

*Kentucky*  
**ANIMAL  
SCIENCE  
RESEARCH  
REPORTS**

*1963*

UNIVERSITY OF KENTUCKY  
AGRICULTURAL EXPERIMENT STATION

July 1963

Progress Report 131

( Filing Code 2 )

PROGRAM FOR 1963 ANNUAL LIVESTOCK FIELD DAY

LEXINGTON

July 17, 1963

Morning

Chairman -- C. F. Buck

Coldstream Farm -- Conducted tours showing beef, sheep and swine research will start at regular intervals beginning at 9 a.m. (EST). Last tour starts at 10 a.m.

Noon

Lunch

Courtesy of G. W. Gardner, Bluegrass Stockyards, Lexington

PRINCETON

July 19, 1963

Morning

Chairman -- S. J. Lowry

Livestock Farm, West Kentucky Substation. Conducted tours showing beef, sheep and swine research will start at regular intervals beginning at 9 a.m. (CST). Last tour starts at 10 a.m.

Noon

Lunch

Courtesy of Farmers Elevators, Inc. and Field Packing Company, Owensboro

Afternoon

Chairman -- W. P. Garrigus

1:15 Address -- "Kentucky's Livestock Future"

Mr. Burl St. Clair  
Past President, Kentucky  
Farm Bureau  
Falls of Rough



KENTUCKY  
ANIMAL SCIENCE RESEARCH REPORTS  
1963

PROGRESS REPORT 131

(Filing Code 2)

JULY 1963

UNIVERSITY OF KENTUCKY  
AGRICULTURAL EXPERIMENT STATION

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SHEEP SECTION

PERFORMANCE OF EWES ON WILTED AND CORN PRESERVED ALFALFA SILAGE

P. G. Woolfolk, C. M. Reese and D. Turner  
University of Kentucky

Fifty-three blackface western ewes were fed in drylot from December 13 to March 24 in a comparison of alfalfa silage preserved with 150 pounds of corn per ton, wilted alfalfa silage and a control alfalfa hay-shelled corn ration. All lots were fed 0.5 pound of shelled corn daily per ewe during the trial. Ewes in the silage lots were fed 1.0 pound of alfalfa hay daily in addition to all the silage they would consume. Bonemeal, salt and ground limestone was available to all lots. Lambs were creep fed a mixture of 89% cracked yellow corn, 10% soybean meal and 1% Aureomycin Crumbles. All lots were run together when turned to pasture; first on small grain and later on permanent bluegrass pasture.

Results are summarized in Table 1. As in last year's silage trial, ewes were quite heavy with lamb when initial weights were taken; consequently, all lots showed ewe weight losses. Again as in previous work, corn-preserved silage more nearly maintained ewe weights and produced fleeces that averaged 0.6 pound heavier. However, this beneficial effect was not evident in lamb weights. Most rapid lamb gains occurred in the wilted silage lot. The differences were small, and no trend in this direction has occurred in previous work. Either method of silage preservation appears to be satisfactory. The addition of 150 pounds of corn per ton to silage is costly; where wilting is feasible this probably should be the preferred method.

Table 1 - Summary of Results

|                                    | Control<br>Alfalfa<br>Hay | Wilted<br>Alfalfa<br>Silage | Corn-preserved<br>Alfalfa<br>Silage |
|------------------------------------|---------------------------|-----------------------------|-------------------------------------|
| Number of ewes                     | 18                        | 17                          | 18                                  |
| <u>Av ration, lb</u>               |                           |                             |                                     |
| Silage                             | ----                      | 8.94                        | 9.21                                |
| Alfalfa                            | 4.09                      | 1.00                        | 1.00                                |
| Shelled corn                       | .50                       | .50                         | .50                                 |
| <u>Av ewe weights, lb</u>          |                           |                             |                                     |
| Initial, Dec. 13                   | 181.9                     | 179.3                       | 175.3                               |
| Final, Mar. 24                     | 146.5                     | 163.2                       | 164.6                               |
| Weight loss                        | 35.4                      | 16.1                        | 10.7                                |
| Fleece weights                     | 8.8                       | 8.8                         | 9.4                                 |
| Number ewes lambing                | 15                        | 15                          | 18                                  |
| Number lambs raised                | 22                        | 23                          | 26                                  |
| <u>Birth weight of lambs, lb</u>   |                           |                             |                                     |
| Singles                            | 10.4                      | 9.2                         | 9.4                                 |
| Twins                              | 8.0                       | 8.6                         | 8.2                                 |
| <u>28-day weight of lambs, lb</u>  |                           |                             |                                     |
| Singles                            | 29.2                      | 29.0                        | 25.2                                |
| Twins                              | 20.5                      | 23.6                        | 21.8                                |
| <u>56-day weight of lambs, lb</u>  |                           |                             |                                     |
| Singles                            | 47.5                      | 47.4                        | 43.6                                |
| Twins                              | 34.9                      | 38.6                        | 37.1                                |
| <u>100-day weight of lambs, lb</u> |                           |                             |                                     |
| Singles                            | 66.5                      | 73.1                        | 65.2                                |
| Twins                              | 57.9                      | 65.4                        | 59.9                                |



# CREEP FEEDING OF LAMBS ON PASTURE

P. G. Woolfolk, E. G. Holbert and O. D. Hawkins  
University of Kentucky

The second year of a trial designed to determine whether lambs should be continued on creep feed when turned to pasture was completed in 1962. On April 18 a group of 135 suckling spring lambs were allotted according to sire, age and whether single or twin to either of two treatments as follows: Lot 1 - control, no creep on pasture; Lot 2 - creep fed on pasture a ration consisting of 78.5% cracked yellow corn, 20% soybean meal and 1.5% Aureomycin Crumbles. Prior to allotment, all lambs had been running together along with their dams and had been creep-fed the same ration used in the trial. The two groups were rotated on pasture, and management was the same. Lambs were sold as they reached market weight and finish. On July 16 all lambs on hand were weaned and continued on their respective treatments. Ten lambs from Lot 2 and 34 lambs from Lot 1 were turned together on September 24 and finished on the Lot 2 ration. All remaining lambs were sold on October 17, including some from Lot 1 that had not reached optimum market weight.

Results are summarized in Table 1. Two lambs died in Lot 1 and one in Lot 2.

Table 1 - Summary of Results, April 18, 1962, to Marketing

|                                          | Lot 1<br>Control, No Creep<br>on Pasture | Lot 2<br>Creep-Fed<br>on Pasture |
|------------------------------------------|------------------------------------------|----------------------------------|
| Number of lambs on test                  | 67                                       | 68                               |
| Number of lambs marketed                 | 65                                       | 67                               |
| Av number of days on test                | 155                                      | 130                              |
| Av initial weight, lb                    | 46.1                                     | 45.2                             |
| Av market weight, lb                     | 84.3                                     | 92.0                             |
| Av gain per lamb, lb                     | 38.2                                     | 46.8                             |
| Av daily gain, lb                        | 0.25                                     | 0.38                             |
| Av marketing date                        | Sept. 20                                 | Aug. 26                          |
| Av daily feed per lamb, lb <sup>a/</sup> | .05                                      | 1.04                             |
| Av total feed per lamb, lb <sup>a/</sup> | 7.75                                     | 135.2                            |
| Av market price per cwt.                 | \$19.78                                  | \$21.78                          |
| Av market value per lamb                 | \$16.67                                  | \$20.04                          |
| Av feed cost per lamb <sup>b/</sup>      | .22                                      | 3.85                             |
| Returns per lamb over feed               | \$16.45                                  | \$16.19                          |

<sup>a/</sup> All feed after allotment up to market, including that used to finish control lambs remaining after September 24

<sup>b/</sup> Cost of ration, \$2.85 per cwt.

Creep-fed lambs gained 52% faster and were marketed 25 days earlier and 8 pounds heavier on the average than control lambs but returns over feed cost were slightly higher for the control lambs. This is in agreement with last year's work with the same flock. Costs other than creep feed were not considered in this summary. The increase in daily gain due to creep feeding of 0.13 pound per day was not enough to offset the cost of the extra pound of feed consumed daily by the creep-fed group. Although creep feeding on pasture will generally move lambs to an earlier and stronger market, response in rate of gain must be greater than obtained in this trial for the practice to be profitable. In recent years much emphasis has been placed on supplemental grain feeding for finishing spring lambs. This trial reveals the high cost that may be involved in use of grain for lambs on pasture. Since lambs can be finished to top grades on pasture alone, perhaps a more profitable alternative is to strive for high quality and good management of both pastures and lambs.



## CREEP RATIONS FOR LAMBS

C. M. Reese and P. G. Woolfolk  
University of Kentucky

The third year of a lamb creep feeding project was completed in 1962. Five lots of 17 or 18 pregnant blackface-cross western ewes each were assigned to this trial as follows: Lot 1 - control, no creep; Lot 2 - simple creep mixture, 89% cracked yellow corn, 10% soybean meal and 1% Aureomycin Crumbles; Lot 3 - complex creep mixture, 56.5% cracked yellow corn, 30% soybean meal, 5% alfalfa meal, 5% sugar, 1.5% bonemeal, 1% trace-mineralized salt and 1% Aureomycin Crumbles; Lot 4 - shelled corn-linseed meal mixture, 85% shelled yellow corn, 14% linseed meal and 1% Aureomycin Crumbles; Lot 5 - complete pelleted mixture, 55% alfalfa meal, 24% ground oats, 9% ground yellow corn, 5% soybean meal, 5% molasses, 1% trace mineralized salt, 0.5% deflourinated phosphate, 0.5% ground limestone plus 20 grams of Aureomycin included per ton.

Ewes in all lots were fed the same alfalfa hay, alfalfa silage, and shelled corn ration from December 13 to April 7 in drylot. Creep feeding of lambs was started on January 26. Lambs were run with their dams on pasture and continued on creep treatments during the period from April 7 to May 29. During this and the following periods, lambs were sold as they reached market weight. On May 29 all remaining lambs were weaned and continued on their respective treatments until July 9 when all groups were run together on pasture and fed the simple grain mixture until the last group was sold on September 11. During the pasture phase of the experiment, all lots were rotated in an effort to remove variability due to forage. Permanent pastures made up predominately of bluegrass were grazed.

Results are summarized in Tables 1 and 2. As in previous year's work, creep feeding increased rate of gain. Control lambs on no creep failed to make satisfactory gains during the drylot period and the period after weaning. They made only fair gains during the final finishing period but did make gains comparable with other lots when first turned to pasture. Among the creep rations, gains were superior on the simple and complex mixtures. The shelled corn and complete pelleted rations were consumed at lower levels, which probably accounts for the slower gains on these two treatments. In agreement with previous results, cost of gain on the complex mixture was high and gains were not appreciably better than those on the simple mixture. Cost of supplemental feed was lowest for the control lambs since they were fed only during the final period, but it should be stressed that these lambs were marketed from 34 to 65 days later than lambs on the simple creep. Work on this project is being continued for one more year.

Table 1 - Summary of Lamb Weights

|                               | Control<br>No Creep | Simple<br>Creep | Complex<br>Creep | Shelled<br>Corn, LSM | Complete<br>Pelleted |
|-------------------------------|---------------------|-----------------|------------------|----------------------|----------------------|
| Number of ewes                | 18                  | 17              | 17               | 17                   | 18                   |
| Number of ewes<br>lambing     | 16                  | 17              | 15               | 15                   | 15                   |
| Number of lambs<br>raised     | 24                  | 20              | 22               | 21                   | 24                   |
| <u>Av birth weights, lb</u>   |                     |                 |                  |                      |                      |
| Singles                       | 9.5                 | 9.6             | 10.5             | 9.4                  | 7.8                  |
| Twins                         | 8.3                 | 8.1             | 8.6              | 8.2                  | 7.9                  |
| <u>Av 28-day weights, lb</u>  |                     |                 |                  |                      |                      |
| Singles                       | 27.7                | 29.8            | 31.3             | 28.7                 | 23.0                 |
| Twins                         | 21.8                | 24.0            | 24.2             | 22.5                 | 21.2                 |
| <u>Av 56-day weights, lb</u>  |                     |                 |                  |                      |                      |
| Singles                       | 43.2                | 51.6            | 53.7             | 48.0                 | 41.7                 |
| Twins                         | 33.9                | 41.3            | 41.0             | 36.7                 | 37.4                 |
| <u>Av 100-day weights, lb</u> |                     |                 |                  |                      |                      |
| Singles                       | 65.0                | 77.7            | 81.7             | 73.7                 | 66.0                 |
| Twins                         | 54.3                | 67.5            | 67.8             | 61.9                 | 60.2                 |
| <u>Av market weight, lb</u>   |                     |                 |                  |                      |                      |
| Singles                       | 87.3                | 94.8            | 94.0             | 91.5                 | 88.0                 |
| Twins                         | 87.5                | 87.6            | 90.4             | 88.5                 | 87.5                 |
| <u>Av market age, days</u>    |                     |                 |                  |                      |                      |
| Singles                       | 171                 | 137             | 124              | 138                  | 166                  |
| Twins                         | 203                 | 138             | 146              | 164                  | 186                  |



Table 2 - Summary by Periods

|                                          | Control | Simple | Complex | Shelled<br>Corn,<br>LSM | Complete<br>Pelleted |
|------------------------------------------|---------|--------|---------|-------------------------|----------------------|
| <u>Av daily feed intake per lamb, lb</u> |         |        |         |                         |                      |
| Drylot, Jan. 26-Apr. 7                   | ----    | 0.70   | 0.86    | 0.74                    | 0.55                 |
| To weaning, Apr. 7-May 29                | ----    | 0.72   | 0.95    | 0.54                    | 0.39                 |
| After weaning, May 29-July 9             | ----    | 2.24   | 2.53    | 1.33                    | .35                  |
| Combined lots, July 9-Sept. 11           | 1.38    | 1.38   | 1.38    | 1.38                    | 1.38                 |
| <u>Av daily gain, lb</u>                 |         |        |         |                         |                      |
| Drylot, Jan. 26-Apr. 7                   |         |        |         |                         |                      |
| Singles                                  | 0.57    | 0.71   | 0.73    | 0.67                    | 0.55                 |
| Twins                                    | 0.42    | 0.59   | 0.57    | 0.56                    | 0.51                 |
| To weaning, Apr. 7-May 29                |         |        |         |                         |                      |
| Singles                                  | 0.51    | 0.50   | 0.57    | 0.56                    | 0.55                 |
| Twins                                    | 0.56    | 0.55   | 0.57    | 0.50                    | 0.48                 |
| After weaning, May 29-July 9             |         |        |         |                         |                      |
| Singles                                  | 0.06    | 0.42   | ----    | 0.25                    | 0.48                 |
| Twins                                    | 0.16    | 0.50   | 0.46    | 0.25                    | 0.18                 |
| Combined lots, July 9-Sept. 11           |         |        |         |                         |                      |
| Singles                                  | 0.27    | 0.52   | ----    | ----                    | 0.28                 |
| Twins                                    | 0.33    | ----   | 0.45    | 0.49                    | 0.36                 |
| Complete trial, Jan. 26-Sept. 11         |         |        |         |                         |                      |
| Singles                                  | 0.46    | 0.62   | 0.67    | 0.59                    | 0.48                 |
| Twins                                    | 0.39    | 0.57   | 0.56    | 0.49                    | 0.43                 |
| Feed per 100 lb gain, lb                 | 44      | 130    | 168     | 133                     | 126                  |
| Feed cost per 100 lb gain <sup>a/</sup>  | \$1.17  | \$3.44 | \$6.70  | \$3.70                  | \$4.02               |

<sup>a/</sup>

Simple creep, \$2.65/cwt.; Complex creep, \$4.04; Shelled corn-LSM creep, \$2.80; Complete pelleted creep, \$3.50

## WEST KENTUCKY SUBSTATION EWE PERFORMANCE AND CREEP FEEDING TRIALS

P. G. Woolfolk, J. R. Overfield and S. J. Lowry  
University of Kentucky

Two groups of blackface Colorado ewes and a group of Montana ewes were used in trials at the West Kentucky Substation during 1961-62. Group 1 Colorado ewes had originally been wintered in 1956-57 at a high level of nutrition (3.6 lb alfalfa hay) and Group 2 ewes at a low level (2.4 lb alfalfa hay). The Montana ewes were 2- and 3-year-olds added to the flock in 1959 and 1960. All ewes were bred to Hampshire rams, and their feeding and management were the same.

In the third and final year of a creep feeding trial, lambs were allotted according to type of dam and whether twin or single to either or two creep rations as follows: (1) 90% cracked yellow corn, 10% soybean meal plus 50 grams of Aureomycin per ton of mixture; (2) 67.5% cracked yellow corn, 25% soybean meal, 5% alfalfa meal, 1.5% bonemeal, 0.8% salt, 0.2% trace minerals plus 50 grams of Aureomycin per ton. When the two groups went to pasture they were rotated every 2 weeks. Unsold lambs were weaned and turned together on July 14. They were held on pasture until mid-August and then fed creep ration No. 1, first along with alfalfa hay and later on Ladino clover pasture.

Ewe performance is summarized in Table 1. Montana ewes lambed earlier than either of the Colorado groups and yielded heavier fleeces. The low level Colorado group yielded the lightest fleeces, as has been the case in previous years with this group. Lamb production was not greatly different for the three groups.

A summary of creep feeding results is shown in Table 2. As was true for work during two previous years, the simpler creep ration was equal in value to the more complex ration. This is in agreement with work at the U. K. Coldstream Farm where a simple corn-soybean meal mixture has proven satisfactory as a creep ration for lambs.



Table 1 - Summary of Ewe Performance

|                                        | Blackface Colorado Ewes |           | Montana Ewes |
|----------------------------------------|-------------------------|-----------|--------------|
|                                        | High Level              | Low Level |              |
| Number of ewes, fall 1961              | 16                      | 13        | 27           |
| Initial number ewe lambs, 1956         | 28                      | 28        | --           |
| Average lambing date                   | Feb. 16                 | Feb. 17   | Feb. 6       |
| Lambs sold per ewe                     | 0.94                    | 1.23      | 1.11         |
| <u>Average 56-day lamb weights, lb</u> |                         |           |              |
| Singles                                | 47.2                    | 54.0      | 50.5         |
| Twins                                  | 39.6                    | 41.2      | 34.9         |
| Average age marketed, days             | 182                     | 171       | 187          |
| Average market weight, lb              | 96.0                    | 91.8      | 97.0         |
| Average market price per cwt           | \$21.70                 | \$22.80   | \$22.20      |
| Average market value per lamb          | \$20.83                 | \$20.95   | \$21.54      |
| Average dressing percentage            | 54.4                    | 53.8      | 53.1         |
| Average carcass grade                  | Low Prime               | Low Prime | Low Prime    |
| Average fleece weight of ewes, lb      | 8.66                    | 8.04      | 9.76         |

Table 2 - Summary of Creep Feeding Results

|                                        | Creep No. 1<br>Corn<br>Soybean Meal | Creep No. 2<br>Corn, Soybean Meal,<br>Alfalfa Meal, Minerals |
|----------------------------------------|-------------------------------------|--------------------------------------------------------------|
| Number lambs marketed                  | 30                                  | 31                                                           |
| <u>Average 56-day lamb weights, lb</u> |                                     |                                                              |
| Singles                                | 51.4                                | 49.8                                                         |
| Twins                                  | 36.8                                | 40.3                                                         |
| Average age marketed, days             | 189                                 | 174                                                          |
| Average market weight, lb              | 97.7                                | 93.2                                                         |
| Average market price per cwt           | \$22.13                             | \$22.33                                                      |
| Average market value per lamb          | \$21.61                             | \$20.82                                                      |
| Creep fed cost per lamb                | \$1.99                              | \$ 1.93                                                      |
| Creep feed cost per 100 lb gain        | \$ 2.44                             | \$ 2.66                                                      |
| Average dressing percentage            | 53.6                                | 53.6                                                         |
| Average carcass grade                  | High Choice                         | Low Prime                                                    |



SOUTHDOWN, SOUTHDOWN-HAMPSHIRE CROSSBRED, AND HAMPSHIRE  
RAMS AS SIRES OF SPRING LAMBS

P. G. Woolfolk, L. H. Boyd, C. M. Reese, M. A. Slaughter  
E. G. Holbert and O. D. Hawkins  
University of Kentucky

During the years 1959-62, 13 Southdown, 4 Southdown-Hampshire crossbred and 4 Hampshire rams were bred to crossbred western ewes for commercial spring lamb production at the U. K. Coldstream and Eden Shale farms. Some of the rams were used more than one year, and several of the rams were used on both farms, making a total of 34 sire groups involved in this summary. Each year ewes were allotted to rams according to age and type and later allotted to wintering trials according to age, type and sire group. This makes it possible to compare sires on the basis of performance of their lambs.

Summarized results are shown in Table 1. This includes performance data of lambs actually raised but does not include reproductive performance of ewes or rams. Number of lambs per ewe and average age of ewe are included to aid in interpretation of results. At the Eden Shale Farm, crossbred rams sired slightly faster gaining lambs that reached market sooner. At the Coldstream Farm, Hampshire-sired lambs gained fastest, and results on Southdown and crossbred-sired lambs were similar to those at the Eden Shale Farm. Since more Southdown rams were used in earlier years of the trial, their lambs may have been penalized some owing to the slightly younger average age of dam (as noted in the table.) At Coldstream this may have been somewhat compensated for by fewer lambs per ewe as compared with the two other groups. An inspection of the data within years when all three types of rams were used indicates the same general trend in differences noted here and lends support to the conclusion that this summary is an accurate estimate of relative performance of lambs sired by these three types of rams.

Table 1 - Summary of Data on Lambs Sired by Southdown, Southdown-Hampshire Crossbred and Hampshire Rams

| Ram Used                               | Eden Shale Farm    |           | Coldstream Farm    |           |           |
|----------------------------------------|--------------------|-----------|--------------------|-----------|-----------|
|                                        | Southdown          | Crossbred | Southdown          | Crossbred | Hampshire |
| Number of rams                         | 6                  | 2         | 11                 | 2         | 4         |
| Number of years                        | 3                  | 2         | 4                  | 2         | 2         |
| Number of sire groups                  | 8                  | 4         | 14                 | 4         | 4         |
| Number of lambs                        | 211                | 111       | 338                | 101       | 104       |
| Av number lambs per ewe                | 1.7                | 1.7       | 1.5                | 1.6       | 1.7       |
| Av age of dam, years                   | 1.8                | 2.4       | 2.0                | 2.8       | 2.8       |
| Av birth date                          | Feb. 6             | Jan. 27   | Jan. 26            | Jan. 18   | Jan. 22   |
| <u>Av lamb weights, lb</u>             |                    |           |                    |           |           |
| Birth                                  | 8.9                | 9.7       | 8.5                | 9.4       | 9.1       |
| 28-day                                 | 21.4               | 22.5      | 21.6               | 24.0      | 23.9      |
| 56-day                                 | 34.2               | 35.4      | 35.4               | 40.2      | 40.6      |
| 100-day                                | 55.5               | 59.0      | 56.1               | 63.5      | 66.2      |
| Market                                 | 85.9 <sup>a/</sup> | 89.6      | 86.3 <sup>b/</sup> | 88.1      | 89.4      |
| Av market age, days                    | 205                | 200       | 173                | 159       | 154       |
| Weight per day of age<br>at market, lb | .42                | .45       | .50                | .55       | .58       |

<sup>a/</sup>

Market data calculated on 191 lambs.

<sup>b/</sup>

Market data calculated on 234 lambs; 89 lambs were used in a parasite control experiment. The remaining lambs failed to reach market.



ANIMAL NUTRITION SECTION

INFLUENCE OF RUMINAL AND ABOMASAL FISTULATION ON DIGESTION

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Fistulas have been widely used as investigational aids in studying the nutrition of ruminants. It has been assumed that fistulated experimental ruminants perform as normal intact animals. The purpose of this investigation was to evaluate the influence of ruminal and abomasal fistulation on nutrient digestibility in beef steers.

