Valrumeat - How to reconcile the intensive production of ruminants with the production of meat with high nutritional value

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Abstract

Ruminants from intensive meat production systems are fed with low fibre and high energy diets, usually rich in cereals. In such conditions, the rumen environment changes and the pattern of rumen biohydrogenation is modified, compromising the synthesis and deposition in meat of healthy vaccenic (*t*11-18:1) and rumenic (*c*9,*t*11-18:2) fatty acids (FA) (known as *trans*-10 shift). The causes of *trans*10-shift are still not known but has been associated to diets with high starch content and to low rumen pH. ValRuMeat aims to study the main factors related to *trans*-10 shift and define the main lines for the formulation of diets to enhance *t*11-18:1 and *c*9,*t*11-18:2 levels in meat. Three trials with Merino Branco lambs were carried out for 6 weeks each to study: a) the source of neutral detergent fiber (ground alfalfa *vs* soybean hulls) (Trial 1); b) the forage particle size (ground *vs* chopped hay); c) the cereal replacement in the concentrate fraction of the diet (100, 65, 35 or 0%) (Trial 2); d) the forage species (alfalfa *vs* ryegrass); and e) the proportion of buffer (sodium bicarbonate) in the diet (0.5 *vs* 2.0%) (Trial 3). All these trials considered growth performance and carcass and meat quality traits, including FA composition of *Longissimus thoracis* muscle and subcutaneous fat. These 3 trials showed a high individual variability in the resistance do *trans*-10 shift. The causes of this variation are poorly understood and probably related to the interaction between the host and rumen microbiome. In addition, the nature of the main energy component of the diet (fiber or starch) does not appear to be mandatory for *trans*-10 shift occurrence. When formulating diets for growing lambs, a minimum 40% of good quality forage should be included (Trial 1), namely alfalfa (Trial 3). The replacement of cereals by low-starch agro-industrial by-products reduced the *t*10/*t*11-18:1 ratio but depressed growth performance, with 35% of replacement being the best compromise solution (Trial 2). Increasing the buffer capacity of the rumen content, including 2% of sodium bicarbonate in the concentrate, increased *t*11-18:1 (P=0.030) and *c*9,*t*11-18:2 (P=0.021) proportions, reducing *t*10/t11-18:1 ratio (P=0.049) (Trial 3). Based on these series of results we will test, in a final trial with growing beef, an experimental diet combining 40% of forage, with 40% replacement of cereals by low-starch by-products and 2% inclusion of sodium bicarbonate, which will be compared with a conventional diet (20% forage and 100% cereals).

Keywords: Rumen biohydrogenation, *trans*10-shift, bioactive fatty acids, lamb meat

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