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Effects of Pre-slaughter Feeding Regimen on Beef Carcass Characteristics

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INTRODUCTION

The loss in live weight and individual body components of meat animals during pre-slaughter handling and slaughter are of economic importance to the meat industry. Traditionally, cattle have been allowed access to feed while being held by the packer until the time of slaughter with the idea that this feed will help avoid a loss in dressing percentage. Recently, this tradition has been questioned. The packing industry has become interested in the effects of pre-slaughter fasting on dressing percentage and other carcass characteristics. Pre-slaughter fasting is attractive to the packer because of the potential savings in cost of feed.

The rumen contents have always been a problem to the packer and disposal is an added expense. Pre-slaughter fasting offers a potential savings in the disposal of rumen material because less solid rumen material remains at slaughter.

Large feedlot operators who sell directly to packing plants could benefit from practicing pre-slaughter fasting in their own feedlots. By discontinuing feeding a few days before slaughter, savings could be made in feed costs.

The objectives of this study were: (1) to determine the effect of pre-slaughter fasting on dressing percent; (2) to observe the effects of pre-slaughter fasting on rumen contents; and (3) to determine if liver weight and liver glycogen were affected by pre-slaughter fasting.

REVIEW OF LITERATURE

Little information is available in the literature on the effects of pre-slaughter fasting of beef cattle. In a study in which cattle were fed reduced diets for as long as 7 months pre-slaughter, Yeates (1964) found that various portions of the carcass were affected by starvation to differing degrees ranging from a minimum effect in the leg (20 percent loss in weight) to a maximum effect in the kidney fat (84 percent loss in weight). Starvation also caused a reduction of muscle fiber diameter, but there appeared to be no evidence of change in connective tissue due to starvation.

Wilcox *et al.* (1953) reported feeding only sucrose to cattle for periods of 6 hours, 30 hours, and 3 days prior to slaughter. Feeding 2 to 12 pounds of sucrose for 6 hours did not affect the dressing percentage, whereas, feeding 6 pounds of sucrose for 30 hours before slaughter increased dressing percentage, and feeding 12 pounds for 30 hours decreased dressing percentage. The liver weights of cattle fed sucrose for 30 hours increased significantly. Feeding sucrose for 3 days increased dressing percentage and liver weights significantly.

Fasting Sheep

There has been more work reported on fasting of sheep than of cattle or swine. In a study with wethers that had been fasted 4½ days, Blaxter (1962) found that sheep still produced methane which showed that fermentation of food still occurred. Blaxter also found that sheep greatly reduced their water intake during fasting.

There is little information available on the components of body weight loss when animals are starved. Meyer *et al.* (1955) found that there was a difference in fluid loss for different rations. Sheep fed a high salt ration before fasting lost a large part of their body weight as extra-cellular fluid. Sheep that were fed a lower salt ration before fasting appeared to lose body weight primarily through loss of intracellular fluid. These investigators concluded that a real weight loss occurred.

Callaghan and Thompson (1940) divided 170 lambs averaging about 63 pounds into six treatment groups ranging from zero hours off feed to 96 hours off feed. The results showed that the greatest live weight loss occurred during the first 24 hours, with the weight loss being 4.31 pounds. Lambs which were fasted for 96 hours lost an average of 7.08 pounds. The hot carcass yields decreased as the length of the fast increased. These investigators observed no significant differences in bloom and condition of carcasses attributable to treatment.

Kirton *et al.*(1967) in an experiment with 100 ram lambs, 50 of which were fasted for 16 hours prior to slaughter and 50 of which were fasted for 75 hours before slaughter, reported that the groups lost an average of 1.4 pounds and 6.7 pounds per lamb, respectively.

In a study with four groups of 20 lambs held off feed for 8, 32, 56, and 77 hours, respectively, Shier (1939) observed that the average loss in live weight ranged from 2.75 pounds to 9.1 pounds. There appeared to be no difference in grade, color, or bloom of the carcasses due to fasting.

Fasting Swine

In a study with 348 Yorkshire pigs divided into four groups which were held without feed but given water for 0, 1, 2, and 3 days before slaughter, Ingram *et al.* (1967) reported that hot carcass weights decreased progressively ($P < .01$) with each day of fasting. The results showed that the largest weight loss was during the first day of fasting.

