

PV, en 1 min). Le sang est prélevé avant l'injection (t_0), puis 2, 6, 10, 14, 18, 22, 29, 45, 87 min après t_0 , pour déterminer le glucose (GLU), l'insuline (INS), le β -hydroxybutyrate (BHB) et les acides gras non estérifiés (AGNE).

Après l'injection, GLU augmente fortement jusqu'à un maximum (GLU_{max}) atteint 15 min environ après t_0 , puis décroît ensuite lentement jusqu'à t_{87} , mais demeure plus élevé qu'à t_0 , de 30% environ, (GLU _{t_0} = 3,0 ; 3,2 ; 3,0 ; 3,2 mM et GLU_{max} = 8,2 ; 7,8 ; 8,4 ; 7,5 mM, pour RB, RH, PB et PH). Il n'y a pas de différence entre R et P pour GLU _{t_0} et GLU_{max}. Les chèvres B présentent une valeur de t_0 plus basse, un GLU_{max}, un accroissement de GLU, et un délai pour atteindre GLU_{max}, plus élevés que chez les chèvres H ($P < 0,05$; P : NS, $P = 0,06$, et $P < 0,05$, respectivement). Le taux d'insuline croît fortement de t_0 jusqu'à un maximum situé vers 12 min après t_0 puis revient aux valeurs basales à t_{87} (INST _{t_0} = 8, 10, 3, 9 mU et INST_{max} = 48, 64, 51, 63 mU pour RB, RH, PB et PH, respectivement ; P lots : NS). Le PR provoque, sitôt l'injection, une baisse des AGNE et du BHB, de même amplitude relative mais plus tardive et plus durable pour le BHB.

Ces résultats indiquent que la nature de l'aliment concentré de la ration n'aurait pas, en pleine lactation, d'influence sur la gluconéogenèse apparente à partir de PR, alors qu'un niveau restreint d'apport d'énergie pourrait la favoriser ou avoir un effet moindre sur l'utilisation du glucose produit en raison d'une plus faible activité insulínique.

***In vitro* measurement of glucose-transport rate in muscle from prerinant or weaned calves and from normal or double-muscled calves.** F Bornes¹, JF Hocquette¹, D Dardevet², M Vermorel¹, Y Geay¹, P Ferré³ (¹ INRA-Theix, Laboratoire Croissance et Métabolismes des Herbivores; ² Laboratoire d'Étude du Métabolisme Azoté, 63122 Saint-Genès-Champagnelle; ³ INSERM U342, hôpital Saint-Vincent-de-Paul, 75014 Paris, France)

Glucose is an important energy-yielding substrate for muscle in both monogastrics and ruminants. Glucose transport across the cell membrane is a rate-limiting step for glucose utilization, and this step is acutely regulated by insulin. The

aim of this work was to study nutritional and genetic regulation of glucose transport in bovine muscle.

We adapted an *in vitro* method for the measurement of the glucose-transport rate (GTR) developed for rat and human metabolic studies to the bovine muscle *rectus abdominis*. GTR was measured using 2-deoxyglucose (DOG) in muscle fiber strips, which were isolated, incubated and kept viable for 90 min. GTR were 300-400 and 500-720 nmol DOG/20 min•g wet tissue in basal conditions and after stimulation by insulin (10^{-6} M), respectively.

A first experiment was conducted on 2 groups of 7 prerinant or weaned Montbéliard calves. Calves of the second group were weaned onto a low starch diet at the age of 118 d. Net energy intake from birth onwards, age (170 d), empty body weight (194 kg) and blood parameters at slaughter were similar for the 2 groups so that only the effect of change in energy-yielding substrates was studied. Basal and insulin-stimulated GTR were higher in weaned calves than in prerinant calves (+31% and +43% respectively; $P < 0.01$). Insulin stimulation of GTR was also higher in weaned calves (+305 vs +201 nmol DOG/20 min•g tissue; $P < 0.01$). It can be hypothesized that the high fat content (16.8%) and the high lactose content (42%) in the diet of prerinant calves may affect glucose transporter activity.

A second experiment was conducted on 2 groups of 6 normal or double-muscled (DM) Belgian Blue calves fed a low starch diet and slaughtered at 9-11 months of age. DM cattle exhibited muscle hypertrophy and a higher proportion of glycolytic muscle fibers. Basal and insulin-stimulated GTR were not significantly different between normal and DM animals. Half-maximum GTR increase was observed for the same insulin concentration (0.7 nM) in the 2 groups. Results were similar when expressed per mg protein or per μ g DNA.

