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Digestive physiology of pigs 2018

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On behalf of the scientific and organising committees of the 14th International Symposium of the Digestive Physiology of Pigs, we are delighted to introduce this special topic of *Animal*. This symposium has been the main forum where the scientific and technical developments in digestive physiology of pigs have been discussed on a triennial basis since 1979. Australia was proud to be the host country for the symposium which was held in Brisbane in August 2018, the first to be ever been held in Asia-Pacific. The symposium sessions focused not just on issues of importance for pig production but also on human health as the pig is increasingly being used as a biomedical model, in particular when studying diseases of the gastrointestinal tract (**GIT**).

As expected, the themes of the symposium were centred on the digestive system, focusing on specific aspects such as the emerging areas of the microbiota and the nutrient chemosensory mechanisms in the pig GIT. The role of the microbiota in gut and other health is topical and anyone with a passing interest in human or animal health has heard of the microbiota. Indeed, many of the submitted papers presented at the symposium and published in *Advances in Animal Biosciences* (2018) were devoted to characterising the microbiome in pigs but with very few insights into the regulation of the microbiota. However, understanding the nutritional and other factors that can impact on the microbiota has proven to be elusive; and in an elegant paper, Lyte and Lyte (2019) talk about the role the neuroendocrine system and neurotransmitters may play in the regulation of the microbiome. A theme throughout their paper is the interaction between stress, stress hormones and the microbiota and the complex feedback mechanisms that are operating.

Val-Laillet (2019) continued the theme of the complex interactions between the gut and brain; and over a decade, *in vivo* brain imaging studies have collated to present some fascinating insights about the gut–brain axis. They explain how the brain responds to food signals including preferred and aversive flavours or basic tastants such as sweet and bitter. Another fascinating area of their research is the impact of weight gain and obesity on the brain activity and metabolism and they draw parallels with obese human patients.

Roura *et al.* (2019) have summarised our current understanding on the sensing of nutrients in the GIT, describing the network of receptors and transceptors associated with the entero-endocrine system and gut peptide secretion (i.e. cholecystokinin, peptide tyrosine, glucagon-like peptide 1 or ghrelin). In addition, the mammalian chemosensory system has also been identified as a target for bacterial metabolites that stimulate nutrient receptors and trigger host cellular functions. Finally, a prolific area in chemosensing research refers to the studies of genetic polymorphisms associated with food choices and appetite. While most of the current knowledge has been obtained in laboratory rodents and humans, the review highlights the progress in pigs.

Piglet intestinal health is a major health concern in swine production and plays a critical role in the whole growth and development and in particular around weaning. Numerous potential stress factors around weaning can induce intestinal dysfunction in piglets, and Ji *et al.* (2019) review some of the nutritional interventions such as functional amino acids and, in particular, glutamine that may assist during the weaning transition. Humphrey *et al.* (2019) also focused their review on the impact of weaning on intestinal function and in particular intestinal barrier function and immunity. They hone in on practical and scalable nutritional approaches to influence intestinal barrier function and immunity through dietary lipid, protein and antioxidant manipulations.

The small intestine is the primary site for enzyme digestion of macronutrients in pigs; and for each macronutrient, digestion can start in the mouth (starch) or stomach (protein, triglyceride) but mostly occurs in the small intestine with catalysis by pancreatic enzyme secretions. Ratanpaul *et al.* (2019) focused on the likely rate-limiting steps in converting macronutrients into absorbable small molecules which are the access of enzymes for macronutrient substrates, enzyme activity levels available for digestion and uptake of products across the mucus layer that covers the epithelial cells. In particular, they focus on the roles of both soluble and insoluble dietary fibre components as modulators of each potential rate-limiting step. Ratanpaul *et al.* (2019) discuss the implications of these rate-limiting processes for both pig production and human health.

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We are sure that the reader will find that this series of reviews will provide many insights into the latest developments in digestive physiology of pigs and will appreciate the implications of this work for pig production specifically, livestock production in general and human health.

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Declaration of interest

None.

Ethics statement

None.

Software and data repository resources

None.

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