Stout and Armstrong (1960), in a study with 6,600 hogs shipped various distances, concluded that there was no advantage in feeding hogs intended for immediate slaughter. In fact they found the immediate effect of feeding was to lower dressing percent. Dealers who sell hogs that gain weight during feeding at the stockyards do not sell additional meat; they apparently sell an increased amount of feed and water.

Saffle and Cole (1960) found that dressing percentage decreased with time off feed from zero to 96 hours, but the decrease was not significant.

When Bowland and Standish (1960) withheld feed from swine for 24 hours, they found there was a live weight shrink of 5.7 percent and a 2.1 percent carcass weight shrink. Withholding feed for 48 hours resulted in 7.9 percent live weight shrink and 3.1 percent carcass weight shrink.

According to Callow (1938), the loss in weight of tissues caused by fasting pigs for 2 days was due to an abnormal loss of water from the muscular tissue.

Davidson *et al.* (1968) found that swine fasted for 70 hours weighed significantly less at slaughter than swine fed to time of slaughter.

Cole and Miller (1968) reported that fasting pigs for 0, 24, 48, and 72 hours resulted in significant dressing percentage differences among treatments; however, small differences in live weight and fat thickness among lots probably accounted for as much of the variation in dressing percentage as treatment effects. From this study it was concluded that feeding market pigs 48 hours before slaughter is probably a waste of feed and labor.

Changes in the Digestive Tract During Fasting

Sheep. Kirton *et al.* (1967) used two groups of ram lambs, one fasted for 16 hours prior to slaughter and the other group fasted for 75 hours. There was no difference in the rumen contents between the two groups. However, the lambs fasted for 75 hours had significantly lower rumen weights.

After a 14 hour fast, the rumen contents of 80 lambs in a study conducted by Kirton *et al.* (1965) weighed 7 pounds. The rumen contents of 80 lambs after a 74 hour fast weighed 3.3 pounds.

There was a decline in the contents of the digestive tracts from 6.63 pounds to 3.16 pounds between zero and 96 hours off feed in experiments with 170 lambs by Callaghan and Thompson (1940). They concluded that the loss of digestive tract contents was probably reduced by the fact that water was available. Their work also showed that the tract itself showed a loss in weight with time off feed.

Swine. Saffle and Cole (1960) reported significantly lower weights of full gastrointestinal tract, full stomach, full small intestines, and full large intestines for 84 hogs as the length of fasting increased.

Davidson *et al.* (1968) found that about 34 percent of the difference in average live weight at slaughter was due to the difference in the fill of the gastrointestinal tract. Another 6 percent of the difference in slaughter weight resulted from the difference in the weight of the empty digestive tract.

Changes in the Liver During Fasting

Little information is available in the literature on the effects of fasting on the liver glycogen of farm animals. According to White *et al.* (1964) liver glycogen is a relatively labile store of chemical energy. If an animal is fasted for 24 hours or longer, the liver is virtually depleted of glycogen. In the normal animal with access to food, the quantity of glycogen in the liver remains relatively constant, being continuously formed and degraded.

Sheep. Callaghan and Thompson (1940) in an experiment with 170 sheep reported that livers became progressively paler in color as the length of the fasting period increased. One function of the liver is storage of glycogen and it was expected that the liver would be one of the first organs to show a decline in glycogen as a result of a fast. They found a definite decline in liver weights and the greatest decline occurred in the first 24 hours. However, it was not determined whether or not the decline in weight was due to decline in glycogen content.

Swine. Saffle and Cole (1960) found that the liver was the only organ of economic significance which was significantly affected by fasting of hogs. The percentage of liver gradually decreased with fasting, probably due to glycogen depletion.

Davidson *et al.* (1968) found that livers from non-fasted swine averaged 352 grams more ($P < .01$) than those from fasted swine.

In a study with pigs which were transported various distances and then either rested 16 hours with feed or rested various periods with no feed, Hall *et al.* (1961) found that liver glycogen of the pigs which were fed was significantly higher than that of the pigs which were fasted.

Effects of Fast on the pH of Muscle

Cattle. According to Lawrie (1966), steers can be fasted for up to 28 days without affecting ultimate muscle pH, although the muscle glycogen reserves declined a little after 7 days. Even if followed by heavy pre-slaughter exercise, fasting normally had no effect on the glycogen reserves of steers.