One set of dizygous twin steers of Hereford and dairy breeding and three sets of monozygous twin Angus steers that weighed approximately 950 pounds each were used in a series of digestion trials. A digestion trial was conducted with one steer selected at random from each set of twins. After the incorporation of plexiglass cannulae into the rumen walls of the same steers, another digestion trial was conducted to ascertain any influence of fistulation on digestion. The remaining intact twins were included in this trial. Then a second operation was performed on each rumen-fistulated steer to insert a plexiglass cannula into the abomasum. Each of the intact steers was also fitted with a rumen cannula. Another digestion trial was then conducted to determine the nutritional status of the steers. Recovery periods of at least 3 weeks were allowed after each surgical operation. Each digestion trial included a preliminary feeding period of at least 10 days and a 7-day collection period during which time each steer received 12 pounds of a complete pelleted ration daily. The steers were fed twice and watered once each day. Ingredient composition and proximate analysis of the ration are presented in Table 1.

Differences between paired data were analyzed statistically by the "Student's" t-test.

Results of the digestion trials, in the form of apparent digestion coefficients, are shown in Table 2. Only three of the four sets of twins were included in the comparison between steers with fistulas in both the rumen and abomasum and their rumen-fistulated twins because one of the steers expelled the abomasal cannula immediately prior to the collection period of the final digestion trial. No statistically significant differences were observed in any of the comparisons. Apparent digestion of the complete pelleted ration was not adversely affected by fistulation.

Table 1 - Pelleted Ration Used in Digestion Trials

| Ingredient                   | Percent |
|------------------------------|---------|
| Oat mill feed                | 52.5    |
| Alfalfa meal                 | 5.0     |
| Molasses                     | 5.0     |
| Soybean oil meal             | 15.0    |
| Ground corn                  | 20.0    |
| Ground limestone             | 1.0     |
| Dicalcium phosphate          | 1.0     |
| Salt                         | 0.5     |
| Total                        | 100.0   |
| Proximate analysis           |         |
| Dry matter                   | 86.94   |
| Crude protein                | 11.34   |
| Ether extract                | 1.68    |
| Crude fiber                  | 17.16   |
| Ash                          | 7.26    |
| Cellulose                    | 20.27   |
| Gross energy (kcal per gram) | 3.879   |

Vitamins A and D were supplemented according to NRC requirements.



Table 2 - Effect of Ruminant and Abomasal Fistulation on Apparent Digestion Coefficients

| Fraction                                                                                   | Average Digestion Coefficients |                        |                        |                                      |
|--------------------------------------------------------------------------------------------|--------------------------------|------------------------|------------------------|--------------------------------------|
|                                                                                            | Ruminal Fistulation            |                        | Abomasal Fistulation   |                                      |
|                                                                                            | Intact                         | Ruminal<br>Fistulation | Ruminal<br>Fistulation | Ruminal +<br>Abomasal<br>Fistulation |
| Comparisons between twin steers <sup>a</sup>                                               |                                |                        |                        |                                      |
| Dry matter (%)                                                                             | 51.9                           | 53.5                   | 57.0                   | 57.6                                 |
| Gross energy (%)                                                                           | 53.9                           | 56.3                   | 58.6                   | 58.9                                 |
| Crude protein (%)                                                                          | 71.2                           | 72.4                   | 75.2                   | 72.5                                 |
| Ether extract (%)                                                                          | 73.9                           | 79.5                   | 80.9                   | 79.6                                 |
| Crude fiber (%)                                                                            | 25.9                           | 29.1                   | 36.2                   | 36.6                                 |
| NFE (%)                                                                                    | 58.5                           | 58.6                   | 62.5                   | 63.4                                 |
| Cellulose (%)                                                                              | 33.4                           | 35.2                   | 29.3                   | 32.8                                 |
| Comparisons of individual steers with themselves before and after fistulation <sup>b</sup> |                                |                        |                        |                                      |
| Dry matter (%)                                                                             | 50.0                           | 54.0                   | 51.4                   | 57.6                                 |
| Gross energy (%)                                                                           | 52.2                           | 56.2                   | 54.4                   | 58.9                                 |
| Crude protein (%)                                                                          | 72.5                           | 72.8                   | 70.6                   | 72.5                                 |
| Ether extract (%)                                                                          | 73.6                           | 78.4                   | 78.0                   | 79.5                                 |
| Crude fiber (%)                                                                            | 27.2                           | 31.3                   | 27.2                   | 36.6                                 |
| NFE (%)                                                                                    | 55.7                           | 59.5                   | 56.1                   | 63.4                                 |
| Cellulose (%)                                                                              | 32.4                           | 30.0                   | 32.7                   | 32.8                                 |

<sup>a</sup> Four sets of twins were used in ruminal fistulation comparisons; three sets were used in abomasal fistulation comparisons.

<sup>b</sup> Eight steers were used in ruminal fistulation comparisons; three steers were used in abomasal fistulation comparisons.

## INFLUENCE OF GLUCOSE DRENCHING ON ACID: BASE COMPONENTS OF EXTRACELLULAR FLUIDS OF SHEEP

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Economic considerations have caused many beef cattle and sheep feeders to increase the level of grain in their rations. The use of high-concentrate rations is accomplished by a constant threat of digestive disturbances. In their acute forms, such disturbances are usually associated with low rumen pH. Drenching with large amounts of glucose is known to reduce fatal indigestion in sheep. In this study, glucose drenching was used to facilitate the study of acid:base components of rumen-fluid, serum, and urine during the development of acute indigestion. Such information should be of value in determining the soundness of attempting to control rumen pH in preventing digestive disturbances on high-concentrate rations.

Samples of rumen fluid, blood, and urine were taken from two wethers at regular intervals after feeding 3 pounds of alfalfa hay. Both wethers had been previously fed all-hay rations. After 24 hours each wether was given 3.5 pounds of glucose in warm water by stomach tube. Similar samples were then taken until death terminated the experiment.

Serum, centrifuged (18,400 x G) rumen fluid and urine were analyzed for pH, bicarbonate, buffering capacity, sodium, potassium, calcium and magnesium. Total concentration and molar percentages of acetate, propionate and butyrate were also determined on rumen fluid. The results of these analyses are presented in Tables 1, 2 and 3.

Severe diarrhea began about 4 hours after glucose treatment and was accompanied by increased water consumption, depression and shifting of weight from one rear foot to the other. Death occurred at 7 and 11.5 hours after glucose administration for wethers 1 and 2, respectively.

The pH of both rumen fluid and serum was drastically lowered by glucose treatment (Table 1). Ruminal pH fell below 5.0 two to five hours before death and terminal values for serum pH were below 7.0. Urine also changed from acid to alkaline as a result of glucose treatment. Sharp reductions in ruminal and serum bicarbonate accompanied declines in pH. Total buffering capacity followed a similar but less consistent pattern.

Both the total concentration of volatile fatty acids and the molar percentage of propionate in the rumen fluid decreased after glucose administration (Table 2).

Glucose administration reduced ruminal sodium and potassium concentrations but had irregular effects on calcium and magnesium (Table 3). Slight increases in sodium and potassium as well as protein (from 6.5 to 8.1%) were observed in the serum. The excretion of all four minerals studied was depressed by glucose administration.



Table 1 - Bicarbonate, Buffering Capacity and pH of Rumen Fluid, Serum and Urine Following Administration of Alfalfa Hay or Glucose<sup>a</sup>

| Treatment and<br>Collection Time<br>(hr) After Treat-<br>ment | Rumen Fluid |                                              | Serum                                |      | Urine                                        |                                      |
|---------------------------------------------------------------|-------------|----------------------------------------------|--------------------------------------|------|----------------------------------------------|--------------------------------------|
|                                                               | pH          | HCO <sub>3</sub> <sup>-</sup><br>(Meq/liter) | Buffering<br>Capacity<br>(Meq/liter) | pH   | HCO <sub>3</sub> <sup>-</sup><br>(Meq/liter) | Buffering<br>Capacity<br>(Meq/liter) |
| Alfalfa Hay<br>(3 lb)                                         |             |                                              |                                      |      |                                              |                                      |
| 0                                                             | 6.91        | 24.92                                        | 4.56                                 | 7.38 | 15.53                                        | 6.75                                 |
| 2                                                             | 6.76        | 14.61                                        | 4.56                                 | 7.35 | 18.65                                        | 6.60                                 |
| 4                                                             | 6.80        | 17.35                                        | 6.65                                 | 7.54 | 15.39                                        | 7.10                                 |
| 8                                                             | 6.84        | 29.90                                        | 7.15                                 | 7.46 | 16.69                                        | 8.55                                 |
| 12                                                            | 6.80        | 41.59                                        | 7.62                                 | 7.40 | 15.18                                        | 8.25                                 |
| 18                                                            | 6.95        | 45.92                                        | 6.62                                 | 7.43 | 19.34                                        | 6.75                                 |
| Glucose<br>(3.5 lb)                                           |             |                                              |                                      |      |                                              |                                      |
| 0                                                             | 7.14        | 48.75                                        | 6.95                                 | 7.36 | 15.53                                        | 10.90                                |
| 2                                                             | 6.45        | 7.78                                         | 5.89                                 | 7.41 | 13.60                                        | 10.20                                |
| 4                                                             | 6.12        | 5.25                                         | 4.20                                 | 7.29 | 11.12                                        | 10.50                                |
| 7 <sup>b</sup>                                                | 4.90        | 0                                            | 1.20                                 | 6.10 | 8.66                                         | 9.15                                 |
| 8                                                             | 5.50        | 3.10                                         | 4.28                                 | 7.16 | 7.93                                         | 10.40                                |
| 11.5                                                          | 4.40        | 1.32                                         | 3.21                                 | 6.85 | 3.16                                         | 9.10                                 |
|                                                               |             |                                              |                                      | c    | c                                            | c                                    |
|                                                               |             |                                              |                                      |      | 45.50                                        | 5.82                                 |
|                                                               |             |                                              |                                      |      | 17.79                                        | 5.48                                 |
|                                                               |             |                                              |                                      |      | 14.40                                        | 5.67                                 |
|                                                               |             |                                              |                                      |      | 22.27                                        | 1.27                                 |
|                                                               |             |                                              |                                      |      | 28.20                                        | 4.90                                 |

<sup>a</sup> - Average for two sheep

<sup>b</sup> - Values for 7, 8 and 11.5 hr in glucose treatment are for one sheep.

<sup>c</sup> - No samples available

Table 2 - Rumen Acetate, Propionate and Butyrate Following Administration of Alfalfa Hay or Glucose<sup>a</sup>

| Treatment and<br>Collection Time<br>(hr) After Treat-<br>ment | Total Conc.<br>(Micromoles/al.) | Molar Percentage |            |          |
|---------------------------------------------------------------|---------------------------------|------------------|------------|----------|
|                                                               |                                 | Acetate          | Propionate | Butyrate |
| Alfalfa Hay<br>(3 lb)                                         |                                 |                  |            |          |
| 0                                                             | 91.7                            | 67.0             | 21.5       | 11.5     |
| 2                                                             | 171.9                           | 64.2             | 26.4       | 9.4      |
| 4                                                             | 145.7                           | 62.4             | 23.0       | 14.6     |
| 8                                                             | 92.5                            | 67.5             | 21.7       | 10.8     |
| 12                                                            | 57.4                            | 67.1             | 24.8       | 8.1      |
| 18                                                            | 40.7                            | 60.0             | 31.1       | 8.9      |
| Glucose<br>(3.5 lb)                                           |                                 |                  |            |          |
| 0                                                             | 30.2                            | 61.4             | 32.4       | 6.2      |
| 2                                                             | 38.5                            | 75.5             | 15.5       | 9.0      |
| 4                                                             | 43.2                            | 73.8             | 11.9       | 14.3     |
| 7 <sup>b</sup>                                                | 64.4                            | 66.8             | 17.4       | 15.7     |
| 8                                                             | 12.3                            | 94.0             | 6.0        | 0        |
| 11.5                                                          | 9.3                             | 100.0            | 0          | 0        |

<sup>a</sup> - Averages for 2 sheep

<sup>b</sup> - Values for 7, 8 and 11.5 hrs. in glucose treatment are for one sheep



Table 3 - Mineral Composition of Rumen Fluid, Serum and Urine of Sheep Following Administration of Alfalfa Hay or Glucose<sup>a</sup> (Milliequivalents per liter)

| Treatment and<br>Collection Time<br>(hr) After Treat-<br>ment | Rumen Fluid |      |      | Serum            |                    |     |      | Urine |      |       |      |                  |  |
|---------------------------------------------------------------|-------------|------|------|------------------|--------------------|-----|------|-------|------|-------|------|------------------|--|
|                                                               | Na          | K    | Ca   | Mg               | Na                 | K   | Ca   | Mg    | Na   | K     | Ca   | Mg               |  |
| Alfalfa Hay<br>(3 lb)                                         |             |      |      |                  |                    |     |      |       |      |       |      |                  |  |
| 0                                                             | 89.5        | 89.7 | 13.5 | .70              | 155.0              | 4.0 | 12.0 | .70   | 12.0 | 228.5 | 42.5 | 1.5              |  |
| 2                                                             | 84.0        | 80.5 | 16.5 | .75              | 170.0              | 4.0 | 13.5 | .70   | 29.5 | 320.0 | 33.5 | 2.6              |  |
| 4                                                             | 89.0        | 89.2 | 14.0 | .70              | 167.5              | 4.0 | 12.5 | .80   | 60.0 | 232.0 | 44.5 | 2.3              |  |
| 8                                                             | 109.0       | 76.0 | 13.5 | .70              | 157.5              | 4.0 | 14.5 | .70   | 47.5 | 269.0 | 21.0 | 1.5              |  |
| 12                                                            | 107.5       | 81.5 | 13.5 | .70              | 166.5              | 4.0 | 14.0 | .75   | 19.6 | 217.5 | 22.0 | 1.2              |  |
| 18                                                            | 110.0       | 81.5 | 13.0 | .70              | 163.5              | 4.0 | 13.5 | .70   | 10.0 | 139.0 | 23.0 | 1.0              |  |
| Glucose<br>(3 lb)                                             |             |      |      |                  |                    |     |      |       |      |       |      |                  |  |
| 0                                                             | 120.0       | 66.5 | 13.5 | 1.0 <sup>c</sup> | 152.5              | 6.5 | 12.5 | .70   | 10.0 | 125.0 | 29.5 | 1.5              |  |
| 2                                                             | 88.5        | 25.5 | 14.5 | .5               | 178.5              | 2.5 | 13.0 | .70   | 6.5  | 117.0 | 14.0 | 1.5 <sup>c</sup> |  |
| 4                                                             | 81.0        | 19.0 | 14.0 | 1.0              | 180.0 <sup>c</sup> | 5.5 | 14.0 | 1.00  | 14.5 | 110.0 | 13.5 | 1.0 <sup>c</sup> |  |
| 7 <sup>b</sup>                                                | 75.2        | 7.0  | 15.0 | 0                | 115.0              | 7.0 | 13.0 | .40   | 15.0 | 36.0  | 16.0 | 1.0              |  |
| 8                                                             | 79.0        | 18.0 | 25.0 | 1.0              | 186.0              | 4.0 | 17.0 | .50   | 14.0 | 176.0 | 18.0 | 1.0              |  |
| 11.5                                                          | 87.0        | 18.0 | 30.0 | 1100             | 180.0              | 9.0 | 14.0 | 1.00  | d    | d     | d    | d                |  |

a - Average for two sheep

b - Values for 7, 8 and 11.5 hr in glucose treatment are for one sheep

c - Values for one sheep

d - No samples available

## IN VITRO DESTRUCTION OF VITAMIN A BY ABOMASAL AND RUMEN CONTENTS

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An apparent need for re-evaluating the vitamin A requirements of beef cattle has led to renewed interest in the relative inefficiency of ruminants in utilizing vitamin A and its precursors. Previous work at the Kentucky, Illinois, Missouri and South Dakota stations suggests that gastro-intestinal destruction may be partially responsible for this inefficiency. This report gives preliminary results of *in vitro* studies being conducted at this station in an attempt to determine the roles of the abomasum and rumen in the pre-intestinal destruction of vitamin A which has been observed in *in vivo* studies with sheep

Rumen and abomasal contents have been obtained from dual fistulated animals fed low pigment diets without vitamin A. The contents were processed by being strained through cheesecloth and centrifuged at low speed. In each trial series of incubation tubes containing 10 ml of either rumen or abomasal fluid and approximately 20 I.U. of vitamin A acetate in oil either dissolved in alcohol or dispersed in 20% Tween 80 was added to each tube. Three tubes randomly selected from each series were analysed for vitamin A before and after incubation under carbon dioxide for 4 hours at 37°C. Simultaneous trials with distilled water were also conducted.

The percentage of vitamin A recovered has averaged  $81 \pm 4$  in nine trials involving 4-hour incubations with water,  $61 \pm 5$  in 13 trials (9 from sheep and 4 from steers) with abomasal fluid (pH 2.4 to 2.8) and  $57 \pm 10$  in 4 trials with rumen fluid from steers (pH 5.9 to 6.8). These results suggest that possible destruction in both the rumen and the abomasum should be considered in attempts to obtain maximum utilization of oral vitamin A.



## UTILIZATION OF PURIFIED SOY PROTEIN AND ZEIN BY WETHERS WHEN GIVEN ORALLY OR INTO THE ABOMASUM

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Considerable work has been conducted comparing protein and non-protein nitrogen feeds. It has been established that ruminants are capable of utilizing many different nitrogenous substances through the rumen function. However, under carefully controlled experimental conditions, differences in the efficiency of nitrogen utilization from variable sources have been shown. Reasons for these differences are not clear. Research suggests that certain proteins are extensively digested in the rumen while other proteins are only partially digested in the rumen. Little information is available on the digestion of protein posterior to the rumen in ruminant animals. If sizable quantities of dietary proteins pass through the rumen unaltered, the digestion of these proteins in the abomasum and small intestines may be of significance in understanding protein utilization by ruminants. This work was initiated to obtain information on the digestion and resulting nitrogen balance of different purified proteins posterior to the rumen.

Four western crossbred wethers, weighing approximately 100 pounds each were used in a series of digestion and nitrogen balance trials. Two of the wethers were fitted with permanent abomasal fistulas prior to the beginning of these trials. A basal ration, consisting of 400 grams wheat straw and 200 grams ground shelled corn, was given orally to all wethers in equal portions twice daily. In addition, 50 grams of purified soy protein or zein was administered orally to the intact wethers. The same quantity of these purified proteins was administered in a warm water slurry into the abomasum of the fistulated wethers. Of the total nitrogen intake, 58% was from the purified protein source. Seven-day fecal and urine collection periods were preceded by 7-day preliminary periods. Treatments were arranged so that each wether received both protein sources during the experiment. Ration and fecal protein, dry matter and cellulose, as well as urinary nitrogen, were determined by standard analytical procedures.

The results are summarized in Table 1. No differences were noted in nutrient digestibility and nitrogen balance between soy protein and zein when they were fed. Abomasal administration of soy protein did not affect digestibility but increased nitrogen balance. Zein was less digestible when it was given directly into the abomasum and nitrogen balance was reduced. Although only a few animals were used, these differences suggest that variations in the utilization of proteins posterior to the rumen may be of practical significance in determining their value for ruminants.

Table 1 - Digestibility and Nitrogen Balance Data From Wethers Receiving Purified Soy Protein and Zein Orally or Into Abomasum

|                     | Oral Administration |      | Abomasal Administration |      |
|---------------------|---------------------|------|-------------------------|------|
|                     | Soy                 | Zein | Soy                     | Zein |
| Digestibility (%)   |                     |      |                         |      |
| Protein             | 72.7                | 71.7 | 70.4                    | 50.5 |
| Dry matter          | 61.4                | 62.9 | 60.6                    | 55.2 |
| Cellulose           | 60.7                | 60.8 | 58.2                    | 52.9 |
| Nitrogen balance    |                     |      |                         |      |
| % Intake retained   | 11.2                | 11.3 | 19.5                    | 6.5  |
| % Digested retained | 15.4                | 15.5 | 27.7                    | 12.9 |



EFFECT OF PHYSICAL FORMS OF CORN ON ACETATE, PROPIONATE  
AND BUTYRATE LEVELS IN RUMEN CONTENTS OF STEERS

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The rumen volatile fatty acids produced during microbial fermentation of feeds have a significant role in the energy metabolism of ruminant animals. Research indicates that differently processed feed may alter the quality and quantity of these rumen fermentation products. During recent years, this station has reported results of steer fattening experiments in which ground, pelleted and flaked corn was fed. Differences in rate of gain and feed efficiency were observed. These results have stimulated an interest in the effect of these different physical forms of corn on the major volatile fatty acids in the rumen. The experiment reported here was initiated to determine levels and ratios of acetate, propionate and butyrate in the rumen of steers following consumption of ground, pelleted, flaked and steam rolled corn.

Four yearling Hereford steers, previously fitted with a permanent rumen fistula were used in this experiment. They were individually fed 12 pounds of corn, 4 pounds of alfalfa hay and 1 pound of soybean oil meal in two equal portions twice daily. The treatments consisted of feeding ground, pelleted, flaked (Hales and Hunter) and steam rolled (Aubrey) corn in a 4x4 Latin Square design. Each steer received each form of corn for a 14-day period. Rumen samples were taken through the fistula on the 10th and 14th day of the period at 4, 8 and 16 hours after feeding. Volatile fatty acids were determined quantitatively by gas chromatography.

The results of this experiment are summarized in Table 1. Little difference was noted in the levels and ratios of the samples taken on the 10th and 14th day, so these values have been combined. When steers were fed the steam rolled corn there was a significantly larger molar percentage of acetate than when fed pelleted or flaked corn. Likewise, ground corn produced a significantly higher percentage of acetate than pelleted corn. Molar percentage of propionate was not significantly affected by form of corn fed. Pelleted corn produced a significantly larger molar percentage of butyrate than ground, flaked or steam rolled corn. The total concentration of these volatile fatty acids was not significantly affected by the forms of corn, although pelleted appeared to be somewhat higher.

The molar percentages of either acetate or butyrate did not significantly change at the different sampling times after feeding, however, the molar percentage of propionate as well as the total concentration of volatile fatty acid was significantly higher 4 hours after feeding than 16 hours after feeding.

Table 1 - VFA Concentrations in Rumen Fluid from Steers Fed Different Physical Forms of Corn

| Time after Feeding |                          | Form of Corn |          |        |              | Time Ave. |
|--------------------|--------------------------|--------------|----------|--------|--------------|-----------|
|                    |                          | Ground       | Pelleted | Flaked | Steam Rolled |           |
| 4 hours            | C <sub>2</sub> (Molar %) | 65.9         | 57.7     | 59.9   | 62.4         | 61.5      |
| " "                | C <sub>3</sub> (Molar %) | 23.5         | 24.9     | 28.1   | 25.4         | 25.5      |
| " "                | C <sub>4</sub> (Molar %) | 10.6         | 17.4     | 12.0   | 12.2         | 13.0      |
| " "                | Total (uM/ml)            | 92.9         | 153.9    | 104.7  | 108.9        | 115.1     |
| 8 hours            | C <sub>2</sub> (Molar %) | 62.3         | 60.4     | 60.8   | 64.8         | 62.1      |
| " "                | C <sub>3</sub> (Molar %) | 26.4         | 23.5     | 26.4   | 23.1         | 24.8      |
| " "                | C <sub>4</sub> (Molar %) | 11.3         | 16.1     | 12.9   | 12.3         | 13.1      |
| " "                | Total                    | 101.3        | 116.4    | 100.6  | 86.6         | 101.2     |
| 16 hours           | C <sub>2</sub> (Molar %) | 62.2         | 61.0     | 61.5   | 66.5         | 62.8      |
| " "                | C <sub>3</sub> (Molar %) | 23.9         | 20.4     | 23.4   | 18.8         | 21.6      |
| " "                | C <sub>4</sub> (Molar %) | 13.9         | 18.6     | 15.1   | 14.7         | 15.6      |
| " "                | Total                    | 67.6         | 90.5     | 80.2   | 73.4         | 77.9      |
| Ration Av          | C <sub>2</sub> (Molar %) | 63.5         | 59.7     | 60.7   | 64.5         |           |
|                    | C <sub>3</sub> (Molar %) | 24.6         | 22.9     | 26.0   | 22.4         |           |
|                    | C <sub>4</sub> (Molar %) | 11.9         | 17.4     | 13.3   | 13.1         |           |
|                    | Total                    | 87.3         | 120.3    | 95.2   | 89.6         |           |



INFLUENCE OF TAPAZOLE AND IODINATED CASEIN ON CAROTENE  
DISAPPEARANCE FROM THE LIGATED RAT INTESTINE

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Both nitrate and thyroid active compounds have been reported to influence vitamin A status in several species of laboratory and farm animals. Previous work at this station has shown that carotene disappears more rapidly from the intestines of nitrate-fed rats than from controls. This increased disappearance apparently results from absorption without prior conversion to vitamin A. In view of postulation that the influence of nitrate is mediated through its effect on thyroid activity, we have been interested in determining whether either iodinated casein or Tapazole would produce effects in rats similar to those observed for nitrate.

