

Naturally Produced Lovastatin Modifies the Histology and Proteome Profile of Goat Skeletal Muscle

ABSTRACT

Enteric methane formation in ruminants is one of the major contributors to climate change. We have reported that supplementation of naturally produced lovastatin reduced methane emissions in goats without adversely affecting rumen fermentation and animal performance, except that at higher level, lovastatin can have a negative effect on the palatability of the formulated diet. As statins are associated with the development of muscle-related adverse effects at higher than recommended therapeutic doses, this study was conducted to examine the effects of lovastatin on the histology and proteome profile of goat skeletal muscle. A total of 20 intact male Saanen goats were randomly assigned in equal numbers to 4 groups, and fed with a total mixed ration containing 50% rice straw, 22.8% concentrates and 27.2% of various proportions of untreated or treated palm kernel cake (PKC) to achieve the target daily intake levels of 0 (Control), 2 (Low), 4 (Medium) or 6 (High) mg lovastatin/kg body weight (BW). Histological examination discovered that the longissimus thoracis et lumborum muscle of animals from the Medium and High treatment groups showed abnormalities in terms of necrosis, degeneration, interstitial space and vacuolation. Western blot analysis conducted on the myosin heavy chain showed that the immunoreactivity of myosin heavy chain in the High treatment group was significantly lower than the Control, Low and Medium treatment groups. Comparisons between control and lovastatin-treated groups demonstrated that lovastatin supplementation induced complex modifications to the protein expression patterns of the longissimus thoracis et lumborum muscle of the goat. There were 30, 26 and 24 proteins differentially expressed in Low, Medium and High treatment groups respectively, when compared to the Control group. Supplementation of lovastatin down-regulated proteins involved in carbohydrate and creatine metabolism, indicative of reduced energy production, and may have contributed to the skeletal muscle damage. Supplementation of naturally produced lovastatin induced muscle damage in longissimus thoracis et lumborum muscle of goats with increasing dosages, particularly at 6mg/kg BW. In addition, proteomics analysis revealed that lovastatin supplementation induced complex modifications to the protein expressions of skeletal muscle of goats which may have contributed to the observed skeletal muscle damage. Present study suggested that supplementation of naturally-produced lovastatin at 6mg/kg BW could adversely affecting health and wellbeing of the animals.