

**Quantitative analysis of nycterohemeral eating and ruminating patterns in beef cattle fed pelleted concentrates with or without supplemental roughage.**

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The effects of 5 diets on nycterohemeral pattern of chewing behaviour were evaluated in 10 Hereford steers in a replicated 5 x 5 latin square design (5 x 28 d). Steers were given *ad libitum* access to diets fed once daily at 09:00 h. Chewing behaviour was continuously measured for 4 d. Diets were: 1) traditional, 80% pelleted concentrate (PC; mostly ground cereals) and 20% long timothy hay (H); 2) 80% PC and 20% alfalfa cubes; 3) 90% PC and 10% alfalfa cubes; 4) a completely pelleted diet with PC and 40% corn cobs; and 5) 80% textured concentrate (mostly rolled grains) and 20% H.

Spectral analysis of hourly time spent eating and ruminating was performed using the finite Fourier transform, and allowed us to decompose the total dispersion of 24-h mastication series into 12 rhythm components (R).

Patterns of time spent eating and ruminating the 5 diets consisted mainly of R1, 2 and 3. R1 was the most important in explaining total daily dispersion of time spent eating 'traditional' (1), 'corn cobs' (4) and 'textured' (5) diets, while R1 and R3 were the most important for 'alfalfa cubes' (2, 3) diets. The relative importance (RI) of R1 for time spent eating a diet was related positively to daily voluntary intake (VI) of DM of these 5 diets ( $n = 5$ ,  $r = 0.93$ ,  $P < 0.02$ ), suggesting that importance of R1, 1 cycle/d, influences significantly VI.

R1, 2, 3 and 4 contributed mostly in explaining eating and ruminating patterns of each steer. The RI of R12 of time spent ruminating by each steer was related positively to VI of DM and NDF of those 10 steers ( $n = 10$ ; respectively,  $r = 0.67$ ,  $P < 0.04$  and  $r = 0.70$ ,  $P < 0.02$ ), which suggests that steers presenting a larger VI showed more daily ruminating peaks (cycles/d) than those with smaller VI, especially when they were fed diets with a larger NDF content.

**Seasonal hay intake in sheep: effects of environmental temperature and its variation.**

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The aim of this experiment was to evaluate the environmental effects (mainly temperature) on the prediction of forage intake of 2 types of hay in Mediterranean conditions (46°N, 2°E). The animal effect was controlled by mean of the experimental design. Twelve adult Manchega wethers were used in a triplicate (3 wethers) 4 x 4 latin square design (2 hays and 2 housing), repeated for each season throughout a whole year. The wethers were individually housed in pens placed indoors or outdoors and fed lucerne (LU) (85.6% DM; 18.9% CP and 24.7% CF, DM basis) or Italian rye-grass (RG) (83.6% DM; 14.7% CP and 27.9% CF, DM basis) hay *ad libitum*. The animals were not sheared during the experiment. In each season, every latin square (10 weeks) was centred around the equinoxes, autumn and spring, or solstices, winter and summer. Within one season each animal received both diets in the 2 housing systems. Adaptation to diet (2 weeks) or housing (1 week) was followed by a measuring week where dry matter intake (DMI), daily temperatures (minimum ( $T_i$ ), mean ( $T_m$ ) and maximum ( $T_a$ )), live weight (LW) and body condition score (BC) were recorded. Mean DMI (g/kgLW<sup>0.75</sup>) was unaffected during autumn (70.1), winter (68.4) and spring (68.2), but decreased ( $P < 0.001$ ;  $sed = 1.14$ ) in summer (63.8). The DMI was also higher indoors (70.3) than out (64.9), although this effect only was significant for winter ( $P < 0.001$ ) and spring ( $P < 0.01$ ), and showed a tendency ( $P < 0.10$ ) in autumn. Furthermore, the mean DMI was significantly higher ( $P < 0.001$ ) for LU (73.7) than for RG (61.7). The LW (kg) was consistently higher ( $P < 0.001$ ;  $sed = 0.34$ ) indoors (83.7) than out (81.4), whereas BC was unaffected by housing. The RG intake was unrelated to any of the recorded temperatures but a significant ( $P < 0.01$ ) relationship was found for LU ( $DMI = 67.6 + 0.60 T_m - 2.30(T_m - 18.7)$ ;  $n = 32$ ,  $R^2 = 0.23$ ). High temperatures ( $T_m > 18.7^\circ\text{C}$ ) caused heat stress, which depressed intake, mainly in summer and with year wool coats. In fact, ignoring all summer measurements, DMI and  $T_m$  were unrelated in LU. In this case, DMI was still related ( $P < 0.01$ ) to extreme daily temperatures ( $DMI = 83.1 - 0.79 (T_a - T_i)$ ;  $n = 24$ ,

$R^2 = 0.31$ ). Consequently, with daily mean temperatures included in the thermoneutral zone, DMI of a good quality LU hay was slightly reduced proportionally to the maximum difference registered in daily temperatures ( $T_a - T_i$ ).