Three trials were conducted to study possible effects on the disappearance of beta carotene from the ligated intestine. The test materials were fed mixed in a commercial laboratory diet for 10 days. The rats were then transferred to a carotene and vitamin A free diet without additives for 24 hours. They were then placed under ether anesthesia for ligation. The small intestine was ligated at both ends and 300 mcg of beta carotene dispersed in 1 ml of 20% Tween 80 was injected. After a 3-hour incubation the ligated section of intestine was removed with its contents and analyzed for carotene.

In Trial 1 four groups of 10 rats each (average weight 170 g) received (1) no additive, (2) 400 ppm iodinated casein, (3) 55 ppm Tapazole, and (4) 400 ppm iodinated casein plus 55 ppm Tapazole. The thyroids of rats in group 3 were slightly enlarged, but none of the treatments significantly affected carotene disappearance.

In Trial 2 groups of 10 rats (average weight 214 g) received (1) no additive, (2) 800 ppm iodinated casein, (3) 110 ppm Tapazole, and (4) 800 ppm iodinated casein plus 110 ppm Tapazole. In this trial, adding iodinated casein caused a highly significant increase in carotene disappearance. Tapazole did not significantly affect either carotene disappearance or gains.

Trial 3 was conducted with 40 rats averaging 233 grams which received the same treatments administered in Trial 2. Serum analyses for vitamin A and carotene and thyroid weights were added to the criteria used to evaluate the results. The data obtained from Trial 3 are summarized in Table 1. Iodinated casein again significantly increased carotene disappearance from the ligated intestine. The blood data suggest that this added disappearance was due mainly to increased conversion of carotene to vitamin A but that some additional carotene may have been absorbed intact. Tapazole appeared to have little influence on either carotene disappearance or serum analyses

other than to counteract some of the influence of iodinated casein when both were fed. These data do not support the hypothesis that the influence of dietary nitrate on carotene disappearance from the rat intestine can be attributed to its goitrogenic effect.

Table 1 - Influence of Iodinated Casein on Carotene Disappearance From the Rat Intestine <sup>a/</sup>

|                             | Control | Iodinated Casein <sup>b/</sup> | Tapazole <sup>c/</sup> | Iodinated Casein <sup>b/</sup> plus Tapazole <sup>c/</sup> |
|-----------------------------|---------|--------------------------------|------------------------|------------------------------------------------------------|
| Av gain, g                  | 1.6     | -8.6                           | 6.9                    | -10.1                                                      |
| Av thyroid wt, mg           | 13.4    | 13.0                           | 16.7 <sup>e/</sup>     | 13.8                                                       |
| % Carotene disappearance    | 10.4    | 21.1 <sup>d/</sup>             | 14.6                   | 5.3                                                        |
| Serum carotene mcg./100 ml  | 25.9    | 33.0                           | 32.9                   | 27.3                                                       |
| Serum vitamin A mcg./100 ml | 17.5    | 22.4 <sup>e/</sup>             | 14.3                   | 17.7                                                       |

<sup>a/</sup> 10 rats per treatment  
<sup>b/</sup> 800 ppm  
<sup>c/</sup> 110 ppm  
<sup>d/</sup> P < .05  
<sup>e/</sup> P < .10



# INFLUENCE OF RATION ON HYDROGEN ION CONCENTRATION AND BUFFERING CAPACITY OF SHEEP SALIVA

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An important function of the large volumes of saliva secreted by sheep is the neutralization of organic acids in the rumen. The buffering action of saliva is especially important when high levels of concentrates are fed and the rate of organic acid production is increased. Under these conditions either a larger volume of saliva or saliva with greater buffering capacity would be required to stabilize acidity in the rumen. Most studies on rate of salivary excretion suggest that the volume of saliva secreted is less when high-concentrate rations are fed than when high-roughage rations are fed.

This experiment was conducted to determine the influence of adding corn to all-roughage rations on hydrogen ion concentration (acidity) and buffering capacity of the saliva.

Twelve western yearling wethers were randomly divided into three groups and fed: (1) bluegrass pasture, (2) 4 pounds of alfalfa hay, and (3) 1 pound of alfalfa hay plus 1.5 pounds of ground shelled corn. Samples of sodium-pentobarbital-induced mixed saliva were taken 3 and 6 weeks after the wethers were on feed. After the 6-week collection, the grass-fed wethers were randomly allotted into the other two groups and rations 2 and 3 were reversed. Saliva samples were taken 3 and 5 weeks after ration reversal.

Results obtained before ration reversal are summarized in Table 1

Table 1 - Influence of Ration on Hydrogen Ion Concentration and Buffering Capacity of Sheep Saliva <sup>a/</sup>

| Time on<br>Ration | Bluegrass Pasture  |                     | Alfalfa Hay |       | Hay + Corn |       |
|-------------------|--------------------|---------------------|-------------|-------|------------|-------|
|                   | (H+) <sup>b/</sup> | B. C. <sup>c/</sup> | (H+)        | B. C. | (H+)       | B. C. |
| 3 Weeks           | 1.22               | 1.18                | 1.72        | 0.70  | 0.35       | 1.04  |
| 6 Weeks           | 1.78               | 2.10                | .81         | 1.69  | 0.51       | 2.96  |

<sup>a/</sup> 4 sheep per treatment

<sup>b/</sup> Hydrogen ion concentration x 10<sup>-9</sup>

<sup>c/</sup> Buffering capacity (ml of 0.02N HCl to titrate 10 ml of saliva to the end point of methyl orange)

Wethers receiving corn in the ration showed a significant reduction in hydrogen ion concentration of the saliva within 3 weeks. This difference was maintained at 6 weeks. The saliva of corn-fed wethers had significantly more buffering capacity than that from hay-fed wethers at 3 weeks and either hay-fed or grazing wethers at 6 weeks.

Results obtained after the rations were reversed are shown in Table 2. The buffering

Table 2 - Hydrogen Ion Concentration and Buffering Capacity of Saliva after Ration Reversal <sup>a/</sup>

| Time on Ration | Alfalfa Hay        |                     | Hay + Corn |       |
|----------------|--------------------|---------------------|------------|-------|
|                | (H+) <sup>b/</sup> | B. C. <sup>c/</sup> | (H+)       | B. C. |
| 3 Weeks        | 0.53               | 1.70                | 0.53       | 2.03  |
| 5 Weeks        | 0.56               | 1.31                | 0.45       | 1.43  |

<sup>a/</sup> 6 sheep per treatment

<sup>b/</sup> Hydrogen ion concentration  $\times 10^{-9}$

<sup>c/</sup> Buffering capacity (ml of 0.02 N HCl to titrate 10 ml. of saliva to the end point of methyl orange)

capacity of saliva from sheep switched to corn was greater than that from sheep fed only hay 3 weeks but not 5 weeks after the rations were reversed. Hydrogen ion concentrations were not significantly different. A comparison of Tables 1 and 2 shows that including corn in the ration again reduced the hydrogen ion concentration of the saliva. However, removing corn had little influence on hydrogen ion concentration. Replacing corn with hay reduced buffering capacity considerably, but adding corn produced a less consistent effect than observed in the first phase of the experiment. Buffering capacity of saliva from corn-fed wethers was significantly greater than for hay-fed wethers 3 weeks but not 6 weeks after reversal. It appears that the adjustment period may have been inadequate for the values to stabilize or that factors other than the ration fed were influencing composition.

These data suggest that changing salivary composition is a factor in the physiological adjustment of ruminants to the addition of grain to their rations. These results are too limited for definite conclusions, but adding grain to the rations appears to result in decreased hydrogen ion concentration and reduced buffering capacity of the saliva. The time required for these changes in composition could possibly be related to the time required to get ruminants on a full feed of concentrates. More work is needed to determine specific components of saliva which are affected and possible relationships between these changes and the formulation of high-concentrate rations for ruminants.



SWINE SECTION

FEED ADDITIVES FOR EARLY WEANED PIGS

D. R. Ramage, C. E. Barnhart, C. H. Chaney, C. W. Nichols and T. Carlin  
University of Kentucky

Fifty pigs which were approximately 3 weeks old were allotted to five treatments. The pigs were housed in 8' x 8' pens in a totally enclosed nursery building. Pens and equipment had been thoroughly steam cleaned and disinfected prior to starting the experiment. The pigs averaged 15.2 pounds at the start of the trial and were fed to a final lot average of 40 pounds. All pigs were self-fed and had access to water at all times. All pigs and feed were weighed weekly.

The ration fed were: (1) basal; (2) basal plus 100 grams aureomycin/ton; (3) basal plus 100 grams BA-9837/ton; (4) basal plus 100 grams Formo cibazol; (5) basal plus 100 grams cosulid/ton. The results of this early weaning experiment are presented in Table 1.

Table 1 - Summary of Experiment

| Treatment                       | Average<br>Initial<br>Wt lb | Average<br>Final<br>Wt lb | Average<br>Daily<br>Gain, lb | Average<br>Daily Feed<br>Consumed, lb | Average<br>Feed Per<br>100 lb gain, lb |
|---------------------------------|-----------------------------|---------------------------|------------------------------|---------------------------------------|----------------------------------------|
| Basal                           | 14.6                        | 58.7                      | 0.88                         | 2.08                                  | 2.37                                   |
| Basal + 100 grams<br>aureomycin | 15.7                        | 57.5                      | .84                          | 2.12                                  | 2.54                                   |
| Basal + 100 grams<br>BA-9837    | 15.2                        | 51.2                      | .72                          | 1.94                                  | 2.69                                   |
| Basal + 100 grams<br>Cibazol    | 15.2                        | 62.3                      | .94                          | 2.11                                  | 2.24                                   |
| Basal + 100 grams<br>cosulid    | 15.2                        | 61.8                      | .93                          | 2.15                                  | 2.31                                   |

All pigs responded well. There was no significant difference between the basal and any of the other treatments at the 5% level. No scouring was observed among any of the pigs.

# FEED ADDITIVES FOR GROWING PIGS

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University of Kentucky

Eighty purebred Hampshire weanling pigs were randomly allotted to 10 treatments with 2 replicate lots of 4 pigs for each ration treatment. All pigs were confined on concrete.

The rations and additives used per ton of feed were as follows: (1) basal; (2) basal plus 20 grams aureomycin; (3) basal plus 20 grams terramycin; (4) basal plus 20 grams oleandomycin; (5) basal plus 20 grams Pro Strep; (6) basal plus 20 grams tylosin; (7) basal plus 20 grams Zn bacitracin; (8) basal plus 20 grams BA-9837; (9) basal plus 20 grams cosulid; (10) basal plus 50 grams cyanamid mix.

All pigs were weighed every 2 weeks, and feed consumption weights were made each weigh day. This trial was terminated when the lots averaged 125 pounds. The results are shown in Table 1.

Table 1 - Results of Experiment

| Treatment                      | Av Initial<br>Wt.,<br>lb | Av Final<br>Wt.,<br>lb | Av Daily<br>Gain,<br>lb | Av Daily<br>Feed Con-<br>sumed, lb | Feed per lb<br>Gain,<br>lb |
|--------------------------------|--------------------------|------------------------|-------------------------|------------------------------------|----------------------------|
| Basal                          | 38.60                    | 126.25                 | 1.38                    | 4.35                               | 3.16                       |
| Basal + 20 gm<br>aureomycin    | 38.50                    | 124.00                 | 1.35                    | 4.17                               | 3.08                       |
| Basal + 20 gm<br>terramycin    | 39.75                    | 124.75                 | 1.40                    | 4.37                               | 3.15                       |
| Basal + 20 gm<br>oleandomycin  | 37.75                    | 124.00                 | 1.37                    | 4.11                               | 3.05                       |
| Basal + 20 gm<br>Pro Strep     | 38.63                    | 126.25                 | 1.58**                  | 4.27                               | 2.91                       |
| Basal + 20 gm<br>tylosin       | 38.88                    | 130.75                 | 1.53**                  | 4.38                               | 2.89                       |
| Basal + 20 gm<br>2n Bacitracin | 39.75                    | 124.12                 | 1.39                    | 4.11                               | 3.01                       |
| Basal + 20 gm<br>BA-9837       | 38.38                    | 124.58                 | 1.35                    | 4.29                               | 3.20                       |
| Basal + 20 gm<br>cosulid       | 38.12                    | 125.75                 | 1.41                    | 4.26                               | 3.02                       |
| Basal + 50 gm<br>cyanamid mix  | 38.50                    | 128.38                 | 1.47                    | 4.29                               | 2.92                       |

\*\* Significant at the 1% level from the basal lot



In terms of gain, the treatment effects were significant at the 5% level. The rate of gain was highly significant for pigs fed Pro Strep and tylosin, when each ration treatment was compared individually with the basal ration. Pro Strep improved gain and feed efficiency 13.8 and 8.6%, respectively.

# A COMPARISON OF CONCRETE AND SLATTED FLOORS FOR GROWING-FINISHING HOGS

D. R. Ramage, C. E. Barnhart, C. H. Chaney and T. W. Cathey  
University of Kentucky

In two separate experiments, 97 pigs were used to compare concrete and slatted wood floors during the growing-finishing period. Approximately 12 square feet of floor space was provided each pig under both conditions of feeding. All pigs were self-fed and had access to water at all times. The pens, feeders and waters were thoroughly steam cleaned before each experiment was started. All pigs were weighed bi-weekly, with rate of gain and feed efficiency being calculated at each weigh period. The results are presented in Tables 1 and 2.

Table 1 - Summary of Experiment 1

| Treatment     | Number | Av<br>Initial<br>Wt lb | Av<br>Final<br>Wt lb | Av<br>Daily<br>Gain, lb | Av<br>Daily Feed<br>Consumed, lb | Av Feed<br>per 100 lb<br>Gain, lb |
|---------------|--------|------------------------|----------------------|-------------------------|----------------------------------|-----------------------------------|
| Concrete      | 24     | 55.83                  | 190.50               | 1.54*                   | 6.07                             | 3.94                              |
| Slatted floor | 23     | 54.90                  | 176.04               | 1.40                    | 5.42                             | 3.88                              |

Table 2 - Summary of Experiment 2

| Treatment     | Number | Av<br>Initial<br>Wt lb | Av<br>Final<br>Wt lb | Av<br>Daily<br>Gain, lb | Av<br>Daily Feed<br>Consumed, lb | Av Feed<br>per 100 lb<br>Gain, lb |
|---------------|--------|------------------------|----------------------|-------------------------|----------------------------------|-----------------------------------|
| Concrete      | 25     | 33.64                  | 197.60               | 1.374                   | 4.88                             | 3.58                              |
| Slatted floor | 25     | 33.80                  | 186.56               | 1.273                   | 4.63                             | 3.57                              |

The pigs fed on concrete in the first experiment gained significantly ( $P < .05$ ) faster than the pigs fed on the slatted floors. There were no other statistical differences found in these experiments.



# FEEDING HIGH LEVEL TERRAMYCIN TO BRED SOWS

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Thirty-nine mature brood sows of proven productivity were fed a basal gestation ration and the basal gestation ration plus Terramycin for three different periods. Group 1 sows were fed the basal ration. Group 2 sows were fed the basal ration plus Terramycin for 2 weeks before farrowing and 2 weeks after farrowing. Group 3 sows were fed the basal plus Terramycin 2 weeks before farrowing and Group 4 sows were fed the Terramycin supplemented ration 2 weeks before and after breeding and 2 weeks before farrowing. The level of Terramycin fed was 250 grams per ton of gestation ration. Sows were fed 6 pounds of the gestation ration per day throughout the gestation period. Sows were maintained in a dirt drylot. At the start of the experiment 15 sows were allotted to each treatment.

Those sows that failed to breed within approximately 2 weeks after starting the experiment or did not settle on the first service were eliminated from the trial. Results of the trial are summarized in Table 1.

Table 1 - Results of Trial

| Treatment                                                                                          | No.<br>Sows<br>Farrowed | Av No.<br>Pigs<br>Farrowed | Av No.<br>Live Pigs<br>Farrowed | Av Farrowing<br>Wt<br>lb | Av No.<br>Pigs Weaned,<br>56 Days |
|----------------------------------------------------------------------------------------------------|-------------------------|----------------------------|---------------------------------|--------------------------|-----------------------------------|
| Basal                                                                                              | 13                      | 10.9                       | 9.0                             | 3.13                     | 7.0                               |
| Basal +<br>Terramycin 2<br>weeks before and<br>after breeding                                      | 8                       | 10.6                       | 8.0                             | 2.82                     | 7.0                               |
| Basal +<br>Terramycin 2<br>weeks before<br>farrowing                                               | 10                      | 10.5                       | 8.82                            | 2.75                     | 6.7                               |
| Basal +<br>Terramycin 2<br>weeks before<br>and after breeding<br>and 2 weeks be-<br>fore farrowing | 8                       | 9.5                        | 7.5                             | 2.95                     | 5.6                               |

THE EFFECTS OF HIGH LEVELS OF CALCIUM IN A CORN-SOYBEAN  
RATION UPON THE INCIDENCE OF PARAKERATOSIS IN  
GROWING SWINE

N. Stephens, C. E. Barnhart and C. H. Chaney  
University of Kentucky

Forty Hampshire weanling pigs averaging 34 pounds were randomly allotted by sex and weight to four treatments. Each ration was fed to two replicate lots of five pigs each.

The basal ration consisted of corn and soybean meal, properly supplemented with minerals except zinc, and vitamins, and contained 1.3% calcium. The rations and additives used were as follows: (1) basal, (2) basal plus 40 ppm zinc, (3) basal plus 500 ppm EDTA, and (4) basal plus 0.5% glycine.

Results of this experiment are presented in Table 1

Table 1 - Summary of Experiment

| Treatment               | Average<br>Initial<br>Wt, lb | Average<br>Final<br>Wt, lb | Average<br>Daily<br>Gain, lb | Feed per<br>lb<br>Gain, lb |
|-------------------------|------------------------------|----------------------------|------------------------------|----------------------------|
| Basal                   | 34.1                         | 78.3                       | 0.79                         | 3.98                       |
| Basal + 40 ppm<br>zinc  | 34.1                         | 113.4                      | 1.42                         | 3.01                       |
| Basal + 500 ppm<br>EDTA | 34.2                         | 102.4                      | 1.22                         | 2.93                       |
| Basal + 0.5%<br>glycine | 33.9                         | 73.1                       | .70                          | 3.53                       |

The feeding of these rations resulted in reduced gains and decreased feed efficiency in rations 1 and 4. Nine of the 10 pigs on ration 1 and 5 of the 10 pigs on ration 4 developed parakeratosis. No parakeratosis was observed in the pigs on rations 2 and 3.



When the pigs from rations 1 and 4 were placed on a reversal (either ration 2 or 3) for 4 weeks, the parakeratotic lesions disappeared and average daily gains and feed efficiency were restored to normal (Table 2).

Table 2 - Summary of Experiment 2, Reversal Phase

| Treatment               | Average<br>Initial<br>Wt, lb | Average<br>Final<br>Wt, lb | Average<br>Daily<br>Gain, lb | Feed per<br>lb<br>Gain, lb |
|-------------------------|------------------------------|----------------------------|------------------------------|----------------------------|
| Basal + 40 ppm<br>zinc  | 75.0                         | 130.2                      | 1.97                         | 3.01                       |
| Basal + 500 ppm<br>EDTA | 76.5                         | 127.6                      | 1.93                         | 3.39                       |

These findings indicate that zinc should be added to rations containing soybean meal as the only source of protein when a high level of calcium is added to the ration of growing pigs.

# EFFECT OF PHYTIC ACID UPON THE INCIDENCE OF PARAKERATOSIS IN GROWING PIGS

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University of Kentucky

Fifty Hampshire weanling pigs averaging approximately 30 pounds were randomly allotted by sex and weight to five ration treatments. Each ration treatment was fed to two replicate lots of five pigs each.

The basal ration consisted of corn and dried skim milk to which calcium was added at the level of 1%. The ration treatments were as follows: (1) basal, (2) basal plus 0.24 pound of phytic acid per cwt, (3) basal plus 0.24 pound of phytic acid per cwt plus 500 ppm EDTA, (4) basal plus 0.24 pound of phytic acid per cwt plus 40 ppm zinc, (5) basal plus 0.24 pound of phytic acid per cwt plus 0.5% glycine.

Results of this experiment are presented in Table 1.

Table 1 - Summary of Experiment

|                                                      | Average<br>Initial<br>Wt, lb | Average<br>Final<br>Wt, lb | Average<br>Daily<br>Gain, lb | Feed per<br>lb<br>Gain, lb |
|------------------------------------------------------|------------------------------|----------------------------|------------------------------|----------------------------|
| Basal                                                | 29.7                         | 89.8                       | 1.23                         | 2.56                       |
| Basal + 0.24 lb<br>phytic acid/cwt                   | 29.2                         | 93.7                       | 1.32                         | 2.63                       |
| Basal + 0.24 lb<br>phytic acid/cwt +<br>500 ppm EDTA | 29.4                         | 89.8                       | 1.23                         | 2.68                       |
| Basal + 0.24 lb<br>phytic acid/cwt +<br>40 ppm zinc  | 29.7                         | 88.8                       | 1.21                         | 2.64                       |
| Basal + 0.24 lb<br>phytic acid/cwt +<br>0.5% glycine | 29.8                         | 90.9                       | 1.25                         | 2.63                       |

The introduction of phytic acid at the 0.24 pound level did not influence gains or feed efficiency in any of the ration treatments. No parakeratosis was noted in any of the ration treatments.



THE EFFECTS OF VARIOUS ADDITIVES WHEN ADDED TO A  
CORN-SOYBEAN MEAL DIET CONTAINING 1% CALCIUM

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University of Kentucky

Forty Hampshire and Yorkshire weanling pigs averaging 19 pounds each were randomly allotted by sex and weight to four treatments. Each ration was fed to two replicate lots of five pigs each.

The basal consisted of corn and soybean meal and contained 1.0% calcium. The rations and additives used were as follows: (1) basal, (2) basal plus 40 ppm zinc, (3) basal plus 500 ppm EDTA and (4) basal plus 0.5% glycine.

Results of this experiment are presented in Table 1

Table 1 - Summary of Experiment

| Ration                  | Av Initial<br>Wt, lb | Av Final<br>Wt, lb | Av Daily<br>Gain/lb | Feed per<br>lb Gain |
|-------------------------|----------------------|--------------------|---------------------|---------------------|
| Basal                   | 18.6                 | 84.2               | 0.78                | 2.88                |
| Basal + 40 ppm<br>zinc  | 19.5                 | 88.8               | .82                 | 2.94                |
| Basal + 500 ppm<br>EDTA | 19.1                 | 76.1               | .68                 | 2.99                |
| Basal + 0.5%<br>glycine | 18.9                 | 83.7               | .77                 | 2.99                |

Average daily gains were markedly reduced in all treatments of this experiment. The reduced gains can be attributed to a high level of calcium (1%) and a low level of phosphorus (0.34%). No parakeratosis was noted in any of the treatments; however, rickets and general phosphorus deficiency symptoms were noted in the groups fed the ration in which EDTA was added.