Howard and Lawrie (1956) showed that neither fasting nor exercise alone depleted muscle glycogen reserves enough to raise the ultimate pH of the muscles above the normal values in two steers fasted for 7 days. These studies agree with White *et al.* (1964) who reported that in contrast to liver glycogen, muscle glycogen is not readily depleted by fasting, even for long periods.

Swine. In contrast to the work done with cattle, Callow (1938) observed that the average ultimate pH of muscles of fasted pigs was higher than that of normal pigs. This indicated that fasted pigs were more fatigued when they were slaughtered. Callow also postulated that fasting may lower an animal's resistance to muscular fatigue.

According to Henning and Stout (1932) glycogen levels were reduced and ultimate pH of muscle was higher when hogs were fatigued or fasted. In contrast Cole and Backus (1967) reported that fasting hogs from zero to 96 hours produced significantly lower ultimate muscle pH. However, Saffle and Cole (1960) found that the ultimate pH of muscle was not significantly affected by fasting for zero to 96 hours.

METHODS

One hundred and twenty-two heifers and 158 steers and their subsequent carcasses were used in this study. Forty-one of the heifers and 51 of the steers were obtained by a local packer from the St. Joseph stockyards, St. Joseph, Mo. The remaining 81 heifers and 107 steers were obtained by a packer from two feedlots in Sterling, Colo.

In Experiment I, the 51 steers were divided into 8 lots of 5 each and one lot of 11. In Experiment II, the 41 heifers were divided into 8 lots of 4 each, and one lot of 9. Cattle of each lot were weighed after they were purchased at the yards; they were weighed again just before slaughter. The lots of 11 steers and 9 heifers were slaughtered immediately and were considered off feed for zero days. The rest of the cattle were kept at the stockyards until they were to be slaughtered. In both experiments, half of the lots had access to feed and the other half had no feed. All of the cattle had access to water. Each day, one lot of steers and one lot of heifers on feed and one lot of each that were off feed were slaughtered. The last 4 lots had been held for 4 days. Each carcass was weighed hot and then after a 24 hour chill. The carcasses were ribbed in the conventional manner and a marbling score and a grade were given to each carcass. Then a one-fourth inch rib-eye sample was taken from the 12th rib area and frozen for subsequent pH determination. The full rumen was weighed, then the liquid and solid contents were weighed and the weight of the rumen was determined by difference. Liver weights were obtained. In Experiment I, the rib samples were chopped finely and a small portion was placed in a 10 ml. beaker with distilled water. A Leeds and Northrup pH meter was used to make the determinations.

In Experiment III, 81 heifers were allotted to 3 lots of 15 each, 4 lots of 12 each, and one lot of 14. In Experiment IV, 107 steers were allotted to 3 lots of 15 each, 4 lots of 12 each, and one lot of 14. At the beginning of the test, each animal was ear tagged and weighed individually. All of the cattle were kept at the feed lots until they were to be slaughtered. In both Experiments III and IV, half of the lots had access to feed and the other half had no feed. All of the cattle had access to water. Each day, one lot of heifers on feed and one lot off feed, as well as one lot of steers on feed and one lot off feed were slaughtered. The last 4 lots had been held for 4 days. A hot weight was obtained for each carcass; after a 24 hour chill, a chilled weight was obtained. The carcasses were ribbed in the conventional manner, the fat thickness at the 12th rib was measured, and a marbling score and grade were given to each carcass.

The rumen contents were taken off a shaker screen after the liquid drained out, so that just the solid contents were weighed. Liver weights were obtained and liver samples were frozen for glycogen analysis. A combination of the Hawk *et al.* (1954) procedure for glycogen extraction and the determination procedure of Loewus (1952) was used for the glycogen analysis.

The data were treated by analysis of variance as outlined by Snedecor and Cochran (1967).

RESULTS AND DISCUSSION

Experiment I

Selected slaughter and carcass characteristics of animals in Experiment 1 are presented in Table 1. All lots of cattle weighed approximately the same at the time of purchase. The animals in all lots that were fasted weighed less when they were slaughtered than when purchased. The fed cattle gained in weight from purchase to slaughter, with the exception of the lot fed for two days which lost one pound. The dressing percentages could not be analyzed statistically because the purchase or initial weight was on a lot basis rather than individual weights. Dressing percent was obtained by dividing the chilled carcass weight by the initial weight x 100. The data show that the fasted lots had a higher dressing percent than the fed lots in every case except the first day. The dressing percent of the fasted animals increased every day except the fourth day of fasting. Dressing percentage of the animals in the fasted lots would have been higher if the dressing percentage had been based on slaughter weights.

