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Fatty acid metabolism in liver slices: a comparison between the rat and preruminant calf. B. Graulet, D. Gruffat, D. Durand, D. Bauchart (Laboratoire croissance et métabolismes des herbivores, Inra, Theix, 63122 Saint-Genès-Champanelle, France)

Preruminant calves receive a milk replacer rich in lipids which are largely utilised as energy substrates for growth. In parallel to their catabolism or storage in peripheral tissues, dietary fatty acids (FA) are also taken up by the liver and subsequently oxidised or esterified. However, the bovine liver is characterised by a low ability to secrete triacylglycerols (TG) as part of very-low density lipoproteins (VLDL) when compared to other mammalian species such as the rat (Pullen et al., J. Anim. Sci. 68 (1990) 1395–1399).The present experiment was conducted to determine the relative importance of the oxidative pathway in the hepatic metabolism of FA in the calf compared to that in the rat.

Three 15-d-old male calves were adapted to a conventional milk diet containing 22.4 % of DM as beef tallow. Three 6-week-old rats were given a standard mixed chow diet. Liver biopsies were taken on fed animals under general anesthesia, cut into slices and incubated for 7 h (37 °C, atmosphere 95 % O_2–5 % CO_2 saturated with water) in a medium containing 0.8 mmol·L^{-1} [^{14}C]oleate (4 Ci/mol). Intensities of oleate oxidation (in CO_2, trapped in hyamine hydroxyde and in perchloric acid soluble products, ASP), and of oleate secretion as part of lipids in VLDL particles (purified by ultracentrifugal flotation) were measured after 7 h of labelling (to allow a significant labelling of secreted TG). Values expressed in nmol of oleate per g of fresh liver were means ± SE. Statistical analyses were carried out by using the ANOVA method with the GLM procedure of SAS.

Oleate incorporation in liver slices was linear with time, between 3 and 7 h of culture for both species. After 7 h of labelling, it was 2.3 times higher in rat than in calf slices (1 016 ± 113 versus 447 ± 200, respectively, $P < 0.01$). Similarly, complete oxidation of oleate into CO_2 was 2.8 times higher (36.3 ± 6.5 versus 13.0 ± 4.2, $P < 0.001$) and partial catabolism of oleate to ASP was 2.1 times higher (167 ± 29 versus 81 ± 27, $P < 0.001$) in rat than in calf slices. Subsequently, the oleate oxidation rate averaged 20 % of the oleate incorporated by the hepatocytes in both species. After 7 h of labelling, rats secreted 7.22 ± 2.35 nmol of oleate into the lipids of VLDL, whereas calves only secreted 0.90 ± 0.29 nmol ($P < 0.001$) which represent 0.71 and 0.20 % of oleate incorporated by hepatocytes, respectively. The low amounts of VLDL produced by calf liver slices compared to rat ones do not seem to be a consequence of a competition between oxidation and esterification of FA. Among possible explanations, the low VLDL secretion rate observed in liver slices of calves is probably linked to a low apolipoprotein B synthesis or to a low TG availability for VLDL assembly in the endoplasmic reticulum owing to their storage in the cytosolic pool and/or an insufficient microsomal TG protein transfer activity.

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Effect of genetic and nutritional factors on Δ9 desaturase activity in hepatic and adipose tissues in the pig. M. Kouba[a,b], J. Mourot[b], P. Peiniau[b] ([a] Ecole nationale supérieure agronomique de Rennes, 65, rue de Saint-Brieuc, 35042 Rennes cedex, France; [b] Station de recherches porcines, Inra, 35590 Saint-Gilles, France)

Oleic acid is produced in mammalian cells through desaturation of stearoyl-CoA by Δ9-desaturase. The Δ9-desaturase activity appears to be an important determinant of cell contents in stearic and oleic acids, which are the most abundant fatty acids in pig tissues. We report here the effects of different factors on Δ9-desaturase activity mea-