Summary Reports

Meat and Carcass Evaluation

The Association Between Net K^{40} Count and Carcass Composition of Gestating Gilts

D.D. Johnson, L.E. Walters, C.V. Maxwell and B.W. Lambert

Previous work at the Oklahoma Agricultural Experiment Station has shown a significant increase in nitrogen storage in bred gilts when fed high protein diets. Other work in swine nutrition suggests that a part of the increased nitrogen storage may be in increased muscle growth. Information leading to storage sites for this nitrogen (in addition to embryonic storage) would be of considerable benefit to swine nutritionists in efforts to more thoroughly describe the nature of bred gilt nutrition.

Inasmuch as the K^{40} whole-body counter has proven to be an effective instrument for predicting fat-free lean in 220 to 240 pound market hogs, the question of its application in monitoring muscle growth in gestating gilts has arisen. In an effort to study the application of the K^{40} whole-body counting technique to muscle deposition during gestation, twenty-two gilts with an average weight of 283 pounds were K^{40} counted and subsequently bred. Following breeding, the gilts were placed on rations containing three different levels of protein and two levels of energy. The gilts were then K^{40} counted on days 30, 60, and 90 of gestation. At the same time, backfat thickness was estimated by an ultra sound probing technique (Scanogram). All animals were slaughtered at the 90th day of gestation, at which time weights of the placenta (with fetus) and the amount of amnionic fluid was measured. After chilling for 48 hours, each right carcass half was cut into the standard wholesale cuts. Each of these cuts was then separated into very closely trimmed lean, fat, and bone. Table 1 presents means of the data collected to this

Table 1. Means of certain live and carcass measurements

Gilt wt. (lbs.)	Carcass wt. (lbs.)	Days of gestation	Net K^{40} count	Backfat probe (in.)	Lbs. of cl. tr. lean	Lbs. of fat trim
312		30	5546	.88		
357		60	5677	.96		
385	238.9	90	6098	1.06	138.26	73.90

point for gilt weight, net K^{40} count, carcass weight, pounds of closely trimmed lean, backfat probe, and fat trim. The simple correlation between mean net K^{40} count and pounds of very closely trimmed lean was found to be 0.85, which sugggests a positive relationship between the last K^{40} count and the actual pounds of muscle in the animal. Greater numbers of animals must be studied before meaningful prediction equations can be developed. When total pounds of fat trim were compared to the Scanogram fat measurement, the data also suggested a positive relationship, from twenty-eight observations, of 0.75 between these two measurements.

In an effort to more accurately identify muscle development in gestating gilts, the effect of weight on the counting efficiency of the K^{40} counter must be determined. It has been demonstrated previously at this station that in beef cattle as weight or mass increases, the efficiency of the K^{40} counter decreases. Other workers in this area have demonstrated that "background depression" and "self-absorption" of the naturally occuring K^{40} is primarily responsible for this loss in counting efficiency. A study is now underway in an effort to identify this loss in counting efficiency in phantoms of weights similar to those of bred gilts between the weights of 240 and 440 pounds. Upon completion of data collection and statistical analyses, a more detailed report of the findings will be presented.

The Estimation of Muscle Cell Numbers in Cattle

J. J. Guenther and R. V. Felber

This research was initiated to develop methods for estimating muscle cell population in bovine muscle. The semitendinosus, biceps brachii, sartorius, and tricepts brachii muscles from a fifteen-day-old Jersey and a fifteen-day-old Holstein calf were removed immediately post-mortem. These muscles were selected for initial investigation because the fibers from these muscles run in one direction, facilitating the obtaining of true cross-sections. The number of muscle cells was estimated, using a microscopic procedure, in cross-sectional areas at 25, 50, and 75 percent of the muscle length. Average cell number for the above named muscles from the Jersey calf were 92.5, 28.4, 34.1 and 47.5 X 10^4, respectively. Cell counts for the Holstein calf were significantly higher, averaging 114.8, 42.2, 48.8 and 59.7 X 10^4, respectively. A strong positive relationship between cell number and muscle weight was indicated by the results.

