

SUMMARY REPORTS ON OTHER PROJECTS

Cow-Calf

Problems Associated with Induced Superovulation and Superfetation in Beef Cows

E. J. Turman, Monte R. Johnson and D. F. Stephens

Previous research has demonstrated that the incidence of multiple births in beef cattle can be greatly increased by injections of the gonadotropic hormone preparation, pregnant mare serum (PMS). The treatments imposed on cows calving in 1971 were designed to study the effectiveness of PMS injections that are timed from a synchronized estrus rather than from a naturally occurring estrus. If feasible, this would greatly reduce the labor requirements by eliminating the need for daily heat checks and PMS injections on an individual cow basis.

Estrus was synchronized in a total of 51 cows by feeding an oral progestogen (CAP, Eli Lilly Co.) for 18 days. Most cows were in estrus on day-2, 3 or 4 following the last feeding of CAP. Day-3 was designated as the average day of estrus and PMS injections were timed from this date, being administered to all cows on the 5th and 17th day following the average day of estrus. A group of 15 control cows were not synchronized and also received their PMS injections on day-5 and 17 following the naturally occurring estrus in each individual cow.

Fewer synchronized cows conceived at the first post-PMS estrus when superovulation would be expected to occur as a result of PMS injections. Thus, multiple births would be expected only to conceptions at this estrus, and in our research to date this has held true with no exceptions. The numbers of cows conceiving at the first post-PMS estrus were: controls, 9 or 60 percent, and synchronized, 10 or 19.6 percent. However, the multiple birth response of the synchronized group was good, with 8 of the 10 cows producing multiple births, compared to 4 of the 9 control cows. The total multiple births obtained in 1971 from both groups of

cows were 7 sets of twins, 4 sets of triplets and 1 set of quadruplets.

The results obtained in the control group of cows is comparable to that observed in previous years in cows treated similarly. The multiple birth response of synchronized cows is encouraging. It's use could do much to make PMS treatments more practical. However, additional research is needed to attempt to improve conception rates.

Publications

The following articles have been published from this project during the past year.

- Johnson, Monte R. 1971. Induction of multiple births in beef cows by injection of pregnant mare serum (PMS) and human chorionic gonadotropin (HCG). MS Thesis, Oklahoma State University.
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- Laster, D. B., E. J. Turman, D. F. Stephens and Renbarger, 1971. Superovulation of beef cows and heifers by injection of pregnant mare serum (PMS) following estrus synchronization by means of an oral progestogen. *Okla. Agr. Exp. Sta. Misc. Publ.* MP-85:24.
- Laster, D. B., E. J. Turman, B. H. Johnson, D. F. Stephens and R. E. Renbarger. 1971. Effect of sex ratio in utero on degree of transformation and chimaerism in neo-natal bovine freemartins. *J. Reprod. Fertil.* 24:361.
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- Turman, E. J. 1971. Superovulation and multiple births. *Charolais, Banner* (November, 1971) 7:137.
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Selection for Increased Weaning Weight and Yearling Weight in Beef Cattle

R. R. Frahm

The beef cattle selection study being conducted at the Fort Reno Livestock Research Station involves both purebred Angus and Hereford cattle. The objective of this study is to determine the direct and correlated genetic responses to selection based on weaning weight and yearling weight, respectively. The experimental design for this study is presented in Okla. Agr. Exp. Sta. Misc. Pub. 85:150. Of particular interest in this study will be the magnitude of the genetic correlation between weaning weight and yearling weight since it will largely determine the extent to which weaning weight performance data can be utilized as an indicator of genetic potential for rapid growth over the entire growth curve.

Several more years of data will be required before critical evaluation of selection responses can be made in this study. Comparisons can, however, be made that will provide some indication of the genetic changes that are perhaps occurring in the selection lines. Since the study was initiated in 1964, the level of performance for both weaning weight and yearling weight in lines being selected on the basis of weaning weight has been very similar to that in lines being selected on the basis of yearling weight. While this information does not indicate the amount of change in performance due to selection, it does suggest that the genetic changes resulting from selection based on weaning weight and yearling weight have been similar thus far in the study.

Comparing performances of approximately the top 20 percent of the bulls produced in the selection lines (one Hereford and one Angus line selected on weaning weight and one Hereford and one Angus line selected on yearling weight) provides some indication of the genetic relationship between weaning weight and yearling weight. During the past 4 years the top bulls in the two weaning weight lines had an average weaning weight ratio of 1.12 whereas their average yearling weight ratio was 1.08. Of these 32 top bulls based on weaning weight only 6 were below average on yearling weight. The top 32 bulls in the two yearling weight lines had an average yearling weight ratio of 1.12 whereas their average weaning ratio was 1.10. Of these top 32 bulls based on yearling weight only two were below average based on weaning weight.