Significant ($P<.05$) differences in rumen contents (liquid and solid material) existed due to treatment (fasting) x days interaction. For the first two days there was no significant difference between the mean rumen contents of the fed and fasted lots (Table 1). For the third and fourth days, the mean rumen contents of the fed lots were significantly greater ($P<.05$) than those of the fasted lots. The mean rumen content of the fed lots, with the exception of lot 4, were not significantly different from that of the control lot. However, the mean rumen content of all the fasted lots was significantly less ($P<.05$) than that of the control lot. There is no apparent reason why the rumen contents of the cattle in lot 5 (fasted) were higher than those of lot 4 (fed), which resulted in a significant ($P<.05$) treatment x days interaction. After the first day of the experiment the rumen contents of the fasted lots contained considerably more liquid than the rumen contents of the fed lots. The uniformity of the total rumen contents of the fasted animals for the last 3 days apparently was due to uniform water consumption.

There was a significant ($P<.05$) difference among liver weights due to treatment effects. The liver weights of all the lots except 2 (fed) and 3 (fasted) were significantly less ($P<.05$) than those of the control lot. For each of the

TABLE 1

COMPARISON OF SELECTED SLAUGHTER AND CARCASS CHARACTERISTICS OF FED AND FASTED STEERS, EXPERIMENT 1

Item	Lot								
	1	2	3	4	5	6	7	8	9
Days fed	Control[a]	1	---	2	---	3	---	4	---
Days fasted	---	---	1	---	2	---	3	---	4
Number of animals	11	5	5	5	5	5	5	5	5
Initial weight, lbs.	1211	1209	1252	1225	1188	1225	1208	1184	1184
Slaughter weight, lbs.	1211	1226	1239	1224	1166	1236	1189	1196	1154
Hot carcass weight, lbs.	786	781	802	782	765	792	803	756	754
Chilled carcass weight, lbs.	773	768	789	768	751	779	790	743	742
Dressing percentage	63.83	63.59	63.05	62.69	63.23	63.62	65.40	62.69	62.80
Rumen contents, lbs.	72.0^{b}	69.6^{bc}	58.7^{cd}	42.6^{e}	46.4^{de}	63.7^{bc}	48.0^{de}	72.9^{b}	41.3^{e}
Liver weight, lbs.	13.35^{b}	13.0^{bcd}	12.9^{bd}	12.0^{de}	11.1^{fe}	11.6^{cdf}	10.9^{f}	10.8^{f}	10.2^{f}
Liver weight as a percentage of hot weight	1.72^{a}	1.70^{a}	1.62^{a}	1.54^{ab}	1.46^{bc}	1.46^{bc}	1.38^{b}	1.36^{b}	1.44^{bc}
Grade[h]	14.27^{b}	14.40^{b}	14.00^{b}	13.40^{b}	12.80^{b}	13.20^{b}	14.20^{b}	13.60^{b}	14.40^{b}
pH longissimus dorsi	5.38^{b}	5.40^{b}	5.38^{b}	5.40^{b}	5.39^{b}	5.38^{b}	5.34^{b}	5.40^{b}	5.39^{b}

[a]Control lot was slaughtered at the beginning of the experiment.

[b,c,d,e,f,g]Means on the same line bearing a common superscript do not differ significantly ($P < .05$).

[h]Carcass grade of 15 = Prime-, 14 = Choice+, 13 = Choice average, etc.

four days, the mean liver weights of the fed lots were slightly higher than those of the fasted lots, but these weights were not significantly different.

Significant differences among liver weights as percentages of hot weights existed due to treatment effects. Liver weights as a percentage of the hot weights of all the lots, except 2 (fed), 3 (fasted), and 4 (fed) were significantly less ($P<.05$) than the liver weights of the control lot. For each of the first three days, the mean percentages of the fed lots were slightly higher than those of the fasted lots, but the fed and fasted lots were not significantly different. On the fourth day, the fasted lot was slightly but still not significantly higher.

Fasting appeared to have no apparent effect on carcass grade. The mean pH values of the *longissimus dorsi* muscle are approximately the same for all lots (Table 1), indicating that fasting had no effect on muscle pH. This is in agreement with the work of Howard and Lawrie (1956).

