Ante-Mortem Fasting and Marketing Stress Effects on Dressed Yields and Quality of Pork Carcasses [1,2]

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The problem of live shrinkage long has been a source of misunderstanding among producers, transportation agents, marketing personnel and packers. Shrinkage is either excretory or tissue loss. It can be assumed that tissues are in a constant state of change. In fact, the only time an animal gains in weight is when it is consuming feed and/or water. At all other times the animal is losing weight. The effects of prolonged fasting periods with or without stress on the yield of various tissues and the quality of pork has not been firmly established. Henning and Stout (1932) showed that tissue shrinkage was over-estimated and over-emphasized. This research was supported by the energy requirement calculated by Brody (1945). However, Bjorka (1938) studied 6,000,000 hogs and found that excretory shrinkage took place at a rapid rate in the early part of transit and reached a maximum after 30 hr. enroute. He postulated that tissue shrinkage began early in transit and continued at a fairly constant rate. Bowland and Standish (1966) found a linear tred between time off feed and carcass weight shrink. Mixing the pigs with strange pigs during the fasting periods had no additional effect on dressing percent.

Callow (1938; 1939), Rose and Peterson (1951) and Briskey et al. (1959) reported that glycogen level was reduced and muscle pH was high when animals were fatigued and/or fasted.

These experiments reported here in were designed to determine the effects of various ante-mortem treatments upong the amount, type and ultimate magnitude of tissue shrinkage and the quality of the pork carcasses.

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EXPERIMENTAL PROCEDURE

Experiment 1.

Data were obtained in 1960 from 84 hogs comprising 13 litters which were divided into 5 fasting groups. Sixty-five of these hogs were obtained within a 15-mile radius of the University Abattoir and are termed "short haul litters". The remainder were purchased from one farm 160 miles from the University and are termed "long haul litters". The breeds represented were Duroc, Hampshire, Yorkshire and Hampshire x Yorkshire and were equally divided by sex. All hogs were weighed out of the feedlot on the same scale.

One hog per litter from the short haul group was slaughtered immediately upon arrival at the Abattoir (0 hr. fasting). The remaining hogs had access to water but not feed. Thereafter, one hog of each litter was killed at the end of 24, 48, 72 and 96 hr. of fasting. Since it was impossible to slaughter any of the long haul hogs at 0 hr. of fasting, the first hog of each litter was slaughtered at the 24-hr. fasting period. Additional hogs from the same litters were slaughtered at 48, 72 and 96-hr. intervals. Selections within litters for fasting intervals were made at random.

All slaughtering and cutting procedures were standardized. Dressing percent was calculated on the basis of a 48-hr. chilled carcass weight and the off-feed weight.

Weights were obtained from the viscera (gastro-intestinal tract plus the heart, liver, caul fat, trachea and spleen), the gastro-intestinal tract (esophagus, stomach, small and large intestines, pancreas, ruffle fat and bung) and all wholesale cuts, liver, stomach small intestine and large intestine. The last three were weighed both full and empty.

Experiment 2.

In 1966, 32 University of Tennessee Duroc gilts, which weighed approximately 100 kg. and were raised under comparable environmental conditions, were slaughtered after 0, 24, 48 and 96-hr. ante-mortem holding periods. Eight hogs in each holding period were subjected to four treatments: fasting with water, fasting with stress and water, feeding with water and feeding with stress and water.

Stress consisted of mixing the experimental hogs in with strange hogs varying in size and class in the holding pens of a local packing plant.

Another group of 24 crossbred barrows from a Tennessee prison farm were hauled approximately 400 miles and subjected to the same four treatments with ante-mortem holding periods of 24, 48 and 96 hr. These hogs were termed the "long haul group". All were slaughtered and cut by standardized procedures in the University Abattoir.

