent technological advances for assessing the microbiome will lead to the development of improved methods for evaluating bird health and performance. However, continued research efforts are needed to determine how the GIT bacteria are modulated by various stimuli and interact with the host to improve performance. As the industry moves away from antibiotic usage, a better understanding of the microbiome may aid in the identification of alternative products. These new insights will ensure that the poultry industry continues to innovate and lead the charge for improved sustainability in animal production.