Experiment II

Selected slaughter and carcass characteristics of animals in Experiment II are presented in Table 2. The initial weights of all the lots of cattle were approximately the same. In every case, animals that were fasted weighed less when they were slaughtered than when purchased. The animals in the fed lots gained weight from purchase to slaughter. The dressing percentages in this experiment could not be analyzed statistically because the purchase was on a lot basis rather than individual weights. For the first two days the fasted lots had a higher dressing percent than the fed lots. But, on the third and fourth days the fed lots showed a higher dressing percent than the fasted lots. The dressing percent of the fasted lots decreased each successive day for all four days. After the first day of fasting, the fasted lots exhibited lower dressing percents than the control lot.

Rumen contents (liquid and solid material) showed a significant ($P<.05$) difference due to treatment. On the first and third days there was no significant difference between the mean rumen contents of the fed and fasted lots. However, the means for the fed lots were significantly greater ($P<.05$) than those for the fasted lots on the second and fourth days. The mean rumen content of the fed lots were not significantly different from that of the control lot (Table 2). The means of rumen contents of fasted lots 3 and 7 were not significantly different from the mean of the control lot, but the means of the other two fasted lots were significantly less ($P<.05$). As was observed in Experiment I, after the first day of fasting, the rumen contents of the fasted lots contained considerably more liquid than the rumen contents of the fed lots.

There was no significant ($P<.05$) difference among liver weights due to effects of treatment. On days one and four the mean weights of the livers of the fasted lots were actually greater than the means of the fed lots. However, for the second and third days the means of the fed lots were greater than those of the fasted lots.

TABLE 2

COMPARISON OF SELECTED SLAUGHTER AND CARCASS CHARACTERISTICS OF FED AND FASTED HEIFERS, EXPERIMENT 2

Item	Lot								
	1	2	3	4	5	6	7	8	9
Days fed	Control[a]	1	---	2	---	3	---	4	---
Days fasted	---	---	1	---	2	---	3	---	4
Number of animals	9	4	4	4	4	4	4	4	4
Initial weight, lbs.	903	958	945	925	885	915	897	933	940
Slaughter weight, lbs.	903	967.5	934	927.5	866	921	872.5	950	917.5
Hot carcass weight, lbs.	582	609.5	611	585	562	587	566	612	585
Chilled carcass weight, lbs.	572	598	600	574	551.5	577	555.5	601	573.5
Dressing percentage	63.30	62.40	63.52	62.03	62.32	63.03	61.89	64.34	61.01
Rumen contents, lbs.	43.77[bc]	42.62[bc]	39.50[bc]	46.87[b]	28.66[d]	43.50[bc]	34.62[cd]	41.50[bc]	28.75[d]
Liver weight, lbs.	10.55[b]	9.87[b]	10.25[b]	9.93[b]	9.50[b]	9.68[b]	8.56[b]	9.00[b]	9.12[b]
Liver weight as a percentage of hot weight	1.81[b]	1.65[b]	1.70[b]	1.70[b]	1.70[b]	1.63[b]	1.53[b]	1.47[b]	1.55[b]
Grade[e]	12.44[b]	12.75[b]	12.75[b]	13.25[b]	12.00[b]	12.25[b]	12.25[b]	12.25[b]	13.00[b]

[a]Control lot was slaughtered at the beginning of the experiment.

[b,c,d]Means on the same line bearing a common superscript do not differ significantly ($P < .05$).

[e]Carcass grade of 15 = Prime-, 14 = Choice+, 13 = Choice average, etc.

No significant ($P<.05$) differences existed among liver weights as percentages of hot weights due to treatment effects. On the first and fourth days the mean percentages of the fasted lots were slightly higher than the means of the fed lots. For the second day the percentages were the same and for the third day the mean of the fed lot was slightly greater than the mean of the fasted lot.

Fasting apparently had no effect on carcass grade.

Experiment III

Selected slaughter and carcass characteristics of animals in Experiment III are presented in Table 3. All of the cattle weighed approximately the same at the time of purchase.

There was no significant ($P<.05$) difference in dressing percent attributable to treatment. The mean dressing percents of the fasted lots were slightly higher than the means of the fed lots for the first two days. However, for the third and fourth days the fed lots had higher dressing percents than the fasted lots.

The mean rumen contents of the fed lots were significantly greater ($P.<.05$) than the means of the fasted lots. Table 3 illustrates that there was no significant difference between means of fed lots, and there was no significant difference between means of the fasted lots.

