

INRA

Action incitative programmée «Tissu adipeux»

**Titres des rapports, présentés au Symposium «Tissu adipeux» (AIP INRA),
18 novembre 1988, Jouy-en-Josas**

- 1) Contrôle de la multiplication et de la différenciation des préadipocytes.
- 2) Différenciation des précurseurs d'adipocytes de lapin en culture primaire.
- 3) Métabolisme et développement du tissu adipeux chez le porcelet adapté au froid.
- 4) Etude biochimique et biophysique de la membrane plasmique de l'adipocyte chez le porc.
- 5) Etude des relations génétiques entre teneur en androstenone des graisses du mâle et développement du tractus génital mâle et femelle chez le porc.
- 6) Influence du degré d'insaturation des lipides sur les caractéristiques organoleptiques des produits carnés divisés.
- 7) Activité métabolique de l'adipocyte et du préadipocyte au cours de la préobésité génétique chez le poulet.
- 8) Biosynthèse et utilisation métabolique des acides gras dans des lignées maigres et grasses de poulet.
- 9) Caractérisation du tissu adipeux brun pendant la période fœtale et périnatale chez les Bovins et les Ovins.
- 10) Utilisation de l'estimation *in vivo* de l'adiposité en vue d'améliorer la sélection des taureaux en station de testage.
- 11) Effets de la restriction alimentaire précoce sur le développement et le métabolisme du tissu adipeux chez le veau.
- 12) Le tissu adipeux et le métabolisme des lipides chez des vaches laitières recevant une infusion duodénale d'huile de colza au début et au milieu de la période de lactation.

Summaries

Control of cell multiplication and differentiation of preadipocyte. D. Gaillard, R.M. Catalioto, S. Deslex, G. Ailhaud et R. Négrel (*Centre de Biochimie, Faculté des Sciences, Parc Valrose, 06034 Nice Cedex, France*)

In order to characterize extracellular as well as intracellular signals involved in the control of adipose tissue development, investigations were carried out using preadipocyte models (mainly cells of the preadipocyte clonal line Ob17) grown and/or maintained in serum-free hormone-supplemented media.

Previous studies from this laboratory had shown that addition of an extract from rat submaxillary gland was required to support exponential growth of rodent adipose precursor

cells in the presence of insulin, transferrin and fibroblast growth factor (4F medium). This growth-promoting activity has been characterized as kallikrein-like protease(s). These results suggest that adipose precursor cells might be under the control of proteolytic events for their expansion through cell multiplication.

In addition to growth hormone (GH) and triiodothyronine (T_3), fetuin, a bovine fetal protein (also present at high concentrations during embryogenesis in mammals), and a serum-derived adipogenic fraction (SDAF) are required to promote adipose conversion of Ob17 cells. In the presence of insulin, GH, T_3 and fetuin, cells are able to express only early events of adipose conversion, such as the emergence of lipoprotein lipase (LPL), but remain unable to express late markers, such as glycerol-3-phosphate dehydrogenase (GPDH), and to accumulate triglycerides. SDAF is strictly required to induce a limited cell proliferation which is accompanied by the expression of the late markers of adipose conversion (terminal differentiation). Both events are strictly controlled by cAMP and modulated by messengers generated through inositolphospholipid breakdown.

Arachidonic acid, as a promoter of both the cAMP and the inositolphospholipid pathways, behaves as a mitogenic—adipogenic stimulus and is indeed able to substitute for SDAF and to induce terminal differentiation. Recent developments of these studies have allowed the characterization of prostaglandins, (prostaglandin (PGI_2) and $PGF_{2\alpha}$) as physiological effectors of this process *in vitro* and to propose that these metabolites could play a critical paracrine/autocrine role in the development of adipose tissue *in vivo*.

Differentiation of rabbit adipocyte precursors in primary culture. J. Nougues, Y. Reyne and J.P. Dulor (*INRA-ENSA, pl. Vala, 34060 Montpellier Cedex, France*)

The differentiation of adipocyte precursors derived from the stromal—vascular fraction (SVF) of rabbit perirenal adipose tissue was studied using two primary culture systems. Adipose conversion was assessed by the development of glycerol-3-phosphate dehydrogenase, acid: CoA ligase and lipoprotein lipase activities.

Culture in a medium supplemented with serum or plasma. Perirenal SVF cells from rabbit fetuses or 4 week old rabbits were not able to differentiate when maintained in a medium containing fetal calf or rabbit serum. In contrast, differentiation was induced when the cells were grown in a medium supplemented with rabbit plasma. The higher density of plasma—cultured SVF cells at the time of differentiation suggests that plasma has a positive effect on the post-confluent mitoses of susceptible cells. Mesenteric lymph or chylomicrons, added to the medium as lipid sources, enhanced greatly both lipid accumulation and enzymatic activities of differentiating cells.

Culture in a chemically defined medium. As rat adipocyte precursors are able to differentiate in a serum-free hormone-supplemented medium (ITT medium) containing insulin, transferrin and triiodothyronine (Deslex *et al.*, 1987; *Exp. Cell Res.* 168, 15—30), we tested this medium with SVF cells from the perirenal adipose tissue of 4 week old rabbits. ITT medium failed to induce adipose conversion or to a very low extent. Supplementation with growth hormone or fibroblast growth factor did not increase the proportion of differentiated cells. In contrast, 20—50% of SVF cells were able to differentiate in the presence of glucocorticoids (dexamethasone, corticosterone) within 2 weeks of culture. Sex steroids (β -estradiol, testosterone, progesterone) did not affect the differentiation process. The stimulatory actions of dexamethasone or insulin were dose-dependent and adipose conversion could be obtained at physiological concentrations of insulin and glucocorticoids. Insulin like growth factor-I was not able to replace insulin under our culture conditions and had only a slight effect when added along with dexamethasone and physiological concentrations of insulin.

In conclusion, glucocorticoids, in association with insulin, may play an important role in the development of rabbit adipocyte precursor cells.

Adipose tissue metabolism and development in cold-acclimated piglets. P. Herpin ¹, R. Bertin ², J. Le Dividich ¹, F. de Marco ² and O. Douillet ¹