### Ingestion volontaire, taille des particules de digesta et poids des compartiments gastriques chez 4 types de taurillons.

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L'objectif de ce travail était de mesurer le niveau d'ingestion volontaire, la distribution de la taille des particules de digesta, le poids des compartiments gastriques, ainsi que les performances de croissance de 4 types biologiques de taurillons.

Trente-neuf taurillons : 11 Pie-Noir (PN), 10 Pie-Rouge (PR), 9 croisés Pie-Noir x Blanc-Bleu-Belge (CPN) et 8 croisés Pie-Rouge x Blanc-Bleu-Belge (CPR), furent suivis au cours de leur croissance de 7 à 12 mois (âge d'abattage). Ils étaient répartis selon leur âge en groupes de 3 à 5 taurillons, et logés dans des box d'une même étable sur une litière de paille. Ils reçurent à volonté du concentré (87% MS, 15% MAT, 16% cellulose brute), de la paille et de l'eau fraîche. L'ingestion volontaire individuelle de concentré (IV) fut mesurée entre 7 et 12 mois d'âge par un système électromagnétique de portillons Calan. Des échantillons de digesta furent prélevés la veille de l'abattage au niveau du rectum, et après l'abattage au niveau du réticulo-rumen (RR), omasum (Om) et abomasum (Ab). La distribution de la taille des particules de digesta (DTPD) fut déterminée par tamisage sous eau. Les compartiments gastriques (RR, Om et Ab) furent pesés pleins et vides.

L'IV journalière de concentré de 7 à 12 mois ne diffère pas significativement ( $P = 0,11$ ) entre les 4 types biologiques de taurillons respectivement 81 (PN), 80 (PR), 76 (CPN) et 77 (CPR) g MS/kgP<sup>0,75</sup>. En revanche, une différence significative est observée pour le gain quotidien moyen de 7 à 12 mois ( $P = 0,001$ ) et le PV à l'abattage ( $P = 0,03$  ; 486<sup>a</sup> (PN), 509<sup>ab</sup> (PR), 534<sup>b</sup> (CPN), 498<sup>a</sup> (CPR) kg). La DTPD et le poids des compartiments gastriques (RR, Om, Ab) pleins ne présentent aucune différence significative entre

les 4 types biologiques. Seuls les poids du RR vide et de l'ensemble des compartiments gastriques vides sont significativement ( $P = 0,005$  et  $P = 0,006$ ) supérieurs chez les taurillons PN, respectivement 9,08 et 13,65 kg comparés aux PR (8,06 et 12,24 kg), CPN (8,12 et 12,45 kg) et CPR (7,58 et 11,47 kg). Cette supériorité de poids et sans doute de la taille de l'orifice réticulo-omasaal chez les PN pourrait expliquer leur DTPD supérieure, quoique non significative.

### The influence of clenbuterol and propranolol on lipid mobilization and food intake in dairy cows.

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The objective of this experiment was to show whether the action of  $\beta_2$ -adrenoceptors that modulate the mobilization of adipose tissues also has an influence on dry matter intake of lactating dairy cows, and if so, whether lipid nutrients can explain this response.

A  $\beta_2$ -agonist, clenbuterol (13.3 ng/kg/min) or a  $\beta$ -blocker, propranolol (8.8  $\mu$ g/kg/min) infused iv over a 4-h period were compared with a lipid emulsion (4 Mcal of NE of Endolipide 20%) or a saline control. The 4 dairy cows in mid-lactation (34 kg of milk/d) were assigned to these 4 treatments on alternate days in a 4 x 4 latin square design with 3 replications. Two trials were carried out: in the first, perfusions were performed at night (03.00 to 07.00 h), and in the second, perfusions were performed in the morning during the main meal (08.00 to 12.00 h). Response on food intake was continuously recorded, while metabolic parameters were studied during the third latin square of each trial. Dairy cows were fed a mixed diet of maize silage (70%) and concentrate (30%) offered *ad libitum* twice daily after milking at 08.00 and 18.00 h.

The results of the 2 trials were similar. In both trials, clenbuterol reduced dry matter intake by about 8% on the day of perfusion (-1.75 and -2.49 kg DM for trials 1 and 2, respectively) whereas propranolol and lipid control had no significant effect. Reduction of food intake induced by clenbuterol was delayed (2-4 h after the end of perfusion) and remained significant on the next day post-treatment (-1.07 and -1.44 DM for trials 1 and 2, respectively). The kinetics of plasma-