After the first day the mean liver weights of the fed lots were significantly greater ($P<.05$) than means of the fasted lots (Table 3). On the first day the fed and fasted lots were not significantly different.

After the first day the mean liver weights of the fed lots were significantly ($P<.05$) different from the means of the fasted lots. On the first day the means of the fed and fasted lots were not significantly different. The means of the fed lots for all four days were not significantly different. The means of the fasted lots declined on each successive day.

There were significant ($P<.05$) differences in liver glycogen due to the effects of treatment x days interaction. In every instance, the mean liver glycogen of the fed lots was significantly greater ($P<.05$) than the mean of the fasted lots. However, the fed lots were similar for all days of the experiment.

After the first day, the fasted lots were not significantly different. However, the data show a trend for liver glycogen of the fasted lots to decrease as time off feed increased. There was considerable animal to animal variation observed in liver for both the fed and fasted lots.

Grade was significantly ($P<.05$) different due to treatment. The mean grades of fed and fasted lots on days two and three were not significantly different; however, on the first day the fed lot graded significantly higher than the fasted lot.

Experiment IV

Selected slaughter and carcass characteristics of animals in Experiment IV are presented in Table 4. The initial weights of all the lots of cattle were ap-

TABLE 3

COMPARISON OF SELECTED SLAUGHTER AND CARCASS CHARACTERISTICS OF FED AND FASTED HEIFERS, EXPERIMENT 3

Item	Lot 1	2	3	4	5	6	7	8
Days fed	1	---	2	---	3	---	4	---
Days fasted	---	1	---	2	---	3	---	4
Number of animals	10	10	10	10	10	10	10	11
Initial weight, lbs.	1004	978.5	945.5	978	967.5	968.5	973.5	999
Hot carcass weight, lbs.	624	611	589	615	605	598	620	620
Dressing percentage	62.17^{a}	62.49^{a}	62.32^{a}	62.94^{a}	62.55^{a}	61.75^{a}	63.71^{a}	62.09^{a}
Rumen contents (solid material), lbs.	---	---	20.8^{a}	7.7^{b}	21.2^{a}	7.1^{b}	19.0^{a}	7.0^{b}
Liver weight, lbs.	13.8^{abc}	12.9^{a}	14.0^{abc}	11.6^{d}	14.5^{bc}	10.1^{e}	13.73^{b}	11.05^{de}
Liver weight as a percentage of hot weight	2.20^{ab}	2.09^{b}	2.34^{a}	1.88^{c}	2.37^{a}	1.73^{cd}	2.22^{ab}	1.62^{d}
Liver glycogen, mg/gram	64.88^{a}	44.97^{b}	69.66^{a}	14.21^{c}	77.80^{a}	5.98^{c}	80.38^{a}	5.64^{c}
Grade[f]	13.7^{a}	12.1^{bc}	12.9^{ac}	13.00^{ac}	13.80^{a}	12.90^{ac}	---	---

[a,b,c,d,e] Means on the same line bearing a common superscript do not differ significantly (P<.05).

[f] Carcass grade of 15 = Prime-, 14 = Choice+, 13 = Choice average, etc.

proximately the same. No significant ($P < .05$) differences in dressing percent existed for effects of treatment. However, the mean dressing percents of the fed lots were slightly higher than those of the fasted lots for every day except the first day.

Significant ($P < .05$) effects in rumen contents (Solid Material) existed for treatment x days. On the second day, the mean rumen contents of the fed and fasted lots were not significantly different, but on the last two days the fed lots had significantly greater ($P < .05$) contents.

With the exception of the second day, the mean liver weights of all the fed lots were significantly greater ($P < .05$) than the means of the fasted lots. There was no significant difference between the lots on the second day (Table 4). The mean liver weights of the fed lots were not significantly different. The liver weights of the fasted lots of the first two days were not significantly different, and the fasted lots of the last two days were not significantly different. However, the mean liver weights of the fasted lots of the first two days were significantly greater ($P < .05$) than those of the last two days.

The mean liver weights as percentages of hot weights of all the fed lots were significantly greater ($P < .05$) than the means of the fasted lots, with the exception of the second day. The mean percentages of the fed lots were not significantly different after the first day. The mean percentages of the fasted lots declined until the last day.