In conclusion, glucose transport in bovine muscle and its acute regulation by insulin may be more affected by nutritional factors than by genetic muscle hypertrophy.

Plasma metabolites in dairy mares related to milk production. V Dell'Orto¹, E Salimei¹, V Bontempo², F Fantuz¹, (¹ Ist Alimentazione Animale, Università di Milano;

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As a part of a larger study on the yield and characteristics of dairy mare's milk, 8 multiparous Franches Montagnes x Bardigiana mares, aged 5–18 years, never milked before and only winter stabled, were penned individually for 1 month before the foaling. As soon the foals were born, they were muzzled, artificially reared and maintained with their dams throughout the experiment. During the lactation, mares were fed 15 kg fresh herbage, 10 kg meadow hay and 4.5 kg commercial concentrate (16.7% CP on dry matter basis) at 8:00 h daily.

Starting from foaling, mares were hand-milked every 2 h (12 milkings/d) and their plasma metabolites were studied in relation to milk production. Blood samples were collected in heparinised vacutainers by jugular vein puncture, at 10:00 h on days 0, 7, 14, 21, 30, 45 and 60 relative to foaling. The mare's body weight and condition were also investigated.

A 2-tailed *t*-test was used to determine the level of significance of the correlation between plasma metabolites and milk yield and composition.

Milk yield showed high individual variability and on 4th week of lactation it ranged between 3 and 5 kg/d. Milk fat content varied between 0.6 and 2.4%, while protein content was 1.9 minimum and 3.4%, maximum.

Glucose plasma concentration was higher after foaling (5.06 ± 1.2 mmol/l) (mean \pm sd) than at 60 d (3.90 ± 0.37 mmol/l) while total protein levels were relatively constant throughout the study (88.5 ± 3.9 g/l) as well as cholesterol (1.19 ± 0.12 mmol/l) values. High variability between mares was found mainly at foaling in triglyceride and NEFA concentrations. The latter are probably due to the thin body condition of some mares at that time.

Milk yield was negatively related to plasma levels of triglyceride (-0.42 ; $P = 0.08$) as well as milk protein content and plasma total protein (-0.46 ; $P = 0.053$). A negative relationship was also observed between milk lactose content and total cholesterol in plasma (-0.42 ; $P = 0.081$).

Excrétion urinaire des sulfates : effet du régime. D Grancher, Y Camier, R Boivin (*Unité associée INRA, physiopathologie du rumen – École nationale vétérinaire de Lyon, BP 83, 69280 Marcy-L'Étoile, France*)

Afin de déterminer les mécanismes qui contrôlent l'élimination urinaire des sulfates chez les moutons, 3 lots de 4 brebis Texel adultes (poids moyen 51 kg) ont été nourris en 8 repas quotidiens avec des régimes synthétiques (hypo-, normo- et hypersoufre) apportant respectivement 0,52, 1,81 et 5,43 g de soufre chaque jour (sous forme de sulfates). Un cathétérisme vésical permettait de récolter l'urine. Les sulfates plasmatiques et urinaires ont été dosés par la méthode turbidimétrique de Lundqvist; parallèlement, la diurèse a été évaluée ainsi que la clairance de l'urée. Le débit de filtration glomérulaire ainsi que le débit plasmatique rénal ont été mesurés par la méthode des clairances à l'inuline et à l'acide para-amino-hippurique.

La modification de la teneur en soufre du régime n'a aucunement modifié ni la diurèse, ni le débit plasmatique rénal, ni la filtration glomérulaire, ni le taux d'excrétion de l'urée.

Au bout de 3 sem de régime les sulfatémies étaient respectivement de 0,795 (0,064), 1,283 (0,026) et 1,852 (0,064) mM/l pour les régimes hypo-, normo- et hypersoufre (moyenne, erreur standard sur la moyenne). Les quantités excrétées étaient respectivement de 0,091 (0,010), 0,301 (0,030) et 2,340 (0,210) μ M/min/kg de poids vif. Les clairances des sulfates étaient de 0,15 (0,03), 0,25 (0,03) et 1,37 (0,13) ml/min/kg de poids vif. Les taux d'excrétion urinaire des sulfates étaient de 7,94% (1,09), 15,34% (1,79) et 50,09% (4,28).

Il apparaît donc que, pour le régime le plus pauvre en soufre, la réabsorption urinaire est maximale (supérieure à 90%) ; en revanche, elle n'est plus que de 50% pour le régime riche en soufre, ce qui laisse supposer que, chez les moutons, la réabsorption tubulaire des sulfates serait limitée par un taux maximal, voisin de celui obtenu dans le régime hypersoufre.