

Molecular effectors involved in the antagonism of atrophy versus hypertrophy of the Skeletal Muscles

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Research on protein and energy metabolism in farm animals is needed to optimize muscle mass, body composition and to ensure the production of meat products of the quality desired. Muscle mass depends on protein synthesis but also protein degradation. Indeed, tissue proteins are constantly synthesized and degraded, and the respective levels of protein synthesis and proteolysis determine protein balance. Recent studies have highlighted genes specifically induced during atrophy ("atrogenes") for their essential role in controlling muscle proteolysis. These genes encode muscle-specific E3-ubiquitin ligases involved in the ubiquitination of proteins targeted to the ubiquitin-proteasome-dependent proteolytic system, but their regulation is complex and their targets are largely unknown. Atrophy and hypertrophy are mechanically linked, in that either the activity or inactivity of a common set of molecules controlling a few cellular pathways determines whether the skeletal muscle tissue will respond to defined stimuli with increased protein synthesis and stimulation of muscle growth or with increased protein breakdown and loss of muscle mass. Achieving these goals requires a better knowledge of molecular mechanisms through which nutrients and hormones regulate specific metabolic pathways.

Atrophic and hypertrophic signalling pathways are well conserved among species, suggesting that the regulation as well as the physiological functions of these regulating proteins are also conserved. Our program concerns the understanding of the molecular mechanisms involved in the regulation of the balance protein synthesis / proteolysis in skeletal muscles, with the applied aim of improving and controlling muscle growth and meat quality in animal production and reducing muscle wasting in some physiological and physiopathological situations such as ageing and diseases

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