Using Live K^{40} Count To Estimate Leanness In Pigs

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Story In Brief

A total of 155 market pigs from the swine breeding herds were evaluated for live K^{40} count at the Live Animal Evaluation Center and then slaughtered at the University Meat Laboratory. All animals were evaluated for K^{40} content for a five minute period with background counts taken before and after each pig was counted. To determine the repeatability of the counts obtained, the pigs in 1970 were randomly allotted to the counter for a second 5-minute evaluation period. The correlation between first and second reading on the same pigs were 0.91, indicating a relatively high degree of repeatability.

The pigs were slaughtered the day after being evaluated by the K^{40} counter. After chilling, the carcasses were cut and the weights of closely trimmed hams, loins and shoulders were obtained. Determination of the fat-free lean content from ether extract analyses were made for the 59 pigs evaluated in 1970.

The pooled within breed correlation between live K^{40} count and fat-free lean for the pigs evaluated in 1970 was 0.89, thus accounting for 79 percent of the variation. The correlations between live K^{40} count and total separable lean and total lean cuts were 0.79 and 0.73, respectively. Net live K^{40} count was more closely correlated with lean yields than was either carcass backfat or loin eye area. Carcass backfat accounted for about 25 percent of the variation in lean yields compared to only 12 percent for loin eye area. The correlation between K^{40} net count and total lean cuts for the pigs evaluated in 1971 was 0.58. This correlation was lower than expected due to monitoring difficulty with the analyzer.

The prediction equation using only live K^{40} count to estimate fat-free lean content accounted for 80 percent of the variation with an average error of 2.8 lbs. Although the degree of accuracy was lower during the second period, these data do indicate that the whole body scintillation counter can be a valuable tool in estimating the amount of lean tissue on live animal.

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Introduction

Ultrasonic measurements of backfat thickness and loin eye area are useful aids in swine breeding but these traits are only estimates of the amount of lean in an animal. Previous work at this station has indicated that the K^{40} whole body scintillation counter may be a reliable instrument for estimating the amount of lean in a live animal.

This study was initiated to evaluate the relationship between K^{40} net counts of live pigs and their carcass data and to develop prediction equations for estimating the amount of lean in the live animal using live K^{40} net counts.

Materials and Methods

A total of 155 pigs were evaluated consisting of 47 barrows and 12 gilts in 1970 and 96 barrows in 1971. The distribution of the pigs by breed group and year is given in Table 1. All pigs were produced in the swine breeding project herds and were self-fed from weaning at six weeks until they weighed approximately 220 lbs. Pigs were removed from test on a weekly basis and held off feed for 24 hours prior to being evaluated for K^{40} count at the University Live Animal Evaluation Center.

Each animal was evaluated using five 1-minute counts with background counts taken before and after the pig was confined to the chamber. To determine the repeatability of the count obtained, the 59 pigs evaluated in 1970 were randomly allotted for counting for a second 5-minute evaluation period. The correlation between first reading and second reading on the same pig was 0.91, thus indicating a high degree of repeatability in obtaining live K^{40} counts. Only one 5-minute counting period was used in 1971.

All pigs were slaughtered at the University Meat Laboratory the

Table 1. Distribution of Pigs Evaluated by Year and Breed Group

Breed Group	Year	
	1970	1971
Duroc	18	12
Hampshire	21	12
Yorkshire	20	12
Duroc-Hamp Cross	--	20
Duroc-York Cross	--	20
Hamp-York Cross	--	20
	59	96

day after being evaluated by the K^{40} counter. After a 24-hour chill, the carcasses were cut into wholesale cuts and weights of the closely trimmed hams, loins and shoulders were obtained. Carcass length, backfat and loin eye area measurements were made.

Fat-free lean estimates were obtained from the 59 pigs evaluated in 1970. The separable lean, fat and bone were obtained from the right side of each carcass and the separable lean was thoroughly ground and mixed for ether extract determinations. Fat-free lean was then determined by subtracting the estimate of the fat in the lean from the separable lean. The 1971 data were adjusted for sex and breed effects using least squares analyses. The means and standard deviations for the two groups are presented in Table 2. There was more variation in the net K^{40} counts obtained among the pigs evaluated in 1971 than among those evaluated in 1970, but there was less variation in total weights of lean cuts in 1971 than in 1970.

Results and Discussion

The pooled within breed correlations for each group are presented in Table 3. Of the measures of leanness, fat-free lean was more closely related to net K^{40} count than was lean or total lean cuts. This would be expected since it is the best measure of the total lean mass of the animal. Because of the time and expense involved, fat-free lean determinations were obtained only in 1970. Live net K^{40} count accounted for 79 percent of the variation in fat-free lean compared to 62 percent of the variation in total separable lean and only 53 percent of the variation in total lean cuts. In 1971 the correlation between net live K^{40} count and yield of total lean cuts was only 0.58, thus accounting for only 34 percent of the variation.

Table 2. Means and Standard Deviations for Traits Evaluated

Trait	1970*		1971	
	Mean	Standard Deviation	Mean	Standard Deviation
Shrunk live wt., lb.	225.7	8.0	210.2	6.1
Carcass backfat, in.	1.05	0.20	1.24	0.14
Loin eye area, sq. in.	4.43	0.57	4.84	0.55
Ham, loin, shoulder wt., lb.	86.1	5.10	85.0	4.19
Total separable lean, lb.	97.2	6.42		
Total fat-free lean, lb.	82.5	6.83		
Net live ^{40}K count	6255	585	5747	630

* Gilt data adjusted to barrow equivalent on a within basis.

For the 1970 pigs live net K^{40} count was more closely correlated with measures of lean yields than was either carcass backfat or loin eye area. Carcass backfat thickness accounted for approximately 25 percent of the variation in lean yield while loin eye area accounted for only 12 percent of the variation. Among the pigs evaluated in 1971, both loin eye area and net K^{40} count accounted for 34 percent of the variation in total lean cuts, while carcass backfat accounted for only 16 percent of the variation.

Since fat-free lean determinations were not obtained in 1971, only the 1970 data were used in calculating prediction equations. Least squares analysis adjusting for breed and sex was used. When slaughter weight was combined with count, neither the amount of variation accounted for or the average miss were changed significantly, so the equations shown in Table 4 involve only live count. As would be expected, the amounts of variation accounted for were smaller and the average misses larger when predicting total lean cuts or total separable lean as compared to fat-free lean.

These results suggest that the K^{40} count on live pigs can be a valuable aid in selecting animals with more lean. Continued research is needed to identify factors that may influence counting efficiency.

Table 3. Pooled Within Breed Correlations Among Various Evaluation Measurements and Carcass Cut-Out Data

Measurements	1970 Data			1971 Data
	Fat-Free Lean	Total Separable Lean	Total Lean Cuts	Total Lean Cuts
Live ^{40}K count	.89**	.79**	.73**	.58*
Carcass backfat thickness	—.57**	—.51**	—.53**	—.40*
Loin eye area	.35**	.35**	.37**	.58*

* Significant at 5% level.
** Significant at 1% level.

Table 4. Prediction Equations for Measures of Leanness Using Net Live ^{40}K Count

Prediction Equations	% of Variation Accounted For	Average Miss
Pounds of Lean Cuts: 43.876 + 0.00676 (^{40}K Count)	55	3.1 lbs.
Pounds of Separable Lean: 39.885 + 0.00912 (^{40}K Count)	63	3.7 lbs.
Pounds of Fat-Free Lean: 14.102 + 0.01093 (^{40}K Count)	80	2.8 lbs.