## HAMPSHIRE SWINE HERD PERFORMANCE RECORD PROJECT

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University of Kentucky

In 1951 a swine performance record project was started. Birth and 56-day weights were taken on each litter farrowed. At weaning, one gilt and one barrow from each of these litters were placed on concrete and self-fed a complete mixed ration until they reached 200 pounds. These test pigs were then slaughtered and detailed carcass measurements were made. Future breeding stock selections were made on the basis of this information. Type of the individual was also considered in making selections for the breeding herd.

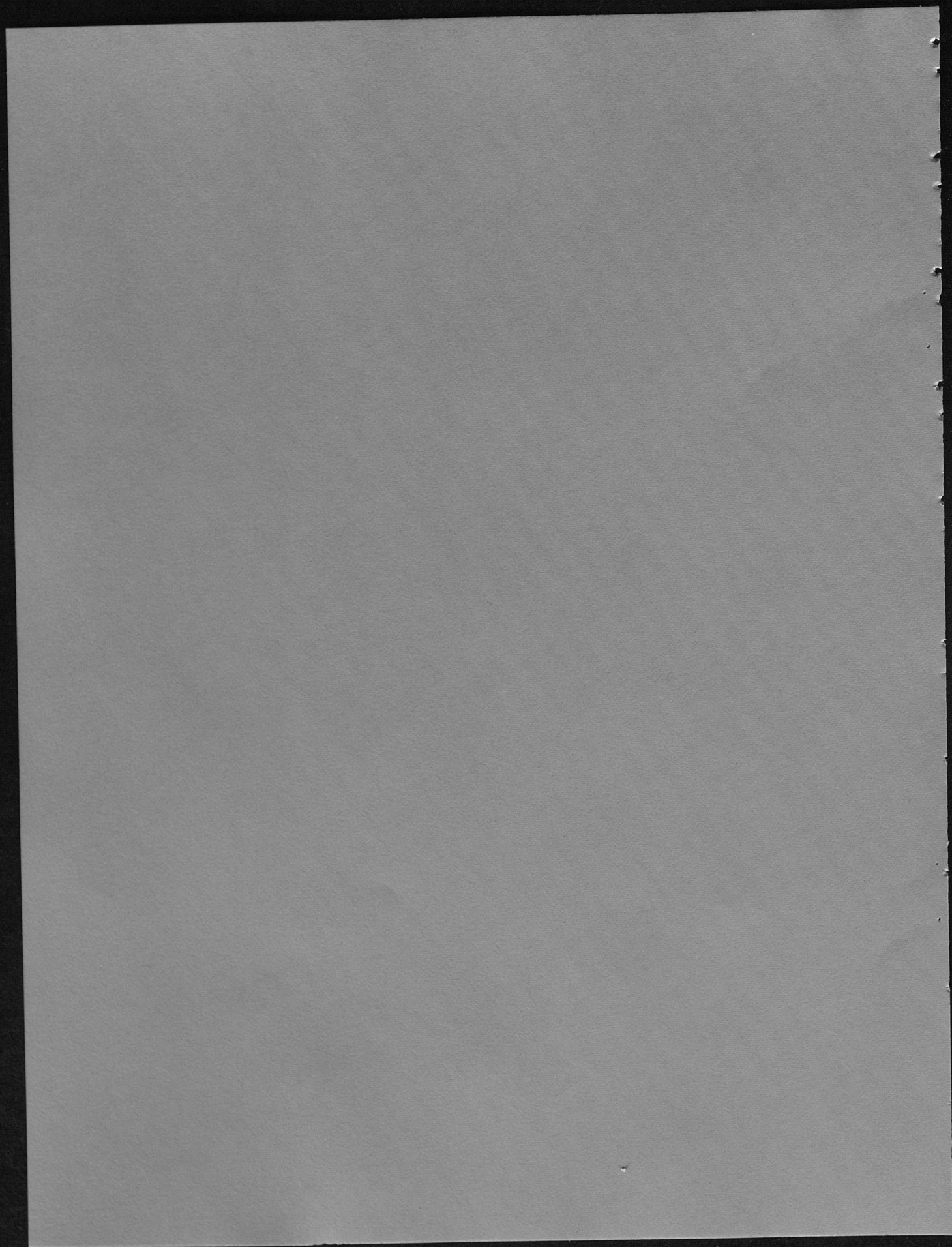
A summary of the performance record of the Hampshire herd for the nine years 1951 and 1954 through 1961 is presented in Table 1.

Although there has been very little change in the average carcass qualities of test pairs of pigs, it should be noted that pigs are becoming more uniform. This observation is best illustrated by the increasing number of Choice No. 1 carcasses.



Table 1 - Summary of Performance Record of Hampshire Herd

|                                      | 1951   | 1954   | 1955   | 1956   | 1957   | 1958   | 1959   | 1960   | 1961   |
|--------------------------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| No. of litters                       | 19     | 25     | 64     | 48     | 37     | 20     | 33     | 35     | 18     |
| Av No. pigs farrowed                 | 9.00   | 9.30   | 9.70   | 10.20  | 10.50  | 11.00  | 10.70  | 11.30  | 11.20  |
| Av birth wt, lb                      | 3.10   | 2.80   | 3.00   | 2.73   | 2.89   | 2.87   | 3.14   | 3.04   | 3.00   |
| Av No. pigs weaned                   | 7.60   | 7.90   | 8.10   | 7.80   | 8.70   | 9.75   | 9.43   | 9.30   | 9.20   |
| Av 56-day wt, lb                     | 29.00  | 31.70  | 31.80  | 34.10  | 35.61  | 36.38  | 38.70  | 37.40  | 37.70  |
| Av daily gain, weaning<br>to 200 lb, | 1.56   | 1.68   | 1.50   | 1.59   | 1.52   | 1.51   | 1.53   | 1.50   | 1.55   |
| Feed per 100 lb gain                 | 374.60 | 364.50 | 367.80 | 358.60 | 356.00 | 346.33 | 346.40 | 338.11 | 334.00 |
| Av backfat, in                       | 1.77   | 1.61   | 1.51   | 1.47   | 1.45   | 1.38   | 1.37   | 1.35   | 1.38   |
| Av carcass length, in                | 28.80  | 29.00  | 29.20  | 29.30  | 29.11  | 29.33  | 29.36  | 29.41  | 29.60  |
| Lean cuts, % carcass                 | 52.60  | 54.40  | 55.14  | 55.68  | 56.00  | 56.39  | 57.60  | 57.83  | 57.42  |
| Av loin eye, sq. in.                 | 4.71   | 4.83   | 4.15   | 4.50   | 4.28   | 4.38   | 4.53   | 4.45   | 4.20   |
| Choice No. 1 carcasses, %            | 55.30  | 83.00  | 90.40  | 89.60  | 91.90  | 95.00  | 98.24  | 98.50  | 91.40  |





MEATS SECTION

CARCASS EVALUATION OF LAMBS FROM SELECTED SIRES

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Carcass data were collected from 65 lambs sired by 3 rams (one Hampshire and two Southdown) which were performance tested for rate of gain. The average daily gain on test was 0.49 lb for the Hampshire and 0.36 and 0.21 lb., respectively, for the Southdowns. Lambs were suckled and received pasture and creep feed. They were slaughtered at approximately 85 lb and evaluated for carcass characteristics.

Table 1 gives a summary of the results. As average daily gain of rams increased, age of lambs at slaughter decreased, carcass weight for day of age increased, and lean weight per day of age increased. The slow-gaining lambs in group 3 were fatter as denoted by a higher percentage of fat in carcass, a thicker covering of fat over the ribeye, and lower percentage of lean and bone. There was no apparent relationship between yield of high-priced cuts (leg, loin and rib) or area of ribeye due to sire.

Wether lamb carcasses were heavier and had more lean per day of age. They contained a higher percentage of lean and bone and less fat.

Table 1 - Summary of Carcass Data

| Group No.           | Breed | A. D. G. of Ram | No. of Lamb | Avg Age at Slaug., Days | Carcass Wt per Day of Age, lb | Av % Yield of Leg, Loin & Rib | Lean Wt per Day of Age lb | % Lean in Carcass | % Fat in Carcass | % Bone in Carcass | Area of Ribeye (Adj to 45 lb Carcass Wt) Sq In | Av Fat Thick- ness Over Ribeye mm |
|---------------------|-------|-----------------|-------------|-------------------------|-------------------------------|-------------------------------|---------------------------|-------------------|------------------|-------------------|------------------------------------------------|-----------------------------------|
| Twin Wether Lambs   |       |                 |             |                         |                               |                               |                           |                   |                  |                   |                                                |                                   |
| 1                   | H     | 0.49            | 5           | 151                     | 0.291                         | 48.46                         | 0.150                     | 54.53             | 30.11            | 14.34             | 2.16                                           | 6.86                              |
| 2                   | S     | .36             | 4           | 174                     | .269                          | 47.94                         | .138                      | 55.18             | 31.05            | 13.04             | 1.93                                           | 7.07                              |
| 3                   | S     | .21             | 6           | 218                     | .172                          | 49.04                         | .093                      | 53.34             | 32.83            | 12.87             | 2.11                                           | 8.87                              |
| Twin Ewe Lambs      |       |                 |             |                         |                               |                               |                           |                   |                  |                   |                                                |                                   |
| 1                   | H     | .49             | 7           | 194                     | .245                          | 48.60                         | .118                      | 51.57             | 34.64            | 12.19             | 2.02                                           | 8.00                              |
| 2                   | S     | .36             | 5           | 217                     | .212                          | 47.70                         | .107                      | 53.73             | 32.59            | 12.68             | 1.90                                           | 7.42                              |
| 3                   | S     | .21             | 15          | 252                     | .173                          | 49.09                         | .082                      | 50.50             | 37.24            | 11.66             | 1.93                                           | 11.41                             |
| Single Wether Lambs |       |                 |             |                         |                               |                               |                           |                   |                  |                   |                                                |                                   |
| 1                   | H     | .49             | 4           | 161                     | .290                          | 47.68                         | .146                      | 54.56             | 30.13            | 14.19             | 2.02                                           | 6.17                              |
| 2                   | S     | .36             | 3           | 161                     | .296                          | 47.75                         | .144                      | 53.06             | 32.24            | 13.53             | 1.80                                           | 7.90                              |
| 3                   | S     | .21             | 4           | 232                     | .205                          | 47.51                         | .099                      | 51.55             | 34.43            | 12.82             | 2.07                                           | 7.78                              |
| Single Ewe Lambs    |       |                 |             |                         |                               |                               |                           |                   |                  |                   |                                                |                                   |
| 1                   | H     | .49             | 7           | 179                     | .239                          | 47.88                         | .112                      | 50.43             | 35.46            | 12.99             | 1.92                                           | 7.51                              |
| 2                   | S     | .36             | 4           | 211                     | .209                          | 47.75                         | .097                      | 49.82             | 37.02            | 12.18             | 1.86                                           | 7.74                              |
| 3                   | S     | .21             | 1           | 183                     | .257                          | 49.97                         | .116                      | 48.36             | 39.45            | 11.23             | 2.04                                           | 15.00                             |
| All Wether Lambs    |       |                 |             |                         |                               |                               |                           |                   |                  |                   |                                                |                                   |
|                     |       |                 | 26          | 185                     | .251                          | 48.17                         | .126                      | 53.73             | 31.80            | 13.45             | 2.04                                           | 7.52                              |
| All Ewe Lambs       |       |                 |             |                         |                               |                               |                           |                   |                  |                   |                                                |                                   |
|                     |       |                 | 39          | 218                     | .209                          | 48.46                         | .099                      | 50.97             | 35.91            | 12.17             | 1.94                                           | 9.32                              |
| All Lambs           |       |                 |             |                         |                               |                               |                           |                   |                  |                   |                                                |                                   |
| 1                   | H     | .49             | 23          | 174                     | .265                          | 48.19                         | .128                      | 52.39             | 33.15            | 13.25             | 2.02                                           | 7.31                              |
| 2                   | S     | .36             | 16          | 194                     | .241                          | 47.78                         | .119                      | 52.99             | 33.24            | 12.80             | 1.88                                           | 8.50                              |
| 3                   | S     | .21             | 26          | 239                     | .181                          | 48.82                         | .088                      | 51.24             | 35.87            | 12.11             | 2.00                                           | 10.41                             |



# EFFECT OF SIRE, BREED AND SEX ON CARCASS CHARACTERISTICS OF BEEF CATTLE

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Carcass data from 33 steers and heifers from Hereford and Red Poll cows and a high-gaining and a low-gaining bull are given in Table 1. The breeding stock was the same as that of the previous year (see data on page 68 of the 1962 "Kentucky Animal Sciences Research Reports"). However, the cow groups were

Table 1 - Carcass Data from Cattle Slaughtered in 1962

|                                             | Sire           |                 | Breed    |          | Sex     |        |
|---------------------------------------------|----------------|-----------------|----------|----------|---------|--------|
|                                             | Low<br>Gaining | High<br>Gaining | Hereford | Red Poll | Heifers | Steers |
| No. of calves                               | 16             | 17              | 17       | 16       | 11      | 22     |
| Live weight                                 | 935            | 1016            | 941      | 1026     | 917     | 1011   |
| Carcass grade <sup>a/</sup>                 | 11.5           | 10.9            | 11.3     | 11.0     | 11.2    | 11.2   |
| Carcass conformation <sup>a/</sup>          | 11.6           | 11.6            | 11.7     | 11.5     | 11.5    | 11.7   |
| Carcass yield (%)                           | 63.1           | 62.6            | 62.4     | 63.3     | 62.6    | 62.9   |
| Fat thickness over<br>ribeye (in.)          | 0.95           | 0.97            | 0.96     | 0.97     | 1.03    | 0.92   |
| Ribeye area (sq in)                         | 9.9            | 11.0            | 10.1     | 10.9     | 9.7     | 10.9   |
| Ribeye area/cwt carcass                     | 1.66           | 1.74            | 1.73     | 1.68     | 1.70    | 1.70   |
| Marbling score <sup>b/</sup>                | 5.4            | 5.2             | 5.5      | 5.0      | 5.5     | 5.2    |
| Physical separation<br>9th, 10th, 11th ribs |                |                 |          |          |         |        |
| Fat%                                        | 43.81          | 41.46           | 42.47    | 42.74    | 45.06   | 41.38  |
| Ribeye (%)                                  | 16.34          | 17.05           | 16.29    | 17.15    | 15.88   | 17.12  |
| Total lean (%)                              | 42.48          | 44.33           | 43.61    | 43.25    | 41.27   | 44.52  |
| Bone (%)                                    | 13.45          | 13.98           | 13.65    | 13.80    | 13.63   | 13.77  |
| Flavor score <sup>c/</sup>                  | 8.03           | 8.11            | 8.19     | 7.95     | 8.05    | 8.09   |
| Tenderness score                            |                |                 |          |          |         |        |
| Panel <sup>c/</sup>                         | 8.10           | 8.03            | 8.09     | 8.05     | 8.26    | 7.98   |
| Shear (1" cores)                            | 18.8           | 20.9            | 20.5     | 19.1     | 18.2    | 20.7   |
| Juiciness score <sup>c/</sup>               | 7.69           | 7.95            | 7.99     | 7.64     | 7.79    | 7.83   |
| Cook loss (%)                               | 25.5           | 26.2            | 25.5     | 26.2     | 25.8    | 25.9   |

<sup>a/</sup> 10 = Good, 11 = high good

<sup>b/</sup> 5 = small amount

<sup>c/</sup> 9 point scale

switched. That is, the cows bred to the high-gaining bull the previous year were subsequently bred to the low-gaining bull. The two-year average is given in Table 2.

Table 2 - Two-Year Average Carcass Data

|                                             | Sire           |                 | Breed    |                        | Sex     |        |
|---------------------------------------------|----------------|-----------------|----------|------------------------|---------|--------|
|                                             | Low<br>Gaining | High<br>Gaining | Hereford | Hereford X<br>Red Poll | Heifers | Steers |
| No. calves                                  | 33             | 34              | 34       | 33                     | 30      | 37     |
| Sex of calves                               |                |                 |          |                        |         |        |
| Steers                                      | 20             | 17              | 19       | 18                     | --      | 37     |
| Heifers                                     | 13             | 17              | 15       | 15                     | 30      | --     |
| Carcass grade <sup>a/</sup>                 | 11.9           | 11.3            | 11.8     | 11.4                   | 11.6    | 11.6   |
| Carcass conformation <sup>a/</sup>          | 11.9           | 11.7            | 12.2     | 11.5                   | 11.6    | 12.1   |
| Carcass yield (%)                           | 62.3           | 61.9            | 61.5     | 62.1                   | 61.8    | 62.3   |
| Fat thickness over rib-<br>eye (in.)        | 0.92           | 0.84            | 0.88     | 0.88                   | 0.88    | 0.87   |
| Ribeye area (sq in)                         | 9.7            | 10.9            | 10.0     | 10.6                   | 9.7     | 10.8   |
| Ribeye area/cwt car-<br>cass                | 1.68           | 1.82            | 1.81     | 1.69                   | 1.76    | 1.74   |
| Marbling score <sup>b/</sup>                | 6.1            | 5.9             | 6.2      | 5.6                    | 6.5     | 5.6    |
| Physical separation<br>9th, 10th, 11th ribs |                |                 |          |                        |         |        |
| Fat (%)                                     | 43.87          | 40.61           | 41.68    | 42.77                  | 44.06   | 40.73  |
| Ribeye (%)                                  | 15.90          | 17.34           | 16.34    | 16.92                  | 16.08   | 17.11  |
| Total lean (%)                              | 42.38          | 45.51           | 44.65    | 43.27                  | 42.62   | 45.07  |
| Bone (%)                                    | 13.35          | 13.62           | 13.42    | 13.54                  | 13.10   | 13.78  |
| Flavor score <sup>c/</sup>                  | 7.87           | 8.03            | 8.01     | 7.89                   | 7.92    | 7.98   |
| Tenderness score                            |                |                 |          |                        |         |        |
| Panel <sup>c/</sup>                         | 7.96           | 7.99            | 7.87     | 7.84                   | 7.93    | 7.91   |
| Shear (1" cores)                            | 18.4           | 18.7            | 18.6     | 18.4                   | 17.9    | 19.5   |
| Juiciness score <sup>c/</sup>               | 7.60           | 7.82            | 7.77     | 7.59                   | 7.68    | 7.71   |

<sup>a/</sup> 11 = high good

<sup>b/</sup> 5 = small amt., 6 = modest amt

<sup>c/</sup> 9 point scale



PHYSICAL COMPOSITION OF PORK CUTS AND RELATIVE CUTOUT PERCENTAGES  
OF PORK CARCASSES FROM THREE DIFFERENT WEIGHT GROUPS OF  
HAMPSHIRE LITTERMATES

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Relative cutout data and general carcass information were collected on five litters of Hampshire hogs, each litter containing three pigs all of the same sex. One hog from each litter was slaughtered at  $160 \pm 5$  pounds, one at  $190 \pm 5$  pounds, and one at  $220 \pm 5$  pounds. After the carcass information was obtained, each whole-sale cut was physically separated into fat, bone, and lean. The results are reported in Tables 1 and 2.

These data tend to support previous work at this station that lighter weight hogs have a higher percentage of lean cuts and a lower percentage of lard stock compared with hogs of heavier weights.

This is only a progress report and plans are to collect similar data on 15 more litters. Also, chemical analyses will be run to determine if there are any differences in proximate composition and meat quality among the three weight groups.

Table 1 - Live Animal and Carcass Data

| Live Weight Groups (lb)              | 160          |       | 190          |       | 220          |       |
|--------------------------------------|--------------|-------|--------------|-------|--------------|-------|
|                                      | RANGE        | MEAN  | RANGE        | MEAN  | RANGE        | MEAN  |
| Live Weight (lb)                     | 154-158.5    | 157.7 | 185-192      | 187.6 | 215-220      | 218.3 |
| Carcass Yield (%)                    | 67.1 - 70.7  | 68.7  | 65.9 - 70.9  | 69.4  | 70.7 - 74.4  | 7.12  |
| Carcass Length (in)                  | 27.0 - 28.5  | 27.6  | 28.6 - 29.6  | 29.2  | 29.6 - 31.2  | 30.3  |
| Backfat Thickness (in)               | 0.90- 1.13   | 1.03  | 1.13- 1.33   | 1.24  | 1.20- 1.53   | 1.39  |
| Loin Eye Area at 10th Rib (sq in)    | 3.27- 3.88   | 3.50  | 3.57- 4.40   | 3.93  | 3.65- 5.00   | 4.27  |
| Loin Eye Area/Cwt Carcass (sq in)    | 3.01- 3.50   | 3.24  | 2.77- 3.25   | 3.02  | 2.32- 3.22   | 2.75  |
| Lean Area of Ham (sq in)             | 30.65- 40.45 | 35.76 | 34.99- 43.64 | 38.64 | 36.77- 43.28 | 39.17 |
| Lean Area of Ham/Cwt Carcass (sq in) | 27.61- 37.11 | 33.09 | 27.12- 32.21 | 29.66 | 23.20- 27.83 | 25.23 |
| Ham Fat Thickness (in)               | 0.45- 0.90   | 0.70  | 0.70- 1.00   | 0.78  | 0.90- 1.00   | 0.94  |
| Percent Ham of Carcass               | 20.66- 23.25 | 21.98 | 18.51- 22.39 | 20.83 | 19.14- 22.25 | 20.68 |
| Percent Loin of Carcass              | 16.08- 18.81 | 17.53 | 16.44- 17.63 | 17.19 | 15.92- 17.92 | 16.87 |
| Percent Picnic of Carcass            | 8.65- 11.20  | 9.73  | 8.96- 10.88  | 9.97  | 8.53- 9.27   | 9.02  |
| Percent Boston of Carcass            | 7.37- 8.35   | 7.88  | 6.98- 7.79   | 7.22  | 6.50- 7.60   | 7.20  |
| Percent Belly of Carcass             | 12.50- 14.86 | 13.93 | 12.85- 14.54 | 13.69 | 13.70- 15.30 | 14.79 |
| Percent Lean Cuts                    | 53.67- 60.55 | 57.13 | 54.40- 57.59 | 56.32 | 51.46- 55.94 | 53.83 |
| Percent Primal Cuts                  | 68.07- 73.89 | 71.06 | 67.58- 71.69 | 69.91 | 66.36- 70.52 | 68.56 |
| Percent Lard Stock                   | 11.82- 17.05 | 13.66 | 13.90- 17.36 | 15.72 | 15.44- 20.35 | 17.68 |



Table 2 - Physical Composition of Primal Cuts

| Live Weight Groups (lb)  | 160         |       | 190         |       | 220         |       |
|--------------------------|-------------|-------|-------------|-------|-------------|-------|
|                          | RANGE       | MEAN  | RANGE       | MEAN  | RANGE       | MEAN  |
| <u>Ham</u>               |             |       |             |       |             |       |
| % Fat                    | 18.51-22.53 | 21.20 | 17.18-22.45 | 19.65 | 19.74-23.61 | 21.59 |
| % Bone                   | 10.03-11.67 | 10.91 | 9.82-10.67  | 10.64 | 9.20-11.00  | 10.07 |
| % Lean                   | 66.25-70.82 | 67.78 | 66.64-73.01 | 69.84 | 66.60-70.18 | 68.27 |
| <u>Loin</u>              |             |       |             |       |             |       |
| % Fat                    | 14.21-22.79 | 19.03 | 13.55-21.35 | 17.80 | 15.38-23.05 | 18.33 |
| % Bone                   | 15.93-19.62 | 17.08 | 16.61-21.47 | 18.32 | 13.97-16.34 | 15.12 |
| % Loin Eye               | 26.94-38.90 | 31.73 | 28.74-34.81 | 32.21 | 29.36-36.64 | 32.01 |
| % Total Lean             | 61.72-66.63 | 63.90 | 60.95-68.73 | 63.84 | 59.98-69.01 | 65.97 |
| <u>Belly</u>             |             |       |             |       |             |       |
| % Fat                    | 51.68-70.70 | 59.04 | 55.07-66.02 | 59.13 | 57.12-63.03 | 60.39 |
| % Lean                   | 29.30-48.32 | 40.96 | 33.98-44.93 | 40.81 | 36.73-42.89 | 39.54 |
| <u>Boston</u>            |             |       |             |       |             |       |
| % Fat                    | 14.79-27.32 | 20.55 | 17.32-23.26 | 20.12 | 17.98-27.96 | 22.79 |
| % Bone                   | 5.01- 6.74  | 5.64  | 4.57- 6.36  | 5.38  | 3.88- 5.35  | 4.60  |
| % Lean                   | 67.67-78.45 | 73.57 | 72.07-77.94 | 74.46 | 68.16-76.86 | 72.54 |
| <u>Picnic</u>            |             |       |             |       |             |       |
| % Fat                    | 19.37-27.11 | 24.21 | 19.68-27.99 | 23.73 | 20.62-29.88 | 25.96 |
| % Bone                   | 13.37-21.00 | 16.78 | 13.01-14.67 | 13.71 | 12.55-15.23 | 14.03 |
| % Lean                   | 53.50-63.16 | 59.01 | 58.85-65.65 | 62.15 | 56.49-64.15 | 59.94 |
| <u>Total of all Cuts</u> |             |       |             |       |             |       |
| % Fat                    | 25.18-31.78 | 28.65 | 26.38-31.14 | 28.47 | 27.32-33.47 | 30.52 |
| % Bone                   | 11.35-12.91 | 11.91 | 11.57-12.86 | 12.05 | 9.74-11.02  | 10.50 |
| % Ribeye                 | 5.75- 7.84  | 6.88  | 6.33- 8.11  | 6.95  | 6.40- 7.90  | 7.13  |
| % Total Lean             | 56.87 63.10 | 59.34 | 55.58-61.67 | 59.38 | 55.43-61.82 | 58.78 |

# QUICK AGING OF HAMS

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Thirty-two hams were dry-cured smoked, tempered at 65°F for 2 weeks and aged for 12 weeks in groups of 8 at 75, 85, 95, and 105°F, respectively, for groups 1, 2, 3, and 4. Peroxide numbers and free fatty acid values were determined on fresh samples, after smoking when put in the aging cabinets and after 4, 8 and 12 weeks aging. Salt and moisture were determined on center slices. Shrinkage was determined at regular intervals during curing and aging. Palatability tests were conducted on center slices after 12 weeks. Butt and shank portions were sold and consumers filled out and returned questionnaires concerning acceptability.

