Microbiome studies in swine systems: Challenges and opportunities (Part 1)
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Key Points:
- Microbiome and more specifically the bacteria residing in the gut play multiple roles related with nutrition and health.
- The study of swine gut bacteria is still in its early stages, and the field contains many possibilities exciting possibilities.
- Funding and microbiome classification are two of the most important barriers to overcome in order to gain insight into the complex field of swine gut bacteria.

The trillions of microbes that inhabit the gastrointestinal tract of mammals, the gut microbiome, play indispensable roles in energy harvest, nutrient synthesis and gut health. In fact, virtually all diet-derived compounds have a direct or indirect effect on the gut microbiome, significantly impacting host physiological performance at organismal and systemic levels. Although these issues have been well-known in the animal science field, microbiome work in swine production systems is still in its infancy, compared with the breakthroughs achieved in the biomedical and human nutrition sciences. More importantly, we still lack foundational perspectives of microbiome manipulation to potentially improve swine performance and health.

This scenario is further complicated due to the complex nature of swine production systems. Because of the multiple environmental, nutritional and health factors influencing the pig’s microbiome along all its anatomy (Figure 1), determining which factors are most important in shaping this microbiome is key to devising microbiome based interventions. Ultimately, the goal is to be able to manipulate the pig’s microbiome through nutritional and environmental interventions, to improve performance and health. Before this is possible, however, and taking into account the latest advances on molecular biology and data science, there are critical research directions that will allow us to maximize the information derived from microbiome techniques to advance swine health, nutrition and production:

1) Funding large-scale, hypothesis generating microbiome research projects in swine production systems: Profiling the microbiome of pigs across large cohorts and along the entire anatomy, is key to identify core and accessory microbes – those which are always fund and those which only arise in specific anatomical, developmental, dietary or environmental conditions (Figure 2).

2) Moving from compositional to functional surveys of the gut microbiome of swine: To infer how the microbiome impacts swine physiology it is necessary to move from compositional (taxonomic) to functional views of the microbiome through metagenomics and/or metatranscriptomics (Figure 3).

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