Muscle Nitrogen Deposition During Growth in Cattle Differing in Body Size

J.J. Guenther

The current profit squeeze has caused beef producers to become more acutely aware of the importance of maximizing production efficiency, with their ultimate goal being to produce quality lean tissue or muscle at the least possible cost. As a result, much interest has been generated in comparing the muscling capabilities of various newer or "exotic" breeds of cattle with those of the standard British breeds in use in the U.S.

The principal constituent of muscle, except for water, is protein. Muscle protein may be separated into its major components: myofibrillar protein, which gives structure to the muscle; sarcoplasmic protein, which contains various enzymes and pigments; and stroma proteins, which comprises the connective tissue of muscle. Each of these components may be conveniently quantitated on the basis of its individual nitrogen content.

This study was conducted to obtain information on the influence of body size in beef muscle nitrogen deposition from early life to a constant market age.

Muscle samples were obtained, via live-animal biopsy, from the longissimus dorsi muscles of eight Angus and eight Charolais crossbred steer calves, beginning when the calves were about one month of age, and subsequently at two month intervals until the calves were about 15 months of age. The Angus calves were selected to represent the small scale body type and were not intended to be representative of the Angus breed. The Charolais calves were selected to represent the large scale body type. Protein nitrogen was extracted, and partitioned into the appropriate fractions following procedures developed in our laboratory.

Results from the muscle nitrogen analyses are presented in Figure 1. The data are presented on a percent of wet tissue basis rather than on an absolute basis in order to show a more direct comparison between the two breed types. Percent total protein nitrogen increased during growth ($P<0.01$) in both breed types, and this component was greater ($P<0.05$) for the large scale (Charolais) cattle. The rate of deposition of total muscle protein nitrogen proceeded at its maximum between the five and eleven-month test periods for the Charolais steers. In general, the small scale (Angus) cattle showed trends similar to those of the large scale cattle in total muscle protein nitrogen deposition. However, the Angus calves appeared to attain maximal rate of increase in this component about sixty days earlier than the Charolais.

Myofibrillar protein nitrogen deposition increased during growth ($P<0.05$) in both breed types, but there were no significant differences be-

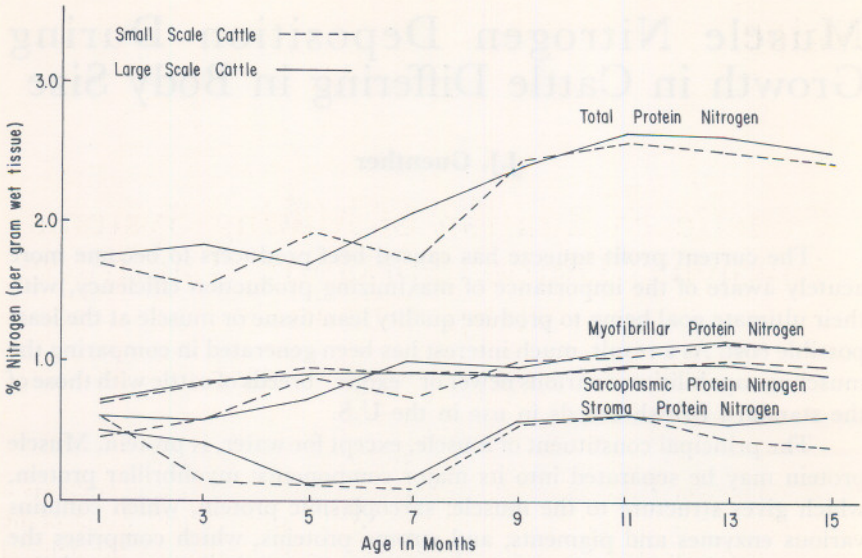

Figure 1. Changes in percent muscle nitrogen during growth in cattle of different body size.

tween breed types. Sarcoplasmic protein nitrogen exhibited only slight increases during growth, and was about the same for both types of cattle. Stroma protein nitrogen decreased during early life, but increased post-weaning ($P<0.01$), and was higher ($P<0.05$) for the Charolais calves.