Table 1 gives the peroxide numbers. Although group 2 shows a higher average at 12 weeks this has little meaning as 3 samples showed unusually high readings. Peroxide numbers increased as aging progressed.

Table 1 - Peroxide Numbers

| Group No. | Temp, °F | Period |        |        |      |       |       |
|-----------|----------|--------|--------|--------|------|-------|-------|
|           |          | Fresh  | Smoked | In Box | 4 Wk | 8 Wk  | 12 Wk |
| 1         | 75       | 1.17   | 4.68   | 3.62   | 7.80 | 9.78  | 12.02 |
| 2         | 85       | 1.04   | 5.26   | 2.63   | 7.54 | 7.06  | 17.48 |
| 3         | 95       | 1.18   | 4.70   | 5.35   | 9.47 | 16.14 | 12.80 |
| 4         | 105      | 1.10   | 3.83   | 2.98   | 7.67 | 9.82  | 12.18 |

Free fatty acids increased as aging progressed but increased less in group 1 and most in group 3. Table 2 shows the average free fatty acid values.

Table 2 - Free Fatty Acid Values

| Group | Temp, °F | Period |        |        |      |       |       |
|-------|----------|--------|--------|--------|------|-------|-------|
|       |          | Fresh  | Smoked | In Box | 4 Wk | 8 Wk  | 12 Wk |
| 1     | 75       | 0.20   | 1.11   | 2.24   | 4.84 | 6.91  | 8.94  |
| 2     | 85       | .21    | 1.33   | 2.39   | 6.54 | 12.89 | 16.20 |
| 3     | 95       | .24    | 1.08   | 2.02   | 6.03 | 11.72 | 18.67 |
| 4     | 105      | .24    | 1.11   | 2.16   | 5.59 | 8.75  | 12.86 |

All groups were similar in salt and moisture content, as shown in Table 3, although group 4, which had more shrinkage, was highest in salt and lowest in moisture.



Table 3 - Salt and Moisture Content

| Group | Temp,<br>°F | Salt % | Moisture % |
|-------|-------------|--------|------------|
| 1     | 75          | 5.30   | 53.77      |
| 2     | 85          | 5.54   | 52.52      |
| 3     | 95          | 5.10   | 53.47      |
| 4     | 100         | 5.80   | 51.02      |

Shrinkage increased throughout the test, as shown in Table 4. It was lowest in group 1 and highest in group 4, indicating that higher temperatures increased shrinkage. The data give the percent weight loss in the aging cabinets and the final column gives percent weight loss based on fresh weight.

Table 4 - Ham Shrinkage

| Group | Temp,<br>°F | Loss in boxes % |       |        | Loss as<br>% of Fresh Wt |
|-------|-------------|-----------------|-------|--------|--------------------------|
|       |             | 4 Wks           | 8 Wks | 12 Wks | 12 Wks                   |
| 1     | 75          | 5.29            | 8.88  | 11.21  | 23.34                    |
| 2     | 85          | 5.23            | 9.47  | 12.00  | 24.88                    |
| 3     | 95          | 5.20            | 9.29  | 11.98  | 24.74                    |
| 4     | 105         | 6.72            | 11.36 | 13.89  | 25.71                    |

Palatability scores for flavor, saltiness, tenderness and overall satisfaction were determined by a six-member taste panel using a nine-point hedonic scale with 9 being "like extremely" and 1 being "dislike extremely." Results are shown in Table 5. There was little difference in flavor or saltiness. Group 4 was more tender due to the higher aging temperature.

Table 5 - Palatability Scores

| Group | Temp,<br>°F | Average Scores |           |            |                         |
|-------|-------------|----------------|-----------|------------|-------------------------|
|       |             | Flavor         | Saltiness | Tenderness | Overall<br>Satisfaction |
| 1     | 75          | 7.24           | 7.21      | 7.18       | 7.24                    |
| 2     | 85          | 7.07           | 7.23      | 7.48       | 7.18                    |
| 3     | 95          | 7.26           | 7.44      | 7.45       | 7.33                    |
| 4     | 105         | 7.26           | 7.34      | 7.71       | 7.44                    |

Results of consumer survey were variable and are shown in Table 6. In general, the hams were well accepted but a few consumers thought some were too dry, not aged enough or too salty. One chief criticism was dryness in group 4. Groups 2 and 3 had the highest overall acceptability.

These data substantiate earlier data showing that acceptable aged hams can be produced by aging 12 weeks at 85° - 95°F after a short salt equalization period.

Table 6 - Results of Consumer Survey <sup>a/</sup>

| Group | Temp. of | No. of Replies | Typical Odor   |                | Proper Color  |          |            | Saltiness |            | Aging    |            | Juiciness  |         |           | Flavor    |      |               | Would Buy Another |    |   |
|-------|----------|----------------|----------------|----------------|---------------|----------|------------|-----------|------------|----------|------------|------------|---------|-----------|-----------|------|---------------|-------------------|----|---|
|       |          |                | Before Cooking | During Cooking | After Cooking | Too Much | Just Right | Too Much  | Just Right | Too Much | Not Enough | Just Right | Too Dry | Ext. Good | Very Good | Fair | Slightly Poor | Yes               | No |   |
| 1     | 75       | 5              | 3              | 4              | 4             | 5        | 3          | 2         | 1          | 2        | 2          | 4          | 1       |           | 2         |      | 1             | 2                 | 2  |   |
| 2     | 85       | 9              | 7              | 8              | 7             | 8        | 1          | 7         |            | 6        | 2          | 6          | 2       | 3         | 5         | 1    |               | 8                 | 1  |   |
| 7     | 95       | 9              | 6              | 7              | 7             | 7        | 3          | 7         |            | 5        | 3          | 8          | 2       | 3         | 4         | 1    | 2             | 8                 | 1  |   |
| 4     | 105      | 12             | 6              | 11             | 8             | 9        | 5          | 8         | 1          | 4        | 5          | 6          | 7       | 1         | 5         | 4    | 2             | 1                 | 10 | 2 |

<sup>a/</sup> All consumers did not answer all questions



CONSUMER SURVEY ON COOKING FATS  
IN LEXINGTON, KENTUCKY

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Interviews were made with 250 Lexington families to learn their fat consumption habits. These families were selected so that there would be 50 in each of five income groups; under \$3,000, \$3,000-\$5,000, \$5,000-\$7,000, \$7,000-\$10,000, and over \$10,000. They were asked: number in family, age of members of family, annual income of family, amount of different cooking fats used per month, reasons for using different cooking fats for different purposes, if they do not use lard now, did they formerly use it, why they quit using lard, whether they prefer a solid or liquid shortening, type of container they prefer, and if they would use more lard if it were more unsaturated.

The overall results of the survey (excluding the reasons for using different fats for different purposes) are presented in Tables 1 and 2.

Table 1 shows the percentage of families using the different cooking fats for all income groups combined.

Table 1 - Percentage of Families Using the Different Cooking Fats <sup>a/</sup>

| Type of Fat             | Percent |
|-------------------------|---------|
| Lard                    | 35.2    |
| Veg. Fats               | 68.0    |
| Margarine <sup>b/</sup> | 71.6    |
| Veg Oils                | 53.2    |

<sup>a/</sup> All income groups combined

<sup>b/</sup> Margarine for cooking

Table 2 - Results of Consumer Survey (Excluding Reasons for Using Different Products)

| Factors                                                      | Income Groups |              |               |                |              |  |
|--------------------------------------------------------------|---------------|--------------|---------------|----------------|--------------|--|
|                                                              | Under \$3000  | \$300-\$5000 | \$5000-\$7000 | \$7000-\$10000 | Over \$10000 |  |
| Percent of Families Using (1) Lard                           | 48.0          | 52.0         | 34.0          | 22.0           | 20.0         |  |
| (2) Veg Fats                                                 | 74.0          | 60.0         | 70.0          | 74.0           | 62.0         |  |
| (3) Margarine                                                | 68.0          | 70.0         | 64.0          | 78.0           | 78.0         |  |
| (4) Veg Oils                                                 | 44.0          | 46.0         | 56.0          | 50.0           | 70.0         |  |
| Average size of Family                                       | 3.6           | 3.4          | 3.7           | 3.6            | 3.6          |  |
| Percent of Families that Quit Using Lard                     | 36.0          | 36.0         | 44.0          | 54.0           | 54.0         |  |
| Reasons for Quitting (%)                                     | 66.7          | 83.3         | 72.7          | 59.3           | 81.5         |  |
| (1) Health                                                   | 27.8          | 11.1         | 18.2          | 14.8           | 7.4          |  |
| (2) Don't Like                                               | 5.5           | 5.5          | 9.1           | -              | -            |  |
| (3) Finished Product                                         | -             | -            | -             | 18.5           | 11.1         |  |
| (4) Convenience                                              | -             | -            | -             | 7.4            | -            |  |
| (5) Advertising                                              | 16.0          | 12.0         | 22.0          | 24.0           | 26.0         |  |
| Percent That Never Used Lard                                 | 10.0          | 22.0         | 26.0          | 22.0           | 32.0         |  |
| Percent That Prefer Liquid Fats                              | 90.0          | 78.0         | 74.0          | 78.0           | 68.0         |  |
| Percent That Prefer Solid Fats                               | 14.0          | 17.9         | 16.2          | 10.3           | 14.7         |  |
| Of Ones Preferring Solids Percent Preferring                 | 76.0          | 74.4         | 78.4          | 87.2           | 76.5         |  |
| (1) Box                                                      | -             | 7.7          | 5.4           | 2.6            | 8.8          |  |
| (2) Can                                                      |               |              |               |                |              |  |
| (3) Bucket                                                   |               |              |               |                |              |  |
| Percent that Would Use More Lard If It Were More Unsaturated | 50.0          | 50.0         | 66.0          | 74.0           | 68.0         |  |
| Of Ones Using the Product: Avg Cons/Family/Mo.               |               |              |               |                |              |  |
| (1) Lard - lbs.                                              | 5.4           | 4.1          | 5.6           | 3.8            | 4.1          |  |
| (2) Veg Fats - lb                                            | 3.3           | 2.8          | 3.0           | 3.2            | 3.0          |  |
| (3) Margarine <sup>a</sup> - lb                              | 2.8           | 3.1          | 3.0           | 3.5            | 3.2          |  |
| (4) Veg Oils - lb                                            | 1.7           | 1.3          | 2.2           | 1.8            | 2.3          |  |
| Avg Consumption of Cooking Fats/Person/Month                 | 2.1           | 2.0          | 1.9           | 1.9            | 1.9          |  |
| Margarine For Cooking                                        |               |              |               |                |              |  |



General observations of the data in Table 2 indicate that: (1) As the income increased, the percentage of families using lard decreased, (2) as income increased, the percentage of families using vegetable oils increased, (3) average family size was about equal for all groups, (4) as income increased, the percentage of families that quit using lard increased, (5) health was the major reason why people quit using lard, (6) the major percentage of the people preferred solid shortening, (7) the major percentage of the people which preferred solid shortening, preferred a metal can as the container, (8) people in the higher income groups would use more lard if it were more unsaturated, and (9) the average consumption of cooking fats per person per month was about equal for all income groups.

The results of answers on the uses of the various fats for different cooking methods are presented in Table 3. In general, the reasons checked for using a particular fat for the various types of cooking were flavor, health and texture of the product, or combinations of these. Price was checked as a reason several times for lard, while lard did not receive any checks for health as a reason for using.

Table 3 - Uses of Cooking Fats (All Income Groups)

| Use             | Product Used | Reasons <sup>a</sup> For Using and Number of Times They Were Checked |       |        |             |               | Texture of Product |
|-----------------|--------------|----------------------------------------------------------------------|-------|--------|-------------|---------------|--------------------|
|                 |              | Flavor                                                               | Price | Health | Smoke Point | Melting Point |                    |
| Deep Fat Frying | Lard         | 43 <sup>b</sup>                                                      | 14    | 0      | 0           | 0             | 3                  |
|                 | Veg Fats     | 63                                                                   | 1     | 49     | 8           | 2             | 10                 |
|                 | Margarine    | 0                                                                    | 0     | 1      | 0           | 0             | 0                  |
|                 | Veg Oils     | 48                                                                   | 1     | 74     | 10          | 7             | 13                 |
| Pan Frying      | Lard         | 72                                                                   | 23    | 0      | 0           | 0             | 4                  |
|                 | Veg Fats     | 80                                                                   | 2     | 65     | 3           | 2             | 7                  |
|                 | Margarine    | 8                                                                    | 1     | 9      | 1           | 0             | 2                  |
|                 | Veg Oils     | 32                                                                   | 5     | 40     | 3           | 4             | 5                  |
| Pastry          | Lard         | 37                                                                   | 11    | 0      | 0           | 0             | 23                 |
|                 | Veg Fats     | 81                                                                   | 1     | 42     | 2           | 1             | 57                 |
|                 | Margarine    | 33                                                                   | 2     | 14     | 0           | 1             | 33                 |
|                 | Veg Oils     | 9                                                                    | 0     | 20     | 1           | 1             | 6                  |
| Cakes, etc.     | Lard         | 31                                                                   | 9     | 0      | 0           | 0             | 22                 |
|                 | Veg Fats     | 74                                                                   | 7     | 34     | 1           | 0             | 48                 |
|                 | Margarine    | 37                                                                   | 4     | 16     | 1           | 1             | 35                 |
|                 | Veg Oils     | 11                                                                   | 0     | 20     | 0           | 1             | 5                  |

<sup>a/</sup> More than 1 reason could be checked for each use.

<sup>b/</sup> For example: Flavor was checked 43 times as a reason for using lard in deep fat frying.



GENETICS SECTION

SPERM PRODUCTION IN RABBITS AFTER INJECTING  
PROGESTERONE OR PROGESTOGENS

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University of Kentucky

Injecting 5 or 10 mg of progesterone subcutaneously every other day for 14 days into fertile rabbits had no effect on sperm cell concentration or motility. Weekly semen collections were made with an artificial vagina. There appeared to be an increase in percentage of cells with protoplasmic droplets, but fertility of the males during the 6th week after start of treatment was not lowered. A reduction in sperm production occurred in two rabbits injected with 10 mg of progesterone every other day for 28 days. Before treatment, sperm concentration averaged 1.2 billion cells/cc and by the 11th week of the trial few sperm cells were produced. This condition was maintained in one of the rabbits through the 22nd week of the trial. Sperm concentration in the other rabbit temporarily increased, but during the 19th through the 22nd weeks no sperm cells were present.

Daily injections of 5mg of 6-methyl-17-aceoxyprogesterone (MAP) for 30 days resulted in significantly lower sperm production. Sperm concentration dropped from an average of 420 million cells/cc to 20 million cells/cc during the 9th week of the trial. A gradual increase in sperm concentration was evident by the 11th week and continued through the 15th week when the sperm concentration was 260 million cells/cc. Six weeks after injecting 10 mg of 6-chloro- $\Delta^6$ -17-acetoxypregesterone (CAP) every other day for 30 days, one male produced few sperm cells and a second, none. Libido was reduced but returned to normal during the 6th week of the trial. These studies suggest that temporary chemical sterilization of the male may be possible.

## SELECTING FOR EARLIER LAMBING DATE IN PUREBRED SOUTHDOWN SHEEP

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A flock of 60 Southdown ewes is maintained at the Kentucky Station, closed to outside breeding. The flock is divided into three breeding groups with early-born yearling rams used as sires each year. Semen quality of the flock sires is determined by laboratory tests each year, but to date the only criterion used in selecting sires has been date of birth. Some selection for early date of birth has been possible among yearling replacement ewes.

A five-year summary for the data of first breeding, the interval between first breeding and conception, average lambing data, percent of ewes lambing and lambing rate is shown in Table 1.

Table 1 -Five-year Summary of Breeding Performance

|                                                          | Year |      |      |      |      |
|----------------------------------------------------------|------|------|------|------|------|
|                                                          | 1958 | 1959 | 1960 | 1961 | 1962 |
| Av date of first breeding                                | 9/10 | 9/21 | 9/30 | 9/20 | 9/27 |
| Av date of lambing                                       | 3/7  | 3/15 | 3/25 | 3/6  | 3/11 |
| Av interval between first breeding and conception (days) | 33   | 33   | 31   | 22   | 20   |
| Percent of ewes lambing                                  | 87.8 | 77.1 | 85.7 | 93.3 | 96.8 |
| Lambing rate                                             | 1.38 | 1.45 | 1.43 | 1.50 | 1.38 |

The percent of ewes lambing has increased, and the lambing rate has been satisfactory. The calculated average interval between the date of first breeding (date when ewes were first marked by ram) and the date of conception has decreased, but no marked change in average lambing date is apparent.



EFFECT OF HEAT STRESS UPON SHEEP OVA  
PRIOR TO OVULATION

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More than 90% of the ova recovered from commercial crossbred ewes that were placed in a heated room (90°F, R. H. 60-65%) on the 12th day of the estrous cycle and removed at time of breeding were fertilized. Embryo loss averaged 15% and was not significantly different for the control and heat-stressed ewes. Eighty percent of the ewes lambed. The average length of time spent in the hot room was 5.5 days. Body temperature increased, but there were no adverse effects on occurrence of subsequent estrus. Ewes in the hot room had a slightly longer cycle than control ewes. Ovulation rate was not significantly affected, and there was no increase in the occurrence of morphologically abnormal ova, similar to that which has been found in ewes exposed to heat stress during estrus. When ewes are exposed to heat at time of or in a few days subsequent to breeding, a high percentage of abnormal ova are found, and conception rate has been very low. This study shows that exposure to high temperature (90°F) before breeding does not affect the ovum if the heat stress is removed at breeding. Fertility and survival of the embryo have been similar to that of control ewes. The most critical period for high temperature with the breeding ewe is during estrus and before or at the time the ovum enters the uterus.

Table 1 - Results from Ewes Exposed to Heat before Breeding <sup>a</sup>

|                      | Control                   | In heat day<br>12 of cycle-<br>out day 16 | In heat day 12<br>of cycle -out<br>at breeding |
|----------------------|---------------------------|-------------------------------------------|------------------------------------------------|
| Ova fertilized,<br>% | 92.5<br>(20) <sup>b</sup> | 100<br>(20)                               | 89.6<br>(20)                                   |
| Ewes lambing,<br>%   | 80.0<br>(20)              | 80.0<br>(20)                              | 80.0<br>(20)                                   |

<sup>a</sup> Results of two years

<sup>b</sup> Figures in parentheses represent number of ewes

# SUMMER SEMEN CHARACTERISTICS OF YEARLING SOUTHDOWN RAMS

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Three weekly semen collections for laboratory study were taken from yearling Southdown rams during July with an electrical ejaculator. All rams tested produced semen containing motile sperm cells at each collection. There were some variation among rams within sire groups, but average values for the traits did not differ significantly among sire groups. Data for the semen characteristics studied are shown by sire groups in Table 1.

Table 1 - Average Semen Characteristics During July

| Sire group | Ram number | Volume cc | Motile cells, % | Sperm cell conc, X 10 | Abnormal cells % |
|------------|------------|-----------|-----------------|-----------------------|------------------|
| 591        | 46         | 1.13      | 60              | 239                   | 27.4             |
|            | 56         | 0.93      | 77              | 240                   | 19.0             |
|            | 69         | 1.07      | 80              | 249                   | 10.2             |
|            | 72         | 0.93      | 57              | 106                   | 34.9             |
|            | 82         | 0.97      | 37              | 90                    | 34.3             |
| Average    |            | 1.01      | 62              | 185                   | 25.1             |
| 5930       | 10         | 1.07      | 70              | 239                   | 21.7             |
|            | 11         | 0.87      | 70              | 207                   | 31.8             |
|            | 16         | 1.10      | 30              | 82                    | 35.3             |
|            | 23         | 0.87      | 60              | 135                   | 22.8             |
|            | 28         | 1.17      | 63              | 88                    | 17.3             |
| Average    |            | 1.02      | 54              | 150                   | 25.8             |
| 5944       | 1          | 0.87      | 67              | 209                   | 14.4             |
|            | 6          | 0.90      | 57              | 198                   | 18.3             |
|            | 8          | 0.97      | 60              | 149                   | 16.8             |
|            | 12         | 0.80      | 50              | 120                   | 31.6             |
|            | 24         | 1.20      | 63              | 138                   | 26.6             |
| Average    |            | 0.95      | 59              | 165                   | 21.3             |



Rams number 10,12 and 46 sired the lambs born in 1963. Average date of birth for the lambs by sire groups was March 15, February 28 and March 11, respectively, and the overall average was March 7. Percent of ewes lambing was 86, 85 and 100, respectively, for the three sire groups. Differences exist in average date of birth of lambs by sires, but there appears to be little relationship with summer semen characteristics. This study is being conducted to determine whether the summer semen traits may be useful in selecting rams capable of siring early lambs.