In addition to the carcase traits described in Experiment 1, subjective quality scores, based on the Wisconsin scoring system, were made on the ham and loin. To further evaluate carcass quality, shear values on cooked samples of the l. dorsi were determined, and pH of the psoas major muscle was taken at the time of slaughter and after 48 hr. of chilling at 2-3°C. In addition to proximate analyses for moisture, protein and ether extract, serum albumin and whole blood urea were determined by colorimetric methods as possible clues of endogenous protein catabolism. Deoxyribonucleic acid content was estimated by measurement of deoxyribose by the diphenylamine reaction (Burton, 1956) on Gracilis, psoas major and diaphragm muscles.

Analysis of variance was used to determine the significance of the differences among means. A least squares analysis was used in the second experiment with constants being fitted for stress effects, feed effects and slaughter periods.

RESULTS AND DISCUSSION

Experiment 1.

Admitting the possibility of variation within litters, it was believed that the effects of feeding, handling, type and environment were minimized by comparing littermates.

Analysis of variance showed no significant difference between the short haul and long haul litters for any of the carcass traits studied. Therefore, the short and long haul litters were combined and treated as one group. Table 1 shows that one-half the total shrinkage in live weight occurred during the first 24 hr. of fasting and 88%

occurred during the first 48 hr. The average total shrinkage during a fasting period of 96 hr. was 8.4%.

Dressing percent was not significantly affected by fasting period, although there tended to be a linear decrease. There was a significant variation in dressing percent among litters. When average dressing percent was correlated with time off feed, a low but significant correlation (r=-.29) was obtained, indicating that it is possible for some tissue shrinkage to occur after prolonged fasting.

Brody (1945) reported that a 100-kg hog would require 2,654 calories for a male and 2,316 calories for a female to fulfill energy requirements during a 24-hr. fasting period. It might be logically reasoned that the hogs used in this study could have obtained enough energy for the first 24 hr. from the loss in liver weight and undigested feed in the intestinal tract. By taking an average of the estimated calories necessary for barrows and gilts, 7,455 calories would be needed in the time interval between 24 and 96 hr. of fasting.

Pomeroy (1941) reported that fat was used first as a source of energy when hogs were placed on a sub-maintenance diet. Since fat has approximately nine calories per gram, it was estimated that 0.83 kg. of fatty tissue would be necessary to supply energy requirements for 72 hr. Table 1 indicates a 1.35-kg. loss in tissue, which is reasonably close to the calculated amount of fat needed. If protein and carbohydrate were used as sources of energy, the calculated value would be even closer to actual loss shown by these data.

Highly significant differences among fasting periods were found for all offal data in Table 2 with the exception of empty stomach weight. This variable approached significance at the 5% level. These losses in weight with fasting no doubt were due to digestion and assimilation of feed and excretion of waste materials. The continued loss in weight of the empty G.I. tract and its components suggests the possibility that in the early stages of fasting the walls of these organs may be richly supplied with blood and digested food. The hogs had free access to water and considerable liquid was

found in the G.I. tract; therefore, it was felt this loss in weight of empty G.I. tract was not due to dehydration.

The liver was the major organ of economic importance which was significantly affected ($P<.01$) by fasting. It is assumed this loss in weight was due to glycogen depletion as shown by Ingraham (1948), Rose and Peterson (1951), Callow (1938) and others.

Based on off-feed weights, no significant differences among fasting periods were found in percent yield of wholesale cuts, even though there was some evidence of tissue shrinkage based on the correlation coefficient between fasting time and dressing percent. Highly significant differences ($P<.01$) were found among litters for yield of all the wholesale cuts. This would indicate that pork carcass cut-out, based on off-feed weight, is affected more by breed differences and litter differences within breeds than by length of fasting period. It further points out the necessity of proper sampling when hogs are selected at the market place for comparisons.

Experiment 2.

In this experiment 32 short haul hogs and 24 long haul hogs were used. The data will be discussed separately.
This decision is based on the sex difference of the two groups and possible effects of the 400-mile hauling period on the long haul hogs.

The data in Table 3 show that pre-slaughter stress had a significant effect in lowering dressing percent, belly yield and cooking losses of rib end loin roasts. The pH of the psoas major was significantly higher after 48 hr. chilling in the stressed hogs, indicating that muscle glycogen may have been depleted prior to slaughter. The subjective quality score of the ham showed a significant improvement with stress, which is contrary to findings of some investigators. It is well to point out that only Duroc gilts were used in obtaining these data. This American breed is noted for its evidence of high quality. However, all breeds may not respond to stress in the same manner. These quality data are in direct contrast to the results of some workers who have used breeds which usually have a higher muscle/fat ratio than the Durocs.

