Crude glycerin, byproduct from biofuel, improved quality of lamb meat

Crude glycerin is a byproduct from biodiesel industry with potential to replace corn in ruminant diet, as an energy source. It provides a substrate that increases the availability of carbon for fatty acid synthesis. Therefore, the substitution of corn by crude glycerin may affect meat quality. Previous studies did not find effects of dietary crude glycerin in bovine and lambs. Nevertheless, these previous efforts fed the animals with high-starch diets that are less efficient than low-starch diets supplemented with glycerin. Crude glycerin may reduce lipolysis and biohydrogenation (incorporation of H in the double bonds) in the rumen, promoting a greater flow of unsaturated fatty acids to be incorporated in the meat. Thus, in our study, we evaluated the effects of total corn replacement by crude glycerin on carcass characteristics and meat quality of feedlot lambs fed high-concentrate diets with low starch.

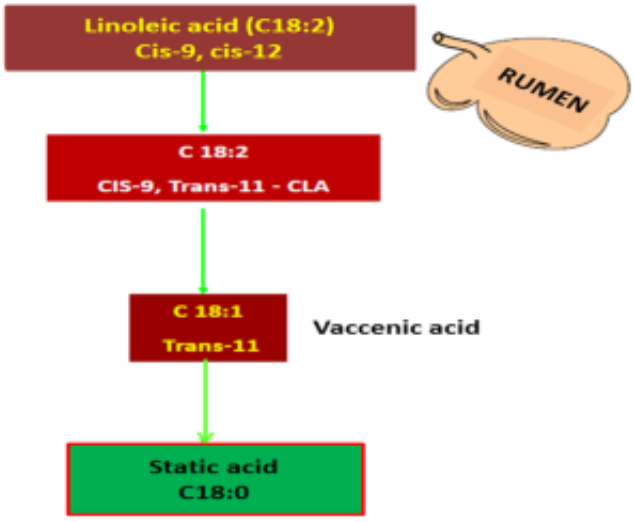

Fig. 1. Biohydrogenation process of linoleic acid by rumen

Forty Santa Ines lambs were fed during 72 days and the slaughters were performed when animals reached 38 kg of body weight (BW). There were a decrease in hot carcass dressing (HCD) and cold carcass dressing (CCD) with increasing dietary glycerin, and it may have related to the increased weight and yield of liver, heart, and kidneys.

We observed increase in odd-chain fatty acids such as pentadecanoic (C15:0), margaric (C17:0), and heptadecanoic (C17:1) acids with inclusion of crude glycerin. This is interesting for human health, since these acids inhibit the growth of cancer cells. In this study, addition of crude glycerin also resulted in increased meat concentrations of oleic acid (C18:1 c9) and palmitoleic acid (C16:1

c9), and decreased concentrations of saturated stearic acid (C18:0), palmitic acid (C16:0), and myristic acid (C14:0). Stearic acid is converted to oleic acid by ?9 desaturase enzime. Thus, the increased oleic acid in our study may be associated with the observed decrease in stearic acid concentrations. The increase in linoleic acid concentrations may have beneficial effects for humans health, because it improves the ratio of plasma high density lipoprotein (HDL) to low density lipoprotein (LDL).

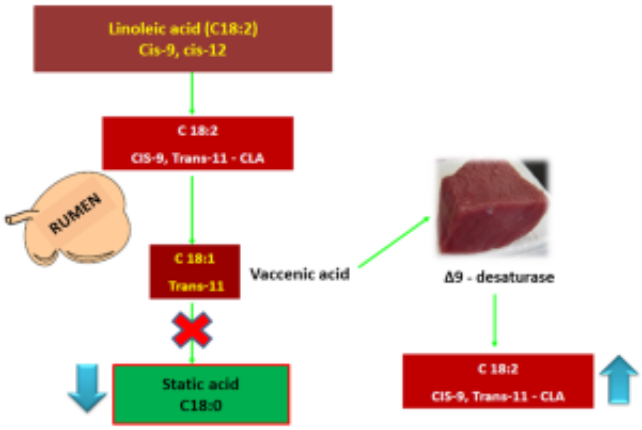

Fig. 2. Conversion of the vaccenic acid to CLA in the muscle

Conjugated linoleic acid (CLA) may protect humans against cancer, cardiovascular disease, and diabetes. In addition, it has an important role in immunological responses and bone health. Our results corroborate with previous studies, which observed an increase of CLA concentration in beef fed with crude glycerin diets. During biohydrogenation process that occur in the rumen, linoleic (C18:2) and linolenic (C18:3) acids are converted to CLA, and CLA is converted to vaccenic acid (C18: 1 t11), which originates stearic acid (C18: 0) as the end product (Fig. 1). However, when crude glycerin is an ingredient of diet, an incomplete biohydrogenation process at rumen can happen, which it may increase the CLA levels reaching the intestine for absorption. The reduction of saturated acids and increase of monounsaturated acids observed in our study may also present benefits to humans, since total saturated fatty acids promote increases in LDL and cardiac disease. Additionally, monounsaturated fatty acids can inhibit arterial platelet aggregation. We also found increase in ?9 desaturase and elongase enzymatic activity indices in meat from animals fed with crude glycerin. These enzymes are responsible per conversion of the vaccenic acid to CLA in the meat (Fig. 2).

The lower atherogenicity index found in meat of animals fed with crude glycerin was due to the higher concentration of unsaturated fatty acids, and the lower concentration of palmitic and myristic acid. Taking it into account is possible to conclude that meat of animals fed with crude glycerin has less chance to promote disease likely cancer, cardiovascular disease and diabetes.

Publication

Carcass characteristics and meat quality of lambs fed high concentrations of crude glycerin in low-starch diets.
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