

digestibility of the protein sources present in this diet.

Suggestions for the future

Digestive secretions have been extensively described. It is now time for looking at the neurohumoral regulation especially around birth.

The extrinsic and intrinsic interactions at the secretory cell level must be emphasized in the future.

The morphological and histological characteristics of the mucosal cell must be related to their neuropeptidergic contents as well as their surface receptors.

The secretory events must be related to other physiological events in an integrative form such as the work described by Dr Lesniewska.

A clear distinction must be performed between pharmacology and physiology especially for the relationship between CCK activity and CCK receptor expression.

The experiments dealing with mechanisms at the cell level must take into account the *in vivo* physiological reality.

If possible, each species must be treated separately and interspecies comparisons must be performed with great care.

Session 2: Lipid metabolism

(Dr D. Bauchart, Dr J.F. Hocquette and Dr A. Orzechowski)

There are interspecies-, interbreed-, food- and age-related differences in lipid metabolism in terms of activities of the enzymes regulating lipogenesis and lipolysis, as well as fatty acid oxidation.

Among them, carnitine palmitoyltransferase I (CPT I) controls the transfer of fatty acids (FA) into mitochondria. The lower sensitivity of CPT I to metabolites derived

from FA in piglet than in rat muscle is an example.

The levels of activity of several enzymes such as lipoprotein lipase (LPL) and CPT I are considered in most situations, but not all, as rate-limiting steps for FA uptake and catabolism in muscles.

To some extent, utilization and distribution of lipids result from variations in very-low density lipoprotein (VLDL) formation in the liver, which depends on dietary and physiological conditions.

Phytoestrogens exert a significant effect on lipid metabolism since they enhance lipolysis and suppress lipogenesis.

Lipids are vulnerable to the action of radicals. TBARS, CD, and more recently found isoprostanes were therefore elected as markers of oxidative stress. Some antioxidants (tocopherols) as well as unknown substances of plant origin (evening primrose) limit the extent of lipid peroxidation

Session 3: Tissue growth

(Dr J. Simon and Professor T. Motyl)

The maintenance of a dynamic equilibrium between cell replication and apoptosis at the physiological level is crucial for proper tissue growth and remodelling, and thereby for the development and health of each multicellular organism. Bcl-2-related proteins establish an important checkpoint in the regulation of programmed cell death in normal, transformed and neoplastic cells. They are also involved in the regulation of mammary gland remodelling.

Endo-, para- and autocrine regulation of tissue growth occurs:

– throughout the expression of early response genes and the activation of enzymes involved in the signal transduction pathway (ODC, MAP, p90RSK and p70S6 kinases);

– at the level of effector genes whose products are responsible for cell proliferation, differentiation and death (Myo D, Myogenin, Bax/Bcl-2)

Growth of skeletal muscles and other tissues, and the resulting balance which determines body composition are dependent upon genotype, age and level of feeding. The above factors strongly affect the endocrine system which can promote either the anabolism (insulin, IGFs, GH, etc.) or the catabolism (glucagon, corticoids, etc.). Both the release and the signalling of these hormones have to be understood. For instance, it is now possible to study glucagon release in isolated chicken islets. High concentrations of IGFs appear to be associated with a higher growth rate and increased fat deposition in genotype of fast growing chicken.

Bovine skeletal muscle is genetically heterogeneous with regard to regulation of proliferation and differentiation of myogenic cells.

Generally, there is an inverse relationship between the rate of myoblast proliferation and their capability of differentiation. Compensatory muscle growth is regulated by insulin and T3, which are implicated in the formation of new fibres from satellite cells. Susceptibility of skeletal muscle cells to programmed cell death depends on the degree of their development. Myoblasts and satellite cells are more sensitive to apoptogenic stimuli than differentiated muscle fibres.

Session 4: Protein metabolism

(Dr J. Grizard and Dr K. Grzelkowska)

It is crucial to understand the regulation of protein metabolism in both human and animal nutrition. Based on this knowledge, we could:

- limit muscle wasting in patients during ageing and catabolic states;
- achieve a better efficiency of feeding in animals.

Perhaps, we could also improve meat quality for consumers.

Different factors can affect protein turnover in the body:

- genotype,
- nutritional status,
- environmental conditions,
- endocrine regulation.

Hormones play a major role in the regulation of protein synthesis and degradation, especially insulin. This hormone is anabolic regardless of the protein metabolism (increasing protein synthesis and decreasing proteolysis). It appears also as a help to catabolic factors, since insulin action on muscle protein synthesis is decreased by glucocorticoids, diabetes, injuries, cytokines and thyroid dysfunction.

We have now begun to have a better understanding of the intracellular events surrounding the insulin receptors to the targets of insulin on protein metabolism. Studies are in progress to understand the insulin-resistant states at the insulin signalling level.