

## **THE ROLE OF THE SOMATOTROPIC AXIS IN THE MAMMALIAN METABOLISM.**

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The metabolism in mammalian is regulated by multiple levels of hormone action, with complex feedback and control mechanisms. The somatotrophic axis, primarily consisting of growth hormone, insulin-like growth factors (-I and -II), their associated carrier proteins (GHBP and IGFBPs), and receptors, plays a key role in the control of the regulation of metabolism and physiological process. Among this axis, other hormones like insulin, leptine, glucocorticoids or thyroid hormones are involved in this mechanism by modulating GH and/or IGF-I synthesis and availability. In the present instance, this review summarizes recent findings and the complexity of the regulation of the metabolism by the growth hormone (GH)-insulin-like growth factor (IGF) axis using different examples: special nutritional situations, use of growth promoters (including hormones and hormone analogs such as bST, corticoids, beta-agonists) and particular physiological status (genetic potential, puberty, growth alteration, ....).

Feed restriction or postpartum negative energy balance leads to elevated GH and IGFBP-2 secretion, but it reduces hepatic GH receptor (GHR) number and plasma levels of IGF-I and IGFBP-3. Distribution of glucogenic compounds to these animals prevents alterations of the somatotrophic axis.

GH treatment in animals leads to up-regulation of GH-receptor, increases synthesis and plasma concentrations of IGF-I and IGFBP-3 whereas concentrations of IGFBP-2 decrease; this may lead to increased availability of IGF-I at target tissues. These endocrine interactions, together with metabolic changes, leads to increased protein anabolism, reduced fat deposition, and enhanced growth rate. However, GH treatment seems to differently altered IGFBP-2 and IGFBP-3 mRNA levels in mammary tissue than in hepatic tissue. Similar alterations of somatotrophic axis is observed in finishing bulls treated with dexamethasone esters while beta-agonist administration reduces IGF-I and IGFBP-3 synthesis and stimulates IGFBP-2 production.

Numerous genetic mutations are reported for molecules of somatotrophic axis. Some of them are directly related with animal performances, endogenous hormonal synthesis and metabolism. Puberty is another important physiological period characterised by a sharp increase of IGF-I and IGFBP-3 levels and decrease of IGFBP-2 independently to steroids production. In the bovine species, a significant correlation seems to exist between GH response to GHRH stimulation or IGF-I/IGFBPs status and animal metabolism. However, in pig, whereas no differences are observed in GH secretion parameters, IGF-I and IGFBP-3 levels in retarded growth piglets are remarkable lower than in normal weight animals. In this cases, an altered responsiveness of hepatic GH receptor is suspected.

The physiological mechanisms of metabolism remains fairly understood in farm animals. However, with the development of new analytical methods, particularly the IGFBPs quantification, advances in research of the somatotrophic axis will improve our understanding of the normal animal performances process and metabolic disorders.

**Key words: growth hormone, IGF, IGFBPs, metabolism**