# INDUCTION OF REPRODUCTIVE ACTIVITY IN ANESTROUS EWES BY USE OF ORAL PROGESTOGENS AND PREGNANT MARE SERUM

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Studies have been conducted with crossbred commercial anestrous ewes in attempts to induce breeding by feeding progestational compounds prior to injecting pregnant mare serum. Two trials were conducted. In Trial I, 20 ewes were fed 50 mg of 6-methyl-17-acetoxypregesterone (MAP) per ewe per day for 7 days and 20 ewes for 14 days. In Trial II, 50 ewes were divided into 5 groups of 10 each. Groups 1 and 2 were fed 75 mg MAP per ewe per day for 14 days and 21 days, respectively. Groups 3 and 4 were fed 1 mg of 6-chloro- $\Delta$ 6-17-acetoxypregesterone (CAP) per ewe per day for 14 and 21 days, respectively. Group 5 served as control. Results of the study are shown in Table 1.

Table - Results of Study to Induce Breeding in Anestrous Ewes by Using Oral Progestogens and Pregnant Mare Serum

| Number of ewes | Hormone fed      | Daily dose | Duration of feeding | PMS Dosage | Ewes in estrus within 8-days, post-injection | Ewes <sup>a</sup> ovulating | Ova ferti-lized | Ewes lambing |
|----------------|------------------|------------|---------------------|------------|----------------------------------------------|-----------------------------|-----------------|--------------|
|                |                  | mg         | days                | I. U.      | %                                            | %                           | %               | %            |
| Trial I        |                  |            |                     |            |                                              |                             |                 |              |
| 20             | MAP <sup>b</sup> | 50         | 7                   | 500        | 25                                           | 90.0                        | 0.0             | 30.0         |
| 20             | MAP              | 50         | 14                  | 500        | 65                                           | 100.0                       | 35.3            | 40.0         |
| Trial II       |                  |            |                     |            |                                              |                             |                 |              |
| 10             | MAP              | 75         | 14                  | 500        | 10                                           | 60.0                        | 33.3            | 20.0         |
| 10             | MAP              | 75         | 21                  | 100        | 40                                           | 100.0                       | 25.0            | 40.0         |
| 10             | CAP <sup>c</sup> | 1          | 14                  | 500        | 10                                           | 80.0                        | 0.0             | 20.0         |
| 10             | CAP              | 1          | 21                  | 1000       | 20                                           | 100.0                       | 33.3            | 40.0         |
| 10             | Control          | --         | --                  | ----       | --                                           |                             |                 |              |

<sup>a</sup> One-half ewes in each group slaughtered for fertility data

<sup>b</sup> 6-methyl-17-acetoxypregesterone

<sup>c</sup> 6-chloro- $\Delta$ 6-17-acetoxypregesterone



## BEEF CATTLE SECTION

### CHOICE SLAUGHTER BEEF FROM GRAIN AND GRASS

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It has been established that a large part of the beef consumed in Kentucky is purchased outside the state. A representative of one of the meat packing companies in Louisville estimated that beef amounting to 435,000 carcasses is brought into Kentucky each year. Many people believe that more of this beef should be produced in Kentucky. It is also believed that if simple, suitable and economical programs for producing this beef are demonstrated, they will be adopted by many Kentucky cattlemen.

During the summer of 1962, two groups of 20 rather fleshy 700-pound yearling Angus steers were used to compare two methods of fattening steers on pasture. One group was fed ground shelled corn from a self feeder during the entire grazing season. The other group received nothing but pasture for the first 56 days and was then self fed ground shelled corn for 112 days. Two 20-acre bluegrass white clover pastures located on the U. K. Coldstream Farm were used. To equalize pasture quality and quantity, the two groups of steers were rotated on the two pastures at 14-day intervals. In order to reduce the possibility of founder, a mixture of 40 percent ground corncobs and 60 percent ground shelled corn was self fed during the first week the cattle were on feed. During the second week, a mixture of 20 percent ground corncobs and 80 percent ground shelled corn was fed. At the beginning of the third week and thereafter, ground shelled corn was self fed. Apparently this method of starting cattle on feed was satisfactory since no founder or digestive disturbances were observed.

The results of this comparison are given in Table 1. During the first 56 days, the steers being fed corn had average gains of 156 pounds while those on pasture gained 125 pounds. The thing which should be emphasized is that during the first two months of the grazing season, bluegrass-white clover is very high quality feed. Proof of this is that yearling steers used in this test gained at the rate of 2.23 pounds per head daily. The deferred feeding plan would make maximum use of the early pasture when it is plentiful and most nutritious by enabling the operator to stock the pastures heavier than usual. When the lush pasture season is over and dryer summer weather sets in, corn can be fed to make up for the lack of pasture.

During the last 112 days when both groups of steers were given a full feed of corn from self feeders, rate of gain was about the same for both groups. At the end of the grazing season, steers which had been fed corn all summer had gained 29 pounds more than steers on the deferred feed, but they had used about 12 bushels more corn.

The test ended the third week of October when the steers were shipped to a Louisville packing plant where they were slaughtered and various carcass measurements were taken. Steers which had been fed corn all summer dressed slightly higher and had about 0.1 inch more fat over the ribs. Carcasses from both groups of steers graded the same even though those on the deferred feed had eaten 12 bushels less corn per head.

This test demonstrated that steers handled under the deferred feeding plan will yield highly desirable carcasses. The quality was high enough that they graded Choice and yet they were not excessively fat since they had only 0.82 inch of fat over the ribs. More important to the producer is that the steers used only 35 bushels of corn each by making good use of pasture early in the season when it is at its best. Since the steers were stocked at the rate of one steer per acre, a return to labor, management and investment of \$56.84 per acre was realized.

The deferred feeding plan was also compared with that of feeding steers during the entire grazing season at the West Kentucky Substation at Princeton. Results of this comparison are given in Table 2. The initial weight of the yearling Angus steers used in this test was somewhat lighter, and the pastures used were predominately fescue. The grazing season started about 2 weeks earlier. Therefore, steers on the deferred feeding plan received pasture only for 70 days and were then full fed ground shelled corn from a self feeder for 112 days. During the first 70 days steers on the deferred feeding plan gained 0.79 pounds per head daily slower than steers which were fed corn. However, the deferred group gained at a faster rate during the last 112 days than the group which has been fed corn all summer. Steers which were fed corn all summer averaged gaining 39 pounds more during the entire period, but they consumed 18 bushels more corn. Both groups of steers yielded carcasses which graded low Choice and were very acceptable to the packers.

It was felt that steers grazing predominately fescue pasture would need some supplemental protein. Therefore, all steers were fed from 0.5 to 1.5 pound of soybean meal per head daily, depending on the condition of the pastures.

Steers on the deferred feeding plan graded as well and returned \$5.33 more per head than steers which received a full feed of grain during the entire 182-day grazing season.



Table 1 - A Comparison of Steers on the Deferred Feeding Plan and Steers which were Fed Corn All Summer -- 168-day Grazing Season (Bluegrass-white clover pasture)

| <u>1st 56 days</u>                    | <u>Deferred Feed</u> | <u>Feed all Summer</u> |
|---------------------------------------|----------------------|------------------------|
| Number of steers                      | 20                   | 20                     |
| Beginning weight                      | 687 lb               | 689 lb                 |
| 56-day weight                         | 812 lb               | 845 lb                 |
| 56-day gain                           | 125 lb               | 156 lb                 |
| 56-day average daily gain             | 2.23 lb              | 2.78 lb                |
| Corn per steer                        | ---                  | 12 bushels             |
| <u>Last 112 days</u>                  |                      |                        |
| 56 to 168-day gain                    | 224 lb               | 222 lb                 |
| 56 to 168-day average daily gain      | 2.00 lb              | 1.97 lb                |
| Corn per steer                        | 35 bushels           | 35 bushels             |
| <u>Entire 168 days</u>                |                      |                        |
| Final weight                          | 1036 lb              | 1067 lb                |
| Total gain                            | 349 lb               | 378 lb                 |
| Average daily gain                    | 2.08 lb              | 2.24 lb                |
| Total corn per steer                  | 35 bushels           | 47 bushels             |
| <u>Carcass and Slaughter data</u>     |                      |                        |
| Weight at packing plant               | 1004 lb              | 1030 lb                |
| Dressing percent                      | 61.1 percent         | 61.7 percent           |
| Carcass grade                         | 12.9 (Choice)        | 12.8 (Choice)          |
| Fat thickness over rib                | 0.82 inch            | 0.91 inch              |
| <u>Cost and Returns per steer</u>     |                      |                        |
| Initial steer cost @\$26/cwt          | \$178.62             | \$179.14               |
| Corn cost*                            | 42.78                | 56.88                  |
| Selling price/cwt**                   | 27.78                | 28.09                  |
| Selling price/head                    | 279.13               | 289.45                 |
| Returns to pasture, labor, investment | 57.73                | 53.43                  |

\* Includes cost of corncobs. Corn @ \$1.20/bushel.

\*\* Based on delivery weight at packing plant.

Table 2 - A Comparison of Steers on the Deferred Feeding Plan and Steers which were Fed Corn All Summer -- 182-day Grazing Season (Predominately fescue pasture)

| 1st 70 days                           | Deferred Feed    | Feed All Summer  |
|---------------------------------------|------------------|------------------|
| Number of steers                      | 12               | 12               |
| Beginning weight                      | 636 lb           | 634 lb           |
| 70-day weight                         | 756 lb           | 809 lb           |
| 70-day gain                           | 120 lb           | 176 lb           |
| 70-day average daily gain             | 1.72 lb          | 2.51 lb          |
| Corn per steer                        | ---              | 16 bushels       |
| <u>Last 112 days</u>                  |                  |                  |
| 70 - 182-day gain                     | 252 lb           | 235 lb           |
| 70 - 182-day average daily gain       | 2.25 lb          | 2.10 lb          |
| Corn per steer                        | 29 bushels       | 31 bushels       |
| <u>Entire 182 days</u>                |                  |                  |
| Final weight                          | 1008 lb          | 1044 lb          |
| Total gain                            | 372 lb           | 411 lb           |
| Average daily gain                    | 2.04 lb          | 2.26 lb          |
| Total corn per steer                  | 29 bushels       | 47 bushels       |
| <u>Carcass and Slaughter data</u>     |                  |                  |
| Weight at packing plant               | 960 lb           | 999 lb           |
| Dressing percent                      | 62.3 percent     | 62.7 percent     |
| Carcass grade                         | 12.08 (Choice -) | 11.58 (Choice -) |
| Fat thickness over rib                | .76 inch         | .82 inch         |
| <u>Cost and Returns per steer</u>     |                  |                  |
| Initial steer cost @ \$26/cwt         | \$165.31         | \$164.71         |
| Supplemental feed cost*               | 42.01            | 63.90            |
| Selling price/cwt**                   | 27.98            | 28.50            |
| Selling price/head                    | 268.98           | 284.94           |
| Returns to pasture, labor, investment | 61.66            | 56.33            |

\* Includes cost of corn, cobs, and protein supplement. Corn @ \$1.20, SBM @ \$80, Cobs @ \$20

\*\* Based on delivery weight at packing plant.



## TYLOSIN AND STILBESTROL FOR BEEF STEERS ON PASTURE WITH AND WITHOUT GRAIN

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Results of many experiments have shown that cattle being fed high roughage rations respond more to nutritional levels of antibiotic than steers being fed high concentrate rations. Kentucky experiments have shown that oxytetracycline administered in salt to grazing steers results in a beneficial rate of gain response. A more convenient and effective way of supplying an antibiotic to grazing steers would probably make this practice more popular. The purpose of the experiments reported here was to obtain information on the effect of a sustained release bolus containing tylosin administered to steers on pasture.

### Experiment I

Forty light yearling Angus steers were divided equally into four groups for the following treatments:

1. Control
2. Tylosin boluses
3. 24 mg stilbestrol (DES) implant
4. Tylosin boluses + 24 mg stilbestrol (DES) implant

Preliminary investigations indicated that the effective life of the boluses was about 30 to 40 days. Therefore, steers on the tylosin treatments were bolused at 42-day intervals throughout the 168-day grazing season. Two 25-acre bluegrass-white clover pastures were used. All steers were confined to the same field, but were rotated from one field to another at 14-day intervals.

The steers were weighed 28 days after the experiment began. Thereafter, in order to study the effective life of the boluses and period effects more closely, they were weighed at 14-day intervals.

Table 1 gives the overall results and the results by periods. Average results of the 168-day grazing period show that tylosin increased rate of gain by 0.12 pound per steer daily. The increased rate of gain for implanted steers which received tylosin was 0.10 pound. Period gains, in general, indicate that the larger increases in rate of gain due to tylosin treatment occurred during the first two weeks after treatment with little or no increased gain from 28 to 42 days.

Table 1 - Experiment I - Grass Only

|                            | <u>Control</u> | <u>Tylosin</u> | <u>DES</u> | <u>Tylosin + DES</u> |
|----------------------------|----------------|----------------|------------|----------------------|
| Number of Steers           | 10             | 10             | 10         | 10                   |
| Initial Weight             | 540            | 537            | 543        | 534                  |
| Final Weight               | 770            | 793            | 822        | 829                  |
| Total Gain                 | 230            | 256            | 279        | 295                  |
| 168-Day A. D. G.           | 1.37           | 1.52           | 1.66       | 1.76                 |
| <u>A. D. G. by Periods</u> |                |                |            |                      |
| * 0-28 days                | 2.60           | 2.75           | 3.05       | 3.30                 |
| 28-42 days                 | 2.14           | 1.82           | 2.25       | 2.21                 |
| * 42-56 days               | 1.54           | 1.75           | 2.11       | 2.50                 |
| 56-70 days                 | 0.82           | 1.11           | 0.89       | 1.07                 |
| 70-84 days                 | 1.11           | 1.36           | 1.21       | 0.89                 |
| * 84-98 days               | 1.14           | 1.46           | 1.71       | 2.32                 |
| 98-112 days                | 2.18           | 2.21           | 2.11       | 2.00                 |
| 112-126 days               | - 0.25         | - 0.14         | - 0.25     | 0.04                 |
| * 126-140 days             | - 0.25         | 0.14           | - 0.21     | 0.18                 |
| 140-154 days               | 0.96           | 1.39           | 1.64       | 1.32                 |
| 154-168 days               | 1.86           | 1.68           | 2.36       | 1.97                 |

\* Tylosin boluses were administered to the tylosin treated steers at the beginning of each of these periods.



## Experiment II

Forty rather fleshy yearling Angus steers were used in this trial. The steers were equally divided into two groups of 20 steers each. One group received a full feed of grain during the entire grazing season, while the other group received pasture alone for the first 56 days and was then full fed grain while on pasture during the remaining 112 days of the grazing season. All steers were implanted with 24 mg stilbestrol at the beginning of the grazing season, and the two groups of 20 steers each were subdivided for tylosin treatment.

Two 20-acre fields of bluegrass-white clover pasture were used in this trial. The two groups of steers were grazed on separate pastures, but were rotated at 14-day intervals. Except for the first 28-day period, they were weighed at 2-week intervals, and tylosin boluses were administered at 42-day intervals during the 168-day grazing season.

Average results are given in Table 2. There was essentially no increase in rate of gain due to tylosin treatment in steers which were full fed during the entire 168-days and 0.12 lb increase for steers which received the deferred feed of grain. Period effects are again of interest and can best be seen in Table 3. The rather large increases in rate of gain during the first 2 weeks after treatment and little or no increased gain from 28 to 42 days indicates that more information is needed relative to release rate of tylosin, bolus formulation and effective levels of tylosin for steers on pasture.

Table 2 - Experiment 2 - Grass and Corn

|                            | Full Feed |          | Deferred Feed ** |          |
|----------------------------|-----------|----------|------------------|----------|
|                            | Control   | Tylosin* | Control          | Tylosin* |
| Number Steers              | 10        | 10       | 10               | 10       |
| Initial Weight             | 691       | 688      | 685              | 688      |
| 168-Day Weight             | 1065      | 1068     | 1025             | 1047     |
| 168-Day Gain               | 374       | 380      | 340              | 359      |
| 168-Day A. D. G.           | 2.23      | 2.26     | 2.02             | 2.14     |
| <u>A. D. G. by Periods</u> |           |          |                  |          |
| * 0-28 days                | 2.98      | 3.06     | 2.81             | 2.66     |
| 28-42 days                 | 2.68      | 3.14     | 1.87             | 2.43     |
| * 42-56 days               | 2.39      | 1.96     | 1.00             | 1.64     |
| 56-70 days                 | 2.25      | 2.89     | 2.82             | 3.07     |
| 70-84 days                 | 2.29      | 1.82     | 1.14             | 1.93     |
| * 84-98 days               | .75       | 1.04     | 1.71             | 1.79     |
| 98-112 days                | 2.18      | 2.64     | 2.32             | 1.54     |
| 112-126 days               | 1.86      | 1.39     | 1.00             | 1.14     |
| * 126-140 days             | 2.18      | 2.46     | 2.64             | 3.36     |
| 140-154 days               | 2.00      | 2.11     | 2.75             | 2.14     |
| 154-168 days               | 2.21      | 1.54     | 1.39             | 1.29     |

\* Tylosin boluses were administered at the beginning of the experiment and repeated at 42, 84, 126 days.

\*\* Started feeding grain at the end of 56 days. These steers were on pasture with no grain during the first 56 days.



Table 3 - Average Daily Gain of Steers at Different Times After Bolusing

| Experiment I - Grass Only       |                     |      |           |      |            |      |            |      |
|---------------------------------|---------------------|------|-----------|------|------------|------|------------|------|
|                                 | Time after Bolusing |      |           |      |            |      |            |      |
|                                 | 0-14 days           |      | 0-28 days |      | 14-28 days |      | 28-42 days |      |
|                                 | C*                  | T**  | C         | T    | C          | T    | C          | T    |
| 1st Bolus                       | ----                | ---- | 2.83      | 3.03 | ----       | ---- | 2.20       | 2.02 |
| 2nd Bolus                       | 1.83                | 2.13 | 1.35      | 1.61 | .86        | 1.09 | 1.16       | 1.13 |
| 3rd Bolus                       | 1.43                | 1.89 | 1.79      | 2.00 | 2.15       | 2.11 | -.25       | -.05 |
| 4th Bolus                       | -.23                | .16  | .54       | .76  | 1.30       | 1.36 | 2.11       | 1.83 |
| Average                         | 1.01                | 1.39 | 1.63      | 1.85 | 1.44       | 1.52 | 1.31       | 1.23 |
| Experiment II - Grass and Corn  |                     |      |           |      |            |      |            |      |
|                                 | Time after Bolusing |      |           |      |            |      |            |      |
|                                 | 0-14 days           |      | 0-28 days |      | 14-28 days |      | 28-42 days |      |
|                                 | C*                  | T**  | C         | T    | C          | T    | C          | T    |
| 1st Bolus                       | ----                | ---- | 2.90      | 2.86 | ----       | ---- | 2.28       | 2.79 |
| 2nd Bolus                       | 1.70                | 1.80 | 2.12      | 2.39 | 2.54       | 2.98 | 1.72       | 1.88 |
| 3rd Bolus                       | 1.23                | 1.42 | 1.74      | 1.76 | 2.25       | 2.09 | 1.43       | 1.27 |
| 4th Bolus                       | 2.41                | 2.91 | 2.40      | 2.65 | 2.38       | 2.13 | 1.80       | 1.42 |
| Average                         | 1.78                | 2.04 | 2.29      | 2.42 | 2.39       | 2.40 | 1.81       | 1.84 |
| Average of Experiments I and II |                     |      |           |      |            |      |            |      |
|                                 | Time after Bolusing |      |           |      |            |      |            |      |
|                                 | 0-14 days           |      | 0-28 days |      | 14-28 days |      | 28-42 days |      |
|                                 | C*                  | T**  | C         | T    | C          | T    | C          | T    |
| 1st Bolus                       | ----                | ---- | 2.86      | 2.94 | ----       | ---- | 2.24       | 2.40 |
| 2nd Bolus                       | 1.76                | 1.96 | 1.73      | 2.00 | 1.70       | 2.04 | 1.44       | 1.50 |
| 3rd Bolus                       | 1.33                | 1.65 | 1.77      | 1.88 | 2.20       | 2.10 | .59        | .61  |
| 4th Bolus                       | 1.09                | 1.54 | 1.47      | 1.64 | 1.84       | 1.74 | 1.96       | 1.62 |
| Average                         | 1.39                | 1.72 | 1.96      | 2.12 | 1.91       | 1.96 | 1.56       | 1.53 |

\* Control

\*\* Tylosin Treatment

EFFECTS OF VITAMIN A, TRACE MINERALS, ALFALFA MEAL, MOLASSES,  
MIXED SUPPLEMENT AND UREA ON FEEDLOT PERFORMANCE OF BEEF STEERS  
BEING FED GROUND EAR CORN AND DISTILLERS DRIED GRAINS WITH SOLUBLES (DDG/S)

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There is considerable current interest in feeding complete mixed rations to beef cattle. "Built-in" roughage feeds such as barley and ground ear corn, when properly supplemented, make excellent complete rations which may be conveniently self fed or handled with mechanical feeding equipment.

The ultimate objective of this study is to obtain information to aid in the proper formulation of supplements for use with ground ear corn.

One hundred and twenty yearling Hereford steers in rather fleshy condition were used in this feeding trial. The steers were randomly allotted to 12 different lots. Rations fed to the 12 different lots of steers are as follows:

| <u>Ration 1</u>  | <u>Lb/ton</u> |
|------------------|---------------|
| Ground ear corn  | 1,614         |
| DDG/S            | 359           |
| Ground limestone | 7.2           |
| Salt             | 20            |
| Vitamin A        | 910,000 I. U. |

Ration 2

Same as ration 1 except that vitamin A was doubled

Ration 3

Same as ration 1 except that trace minerals were added (0.05 lb premix described in Table 2)

Ration 4

Same as ration 1 except that 50 pounds of alfalfa meal replaced 50 pounds of ground ear corn

Ration 5

Same as ration 1 except that 50 pounds of molasses replaced 50 pounds of ground ear corn



Ration 6

Same as ration 1 except that equal parts of soybean meal, cottonseed meal and linseed meal replaced the DDG/S on a protein equivalent basis. Ground ear corn was increased from 1,614 to 1,771 pounds.

| <u>Ration 7</u>  | <u>Lb/ton</u> |
|------------------|---------------|
| Ground ear corn  | 1,776         |
| DDG/S            | 179           |
| Urea             | 18            |
| Ground limestone | 7.2           |
| Salt             | 20            |
| Vitamin A        | 910,000 I. U. |

Ration 8

Same as ration 7 except that the vitamin A was doubled

Ration 9

Same as ration 7 except that trace minerals were added (0.5 lb premix described in Table 2)

Ration 10

Same as ration 7 except that 50 pounds of alfalfa meal replaced 50 pounds of ground ear corn

Ration 11

Same as ration 7 except that 50 pounds of molasses replaced 50 pounds of ground ear corn

Ration 12

Same as ration 7 except that equal parts of soybean meal, cottonseed meal and linseed meal replaced the DDG/S on a protein equivalent basis. Ground ear corn was increased from 1,776 to 1,856 pounds.

Steers being fed all rations except 2 and 8 received vitamin A at the rate of about 10,000 I. U. per head daily. Steers receiving rations 2 and 8, containing the higher level of vitamin A, were provided with about 20,000 I. U. of vitamin A per steer daily.

The rations were mixed and self fed to all lots of steers for a 111-day period. The chemical composition of each ration is given in Table 1.

