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PhD vacancy

Evaluation of the preventive effect of omega 3 rich diets using extruded linseed supplementation on the health of cows and their calves around the calving period: epidemiological approach

The period around calving is critical in terms of health risks and antibiotic use in farms. Indeed, during this transition phase, the cow becomes vulnerable to the onset of diverse physiological, metabolic and nutritional challenges with direct consequences on her health and reproductive performance. Regarding calves, infectious diseases during the first days of life are frequent and often lethal. Strategies to control these diseases are currently distinct (enhanced dry period diets and ensuring calf colostrum intake). A complementary option is to improve the nutritional status of the dam before calving via the intake of Ω 3 fatty acids, which have antioxidant and anti-inflammatory properties and are transferred to the milk and colostrum. The potential of Ω 3 fatty acids has already been demonstrated in lactating cows. For this reasons, in order to study the impacts of nutritional transfers, a follow-up of several epigenetic, metabolic and immune parameters seems necessary, offering the opportunity to develop new biomarkers of the conditions of life *in utero* and during the first days of life.

The hypothesis is that a diet rich in Ω 3 fatty acids during the critical health period around calving can prove to be preventive for the health of the cow and her calf via fetomaternal exchanges, and the intake of colostrum and transitional milk during the first 7 days of life. The objective of the thesis project is: 1/ to evaluate the preventive effect of extruded linseed supplementation during gestation, rich in Ω 3 fatty acids, on the reproductive capacity of cows after calving and on the incidence of health problems of cows and their calves under field conditions and 2/ to identify reliable and easy to use biomarkers, predictors of the nutritional status of pregnant cows and calves, the quality of colostrum and transitional milk and, the health of the cows and their calves.

The main steps of the thesis and scientific procedure

i) Phase 1: This phase will be based on the appropriation of the available literature on the topic. The future PhD student will carry out a review of the scientific literature in order to specify and qualify the pertinent biomarkers. At the same time, he will contribute to the design of the protocols for the studies of phases 2 and 3.

ii) phase 2: a study will be conducted on an experimental farm in order to identify variations in the selected biomarkers during the period of Ω 3 fatty acids supplementation. In addition to the scientific productions carried by the academic partners involved, the PhD student will be able to refine the protocol of the phase 3 study.

iii) phase 3: it consists in the implementation of an interventional epidemiological study in commercial farms. Within each herd included in the study, cows will be randomly assigned to either the control or Ω3 group. The ration will be described in detail; pregnant cows and their calves will be followed from the dry period until 100 days after calving; biomarker measurements will be performed. Statistical analysis will quantify the effects of feeding a diet rich in Ω 3 fatty acids and assess the informational value of biomarkers concerning the cattle health.

Research team publications :

- Meignan T, Lechartier C, Chesneau G, Bareille N. Effects of feeding extruded linseed on production performance and milk fatty acid profile in dairy cows: A meta-analysis. J Dairy Sci. 2017 Jun;100(6):4394-4408. doi: 10.3168/jds.2016-11850
- Ariza J. M., Meignan T., Madouasse A., Beaudeau F., Bareille N. 2019. Effects in milk quantity and composition associated with extruded linseed supplementation to dairy cow diets. *Scientific Reports*, 9(1):17563 [IF20=4.379] DOI: 10.1038/s41598-019-54193-z.
- Meignan T., Madouasse A., Beaudeau F., Ariza J. M., Lechartier C., Bareille N. 2019. Does feeding extruded linseed to dairy cows improve reproductive performance in dairy herds? An observational study. *Theriogenology*, 125:293-301 [IF20=2.740] DOI: 10.1016/j.theriogenology.2018.11.020.
- Ariza, J. M., Meignan, T., Madouasse, A., Chesneau, G., and Bareille, N. 2019. Transgenerational benefits of extruded linseed supply to dairy cows on the reproductive performance. In, *70. Annual Meeting of the European Federation of Animal Science (EAAP)*, Ghent, Belgium, 297.

Scientific and technical skills required by the candidate

- Three profiles are compatible with this thesis: veterinarian, master degree in epidemiology or in animal science. The candidate must have an interest in food and animal nutrition as well as in interdisciplinary research.
- Very good understanding of English, good scientific communication skills to different audiences, written and oral; Expertise of statistical tools such as R or python will be an asset.

Recruitment procedures and schedule

Applications in the form of a CV and a letter of motivation must be sent before Sunday July 10th at midnight. The recruitment process will be based on a pre-selection on this basis and an interview to verify the conditions of enrolment in the EGAAL Doctoral School.

The start of the doctoral contract is planned for October or November 2022. The gross salary is 1975 euros, i.e. approximately 1550 euros net salary.

Contacts

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