Withholding feed during the immediate ante-mortem period resulted in significantly lighter G.I. tracts, lower pH at 0 hr. chilling and lower levels of blood albumin. When the data were divided into four groups according to 0, 24, 48 and 96 hr. ante-mortem holding periods, there was no significant difference in dressing percent.

During the first 24 hr. of fasting, liver weight significantly decreased and subjective ham score and pH of the psoas major at 0 hr. chilling significantly increased. Tenderness as evaluated by the shear test tended to decrease with longer fasting but only the difference between 0 and 96 hr. of fasting was significant. Cooking losses significantly decreased between 24 and 48 hr. of fasting. The increase in blood urea between 48 and 96 hr. of fasting was significant, indicating that some protein catabolism probably occurred.

A summary of observations on the long haul hogs is given in Table 4. The dressing percent of this group of hogs compares favorably to that of the local hogs. This observation supports the data given in Experiment 1 that tissue shrinkage may not occur as early in the transportation procedures as some investigators have indicated. The only characteristic significantly affected by stress was the stomach weight, which was reduced.

Although there appears to be a smaller carcass yield when feed is withheld, this difference was not significant. The data do indicate significant decreases in ham and loin percent, cooking losses and levels of blood albumin. Suitable explanation for these differences would be difficult. It is recognized that sampling error may exert a strong influence on the data because of small numbers.

Delayed slaughter appeared to have a significant effect in making pork less tender. Although there appears to be a reduction in yield of carcass and wholesale cuts with delayed slaughter, these differences were small and not significant in this sample of barrows.

The deoxyribonucleic acid content from samples of the p. major, Gracilis and diaphragm muscle was uniform within each of the three

muscles regardless of treatment. Winick and Noble (1966) showed a decrease in DNA with malnutrition. They worked with rats over a 21-day caloric restriction period. Apparently the treatments in this experiment covered too short a period of time or were not severe enough to obtain a measurable reduction in cell mass. It is feasible that a combination of RNA quantitative data along with DNA may give more revealing information as to what is happening to the cell size and number.

General Discussion. These experiments were designed to represent the common marketing policies for hogs in the United States. Rarely would slaughter be delayed more than 72 hr. Furthermore, it is a simple matter to provide adequate water during the holding period prior to slaughter. Since water is an essential nutrient, especially during fasting periods, it was deemed highly advisable to provide an adequate supply. It would seem reasonable to conclude that data obtained where water was withheld could not be compared directly with the data in these experiments. The effects of fasting were most evident 48 hr. ante-mortem. The possible exception to this is loss in liver weight. These data further indicate that when fasting effected change in carcass traits that the changes were usually of little or no monetary importance.

S U M M A R Y

One hundred forty market weight hogs were used in two experiments to study ante-mortem fasting and marketing stress effects on dressed yields and quality of pork carcasses. In the first experiment, full sibs were compared to study effects of fasting for 0, 24, 48, 72 and 96-hr. periods on excretory and tissue shrinkage. Nearly 50% of the total shrinkage occurred by the end of 24 hr. and 88% by the end of 48 hr. In this experiment where water was provided and no form of stress imposed, dressing percentage was not significantly affected by fasting when off-feed weights are used as the basis for yield. However, a significant correlation (r=-.29) was noted between dressing percent and fasting time, which suggests a possibility of tissue loss. Highly significant differences among fasting periods were found for liver, full vescera, full G.I. tract, full stomach, full small intestine, full large intestine, empty G.I. tract and empty small and large intestines. The yield of pork cuts was not significantly

affected by fasting; whereas, differences in the yield of these cuts among litters were significant. This indicates the danger involved in selecting hogs of unkown origin for such an investigation.