Table 1 - Composition of Rations

| Ration | Percent |                  |                  |                |      | Gross<br>Energy<br>BTU/lb |
|--------|---------|------------------|------------------|----------------|------|---------------------------|
|        | Water   | Crude<br>Protein | Ether<br>Extract | Crude<br>Fiber | Ash  |                           |
| 1      | 9.40    | 12.29            | 3.40             | 8.22           | 2.93 | 7449.0                    |
| 2      | 9.82    | 11.35            | 3.10             | 9.49           | 2.71 | 7388.6                    |
| 3      | 9.90    | 11.42            | 3.59             | 9.26           | 2.65 | 7410.3                    |
| 4      | 9.43    | 10.09            | 3.77             | 8.93           | 2.96 | 7525.4                    |
| 5      | 9.71    | 11.40            | 3.50             | 8.38           | 2.93 | 7534.4                    |
| 6      | 9.97    | 11.82            | 2.56             | 8.14           | 2.58 | 7170.9                    |
| 7      | 10.20   | 12.38            | 2.68             | 7.55           | 2.55 | 7265.4                    |
| 8      | 9.70    | 12.62            | 3.14             | 8.47           | 2.64 | 7290.9                    |
| 9      | 9.72    | 12.18            | 3.15             | 9.03           | 2.43 | 7362.1                    |
| 10     | 9.97    | 11.40            | 2.52             | 8.61           | 2.77 | 7339.2                    |
| 11     | 9.59    | 12.15            | 2.51             | 7.80           | 2.85 | 7307.7                    |
| 12     | 10.15   | 11.96            | 2.04             | 7.70           | 2.59 | 7202.1                    |

Results of the feeding trial are presented in Table 2. In the series of treatments where all of the supplemental protein was from DDG/S, adding additional vitamin A, trace minerals, 0.5 pound alfalfa meal, 0.5 pound of molasses or substituting a mixed supplement for the DDG/S did not improve the rate of gain or feed efficiency. In the series of treatments where urea replaced one-half of the supplemental protein in DDG/S, trace minerals, alfalfa meal and molasses improved average daily gain by 0.14, 0.24 and 0.29 pound, respectively. The 60 steers receiving the ration containing all of the



supplemental protein from DDG/S averaged gaining 0.15 pound per steer daily faster and used 40 pounds less feed for each 100 pounds of gain than the 60 steers receiving the ration where one-half of the supplemental protein was provided by urea.

Although more work is needed to make accurate recommendations for properly supplementing ground ear corn, it would seem that proper supplementation becomes more complex when urea replaces a part of the natural protein.

Table 3 -- Feedlot Performance -- 111 days

| Lot Number        | DDG/S        |       |       |        |       |       |                     |       |       |                 |       |       | DDG/S + Urea 1/ |       |       |         |       |       |                  |       |       |                |       |       |              |       |       |          |       |       |       |       |       |       |      |     |
|-------------------|--------------|-------|-------|--------|-------|-------|---------------------|-------|-------|-----------------|-------|-------|-----------------|-------|-------|---------|-------|-------|------------------|-------|-------|----------------|-------|-------|--------------|-------|-------|----------|-------|-------|-------|-------|-------|-------|------|-----|
|                   | 20,000 I. U. |       |       |        |       |       | Mixed e/ Supplement |       |       |                 |       |       | 20,000 I. U.    |       |       |         |       |       | Mixed Supplement |       |       |                |       |       |              |       |       |          |       |       |       |       |       |       |      |     |
|                   | Control a/   |       |       | Vit. A |       |       | Trace b/ Minerals   |       |       | Alfalfa c/ Meal |       |       | Molasses d/     |       |       | Control |       |       | Vit. A           |       |       | Trace Minerals |       |       | Alfalfa Meal |       |       | Molasses |       |       |       |       |       |       |      |     |
|                   | 1            | 2     | 3     | 4      | 5     | 6     | 7                   | 8     | 9     | 10              | 11    | 12    | 1               | 2     | 3     | 4       | 5     | 6     | 7                | 8     | 9     | 10             | 11    | 12    | 1            | 2     | 3     | 4        | 5     | 6     | 7     | 8     | 9     | 10    | 11   | 12  |
| Number of steers  | 10           | 10    | 10    | 10     | 10    | 10    | 10                  | 10    | 10    | 10              | 10    | 10    | 10              | 10    | 10    | 10      | 10    | 10    | 10               | 10    | 10    | 10             | 10    | 10    | 10           | 10    | 10    | 10       | 10    | 10    | 10    | 10    | 10    | 10    | 10   | 10  |
| Initial weight lb | 725          | 729   | 730   | 717    | 726   | 724   | 729                 | 723   | 721   | 730             | 721   | 716   | 721             | 721   | 721   | 716     | 721   | 721   | 721              | 721   | 721   | 721            | 721   | 721   | 721          | 721   | 721   | 721      | 721   | 721   | 721   | 721   | 721   | 721   | 721  | 716 |
| Final weight, lb  | 1048         | 1034  | 1030  | 1019   | 1047  | 1007  | 1007                | 984   | 1014  | 1035            | 1014  | 1001  | 1031            | 1031  | 1031  | 1001    | 1031  | 1031  | 1031             | 1031  | 1031  | 1031           | 1031  | 1031  | 1031         | 1031  | 1031  | 1031     | 1031  | 1031  | 1031  | 1031  | 1031  | 1031  | 1001 |     |
| Total gain, lb    | 323          | 305   | 300   | 302    | 321   | 283   | 278                 | 261   | 293   | 305             | 293   | 285   | 310             | 310   | 310   | 285     | 310   | 310   | 310              | 310   | 310   | 310            | 310   | 310   | 310          | 310   | 310   | 310      | 310   | 310   | 310   | 310   | 310   | 310   | 285  |     |
| Av daily gain, lb | 2.91*        | 2.74  | 2.70  | 2.72   | 2.89  | 2.55  | 2.50*               | 2.35  | 2.64  | 2.74            | 2.64  | 2.57  | 2.79            | 2.79  | 2.79  | 2.57    | 2.79  | 2.79  | 2.79             | 2.79  | 2.79  | 2.79           | 2.79  | 2.79  | 2.79         | 2.79  | 2.79  | 2.79     | 2.79  | 2.79  | 2.79  | 2.79  | 2.79  | 2.79  | 2.57 |     |
| Diff. in ADG, lb  | ---          | -0.17 | -0.21 | -0.19  | -0.02 | -0.36 | 0.---               | -0.15 | +0.14 | +0.24           | +0.29 | +0.07 | +0.29           | +0.29 | +0.29 | +0.07   | +0.29 | +0.29 | +0.29            | +0.29 | +0.29 | +0.29          | +0.29 | +0.29 | +0.29        | +0.29 | +0.29 | +0.29    | +0.29 | +0.29 | +0.29 | +0.29 | +0.29 | +0.07 |      |     |
| Feed/head/day     | 23.0         | 22.4  | 21.5  | 21.1   | 22.4  | 20.8  | 20.8                | 20.4  | 21.4  | 22.02           | 22.9  | 21.6  | 22.9            | 22.9  | 22.9  | 21.6    | 22.9  | 22.9  | 22.9             | 22.9  | 22.9  | 22.9           | 22.9  | 22.9  | 22.9         | 22.9  | 22.9  | 22.9     | 22.9  | 22.9  | 22.9  | 22.9  | 22.9  | 21.6  |      |     |
| Feed/cwt gain     | 854          | 884   | 861   | 842    | 836   | 892   | 909                 | 950   | 881   | 871             | 889   | 915   | 889             | 889   | 889   | 915     | 889   | 889   | 889              | 889   | 889   | 889            | 889   | 889   | 889          | 889   | 889   | 889      | 889   | 889   | 889   | 889   | 889   | 915   |      |     |
| Carcass grade     | 11.4         | 11.1  | 11.0  | 10.7   | 10.7  | 11.5  | 11.6                | 11.2  | 10.3  | 10.3            | 11.5  | 11.1  | 11.5            | 11.5  | 11.5  | 11.1    | 11.5  | 11.5  | 11.5             | 11.5  | 11.5  | 11.5           | 11.5  | 11.5  | 11.5         | 11.5  | 11.5  | 11.5     | 11.5  | 11.5  | 11.5  | 11.5  | 11.5  | 11.1  |      |     |
| Dressing percent  | 62.2         | 62.9  | 63.5  | 62.0   | 61.3  | 62.3  | 62.5                | 62.6  | 62.6  | 62.4            | 63.6  | 61.7  | 62.6            | 62.6  | 62.6  | 61.7    | 62.6  | 62.6  | 62.6             | 62.6  | 62.6  | 62.6           | 62.6  | 62.6  | 62.6         | 62.6  | 62.6  | 62.6     | 62.6  | 62.6  | 62.6  | 62.6  | 62.6  | 61.7  |      |     |
| Selling price/lb  | \$28.39      | 28.62 | 28.87 | 27.89  | 27.74 | 28.57 | 28.65               | 28.37 | 27.90 | 28.23           | 28.98 | 27.91 | 27.90           | 28.37 | 28.65 | 27.91   | 28.37 | 28.65 | 28.37            | 28.65 | 27.90 | 28.23          | 28.98 | 27.91 | 27.90        | 28.37 | 28.65 | 28.37    | 28.65 | 28.37 | 28.65 | 28.37 | 28.65 | 27.91 |      |     |

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a/ The control ration provided 10,000 I. U. of vitamin A per steer daily

b/ % Element in Premix

|                   |        |
|-------------------|--------|
| Cobalt Carbonate  | .220   |
| Calcium iodate    | .264   |
| Zinc sulfate      | .440   |
| Copper carbonate  | 1.650  |
| Ferrous carbonate | 14.300 |
| Manganese sulfate | 2.420  |
| Calcium carbonate | 14.500 |

c/ Each steer received about 0.5 lb of alfalfa meal daily

d/ Each steer received about 0.5 lb of molasses daily

e/ The mixed supplement was equal parts of soybean meal, linseed meal and cottonseed meal. It replaced DDG/S in the control ration on an equal protein basis.

f/ Urea and ground shelled corn were substituted for one-half the distillers grains and one-half the mixed supplement in the first series of treatments.

g/ 10 = Good, 11 = Good+, 12 = Choice --

\* Lot 1 gained significantly faster than Lot 7 (5% level)



# EFFECT OF SIZE AND HARDNESS OF PELLETS FOR WINTERING BEEF CALVES ON SOYBEAN HULLS

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Previous experiments have indicated variable results from feeding pelleted soybean hulls to calves. Results of one experiment showed that calves being fed pelleted hulls gained 0.38 pound per head daily faster and used 244 pounds less feed for each 100 pounds of gain than steers fed ground hulls. In a second experiment, calves fed pelleted hulls did not gain quite so fast and used somewhat more feed per unit of gain than calves fed ground hulls. In each experiment feed intake was essentially the same for calves eating pelleted hulls and for those eating ground hulls. The experiment reported here was conducted to see what effect size and hardness of pellet would have on feed intake and animal performance.

Forty Choice grade 500-pound Angus steer calves were used in this experiment. Ten calves were used in each of the following treatments:

1. Ground hulls
2. "Soft" 12/64 inch pellets
3. "Hard" 12/64 inch pellets
4. "Soft" 3/8 inch pellets

The soybean hulls used in this experiment supposedly all came from the same source and were all shipped to the feedlot at the beginning of the experiment. Some difficulty was experienced in making the same size pellets both soft and hard. Weight per cubic foot and breaking strength, Table 1, indicates that there is not so much difference in the soft and hard pellets as was desired. Considerable fines were present in all three kinds of pellets and none could be classified as very hard.

Steers on all treatments were given 10,000 I. U. of vitamin A per steer daily.

Performance data (Table 2) show that calves receiving the pelleted soybean hulls gained faster than steers being fed ground hulls. Increases in average daily gains were 0.17, 0.21, and 0.19 pound for the small soft pellets, small hard pellets and large soft pellets, respectively. Steers on pelleted hull rations also used considerably less feed for each unit of gain. Feed intake was essentially the same for steers getting the small pellets or ground hulls. Steers receiving the larger pellets consumed about one pound more feed per steer daily than steers on any of the other three forms of hulls.

Soybean hulls supplemented with vitamin A again proved to be a very satisfactory ration for wintering calves. However, during the 3-year study on the value of soybean hulls for wintering calves, considerable variability has been found in animal performance, effect of pelleting and chemical composition of the soybean hulls.

Table 1 - Chemical Composition, Weight Per Cubic Foot and Hardness of Soybean Hulls

|                               | Physical Form |                      |                      |                    |
|-------------------------------|---------------|----------------------|----------------------|--------------------|
|                               | <u>Ground</u> | <u>Pelleted</u>      |                      |                    |
|                               |               | 12/64 inch<br>"soft" | 12/64 inch<br>"hard" | 3/8 inch<br>"soft" |
| <u>Chemical Composition</u>   |               |                      |                      |                    |
| Water, %                      | 8.86          | 9.28                 | 9.02                 | 7.82               |
| Crude protein, %              | 11.16         | 11.09                | 13.31                | 10.27              |
| Ether extract, %              | 1.41          | 1.58                 | 1.61                 | 1.58               |
| Crude fiber, %                | 34.53         | 32.06                | 30.29                | 33.33              |
| Ash, %                        | 4.27          | 4.49                 | 6.03                 | 4.35               |
| Gross energy,<br>B. T. U. /lb | 7005.4        | 6969.7               | 6992.2               | 7176.3             |
| Weight per cubic foot, lb     | 25.5          | 42.2                 | 43.5                 | 41.5               |
| Breaking strength, lb         | ----          | 19.5                 | 20.5                 | 25.2               |

Table 2 - Performance Data of Calves Being Fed Soybean Hulls in Drylot -- 112 Days

|                    | <u>Ground</u> | <u>Physical Form</u> |                      |                    |
|--------------------|---------------|----------------------|----------------------|--------------------|
|                    |               | <u>Pelleted</u>      |                      |                    |
|                    |               | 12/64 inch<br>"soft" | 12/64 inch<br>"hard" | 3/8 inch<br>"soft" |
| Number steers      | 10            | 10                   | 10                   | 10                 |
| Initial weight, lb | 514           | 509                  | 511                  | 510                |
| Final weight, lb   | 672           | 686                  | 693                  | 689                |
| Total gain, lb     | 158           | 177                  | 182                  | 179                |
| A. D. G. , lb      | 1.41          | 1.58                 | 1.63                 | 1.60               |
| Feed/cwt gain, lb  | 1025          | 921                  | 871                  | 951                |
| Feed/head/day lb   | 14.4          | 14.6                 | 14.2                 | 15.2               |



TRANIMAL, VITAMIN A AND STILBESTROL IMPLANTS FOR  
STEERS BEING FATTENED IN DRYLOT

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A feeding trial reported previously showed that 40 mg of Tranimal (a tranquilizing agent) fed during the latter part of the feeding period increased rate of gain of steers being fed a fattening ration. There were also indications that the growth response to Tranimal was greater in steers which had not been implanted with stilbestrol.

This experiment was designed to test the effect of 40 mg of Tranimal per head daily during the entire feeding period with two levels of vitamin A. The treatments were as follows:

1. Basal ration (10,000 I. U. vitamin A)
2. Basal ration + 40 mg Tranimal
3. Basal ration + 20,000 I. U. additional vitamin A
4. Basal ration + 40 mg Tranimal + 20,000 I. U. additional vitamin A

Eighty 700-pound yearling Hereford steers were assigned to eight lots of 10 steers each. Replicated lots of 10 steers each were used for each of the four treatments. One-half of the steers in each lot was implanted with 24 mg stilbestrol (DES). A corn silage fattening ration was fed for a 126-day period.

The results are presented in Tables 1 and 2. Neither 40 mg of Tranimal nor additional vitamin A or a combination of the two increased rate of gain over that of control steers. No period effects were noted and whether or not steers were implanted made no difference so far as response to Tranimal and additional vitamin A was concerned.

Table 1 - Effect of Tranimal and Vitamin A on Beef Steers Being Fattened in Drylot

|                                 | Lots 1 & 5<br>10,000 I. U.<br>Vitamin A | Lots 2 & 6<br>10,000 I. U.<br>Vitamin A<br>40 mg<br>Tranimal | Lots 3 & 7<br>30,000 I. U.<br>Vitamin A | Lots 4 & 8<br>30,000 I. U.<br>Vitamin A<br>40 mg<br>Tranimal |
|---------------------------------|-----------------------------------------|--------------------------------------------------------------|-----------------------------------------|--------------------------------------------------------------|
| Number steers                   | 20                                      | 20                                                           | 20                                      | 20                                                           |
| Initial weight, lb              | 716                                     | 712                                                          | 715                                     | 714                                                          |
| Final weight, lb                | 1001                                    | 995                                                          | 995                                     | 1008                                                         |
| Total gain, lb                  | 285                                     | 283                                                          | 280                                     | 294                                                          |
| Total ADG, lb                   | 2.26                                    | 2.25                                                         | 2.22                                    | 2.33                                                         |
| <u>Period ADG, lb</u>           |                                         |                                                              |                                         |                                                              |
| 0 to 28 days                    | 2.83                                    | 2.80                                                         | 2.73                                    | 2.97                                                         |
| 28 to 56 days                   | 2.73                                    | 2.76                                                         | 2.66                                    | 2.75                                                         |
| 56 to 84 days                   | 1.81                                    | 1.93                                                         | 1.68                                    | 1.72                                                         |
| 84 to 112 days                  | 2.08                                    | 1.96                                                         | 1.92                                    | 1.96                                                         |
| 112 to 126 days                 | 1.48                                    | 1.34                                                         | 2.02                                    | 2.22                                                         |
| Carcass grade <sup>a/</sup>     | 10.85                                   | 10.75                                                        | 10.60                                   | 10.90                                                        |
| Feed/cwt gain, lb <sup>b/</sup> | 877                                     | 867                                                          | 894                                     | 869                                                          |
| <u>Av daily ration</u>          |                                         |                                                              |                                         |                                                              |
| Ground shelled corn, lb         | 12.0                                    | 11.8                                                         | 12.0                                    | 12.4                                                         |
| Corn silage, lb <sup>c/</sup>   | 14.7                                    | 14.5                                                         | 14.6                                    | 14.8                                                         |
| Soybean meal, lb                | 2.0                                     | 2.0                                                          | 2.0                                     | 2.0                                                          |

<sup>a/</sup> 10 = Good, 11 = Good +

<sup>b/</sup> Silage on air-dry basis

<sup>c/</sup> Silage on a fed basis



Table 2 - Effect of Tranimal, Vitamin A and Stilbestrol on Beef Steers Being Fattened in Drylot

|                             | 10,000 I. U. |      | 10,000 I. U. |      | 30,000 I. U. |      | 30,000 I. U. |      |
|-----------------------------|--------------|------|--------------|------|--------------|------|--------------|------|
|                             | Vit. A       |      | Vit. A       |      | Vit. A       |      | Vit. A       |      |
|                             | 40 mg        |      | 40 mg        |      | 40 mg        |      | 40 mg        |      |
|                             | Tranimal     |      | Tranimal     |      | Tranimal     |      | Tranimal     |      |
|                             | No           | No   | No           | No   | No           | No   | No           | No   |
|                             | DES          | DES  | DES          | DES  | DES          | DES  | DES          | DES  |
| Number steers               | 10           | 10   | 10           | 10   | 10           | 10   | 10           | 10   |
| Initial weight, lb          | 705          | 726  | 693          | 731  | 698          | 733  | 699          | 727  |
| Final weight, lb            | 964          | 1038 | 955          | 1035 | 960          | 1030 | 963          | 1050 |
| Total gain, lb              | 259          | 312  | 262          | 304  | 262          | 297  | 264          | 323  |
| A. D. G. , lb               | 2.05         | 2.48 | 2.08         | 2.41 | 2.08         | 2.36 | 2.09         | 2.56 |
| Carcass grade <sup>a/</sup> | 10.8         | 10.9 | 10.8         | 10.7 | 10.5         | 10.7 | 11.1         | 10.7 |
| <u>A. D. G. , lb</u>        |              |      |              |      |              |      |              |      |
| 0 to 28                     | 2.69         | 2.97 | 2.59         | 3.00 | 2.30         | 3.16 | 2.68         | 3.26 |
| 28 to 56                    | 2.39         | 3.07 | 2.52         | 3.00 | 2.57         | 2.73 | 2.55         | 2.95 |
| 56 to 84                    | 1.43         | 2.20 | 1.75         | 2.11 | 1.77         | 1.61 | 1.30         | 2.13 |
| 84 to 112                   | 2.02         | 2.14 | 1.86         | 2.05 | 1.88         | 1.98 | 1.86         | 2.05 |
| 112 to 126                  | 1.43         | 1.52 | 1.26         | 1.41 | 1.71         | 2.28 | 2.06         | 2.31 |

<sup>a/</sup> 10 = Good  
11 = Good +

## EFFECT OF STILBESTROL IMPLANTS ON SUBSEQUENT FEEDLOT PERFORMANCE AND CARCASS

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Many experiments have shown consistent beneficial effects of stilbestrol on rate of gain and feed efficiency of beef cattle. The effect of the use of stilbestrol during wintering or grazing on subsequent feedlot performance, however, has not always been so consistent. The purpose of this experiment was to obtain further information on the effects of stilbestrol used during both a grazing period and a drylot fattening period.

Forty lightweight yearling Angus steers were used in this study. During the spring of 1962 they were divided into 4 groups of 10 steers each. Two of the 4 groups served as controls, and 2 of the groups were implanted with 24 mg of stilbestrol (DES). All steers were kept in one group and grazed bluegrass - white clover pasture for 168 days. The stocking rate was one steer to 1.25 acres.

At the end of the grazing season the steers were placed in drylot and fed a corn silage fattening ration for 102 days. Upon completion of the feedlot phase the steers were slaughtered and the carcasses were evaluated.

The treatments, as well as the results of both phases, are presented in Table 1. Implanted steers responded as usual during the grazing phase. During the feedlot phase, steers which were not implanted during the summer but received a 24 mg implant at the beginning of the feeding period gained 0.23 pound per head daily more than control steers. Steers which were implanted during the summer but not in the winter gained 0.14 pound slower per head daily than steers which were implanted during both the summer and winter phases. The combined results show total weight gain advantages of 35, 18 and 50 pound. For steers which received winter implant only, summer implant only, and both summer and winter implants, respectively.

Carcass grades of steers which received a winter implant only and those which received both summer and winter implants were about one-third of a grade lower than for the other two treatments. Dressing percentage was slightly higher for steers which were implanted at the beginning of both phases. Only small differences occurred in the rest of the carcass observations.

According to these results, as well as many others, a 24 mg stilbestrol implant for grazing steers is recommended. It also seems that if steers have been implanted during a previous phase, they should be implanted during the subsequent phase in order to maintain satisfactory rate of gain.



Table 1 - Effect of Stilbestrol Implants on Grazing Steers and Subsequent Feedlot Performance

| Grazing phase -- 168 days          | Treatments |                             |                             |                          |
|------------------------------------|------------|-----------------------------|-----------------------------|--------------------------|
|                                    | No DES     | No DES Summer<br>DES Winter | DES Summer<br>No DES Winter | DES Summer<br>DES Winter |
| Number steers                      | 10         | 10                          | 10                          | 10                       |
| Initial weight, lb                 | 538        | 539                         | 543                         | 534                      |
| Final weight, lb                   | 775        | 788                         | 826                         | 825                      |
| Total gain, lb                     | 237        | 249                         | 283                         | 291                      |
| A. D. G. , lb                      | 1.41       | 1.48                        | 1.68                        | 1.73                     |
| <u>Feedlot phase* -- 102 days</u>  |            |                             |                             |                          |
| Initial weight, lb                 | 801        | 813                         | 847                         | 857                      |
| Final weight, lb                   | 1018       | 1053                        | 1036                        | 1070                     |
| Total gain, lb                     | 217        | 240                         | 189                         | 213                      |
| A. D. G. , lb                      | 2.12       | 2.35                        | 1.85                        | 2.09                     |
| <u>Combined phases -- 270 days</u> |            |                             |                             |                          |
| Total gain, lb                     | 454        | 489                         | 472                         | 504                      |
| A. D. G. , lb                      | 1.68       | 1.81                        | 1.75                        | 1.87                     |
| <u>Carcass data</u>                |            |                             |                             |                          |
| Carcass grade <sup>a/</sup>        | 11.5       | 10.7                        | 11.3                        | 10.6                     |
| Conformation grade <sup>a/</sup>   | 11.5       | 12.0                        | 12.3                        | 11.5                     |
| Dressing percent <sup>b/</sup>     | 60.5       | 60.2                        | 60.5                        | 61.0                     |
| Cold carcass weight                | 604        | 620                         | 614                         | 645                      |
| Ribeye, sq in                      | 10.37      | 10.19                       | 10.14                       | 10.11                    |
| Ribeye/cwt carcass                 | 1.72       | 1.65                        | 1.67                        | 1.58                     |
| Fat thickness in                   | .82        | .71                         | .72                         | .77                      |
| Marbling score <sup>c/</sup>       | 5.7        | 4.7                         | 5.6                         | 4.7                      |
| Color fat <sup>d/</sup>            | 1.8        | 2.0                         | 1.9                         | 1.9                      |
| Color lean <sup>e/</sup>           | 3.6        | 3.6                         | 3.6                         | 3.6                      |
| Intransit shrink, lb               | 19.2       | 21.9                        | 19.3                        | 12.6                     |
| Carcass shrink, lb                 | 8.5        | 8.0                         | 9.1                         | 8.3                      |

<sup>a/</sup> 10 = Good, 11 = Good, 12 = Choice

<sup>b/</sup> Calculated from live weight at the packing plant and cold carcass weight

<sup>c/</sup> 4 = Slight, 5 = Small, 6 = Modest

<sup>d/</sup> 1 = White, 2 = Creamy white

<sup>e/</sup> The higher the number the darker the lean (3 to 4 is normal)

## EFFECT OF INCREASED SOYBEAN MEAL AND ORAL STILBESTROL ON STEER PERFORMANCE

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Sluggish appetites and low gains during the latter part of the feeding period are common problems in finishing programs. If a higher feed intake and faster rate of gain could be maintained for the entire feeding period, cattle feeders would benefit since faster gaining cattle are usually more efficient and put on cheaper gains.