These comparisons indicate that the top bulls in the four selection lines tended to be above average for both weaning weight and yearling weight, and regardless of which trait selections were based on the use of these selected bulls would be expected to result in genetic improvement for both traits.

Publications

- Cardellino, Ricardo and R. R. Frahm. 1971. Evaluation of two types of age of dam correction factors for weaning weight in beef cattle. *J. Anim. Sci.* 32:1078.
- Deutscher, G. H. and J. V. Whiteman. 1971. Productivity as two-year-olds of Angus-Holstein crossbreds compared to Angus heifers under range conditions. *J. Anim. Sci.* 33:337.
- Frahm, R. R., L. E. Walters and C. R. McLellan, Jr. 1971. Evaluation of K^{40} count as a predictor of muscle in yearling beef bulls. *J. Anim. Sci.* 32:463.
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- Frey, John J. 1971. Evaluation of cow type classification score and its relationship to cow productivity. M.S. Thesis, Okla. State Univ. Library.
- Frey, John, R. R. Frahm and D. F. Stephens. 1971. Relationship between cow type classification score and cow productivity. *Okla. Agr. Exp. Sta. Misc. Pub.* 85:7.
- Frey, John, R. R. Frahm and D. F. Stephens. 1971. Type classification score as related to cow productivity. *J. Anim. Sci.* 33:199 (abstract).
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Comparison of Productivity Among Certain F_1 Crossbred Cow Groups

R. R. Frahm

Research has shown that production in terms of pounds of calf weaned per cow exposed for breeding can be increased at least 15 percent through utilization of a systematic crossbreeding program. Crossbreeding increases production by providing an opportunity to capitalize on combining the desirable characteristics of two or more breeds and by taking advantage of heterosis. The particular traits that have shown the most gain from heterosis have been those affecting reproductive efficiency and maternal performance of the cow and early growth rate of the calf. Thus, the crossbred cow is a major component of increased production through crossbreeding.

The purpose of this newly initiated study is to compare lifetime productivity under range conditions of eight F_1 crossbred cow groups (Hereford-Angus, Angus-Hereford, Simmental-Angus, Simmental-Hereford, Brown Swiss-Angus, Brown Swiss-Hereford, Jersey-Angus and Jersey-Hereford) when mated to a terminal cross sire of a third breed. The eight F_1 crossbred cow groups will consist of 45 cows each made from appropriate matings to comparable sets of Angus and Hereford cows made over a three year period. A foundation herd of 200 Angus and 200 Hereford cows that are typical of good commercial Angus and Hereford cattle in Oklahoma have been assembled at the Lake Carl Blackwell range to produce the respective eight F_1 crossbred cow groups starting with the 1972 breeding season. The lifetime productivity of each crossbred cow group (approximately 10 calf crops) will be compared when mated to a common set of bulls.

Shorthorn and Red Poll bulls will be used to sire the calves produced by the crossbred cows as 2-year-olds. Charolais bulls will be used for the second and subsequent calves until the three different age groups of crossbred cows all reach maturity at which time one other breed can be introduced in any one year for comparison with Charolais as a terminal cross sire breed. Decisions relative to which breed or breeds to involve in this comparison will be delayed until that point in the study is reached pending evaluation of data available on potential terminal sire breeds at that time.

Data will be collected on the reproductive and maternal performance of the cows, growth rate of all calves to weaning and feedlot performance and carcass evaluation of the steer calves.

Results from this study will provide basic information on how systematic crossbreeding programs utilizing available genetic resources (breeds) can be developed that will maximize production under Oklahoma range conditions.

Relationship Between Propertites of Southern Forages and Animal Response

J. E. McCroskey

Research studies have shown that forages grown in the southern part of the United States have different chemical characteristics, and are frequently lower in quality than forages grown in the central and northern states.

In an attempt to characterize as completely as possible the chemical and physical characteristics of these forages, Oklahoma has joined with 12 other southern states in a regional forage study. The primary objective of this cooperative study is to obtain detailed chemical properties and animal responses from seven species of forages which are characteristic of those grown in the southern states. Each forage will be harvested at three stages of maturity. Departments of Animal Science, Agronomy and Biochemistry are cooperating in this effort.