In the second experiment where stress and feed were added to the delayed slaughter periods, the effects, on certain carcass characteristics appear to be different. The data were divided into stress versus no stress, feed versus no feed and four slaughter periods of 0, 24, 48 and 96 hr. The least square means for dressing percent showed no significant effect of stress, feed or delayed slaughter with the exception of stress effects on short haul hogs. In this group of hogs, stress had a further effect in lowering belly yield and cooking losses. Lack of feed showed different effects on the local hogs as compared to hogs hauled long distances. Lack of feed in the local hogs seemed only to affect weight of parts of the G.I. tract; however, in the long haul hogs the percent yield of loin and ham were lowered. None of the treatments had any adverse effect on the subjective quality score of the pork. Delayed slaughter significantly reduced the tenderness of the meat as indicated by higher shear scores. In general, most of the changes effected by fasting appeared 48 hr. ante-mortem and were usually of little or no monetary importance.

ZUSAMMENFASSUNG

Hundertvierzig marktfertige Schweinewurden in zwei Versuchen verwendet, um die Wirkung des Fastens vor dem Schlachten und des Verkaufs-Stress auf Schlachtausbeute und Qualität der Schlachtkörper zu untersuchen. Im ersten Versuch wurden Vollgeschwister verglichen, um die Wirkungen von Fastenzeiten von 0, 24, 48, und 96 Stunden zu untersuchen. Wenn die Schweine vier Tage vor dem schlachten nicht gefüttert wurden, verloren sie fast 50% des gesamten Gewichtsverlustes in den ersten 24 Stunden und 88% in de ersten 48 Stunden, In diesem Versuch, bei dem Wasser vorhanden und keinerlei Stress auferlegt wurde, wurde die Schlachtausbeute nicht signifikant beeinflusst wenn das Körpergewicht von gefütterten Schweinen als Ertragsbasis benutzt wurde. Jedoch wurde ein signifikantes Verhältnis (r=.29) zwischen Schlachtausbeute und Fastzeit bemerkt, welche die Möglichkeit von Gewebsverlust andeutet. Sehr signifikante Unterschiede bei Fastenperioden wurden bei Leber, Eingeweide, vollem Verdauungssystem, vollem Magen, vollem Dünndarm, vollem Dickdarm, leerem Verdauungssystem, und leerem Dünn- und Dickdarm gefunden. Der Ertrag von Handelsstücken wurde nicht signifikant beeinflusst, jedoch waren die Unterschiede im Ertrag zwischen Würfen signifikant. Dies weist auf die Gefahr hin, wenn man Schweine unbekannter Herkunft für einen solchen Versuch verwendet.

Im zweiten Versuch, wo Stress und Futter zu den verzögerten Schlachtzeiten hinzugefügt wurden, scheinen die Wirkungen auf gewisse Schlachtkörper-Charakteristiken verschieden zu sein. Die Ergebnisse wurden in Stress und kein Stress, Futter und kein Futter und 4 Schlachtperioden von 0, 24, 48 and 96 Stunden geteilt. Die "least square" Durchschnitte für Schlachtausbeute zeigten keine signifikante Wirkung von Stress, Futter oder verzögerter Schlachtung, mit Ausnahme von Stress-Wirkung bei kurztransportierten Schweinen. In dieser Gruppe von Schweinen hatte Stress eine weitere Wirkung in niedrigerem Bauchertrag und Kochverlusten. Nichtfütterung zeigte andere Wirkungen an Kurztransportierten Schweinen, verglichen mit Schweinen, welche grosse Entfernungen transportiert wurden. Nichtfütterung bei kurxtransportierten Schweinen schien nur das Gewicht von Teilen des Verdauungssystems zu beeinflussen, aber in den länger

transportierten Schweinen war der Prozentualertrag von Lende und Schinken niedriger. Keine Behandlung hatte irgendeine nachteilige Wirkung an dem subjectiven Qualitätsgrad des Schweinefleisches. Verzögerte Schlachtung beeinflusste signifikant die Zartheit des Fleisches angezeigt durch höhere "shear" Grade. Im allgemeinen traten die meisten durch Fasten bewirkten Veränderung 48 Stunden vor dem Schlachten auf und waren gewöhnlich von nur wenig oder keiner finanziellen Bedeutung.

