

Feed efficiency and inefficiency in dairy ewes: relationship with resilience in response to nutritional challenges, and milk fat depression

Referencia

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Resumen

In the next years, the dairy sheep sector will face the challenge of achieving a large improvement in productivity in a scenario of sustainability risk, which will require maximizing the efficiency in the use of resources. This challenge must be coupled with consumers increasingly demand for animal products, which fosters the improvement of healthy characteristics of milk and dairy products.

Feed efficiency and resilience may be essential for a better selection of dairy ruminants, leading to more efficient and profitable production systems. However, selection towards higher milk yields will probably decrease the resilience of flocks, which may compromise their future productivity. Yet, the extent to which feed efficiency might be improved without compromising resilience remains largely unknown, not only in dairy sheep, but also in other ruminants.

Furthermore, our previous studies have consistently confirmed that the nutritional quality of ovine milk fat (i.e., the fatty acid profile) can be quickly and naturally enhanced through changes in ewe diet, but the loss of production efficiency due to diet-induced milk fat depression undermines the practical application of the most effective strategies in this regard. On the other hand, it provides a valuable model to unravel the interaction between diet and feed (in)efficiency.

On this basis, this project intends:

1) to analyze feed efficiency in dairy ewes and its relationship with resilience. To this aim, two in vivo studies with lactating ewes will be carried out. Sheep ewes will be subjected

either to an extreme nutritional challenge or to a less severe but sustained challenge, and their feed efficiency and resilience will be investigated through an exhaustive characterization of temporal changes in ruminal and mammary metabolism: from the biohydrogenation of lipids in the rumen and its metagenome, to mammary lipogenesis, transcriptome and metabolome.

2) to avoid the milk fat depression syndrome (feed inefficiency) caused by feeding strategies used to improve the nutritional value of the milk fat. To this aim, one in vivo and one in vitro study are proposed to test the hypotheses that the use of HMTBa (a methionine hydroxyl analogue) would reverse milk fat depression, and that this syndrome is partly explained by an antilipogenic effect of dietary 16:1 or some of its little-known ruminal biohydrogenation intermediates. The project will also contribute to identify or validate biomarkers as predictors of feed efficiency under challenging conditions.

The final goal of the whole project would be to offer tools to the ovine sector to achieve a more efficient use of resources and provide an added value to the final product (milk).

This proposal comes as a continuation of a number of previous projects (e.g., from State R&D Plans or H2020 program), and includes the participation of researchers from the Instituto de Ganadería de Montaña (CSIC-Univ. of León) and the Universities of Illinois (USA) and Laval (Canada).