

Ph.D. in Animal Science

Title

Postprandial net portal appearance approach to better understand the effects of dietary calcium to phosphorus ratio and microbial phytase supplementation on the net absorption of calcium, phosphorus, zinc and copper.

Research directors

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Agnes Narcy, INRAE

Other collaborators

Thomas D. Crenshaw, U Wisconsin
Patrick Schlegel, Agroscope

Research environment

This Ph.D. project will be funded by Laval University via a grant in collaboration with Adisseo. During this Ph.D. program, the candidate will be part of the dynamic research team of Laval University Animal Science department, AAFC swine research station and INRAE.

Project description

The sustainability of pig production cannot be achieved without a holistic approach considering the different levers involved, namely social, economic, and environment issues. Environmental impacts and the use of antibiotics represent two of the main concerns. High dietary doses of Zn oxide and Cu sulfate are fed to pigs given their crucial roles in animal health and robustness. However, this practice is jeopardized by the current (Europe) and coming (Canada) severe restrictions in terms of dietary zinc and copper levels allowed in pigs diets. Developing research to identify more efficient strategies regarding the supply of these nutrients is a priority. In this way, the interaction between minerals, mainly calcium (Ca), phosphorus (P), and zinc (Zn), is of great importance. The main calcium (Ca) source is known to have high buffering effects, increasing stomach pH and reducing its functionality. Even if it remains essential for bone growth, it could impair protein digestion as well as dietary phosphorus (P), Cu, and Zn utilization and, consequently, impact pig resilience and the environment. Besides, literature has reported that increasing dietary Zn levels impairs Cu metabolism at different levels. A multi-criteria modeling approach for Ca and P has been developed and is constantly improved by our team. Assessing the interaction between Ca and phosphate as well as phytate and other minerals such as Zn and Cu is imperative. However, the complexity of quantifying their net availability for absorption and retention makes the mechanistic representation of these interactions and the impact of exogenous phytase difficult.

The classical method to evaluate nutrients availability (intake - excretion), is not accurate for trace elements and does not consider neither the dynamic of nutrients absorption nor their intestinal utilisation. This last aspect is far from negligible because the intestinal tissue, although biologically important, is not of economic relevance as only post-intestinal nutrients (detected in the portal vein) are used for growth and development. This proposition will use the distinctive net portal-drained viscera (PDV) appearance approach mastered by AAFC team to study the effect of different Ca:digestible P ratios and microbial phytase on the post-prandial net PDV flux of a panel of minerals (Ca, P, Zn and Cu, among others) and blood gas and pH in pigs. In parallel, a growth trial will be performed with same diets by MPLM to measure the impact of the treatments on growth performance and soft tissue and bone growth dynamics using dual-X ray. Then the different methodologies will be compared to fine-tune recommendations.

Qualifications

- Master's degree in animal science or related topics
- Skills or interest in modelling
- The candidate must be able to follow courses in French after 1 year

Other information

- The selected candidate must be admitted in the Ph.D. program
- This position will be available for 3 years starting in fall 2022
- A scholarship will be available.

Send CV and motivation letter to:

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