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A Little Wet but Warm

The Million Dollar Ram Question

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I bet that all of you who spent a small fortune for that champion ram which got all the honors in the show, or ranked top in its station test wondered while driving home with that ram back in the truck, **was that ram really worth it?** You know very well that this ram was fed the optimum diet during the test and its growth performance is probably the limit of its genetic potential, but will its progeny get the benefits? If they are fed similarly, i.e. a diet based mainly on grain to boost their growth, they will surely benefit from a superior sire, because growth rate and feed efficiency are moderately heritable. But what about the progeny of this sire if they are raised extensively on pasture? Would they be superior simply because their sire was the champion or is it possible that another ram which never got any recognition can beat the champion under the less favorable management? Geneticists call this question, **the genotype by feeding management interaction**, and it has always given them headaches.

Indications of the existence of such interaction has been shown with beef cattle. Back in 1964, Dr. Warwick and his associates in USDA used identical and fraternal twins from different sires. One of the twins was fed a high energy diet while the second received a low energy diet. The interaction between diet and pairs of twins for growth rate was significant. Which meant that the sires ranked differently according to the performance of their progeny fed the two diets. In 1971, Dr. Kress and his associates used the same technique but found no interaction for growth rate from 210 to 701 days of age. In a third study conducted in 1983, Dr. Langholz and co-workers reported on the progeny of nine sires which were tested simultaneously on standard test stations or under farm conditions. They found a significant interaction between testing environment leading to distinct changes in ranking of the sires tested.

The results with sheep are also contradicting. In England, it was shown that Blackface lambs grew faster than Cheviot and Wiltshire lambs on a good plane of nutrition, but breed differences were not as apparent on a low plane of nutrition. A study was conducted in the USA by Dr. Glimp in 1971 in which he subjected lambs from eight breeds to three rations with the percentage of the concentrate level ranging from 60 to 90%. The results indicated a significant breed by concentrate level interaction, with Suffolk and Hampshire responding to higher energy diets, while the other breeds were able to meet their energy requirement for maximum growth on a low concentrate level.

Because the identification of identical twins is rather difficult in sheep, that approach was never used, instead, fraternal twins were used in a study conducted in Australia where the twins were fed different diets. The correlation between twins at 6 months of age was rather low and the interaction was not significant. At 12 and 17 months of age the correlations were higher and the sire by plane of nutrition was significant.

In Canadian Ram Test Stations, ram lambs are received at weights of 16-34 kg (35-75 lb) and about 50 days of age. Following a 14 day adjustment period their growth rate is tested for 65 days. To maximize expression of genetic potential, the rams are fed a grain-based high energy ration supplemented with small amounts of roughages. Rams which rank high according to the test results are often sold at a premium for use as sires on the assumption that they transfer genetic merit for rapid growth to their progeny. We were often asked the million dollar question, to what extent would the ranking of rams fed on concentrates change had they been fed a ration based on roughages? Since we did not have a ready answer and the literature, contradicting as it is, did not provide any help, we decided to conduct a study to try to answer the question.

As can be seen, there are different levels to test the presence or absence of a genotype by feeding management interaction, between identical twins (same genotype), between fraternal twins (both sire and dam are the same), among half sibs (only the sire is common, the dams are different) or among different breeds.

We had fraternal twins from 11 genetic groups all except seven sets were the progeny of Suffolk rams mated to Suffolk, Finn sheep, DLS and seven crosses between Finn and DLS. One lamb from each twin set was fed exactly as in test stations, i.e. a concentrate mixture with half a pound silage a day. Its twin received a diet of all silage supplemented with 20% of the amount of concentrate its twin consumed with a maximum of half a pound a day. The test period extended from weaning when the animals weighed 15 kg (33 lb) until they reached 32 kg (70 lb). The amount of feed consumed and refused was weighed to calculate feed conversion ratio. The growth rate of the animals was calculated by dividing the gain in weight by the number of days on test. Because, the animals started and finished the test at different weights, another measurement of growth referred to as relative growth rate which takes into account these differences was also calculated.

The genotype by diet interaction was examined at the two levels, among genetic groups (breeds) and between individuals within a set of twins. Neither interaction was important for average daily gain. For relative growth rate, the genetic group by diet interaction was significant (with a margin of error of one time out of twenty). The genetic groups which ranked highest and lowest on the high energy diet also ranked highest and lowest on the low energy diet, but other genetic groups varied widely in their ranking on the two diets.

The twin by diet interaction was not significant implying that twin lambs ranked similarly within each diet in average and relative daily gain. The correlation in performance between siblings were moderate averaging 0.40 and 0.43 for the two measurements of growth, respectively. There was no significant effect of breed group by diet interaction, again implying that the breed group which ranked high or low on the high energy diet ranked similarly on the low energy diet.

What we concluded from the study was that the growth performance of one twin lamb on a roughage diet and its twin on a concentrate diet do not differ greatly. I should warn the reader though, that this study was based on a rather small sample, with limited number of sires and small variation among the genetic groups involved. We still need further studies in this area of research using larger samples, and genetic groups with wide variation in their ability to utilize forages to confirm the results we found in this study. Meanwhile, the procedure applied in test stations of feeding lambs high energy, mainly concentrate rations is justified, according to our results, for identifying lamb's genetic potential for growth.

Exercise Improves Tenderness of Lamb

By G.P. Lynch
From Maryland Sheep News

Our management practices may have an effect on the quality of lamb we produce. The following is a brief description of an experiment done at the University of Alberta, Canada. The study is part of a project in the growth, development and meat quality of sheep.

Twenty-two Suffolk ram lambs, about 70 lbs. body weight, were paired by similar individual body weights and assigned into either an exercised or non-exercised group. The exercised lambs were put on a treadmill for 60, 75 and then 90 minutes daily five days per week. Samples from the two leg muscles were removed at slaughter and frozen for later chemical and physical analysis.

The most interesting finding was that the Warner-Bratzler shear test (a measure of the amount of force required to cut a standard size muscle sample) was greater for the non-exercised lambs. These results showed that exercise improved tenderness of leg muscles sampled. The authors suggested that this increase in tenderness was due to an increase in the fibrous protein component of muscle cells, resulting in an increase in the size of muscle cells along with a relative decrease in the collagen content of muscle in the exercised lambs. Collagen is a supportive protein in muscles and its increase contributes to toughness in meat.

There is a commonly held belief that exercise causes an increase in the toughness of meat. This study casts doubt on this belief. The authors suggest that the increase in muscle collagen content that occurs as lambs age may be an important factor in the reduction of lamb tenderness. These lambs were all young ram lambs of similar age so results of this study were not confounded by tenderness changes with age.