

Mechanism of Lipid Metabolism Disorder Trigger by Hyperlipidemia Mediated by AMPK α Signaling Pathway in Adipose Tissue of Dairy Cows

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Abstract: This study aims to investigate the mechanism of AMPK α signaling pathway in lipid metabolism disorder in adipose tissue of hyperlipidemia dairy cows. Twelve Holstein cows were divided into normal group and high fat group according to the levels of serum triglyceride (TG) and total cholesterol (TC). The main biochemical indexes of serum and adipose tissue lipid metabolism indicators were measured by the automatic biochemical analyzer. The pathological changes and

lipid accumulation were observed via the hematoxylin-eosin (H&E) and Oil Red O staining of adipose tissue. Total RNA was extracted from adipose tissue, and the relative expressions of lipid metabolism genes were detected by quantitative real-time polymerase chain reaction (qRT-PCR). Western blotting method was applied to detect the critical protein expression levels of LKB1, p-LKB1, AMPK α 2, p-AMPK α 2, and SIRT1 in AMPK α signaling pathway. The results indicated that lipid metabolism indicators TG, TC and very low density lipoprotein (VLDL) were significantly increased in adipose tissue. Pathological observation showed that a large number of fat droplets were accumulated in the adipose tissue, and the adipocyte formed vacuolated degeneration, the chromatin condensation and side shift of the nucleus which were the typical pathological changes. Relative mRNA expression of SIRT1 was significantly decreased in high fat group, while AMPK α 2 and LKB1, ADPN decreased, which is consistent with the decreased expression of AMPK α 2 and LKB1 proteins. Relative mRNA expression of carnitine palmitoyl transferase 2 (CPT2) was significantly reduced, on the contrary, ApoB-100, ApoE, and hormone-sensitive lipase (HSL) were increased. Relative mRNA expressions of ACSL, PPAR γ , and SREBP-1c significantly increased, which is consistent with a significant increase in the expression of PPAR γ and SREBP-1c proteins. In summary, blood lipid levels increased in hyperlipidemia cows which cause significant pathological changes in adipose tissue. Hyperlipidemia induced lipid metabolism disorder mainly through inhibit AMPK α signaling pathway in adipose tissue.