

pigs are about 53 kJ/g. Heat production is, however, related much more closely to total protein synthesis, most of which takes place in tissues other than "meat". Ways and means of manipulating protein synthesis and the energy cost of growth by nutrition, anabolic agents and anti-microbial growth promoters are considered.

GENETIC IMPROVEMENT OF FEED EFFICIENCY OF GRAZING LIVESTOCK

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Livestock production under grazing is characterised by inability to directly measure feed intake, an interactive pasture-animal complex, marked seasonal fluctuation in feed quantity and quality, high animal maintenance costs and relatively low production levels. Harvesting ability of the animal, resilience to feed fluctuations, resistance to disease or stress and voluntary feed intake contribute importantly to total feed efficiency. Greatest scope for genetic improvement however is through increasing feed conversion efficiency.

The high proportion of maintenance to total feed requirements in a free-grazing system calls into question the effectiveness in improving total productivity of traditional evaluation and selection on yields per animal. An "efficiency index", equivalent to the yield of an animal of average liveweight having similar predicted efficiency, is proposed for adjusting observed yields for the effect of liveweight on feed conversion efficiency. In many situations the efficiency index can be approximated by a linear function of yield and liveweight, to which standard selection index methods can be applied to optimise genetic progress, given appropriate genetic parameters for liveweight and production traits. The procedure is illustrated for single-purpose dairy production using New Zealand data.

FEED EFFICIENCY DURING EARLY LACTATION IN COWS OF SPECIALIZED AND DUAL PURPOSE GENOTYPES

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Feed efficiency analysis of dairy cows feed according to their production potential and belonging to extremely different genotypes (from the *Holstein* to the *Charolais* breed) show that both between and within genotypes, the very first factor of variation is the milk production yield. The second factor observed is the magnitude of weight loss after calving which is related to a mobilization of energy stores.

Using the energy system of LEROY, it was not possible according to the analysis of between and within genotype variations to determine the exact contribution of body store mobilization to milk production. The energy equivalence of the weight change seems to vary from one genotype to another; it should be more accurately defined by taking into account the variations in the feeding level and in the proportion of concentrates in the diet which affects the utilization rate of the rations.

GENETIC DIFFERENCES IN FEED UTILIZATION BY DAIRY CATTLE

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Selection for production of milk or fat corrected milk can be expected to result in an automatic increase in gross feed efficiency. The effectiveness of indirect selection is expected to be 70 to 95 per cent as great as direct selection. Correlated responses of body weight change are less well known. Magnitude of genotype by environmental interactions, defined by energy in the diet, from most work seems negligible or small, but may be real for some comparisons.

Interactions of such small magnitude between genotype and nutritional regimes could not have real consequences for practical breeding decisions. Because genetic differences in milk production are more easily measured on diets higher in energy concentration than all forage diets, the potential reduction in genetic gain for milk production when selecting on all forage diets could be greater than errors in selection caused by interactions, particularly if the interactions could be minimized by rescaling the data.

FEED INTAKE AND MILK YIELD IN MONOZYGOUS CATTLE-TWINS

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In 23 pairs of monozygous cattle twins the relations between feed intake, milk yield and milk constituents were examined. Between milk protein content during 7th to 12th week of lactation and energy intake per kg F.C.M. there was a correlation of $r = 0.41$. Presumably the protein content can be used as indicator for feed intake for selection purpose.

FEED INTAKE AND FEED EFFICIENCY IN DOUBLE MUSCLE AND CONVENTIONAL CATTLE

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The feed intake has been recorded between 215 and 370 days of age on 118 bulls of the *Belgian Blue and White* breed, 64 of the conventional or dual-purpose type and 54 of the double-muscled type, reared and fattened on a high energy diet (2.8 Mcal ME per kg DM of a concentrate fed *ad libitum*).

The average feed consumptions, expressed in kg DM, adjusted for the metabolic weight were: 6 712 (conventional) and 6 442 (double-muscled). They are significantly different ($P < 2$ per cent). The average feed efficiencies, expressed in kg DM per kg weight gain and adjusted for the metabolic weight, were: 5 571 (conventional) and 5 143 (double muscled) and are significantly different ($P < 2$ per cent).

The difference between the conventional and the double-muscled regarding their $\Delta P/\Delta L$ ratio (daily protein deposition on daily lipid deposition) seems to be of the order of 40 per cent. A difference of this magnitude accounts for a difference in feed efficiency similar to that observed, that is, of about 0.4 kg per DM per kg weight gain.

PERFORMANCE TESTING OF BULLS FOR BODY COMPOSITION IN DUAL PURPOSE CATTLE BREEDS

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42 AI-bulls of the *Swedish Red and White* breed have been slaughtered at an average age of 28.6 months when they had produced 30 000 doses of semen. The body composition varied to a large extent. If the values were corrected to the same carcass weight 444 kg, the leanest bull had in total 122 kg less fatty tissue deposited than the fattest one. Expressed in energy units the leanest had only 54 per cent as much energy as the fattest. The difference in total value of retail cuts amounted to more than 1 000 Sw Cr. or about 20 per cent in favour of the leanest one. The correlation between estimated breeding value for growth rate and body composition turned out to be close to zero. Further studies will reveal if the body composition of the AI-bulls is worth while to consider in the selection of dual purpose bulls.