LITERATURE CITED

A.O.A.C. 1960. Official Methods of Analysis (9th ed.). Association of Official Agricultural Chemists, Washington, D.C.

Bjorka, Knuti. 1938. Shrinkage and dressing yields of hogs. U.S.D.A. Tech. Bul. 621.

Bowland, J.P. and J.F. Standish. 1966. Influence of fasting, water deprivation and stress on carcass shrink of pigs and rats. J. Animal Sci. 25:377.

Briskey, E.J., W.G . Hoekstra, R.W. Bray and R.H. Grummer. 1960 A comparison of certain physical and chemical characteristics of eight pork muscles. J. Animal Sci. 19: 214.

Brody, Samuel. 1945. Bioenergetics and Growth. Reinhold Publishing Corp., New York.

Burton, K. 1956. A study of the conditions and mechanisms of the diphenylamine reaction for the colorimetric estimation of deoxyribonucleic acid. Biochem. J. 62: 315.

Callow, E.H. 1938. The after effects of fasting. Great Britain Dept. Sci. Ind. Res. Food Investigation Board. London. p.54.

Callow, E.H. 1939. The pH of muscle tissues. Great Britain Dept. Sci. Ind. Res. Food Investigation Board. London.

Henning, G.F. and W.B.Stout. 1932- Factors influencing the dressing percentage of hogs. Ohio Agr. Ext. Bul. 505.

Ingraham, M. 1948. Fatigue, muscullaire, pH et Prolifixation Bacterienne Dans la Viande. Annales de L'Institut Pasteur 75:139.

Pomeroy, R.W. 1941. The effect of a submaintenance diet on the composition of the pig. J. Agri. Sci. 31:50.

Rose, D.and R. Peterson. 1951. Depletion of carbohydrate reserve by starvation and exercise. Can. J. Technal. 29 (10):421.

Winick, Myron and Adele Noble. 1966. Cellular response in rats during malnutrition at various ages. J. Nutrition. 89:300.

TABLE I. YIELD DATA FROM HOGS SLAUGHTERED AFTER DIFFERENT FASTING PERIODS

Fasting period	Number of hogs	Av. off-feed wt.	Av. kill weight.	Av. total schrinkage	Dressing percent[a]
hr.		kg.	kg.	%	%
0	13	99.8	99.8	0	70.1
24	18	98.4	94.3	4.1	70.0
48	17	98.4	91.2	7.4[b]	69.6
72	18	99.8	92.1	7.7[b]	69.4
96	18	97.5	89.4	8.4[b]	68.8

[a]Based on off-feed weight and 48-hr. chilled carcass weight.

[b]Means within this column bearing the same superscript do not differ significantly. All others differs significantly ($P < .01$).

TABLE 2. OFFAL DATA[a] FROM HOGS SLAUGHTERED AFTER DIFFERENT FASTING PERIODS

Fasting Period	Liver	Viscera	G.I. tract		Stomach		Small intestine		Large intestine	
			Full	Empty	Full	Empty	Full	Empty	Full	Empty
hr	%	%	%	%	%	%	%	%	%	%
0	1.56[b]	14.8	11.4	4.97	3.09	0.68[b]	2.81	1.32[b]	3.93[b]	1.48[b]
24	1.48[b]	11.3	7.9	4.63	1.14[b]	0.66[b]	1.78[b]	1.14[b]	3.55[b]	1.48[b]
48	1.30[c]	9.5[b]	6.4[b]	4.17[b]	0.83[b]	0.66[b]	1.46[bc]	1.04[c]	2.40[c]	1.27[c]
72	1.28[cd]	9.0[b]	5.6[b]	4.22[b]	0.74[b]	0.63[b]	1.27[cd]	0.91[cd]	2.18[cd]	1.29[c]
96	1.15[d]	8.7[b]	5.4[b]	4.07[b]	0.69[b]	0.61[b]	1.17[d]	0.82[d]	1.87[c]	1.22[c]

[a]Expressed as percent of off-feed weight.

