

INFLUENCES OF DIFFERENT DIETARY ENERGY LEVEL ON SHEEP TESTICULAR DEVELOPMENT ASSOCIATED WITH AMPK-ULK1 AUTOPHAGY PATHWAY

Jing Pang, Fengzhe Li, Xu Feng, Hua Yang, Feng Wang, Yanli Zhang*

Nanjing Agricultural University, China

Introduction

Energy balance is an important feature for spermatozoa production in the testis. The 5'-AMP-activated protein kinase (AMPK) is a sensor of cell energy, has been implicated as a mediator between gonadal function and energy balance. Herein, we intended to determine the physiological effects of AMPK on testicular development in feed energy restricted and compensated pre-pubertal ram.

Materials and Methods

Lambs had restricted feeding for 2 months (M) and then provided compensatory feeding for another 3 M. Feed levels were 100% (control), 15% and 30% of energy restriction (ER) diets, respectively. The testes were collected for qRT-PCR, WB, IHC and HE analysis.

Results and Discussion

The results showed that lambs fed the 30% ER group had significantly lower testicular weight ($P < 0.05$) and spermatids number in the seminiferous tubules, but there was no difference between control and 15% ER groups ($P > 0.05$). Meanwhile, 15% ER and 30% ER group induced testis autophagy and apoptosis through activating AMPK-ULK1 (ULK1, Unc-51 like autophagy activating kinase) signal pathway. And with characterization of increased Beclin-1 and Light chain 3-II/Light chain 3-I (LC3-II/LC3-I) ratio, up-regulated the ratio of pro-apoptotic Bcl-2-associated X protein (BAX) and anti-apoptotic B-cell lymphoma 2 (Bcl-2), as well as activated AMPK, phosphorylated AMPK(p-AMPK) and ULK1. Furthermore, a compensation of these parameters occurred when the lambs were re-fed with normal energy requirement after restriction. Taken together, dietary energy levels influence testicular development through autophagy and apoptosis interplay mediated by AMPK-ULK1 signal pathway, which also indicates the important role of the actions of AMPK in the testis homeostasis.