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The value of pork trim depends on its lean content. Accurate assessment of composition is necessary for proper pricing. Procedures often used to estimate composition lack accuracy and require time, thus a rapid, accurate, non-invasive technology to determine lean content of pork trim is needed.

Electromagnetic scanning, also known as ToBEC (total body electrical conductivity), has been studied for prediction of lean in hams (see 1994 Swine Report, p. 8). The equipment consists of a stainless steel cabinet containing a large, plastic-covered coil, through which meat is conveyed. Energy is absorbed from the electromagnetic field by the sample. Because lean is more conductive than fat, the peak of the scanning curve is highly related to lean content. Prior research has demonstrated a strong relationship between electromagnetic scanning and pork carcass lean content (see 1994 Swine Report, p. 5). This study was conducted to evaluate electromagnetic scanning for estimation of pork trim composition.

Materials and Methods

Right sides from 74 carcasses were chilled and boned. Boneless pork trim from each side was allocated to plastic tubs and standardized to 70 lb (n = 51) or 40 lb (n = 23). Animal variation prevented uniform weights of trim. Temperature of trim was recorded and tubs were scanned in duplicate using an electromagnetic scanner at 2.5 MHz. Pork trim was ground to 2.5 cm in particle size and rescanned in duplicate. Oven drying and ether extraction were used to determine moisture and fat content.

Equations for prediction of fat-free lean weight and percentage were generated using peak of the scanning curve, meat temperature and trim weight. All possible one-, two-, and three-variable equations were created, but results are presented only for those which had the highest R^2 with the lowest root mean square error.

Results and Discussion

Although an attempt was made to standardize trim weight, a small variation existed (Table 1). This occurred because some sides yielded less lean trim than the target weight. The pork trim was quite variable in composition, slightly more so for those allocated to a target weight of 70 pounds (Table 1). Differences in tub weight resulted in much lower peaks of the scanning curves for the 40-pound tubs ($\overline{X}$ = 35) than the 70-pound samples ($\overline{X}$ = 108).

Because peak of the scan curve is influenced by sample size and temperature, these variables were included in the analysis. Alone, neither sample size or temperature accounted for much of the variation in composition (Table 2). There was a strong association between peak of the scan curve and fat-free lean content (Table 2). The magnitude of this correlation was greater for the 70-pound sample than the 40-pound sample. The manufacturer specifies a minimum sample size of 30-pounds for this scanning unit. It appears that sample sizes larger than 40 pounds are needed for maximum accuracy.

Nearly twice as much of the variation in fat-free lean content was explained in the 70-pound sample than in the 40-pound sample (Table 3). It was also apparent that grinding produces a more homogenous sample, which improved predictive accuracy in the heavier tubs. Meat temperature (for weight of fat-free lean) in conjunction with meat weight (for percentage fat-free lean) added small but significant improvements in prediction of

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Table 1. Characteristics of pork trim.

Tub weight, lb.	Trait	n	Mean	Standard deviation	Minimum	Maximum
70	Trim weight, lb.	51	69.9	0.42	67.8	70.0
	Lean trim temperature, F	51	43.2	2.49	39.0	50.0
	Ground lean temperature, F	51	43.9	2.52	41.0	52.0
	Fat-free lean weight, lb.	51	43.6	3.73	35.3	52.8
	Fat-free lean, %	51	62.4	5.38	50.5	75.5
40	Trim weight, lb.	23	40.0	0.10	39.5	40.0
	Lean trim temperature, F	23	41.8	4.16	36.9	49.0
	Ground lean temperature, F	23	44.0	3.75	39.6	51.0
	Fat-free lean weight, lb.	23	26.8	1.69	23.1	30.6
	Fat-free lean, %	23	67.0	4.25	57.6	76.4

Table 2. Correlation coefficients for pork trim and scanning characteristics to fat-free lean.

		Fat-free lean weight			Fat-free lean, %		
Tub weight, lb.	Particle Size	Meat temp.	Meat weight	Scan peak	Meat temp.	Meat weight	Scan peak
70	Lean trim	.05	.08	.83	.04	.15	.82
	Ground lean	.10	.03	.90	.11	.12	.89
40	Lean trim	.14	.20	.67	.12	.24	.67
	Ground lean	.12	.20	.60	.11	.24	.60

composition (Table 3) for the 70-pound samples. Conversely, neither grinding nor temperature nor weight improved prediction for the 40-pound samples.

Electromagnetic scanning is effective and accurate (within 2 pounds or < 3%) for prediction of fat-free lean in pork trim, presuming sample size is sufficient.

Table 3. Prediction of fat-free lean in pork trim.

Tub weight, lb.	Particle size	Fat-free lean weight			Fat-free lean, %		
		Model	R^2	RMSE, lb.[a]	Model	R^2	RMSE,%
70	Lean trim	Peak, temp.	.714	2.04	Peak, temp., wt.	.723	2.92
	Ground lean	Peak, temp.	.821	1.62	Peak, temp., wt.	.829	2.29
40	Lean trim	Peak	.451	1.28	Peak	.455	3.22
	Ground lean	Peak	.358	1.38	Peak	.362	3.48

[a]RMSE = root mean square error.

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