

Ph.D. in Animal Science

Title

Improving pig resilience and the sustainability of the production chain through mineral nutrition:
Modeling the fate of dietary zinc and copper in the gastrointestinal tract of growing pigs

Research directors

Marie-Pierre Létourneau Montminy, Ph.D. and Frederic Guay, Ph.D. for Quebec and Patrick Schlegel, Ph.D. in Switzerland

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 and Agroscope research center.

Project description

Context

The sustainability of pig production cannot be achieved without a holistic approach considering the different levers involved, with environmental impacts and the use of antibiotics as two of the main concerns. High dietary doses of Zn oxide and Cu sulfate are fed to pigs giving their crucial roles in animal health and robustness which are jeopardized by the current (Europe) and coming (Canada) severe restrictions in terms of dietary zinc and copper levels allowed in pigs diets making the search for more efficient strategies to feed these nutrients a priority. In this sense, 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, impairing protein digestion as well as dietary phosphorus (P), Cu, and Zn utilization and, consequently, significantly impacting pig resilience and the environment, but remains necessary for bone growth. Besides that, literature has reported impairments at various levels of Cu metabolism associated with increasing dietary Zn levels. A multi-criteria modeling approach for Ca and P has been developed and is constantly improve by our team. Assessing the interaction between Ca and phosphate as well as phytate and other minerals such as Zn and Cu is imperative, but 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. This PhD will be part of a project in which mineral availability will be assessed using different methodologies (T-cannula, ATTD, portal vein) providing data for validating/adjusting actual models of P and Ca digestive fate to then add Zn and Cu, and fine-tune mineral requirements and phytase effect.

Methodology

The program will be oriented to adapt the current model to other minerals while generating in parallel critical missing data and integrate them into the model. More precisely, the first step will be the adaptation of the model

to develop a first model for Zn and Cu GIT fate using data available in the literature and in previous studies performed by the team. The student will also participate to two animal trials on minerals. Third, the model will be modified according to the results obtained and used to develop strategies to improve the use of mineral by growing pigs.

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:

Marie-Pierre Létourneau-Montminy, Ph.D.

Professeure

Phone: 1 418 656-2131 407352

Email: Marie-Pierre.Letourneau@fsaa.ulaval.ca

Frédéric Guay, Ph.D.

Professeur

Phone: 1 418 656-2131 403392

Email: Frederic.Guay@fsaa.ulaval.ca

Patrick Schlegel, Ph.D.

Researcher

Phone: +41 (0)58 466 72 75

Email: patrick.schlegel@agroscope.admin.ch