Significant ($P < .05$) differences in liver glycogen existed due to the effects of treatment x days. Liver glycogen of all the lots was significantly different. The mean liver glycogen of the fasted lots was significantly less ($P < .05$) than the mean liver glycogen of the fed lots. The amount of glycogen in the fasted lots declined until the fourth day when the glycogen increased. Apparently the cattle had become accustomed to the fast by that time.

Fasting apparently had no effect on carcass grade.

TABLE 4

COMPARISON OF SELECTED SLAUGHTER AND CARCASS CHARACTERISTICS
OF FED AND FASTED STEERS, EXPERIMENT 4

	Lot							
Item	1	2	3	4	5	6	7	8
Days fed	1	---	2	---	3	---	4	---
Days fasted	---	1	---	2	---	3	---	4
Number of animals	15	12	15	12	14	12	15	12
Initial weight, lbs.	1193	1138	1205	1211	1192	1120	1207	1135
Hot carcass weight, lbs.	738	707	760	755	742	688	807	696
Dressing percentage	61.88^{a}	62.09^{a}	63.10^{a}	62.37^{a}	62.26^{a}	61.46^{a}	62.71^{a}	61.38^{a}
Rumen contents (solid material), lbs.	---	---	14.7^{a}	14.6^{a}	16.3^{a}	6.0^{b}	22.4^{c}	8.9^{b}
Liver weight, lbs.	15.3^{a}	13.4^{bc}	14.3^{ac}	13.4^{bc}	14.0^{ac}	10.9^{d}	15.3^{a}	11.6^{d}
Liver weight as a percentage of hot weight	2.07^{a}	1.88^{bc}	1.88^{bc}	1.73^{cd}	1.90^{b}	1.63^{d}	2.00^{ab}	1.64^{d}
Liver glycogen, mg/gram	40.76^{a}	22.83^{b}	36.23^{c}	10.60^{d}	44.60^{e}	6.24^{f}	58.59^{g}	14.39^{h}
Grade[i]	12.26^{a}	12.17^{a}	12.33^{a}	12.92^{a}	12.42^{a}	13.08^{a}	---	---

[a,b,c,d,e,f,g,h] Means on the same line bearing a common superscript do not differ significantly ($P<.05$).

[i] Carcass grade of 15 = Prime-, 14 = Choice+, 13 = Choice average, etc.

SUMMARY

In all, 280 cattle, 122 heifers, and 158 steers were used in 4 experiments to determine what effect preslaughter fasting had on dressing percent, rumen contents, liver weight, and liver glycogen. In all 4 experiments half of the lots had access to feed and the other half were fasted. All of the lots had access to water. Each day one lot of cattle on feed and one fasted lot were slaughtered, so that the last lots had been held for 4 days.

For the first 2 days, most of the fasted lots had a higher dressing percent than the fed lots. Dressing percentage was based on live weight at the beginning of the experiment. In 6 of 8 comparisons the fed lots dressed higher than the fasted lots on the last 2 days. It must be pointed out that there was no significant ($P<.05$) difference in dressing percent due to the effects of treatment or days in Experiments III and IV. Dressing percent was not analyzed statistically in Experiments I and II.

Rumen contents were significantly ($P<.05$) affected by treatment in Experiments II and III, and by treatment x days interaction in Experiments I and IV. For 9 of 12 comparisons of rumen contents, the fed lots had significantly higher rumen content than the fasted lots after the first day of each experiment.

Liver weights were significantly ($P<.05$) affected by treatment or treatment x days interaction in every experiment except Experiment II. In most cases, after the first day the mean liver weights of the fed lots were significantly greater than the means of the fasted lots. In 3 out of 4 comparisons the mean liver weights of the fed and fasted lots for the first day were not significantly different.

Liver weights as percentages of hot weights were significantly ($P<.05$) affected by treatment or treatment x days interaction in every experiment except Experiment II. However, for 10 of 16 comparisons, the mean percentages of the fed lots were not significantly different from the means of the fasted lots.

Liver glycogen was significantly ($P<.05$) affected by an interaction of treatment x days. In every case, the mean liver glycogen of the fed lots was significantly greater than that of the fasted lots. Liver glycogen tended to decrease with time off feed.

Fasting apparently had no effect on carcass grade except in Experiment III. On the first day of Experiment III, the fed lot graded significantly higher than the fasted lot. Fasting apparently had no effect on the pH of the *longissimus dorsi* muscle.

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