[bcd]Means within a column bearing the same superscript do not differ significantly. All others differ significantly ($P < .01$).

TABLE III.

EFFECTS OF ANTE-MORTEM STRESS, FEEDING AND DELAYED SLAUGHTER PERIODS ON CERTAIN YIELD AND QUALITY CHARACTERISTICS OF PORK CARCASSES

Least Squares Means for Short Haul Hogs

Variable	Overall mean	Stress effects		Feed effects		Slaughter Periods			
		Stress	No stress	Feed	No feed	0	24	48	96
Dressing percent[a]	68.6	67.8	69.4$^{\vee\vee}$	69.0	68.2	69.4^{c}	68.6^{d}	68.4^{d}	68.1^{d}
Liver wt., gm.	1288.3	1267.4	1309.2	1326.0	1250.6	1444.8^{c}	1286.4^{cd}	1211.0^{d}	1210.0^{d}
G.I. tract wt., kg.	7.8	7.6	8.1	8.5	7.2$^{\vee}$	9.3^{c}	7.9^{cd}	6.5^{d}	7.6^{cd}
Full stomach wt., kg	1.5	1.4	1.7	1.8	1.3	2.2	1.4	1.1	1.5
Backfat thickness, mm.	32.9	32.5	33.3	33.3	32.5	32.2	33.6^{d}	31.9^{d}	33.9^{d}
Ham score[b]	3.2	3.5	2.9$^{\vee}$	3.2	3.2	2.5^{c}	3.3^{d}	3.3^{d}	3.7^{d}
Loin score[b]	3.2	3.4	3.0	3.2	3.2	2.9	3.2	3.2	3.5
Ham percent[a]	15.2	15.0	15.4	15.0	15.4	15.7	15.0	15.4	14.8
Loin percent[a]	11.4	11.5	11.3	11.4	11.4	11.4	11.6	11.5	11.1
Shoulder percent[a]	12.7	12.6	12.8	12.7	12.7	12.9	12.7	12.8	12.3
Belly percent[a]	7.9	7.7	8.1$^{\vee}$	8.0	7.8	7.8	7.8	7.9	8.1
Fat trim, %[a]	9.6	9.2	10.0	10.0	9.2	8.8	10.0^{cd}	9.3^{cd}	10.3^{d}
Shear value, kg.	7.6	7.8	7.4	7.3	7.9	6.9^{c}	7.4^{cd}	7.8^{cd}	8.3^{d}
Cooking loss, %	21.9	21.1	22.7$^{\vee}$	21.9	21.9	23.2^{c}	22.6^{c}	20.9^{d}	20.9^{d}
P.major pH, 0hr. chilling	5.99	6.02	5.96	6.02	5.96$^{\vee\vee}$	5.39^{c}	5.99^{d}	5.98^{d}	6.09^{e}
P.major pH, 48 hr. chilling	6.10	6.25	5.95$^{\vee}$	6.13	6.07	5.94	6.20	6.15	6.10
Blood urea, mg./100 ml.	7.6	7.8	7.4	7.6	7.6	7.0	7.0^{c}	7.5^{c}	8.9^{d}
Blood albumin, gm/100 ml.	3.6	3.6	3.6	4.0	3.2$^{\vee\vee}$	3.8	3.6	3.5	3.4

[a] Expressed as a percent of off-feed weight.

[b] Based on Wisconsin scoring system of 1 through 5: 1=Pale, soft, exudative pork.

[cde] Slaughter period means with different superscripts are significantly different ($P < .05$). Means with the same or no superscripts are not significantly different.

$^{\vee}$($P < .05$) Within stress and feed effects.

$^{\vee\vee}$($P < .01$) Within stress and feed effects.

TABLE IV.