It was thought that if feed intake could be increased during the latter part of the feeding period, the average daily gain might also be increased.

Forty yearling Hereford steers of medium flesh and averaging 710 pounds each were allotted to 4 lots of 10 steers each. At the beginning of the experiment, each steer received a 24 mg implant of stilbestrol. A corn silage fattening ration fortified with 20,000 I. U. of vitamin A per head daily was fed for the 140-day feeding period.

The treatments were as follows:

Lot 1--Control 1.5 pounds soybean meal (SBM)/head daily for the entire 140 day feeding period.

Lot 2--1.5 pounds SBM/head daily the first 84 days, increased to 2 pounds the last 56 days

Lot 3--1.5 pounds SBM/head daily the entire 140 days plus 10 mg oral stilbestrol/head daily the last 56 days

Lot 4--1.5 pounds SBM/head daily the first 84 days, increased to 2 pounds the last 56 days plus 10 mg oral stilbestrol/head daily the last 56 days

The results of this experiment are summarized in Table 1. The steers in lot 2 where the soybean meal was increased from 1.5 to 2.0 pounds per head daily had the highest average daily gain for the 140-day feeding period, but differences among treatments were very small for both gain and feed efficiency. Increasing the soybean meal in lot 2 did help to maintain a higher average daily gain the last 56 days. Generally, there was little difference in total gain among treatments.

Feed intake was not effected by treatment; it remained essentially the same for all lots throughout the experiment.

There were no significant differences in any of the carcass characteristics measured.



Although no sizable differences were obtained between treatments in this experiment, there were indications that larger differences might have been found if the feeding period had been longer. In feeding periods of 140 days or less it seems that the treatments used in this experiment are not beneficial.

Table 1 - Performance and Carcass Data

|                                     | Lots and Treatments                          |                                   |                                                  |                                                  |
|-------------------------------------|----------------------------------------------|-----------------------------------|--------------------------------------------------|--------------------------------------------------|
|                                     | Lot 1<br>Control<br>1.5 lb SBM <sup>a/</sup> | Lot 2<br>2 lb SBM<br>last 56 days | Lot 3<br>10 mg DES <sup>b/</sup><br>last 56 days | Lot 4<br>10 mg DES +<br>2 lb SBM<br>last 56 days |
| <u>1st 84 days</u>                  |                                              |                                   |                                                  |                                                  |
| Number steers                       | 10                                           | 10                                | 10                                               | 10                                               |
| Initial weight, lb                  | 707                                          | 711                               | 713                                              | 711                                              |
| 84-day weight, lb                   | 914                                          | 912                               | 923                                              | 925                                              |
| 84-day gain, lb                     | 207                                          | 201                               | 210                                              | 214                                              |
| 84-day ADG, lb                      | 2.46                                         | 2.39                              | 2.51                                             | 2.56                                             |
| <u>Last 56 days</u>                 |                                              |                                   |                                                  |                                                  |
| 84 to 140-day gain, lb              | 112                                          | 125                               | 106                                              | 107                                              |
| 84 to 140-day ADG, lb               | 2.00                                         | 2.23                              | 1.89                                             | 1.91                                             |
| <u>Entire 140 days</u>              |                                              |                                   |                                                  |                                                  |
| Final weight, lb                    | 1026                                         | 1037                              | 1029                                             | 1032                                             |
| Total gain, lb                      | 319                                          | 326                               | 316                                              | 321                                              |
| ADG, lb                             | 2.27                                         | 2.33                              | 2.26                                             | 2.29                                             |
| Feed/cwt gain, lb <sup>c/</sup>     | 851                                          | 850                               | 868                                              | 849                                              |
| Feed cost/cwt gain <sup>d/</sup>    | \$17.14                                      | \$17.34                           | \$17.53                                          | \$17.30                                          |
| <u>Av daily ration 1st 84 days</u>  |                                              |                                   |                                                  |                                                  |
| Ground shelled corn, lb             | 12.1                                         | 12.4                              | 12.5                                             | 12.6                                             |
| Corn silage, lb <sup>e/</sup>       | 15.3                                         | 15.5                              | 15.4                                             | 15.5                                             |
| Soybean meal, lb                    | 1.5                                          | 1.5                               | 1.5                                              | 1.5                                              |
| <u>Av daily ration last 56 days</u> |                                              |                                   |                                                  |                                                  |
| Ground shelled corn, lb             | 11.9                                         | 12.1                              | 12.0                                             | 11.0                                             |
| Corn silage, lb <sup>e/</sup>       | 13.3                                         | 13.3                              | 13.3                                             | 13.2                                             |
| Soybean meal, lb                    | 1.5                                          | 2.0                               | 1.5                                              | 2.0                                              |
| <u>Carcass data</u>                 |                                              |                                   |                                                  |                                                  |
| Carcass grade <sup>f/</sup>         | 10.7                                         | 10.8                              | 10.8                                             | 11.4                                             |
| Dressing percent                    | 60.2                                         | 61.6                              | 61.3                                             | 60.4                                             |
| Fat thickness, in                   | .87                                          | .85                               | .91                                              | .82                                              |
| Ribeye sq in                        | 10.3                                         | 10.2                              | 10.4                                             | 10.6                                             |
| Ribeye/cwt chilled carcass, sq in   | 1.71                                         | 1.64                              | 1.69                                             | 1.75                                             |

<sup>a/</sup> Soybean meal  
<sup>b/</sup> Stilbestrol  
<sup>c/</sup> Silage on air-dry basis

<sup>d/</sup> Based on corn@\$1.20/bu., silage  
 @ \$10/ton and soybean meal @ \$80/ton  
<sup>e/</sup> Silage on as fed basis  
<sup>f/</sup> 10 = Good, 11 = Good +

## EFFECTS OF FREE CHOICE AND FORCE FEEDING MINERALS

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Beef cattle feeding operations have become more and more mechanized in recent years. With this increased mechanization has come an increased interest in feeding complete mixed rations. By including minerals, usually fed free choice in a complete mixed ration, further savings in labor and improved animal performance may be possible. This experiment was undertaken to compare force feeding of minerals in the protein supplement against the conventional method of feeding minerals free choice.

Fifty yearling Angus steers of medium flesh and averaging 675 pounds in weight were allotted to 5 lots of 10 steers each for use in this experiment. The steers, which had previously been on pasture with no grain, were all implanted with 36 mg of stilbestrol. They were fed a corn silage fattening ration supplemented with vitamin A at the rate of 10,000 I. U. per head daily for a period of 140 days. The five experimental treatments were as follows:

Lot 1--Control 1.5 pounds soybean meal (SBM)/head daily

Lot 2--1.5 pounds SBM + 0.2 pound salt/head daily

Lot 3--1.5 pounds SBM + 0.11 pound bonemeal/head daily

Lot 4--1.5 pounds SBM + 0.2 pound salt + 0.11 pound bonemeal/head daily

Lot 5--Complex supplement

The composition of the complex supplement was as follows:

| <u>Ingredients</u> | <u>Lb/1000 lbs supplement</u> | <u>Lb/head daily</u> |
|--------------------|-------------------------------|----------------------|
| Soybean meal       | 200                           | 0.50                 |
| Trace mineral salt | 80                            | .20                  |
| Bonemeal           | 44                            | .11                  |
| Corncobs           | 324                           | .81                  |
| Alfalfa meal       | 200                           | .50                  |
| Molasses           | 100                           | .25                  |
| Urea 262           | 52                            | .13                  |



The amount of bonemeal fed was that necessary to balance the ration for calcium according to NRC requirements. This provided phosphorus in slight excess of requirements. The level of salt fed was twice NRC requirements. The minerals were force fed by mixing them in the protein supplement. When the mineral or minerals were included in the supplement, they were not offered free choice. The control steers received salt and bonemeal free choice. Steers in lot 2 received salt mixed in the supplement and bonemeal free choice while steers in lot 3 received bonemeal mixed in the supplement and salt free choice. Both salt and bonemeal were mixed in the supplement for lot 4. Steers in lot 5 received salt and bonemeal mixed in the complex supplement which was substituted on an equal protein basis for the soybean meal used in the first four lots. The amounts of each supplement fed are given in Table 1.

The results of this experiment are summarized in Table 1. Steers in lot 2 receiving salt in the supplement and steers in lot 5 receiving the complex supplement had an average daily gain of 0.17 and 0.13 pound more, respectively, than did control steers. Steers in lot 2 had the lowest feed cost and required less feed per 100 pounds of gain. Feed consumption was essentially the same for all lots except lot 5. Feeding the complex supplement resulted in increased feed intake, but the steers were less efficient in their feed conversion and gains were more costly. The increased gain in lot 2 can be attributed to salt since it is the lone variable. Where the complex supplement was fed, it is not possible to tell whether the response in gain came from the added salt, from another of the ingredients in the supplement, from a combination of ingredients, or possibly from the increased amount of supplement eaten since more of the complex supplement (26.5% crude protein) was fed. The soybean meal fed to lots 1 through 4 was 44% crude protein.

In view of the lower dressing percentage and lower chilled carcass weight of the steers in lot 2 (receiving salt in the supplement) as compared with the control steers, it is felt that much of the extra gain obtained from feeding salt may have been due to water fill. This difference is attributed to fill and not to fluid retention in the tissue since the carcass shrinkage was essentially the same for all lots. The carcass grade and hot-to-cold carcass shrinkage were nearly the same for all lots.

Further study seems warranted to determine if the gains obtained from force feeding salt are actual tissue gains or merely extra fill as suggested here.

Table 1 - Effects of Free Choice and Force Feeding Minerals to Beef Steers Being Fattened in Drylot

|                                  | Lots and Treatments                          |                                |                                    |                                                |                                |
|----------------------------------|----------------------------------------------|--------------------------------|------------------------------------|------------------------------------------------|--------------------------------|
|                                  | Lot 1<br>Control<br>1.5 lb SBM <sup>a/</sup> | Lot 2<br>Salt in<br>Supplement | Lot 3<br>Bonemeal in<br>Supplement | Lot 4<br>Salt and<br>Bonemeal in<br>Supplement | Lot 5<br>Complex<br>Supplement |
| No steers                        | 10                                           | 10                             | 10                                 | 10                                             | 10                             |
| No days                          | 140                                          | 140                            | 140                                | 140                                            | 140                            |
| Initial weight, lb               | 676                                          | 680                            | 675                                | 674                                            | 680                            |
| Final weight, lb                 | 975                                          | 1002                           | 964                                | 972                                            | 996                            |
| Total gain, lb                   | 299                                          | 322                            | 289                                | 298                                            | 316                            |
| ADG, lb                          | 2.13                                         | 2.30                           | 2.06                               | 2.13                                           | 2.26                           |
| Feed/cwt gain, lb <sup>b/</sup>  | 979                                          | 906                            | 994                                | 962                                            | 1084                           |
| Feed cost/cwt gain <sup>c/</sup> | \$20.13                                      | \$18.59                        | \$20.53                            | \$19.95                                        | \$21.40                        |
| Av daily ration                  |                                              |                                |                                    |                                                |                                |
| Ground shelled corn, lb          | 12.9                                         | 12.9                           | 12.5                               | 12.5                                           | 14.3                           |
| Corn silage, lb <sup>d/</sup>    | 18.5                                         | 18.1                           | 18.4                               | 17.7                                           | 21.8                           |
| Supplement, lb                   | 1.5                                          | 1.7                            | 1.6                                | 1.8                                            | 2.5                            |
| Carcass grade                    | C-                                           | C-                             | C-                                 | C-                                             | C-                             |
| Dressing percent                 | 61.2                                         | 58.7                           | 59.8                               | 59.5                                           | 60.1                           |
| Chilled carcass weight, lb       | 597                                          | 588                            | 576                                | 578                                            | 599                            |
| Carcass shrink, lb               | 18.6                                         | 18.2                           | 17.7                               | 17.9                                           | 18.8                           |

<sup>a/</sup> Soybean Meal

<sup>b/</sup> Corn silage on air-dry basis

<sup>c/</sup> Based on corn @ \$1.20/bu, silage @ \$10/ton, soybean meal @ \$80/ton, trace mineral salt @ \$50/ton, salt @ \$30/ton, bonemeal @ \$106/ton, alfalfa meal @ \$63/ton, molasses @ \$45/ton, and urea @ \$102/ton

<sup>d/</sup> Silage on wet basis



Group II -- 0.025 mg of SU-9064/lb of body weight injected intramuscularly

Group III -- 0.037 mg of SU-9064/lb of body weight injected intramuscularly

Group IV -- 0.05 mg of SU-9064/lb of body weight injected intramuscularly

Animals in this experiment were injected with a tranquilizer about 3 hours before being loaded and hauled about 220 miles in 9 hours. An initial weight was taken to determine the dosage level of tranquilizer, and a second weight was taken just prior to loading for determining intransit shrink of the steers.

Initial effects of the tranquilizer were observed 5, 4 and 3 hours after injection for Groups II, III and IV, respectively. All treated groups seemed to reach maximum sedation within 6 hours after treatment, and the tranquilizer apparently began to lose its effect about 10 hours after treatment. All steers receiving tranquilizer seemed to retain some effect from the treatment when they were unloaded 12 hours after treatment. There was a definite tendency for more of the high-level steers to lie down during transit; therefore, this level of tranquilizer was probably too high for optimum hauling conditions for feeder steers.

All levels of treatment resulted in less shrinkage during transit and a slight improvement in gain during a subsequent 84-day feeding period as shown in Table 2.

Table 2 - Results of Experiment II

|                                           | Control | Low <sup>a/</sup><br>Level | Medium <sup>b/</sup><br>Level | High <sup>c/</sup><br>Level |
|-------------------------------------------|---------|----------------------------|-------------------------------|-----------------------------|
| Number of steers                          | 15      | 15                         | 15                            | 15                          |
| Initial weight (shrinkage experiment,) lb | 702     | 691                        | 690                           | 688                         |
| Final weight (shrinkage experiment,) lb   | 665     | 660                        | 661                           | 660                         |
| Weight loss (shrinkage experiment,) lb    | 37      | 31                         | 29                            | 28                          |
| Initial feedlot weight, lb                | 714     | 702                        | 697                           | 701                         |
| Gain, <sup>d/</sup>                       | 12      | 11                         | 7                             | 13                          |
| 28-day weight                             | 791     | 786                        | 785                           | 777                         |
| 28-day gain                               | 77      | 84                         | 88                            | 76                          |
| 56-day weight                             | 880     | 863                        | 855                           | 860                         |
| 56-day gain                               | 166     | 161                        | 158                           | 159                         |
| 84-day weight                             | 913     | 917                        | 910                           | 913                         |
| 84-day gain                               | 199     | 215                        | 213                           | 212                         |

<sup>a/</sup> 0.025 mg per pound of body weight

<sup>b/</sup> 0.037 mg per pound of body weight

<sup>c/</sup> 0.05 mg per pound of body weight

<sup>d/</sup> Weight gain from the initial weights for the shrinkage experiment to initial weights for the feedlot trial (7 days)

### Experiment III

Sixty yearling Hereford steers which had been wintered similarly and were carrying considerable finish were used in this experiment. The steers were randomly allotted from the 4 winter treatment groups into 4 groups of 15 steers each which were treated as follows:

Group 1--2 pounds per head of carrier, consisting of 3 parts corn and 1 part soybean hulls

Group II--carrier plus 0.25 mg of SU-9064 per pound of body weight

Group III--carrier plus 0.375 mg of SU-9064 per pound of body weight

Group IV--carrier plus 1.5 mg per pound of body weight of SU-9064

A fasting period of approximately 36 hours was required before observation indicated that the steers would consume 2 pounds per head of the carrier containing the SU-9064 within a short period of time. All steers were weighed prior to treatment to determine the amount of active tranquilizer to be fed each group.

The tranquilizer and carrier were fed about 4 hours prior to loading the steers for a 10-hour haul for a distance of about 185 miles. Most of the feed was consumed within 1/2 hour after feeding. Slight sedation was apparent in the Group IV steers about 3 hours after treatment and in Group III about 3 1/2 hours after treatment.

Apparent tranquilization followed a pattern similar to that observed when similar levels of tranquilizer were injected in Experiment II. However, several steers in Groups III and IV over-reacted, suggesting that they consumed more than their share of the feed with tranquilizer. It was necessary to remove 4 steers from each of these groups and 1 from Group II before the haul was completed. One steer from Group IV died 2 days later, and a steer from Group II did not return to normal after treatment. The activity of Groups I and II was similar at the end of the haul.

As shown in Table 3 intransit shrinkage was slightly less for Group II and Group IV steers and slightly more for the Group III steers than for the control steers; however, Groups II and III had a small advantage in gain over Groups I and IV in the subsequent 112-day feeding period.



Table 3 - Results of Experiment III

|                                           | Control | Low <sup>a/</sup> | Medium <sup>b/</sup> | High <sup>c/</sup> |
|-------------------------------------------|---------|-------------------|----------------------|--------------------|
| Number of steers                          | 15      | 14                | 10                   | 11                 |
| Initial weight (shrinkage experiment), lb | 736     | 755               | 724                  | 743                |
| Final weight (shrinkage experiment), lb   | 706     | 727               | 692                  | 716                |
| Weight loss (shrinkage experiment), lb    | 30      | 28                | 32                   | 27                 |
| Initial feedlot weight, lb                | 754     | 766               | 738                  | 754                |
| Gain, lb <sup>d/</sup>                    | 18      | 11                | 14                   | 11                 |
| 28-day weight, lb                         | 861     | 886               | 859                  | 861                |
| 28-day gain, lb                           | 107     | 120               | 121                  | 107                |
| 56-day weight, lb                         | 928     | 950               | 929                  | 928                |
| 56-day gain, lb                           | 174     | 184               | 191                  | 174                |
| 84-day weight, lb                         | 987     | 1017              | 996                  | 984                |
| 84-day gain, lb                           | 233     | 251               | 258                  | 229                |
| 112-day weight, lb                        | 1033    | 1051              | 1032                 | 1028               |
| 112-day gain, lb                          | 279     | 285               | 297                  | 274                |

<sup>a/</sup>

Low level, 0.25 mg per lb of body weight

<sup>b/</sup>

Medium level, 0.375 mg per lb of body weight

<sup>c/</sup>

High level, 0.50 mg per lb of body weight

<sup>d/</sup>

Weight gain from the initial weight for the shrinkage experiment to the initial weights for the feedlot trials (9 days)

#### Experiment IV

Sixty yearling Hereford steers in medium flesh condition that had been wintered together were used in this experiment. Conduct of this experiment was similar to that of Experiment III except that the carrier used consisted of 3/4 soybean oil meal and 1/4 corn, the interval from feeding to loading was reduced to 3 hours, and the levels of tranquilizer were reduced as follows:

Group I--none

Group II--0.05 mg SU-9064 per pound of body weight

Group III--0.1 mg of SU-9064 per pound of body weight

Group IV--0.2 mg of SU-9064 per pound of body weight

All three groups of tranquilizer-treated cattle handled easier during the weighing operation than did the controls.

Steers receiving the low and medium levels of tranquilizer tended to ride in a normal standing position during this experiment, while about 1/3 of the steers receiving the high level wanted to ride lying down.

As shown in Table 4, intransit shrink was essentially the same for all groups of steers, the high-level treatment resulting in 2 pounds more shrinkage per steer. Low-level steers gained less, high-level steers gained about the same, and the medium-level steers gained 19 pounds per head more than the control steers in the subsequent 112-day finishing period.

Table



Table 4 - Results of Experiment IV

|                                           | Control | Low <sup>a/</sup><br>Level | Medium <sup>b/</sup><br>Level | High <sup>c/</sup><br>Level |
|-------------------------------------------|---------|----------------------------|-------------------------------|-----------------------------|
| Number of steers                          | 15      | 15                         | 15                            | 15                          |
| Initial weight (shrinkage experiment), lb | 687     | 685                        | 700                           | 708                         |
| Final weight (shrinkage experiment), lb   | 660     | 658                        | 673                           | 679                         |
| Weight loss (shrinkage experiment), lb    | 27      | 27                         | 27                            | 29                          |
| Initial feedlot weight, lb                | 715     | 712                        | 726                           | 736                         |
| Gain, lb <sup>d/</sup>                    | 28      | 27                         | 26                            | 28                          |
| 28-day weight, lb                         | 789     | 784                        | 811                           | 813                         |
| 28-day gain, lb                           | 74      | 72                         | 85                            | 77                          |
| 56-day weight, lb                         | 863     | 862                        | 881                           | 887                         |
| 56-day gain, lb                           | 148     | 150                        | 155                           | 151                         |
| 84-day weight, lb                         | 912     | 912                        | 937                           | 933                         |
| 84-day gain, lb                           | 197     | 200                        | 211                           | 197                         |
| 112-day weight, lb                        | 972     | 959                        | 1002                          | 992                         |
| 112-day gain, lb                          | 257     | 247                        | 276                           | 256                         |

<sup>a/</sup> 0.05 mg per pound of body weight

<sup>b/</sup> 0.1 mg per pound of body weight

<sup>c/</sup> 0.2 mg per pound of body weight

<sup>d/</sup> Weight gain from initial weights for the shrinkage experiment to initial weights for the feedlot trial (8 days)

### Summary

In the four experiments reported here, steers receiving proportionately equal levels of tranquilizer within the same treatment groups responded to the treatment differently. Observation of these experiments indicates that variable individual animal response to a given dosage of tranquilizer would be predicted.

All levels of tranquilizer tended to (a) affect the animals slightly, then (b) to reach a peak period of effectiveness, and (c) to recede from the peak sedation period to normal. The time required for maximum sedation and the total length of time over the tranquilizer was effective were apparently directly related to the dosage level.

Both the 0.1 and 0.2 mg levels per pound of body weight injected intramuscularly in Experiment I were apparently too high, based on the tendency for these animals to ride in a prone position during transit. Also, the 0.375 and 0.50 mg levels used in Experiment III appeared to be too high for optimum transit of the steers. The low-level tranquilizer (0.25 mg/lb body weight) used in Experiment III, all levels used in Experiment II, and the low and medium levels used in Experiment IV were satisfactory for proper hauling of the steers.

In the four experiments there was an inconsistent trend for the tranquilizer-treated steers to shrink less during transit and to gain more during the subsequent feeding period. On the basis of these experiments, the use of this tranquilizer when shipping feeder cattle is not justified, but these results might warrant further study with the lower levels of tranquilizer used in Experiments II and IV or with other tranquilizer materials.



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