EFFECTS OF ANTE-MORTEM STRESS, FEEDING AND DELAYED SLAUGHTER PERIODS ON CERTAIN YIELD AND QUALITY CHARACTERISTICS OF PORK CARCASSES

Least Squares Meanes for Long Haul Hogs

Variable	Overall Mean	Stress Effects		Feed Effects		Slaughter Periods		
		Stress	No Stress	Feed	No Feed	24	48	96
Dressing percent[a]	69.1	69.1	69.1	70.0	68.2	70.5	68.6	68.2
Liver wt., gm.	1377.5	1334.7	1420.3	1423.4	1331.6	1470.3	1398.5	1263.7
G.I. tract wt., kg.	7.7	7.6	7.8	8.2	7.2	8.2	7.6	7.4
Full stomach wt., kg.	1.5	1.4	1.5*	1.8	1.1	1.5	1.6	1.2
Backfat thickness, mm.	36.2	35.6	36.8	35.5	36.9	35.5	37.6	35.6
Ham score[b]	3.1	3.2	3.0	3.2	3.0	3.3	3.1	2.9
Loin score[b]	3.0	3.1	2.9	2.9	3.1	3.2	2.9	2.9
Ham percent[a]	13.6	13.9	13.3	14.0	13.2*	13.7	13.5	13.6
Loin percent[a]	10.9	10.8	11.0	11.3	10.5*	11.2	11.0	10.5
Shoulder percent[a]	12.4	12.6	12.2	12.6	12.2	12.7	12.3	12.2
Belly percent[a]	8.8	8.7	8.9	8.8	8.8	8.8	8.8	8.8
Fat trim, %a	12.1	11.8	12.4	11.9	12.3	12.1	12.1	12.1
Shear value, kg.	7.3	7.0	7.5	7.2	7.4	6.5[c]	7.8[d]	7.6[d]
Cooking loss, %	22.8	22.5	23.1	23.7	21.9*	23.2	21.9	23.3
P. major pH, 0 hr.	5.9	5.9	5.9	5.9	5.9	5.9	6.1	5.7
P. major pH, 48 hr.	5.7	5.9	5.9	5.9	5.9	5.8	5.8	6.0
Blood urea, mg/100 ml.	7.1	7.1	7.1	7.2	7.0	6.8	7.2	7.3
Blood albumin, gm./100 ml.	3.3	3.2	3.4	3.6	3.0**	3.3	3.3	3.2

* ($P < .05$) Within stress and feed effects.
** ($P < .01$) Within stress and feed effects.
[a]Expressed as percent of off-feed weight. [b]Based on Wisconsin scoring system of 1 through 5:1=Pale, soft, exudative pork. [cd]Slaughter period means with different superscript are significantly different ($P < .05$). Means with the same superscript or no superscript are not significantly different.

1967 SLAUGHTER AND CARCASS DATA FROM ANTE MORTEM FASTING HOGS
Tennessee Agricultural Experiment Station, Knoxville, Tennessee

Traits	Lot 12	Lot 32	Lot 48	Lot 72
Number of pigs	21	20	20	21
Buying wt., lb.	5045	4635	4470	5265
Kill wt., lb.	4975	4490	4285	4800
Ante mortem shrinkage, lb.	70	145	185	465
Hot carcass wt., lb.	3726	3422	3266	3730
Chilled carcass wt., lb.	3633	3366	3184	3637
Hot carcass wt./buying wt.	73.9	73.8	73.1	70.8
Chilled carcass wt./buying wt.	72.0	72.6	71.2	69.1
Backfat thickness, in.	1.63	1.54	1.61	1.54
Carcass length, in.	30.7	30.2	30.3	31.1
[a]Ham %	13.9	14.8	15.1	14.7
[a]Loin %	11.5	12.3	12.6	11.7
[a]Picnic %	6.0	5.9	5.7	5.8
[a]B. Butt %	5.2	5.0	5.0	5.0
[a]Belly %	11.1	10.1	10.0	10.6
[a]Lean cut %	36.6	38.0	38.5	37.2
[a]Prime cut %	47.7	48.1	48.5	47.8
[b]Ham quality score	2.9	2.8	3.0	2.8
Ham smokehouse gain %	3.6	4.7	4.6	1.4
Belly smokehouse gain %	3.6	.4	3.1	2.9
[a]Smoked ham %	14.0	15.0	15.3	14.2
% pump	14.6	15.0	15.0	12.8

[a]Based on buying wt.

[b]Based on Wisconsin system.