Oklahoma's contribution is to produce four species of forages (alfalfa, bermudagrass, fescue and a sorghum-sudan hybrid), each at three stages of maturity. Animal data to be collected on these forages include rate of gain, feed efficiency, voluntary feed intake and a determination of digestible energy, metabolizable energy, and net energy. In addition, detailed laboratory analyses will be determined to characterize the forages with regard to all chemical properties known to be important in measuring quality.

During the summer of 1971, a sorghum-sudan hybrid (haygrazer) was harvested. Laboratory analyses and animal response data are in the process of being collected. One forage will be produced each year until all four forages have been studied.

Upon completion of the regional project, the seven forages will be rather completely characterized with regard to animal response and chemical composition standpoints. These data should be quite useful in determining the feeding value of these and other similar southern forages.

Development of Regression Equations for Predicting Performance of Cows and Calves Grazing Bermudagrass Pastures

J. E. McCroskey

Prediction of performance of grazing animals is rather difficult and depends primarily upon the quality of forage available and the amount the animal consumes. There are no accurate, direct methods for measuring or predicting the amount of bermudagrass which grazing cattle consume. Therefore, a study was initiated at the Ft. Reno Experiment Station to determine intake of grazed bermudagrass by cows and calves, and to establish mathematical equations for predicting intake.

Midland Bermudagrass fertilized at three levels of nitrogen (60, 180, and 300 lb. N./A.) will be used in an attempt to obtain a wide range in quality of bermudagrass pasture. Sixty Angus X Hereford crossbred cows, calving for the first time in the spring of 1972, will be assigned to the three treatments at calving time and will be used to measure forage intake at five times during the year over a five-year period. Intake of pasture by their calves will be determined three times during the nursing period. Esophageal fistulated cows and calves will be used to collect forage samples for laboratory analysis. In addition to forage intake determination, data will be collected on forage available per acre, cow weight changes, and calf weaning weights.

At the end of the study data obtained on forage chemical characteristics, yield of forage, and intake of grass by cows and calves will be used to establish regression equations for predicting intake of bermudagrass. For practical use, we should be able to calculate forage intake and animal performance if we have a measure of the amount of forage available, and its chemical characteristics.

Results of the first year's study will be reported in the 1973 Animal Sciences and Industry Research Report.

Studies on Nutritive Value of Wheat Pasture

R. R. Johnson, M. McGeehon and I. Williams

Although small grain pasture has been a valuable source of winter grazing for cows, stockers and sheep for several years, studies on the nutritive value of winter small grain forage are very limited. The impossibility of harvesting sufficient small grain forage for digestion studies and growth trials in stalls and pens makes such an investigation even more difficult. Consequently, a study was initiated this past year to utilize newer laboratory methodology to investigate the nutritive characteristics of small grain pasture.

Wheat pasture samples are being harvested from experiment station plots at various times during the winter. The samples are frozen in the field at the time of harvest by placing in dry ice and stored at -20° C. Special techniques are used to grind this material without thawing or dehydrating it so that the samples analyzed are truly representative of the type of material consumed by animals.

Samples are being analyzed for:

Soluble carbohydrate

Cell wall constituents

Acid detergent fiber

Total crude protein

Non protein nitrogen

Rate of ammonia liberation when incubated with rumen microorganism

Dry matter disappearance and gas production when incubated with rumen microorganisms

Preliminary data accumulated to date shows that the total crude protein may be as high as 30 percent of the dry matter and decreases to 15-20 percent toward the latter part of the winter season. Approximately $\frac{1}{6}$ of this crude protein is in the form of non-protein nitrogen in early harvests. Soluble carbohydrate is low (8 percent) in late October but increases (15-20 percent) in late November. Samples harvested after that date have not yet been analyzed.

Mouse Selection Studies As An Aid To Animal Breeding Research

R. R. Frahm, I. T. Omtvedt and C. R. McLellan, Jr.

Studies are being conducted with mice to obtain a basic understanding of the genetic interrelationship that exist among growth rate at different stages of the growth curve and with other performance and productivity traits. Knowledge of these genetic relationships will aid in the development of more effective breeding programs to improve the performance level of the livestock species.

A selection study with mice is currently underway to specifically measure direct and correlated response to selection for preweaning and postweaning rate of gain for the purpose of determining the genetic correlation between growth rate at these two intervals in the life cycle. This study consists of 6 selection lines of 20 litters each (3 lines being selected on an intralitter basis for increased 3 weeks weight and 3 lines selected for increased average daily gain from 3 to 6 weeks of age) and a random mating control line of 40 litters that is used to measure genetic changes that occur in the selection lines.

After 6 generations of selection the average 3 week weight of the 3 lines selected for preweaning growth was 10.7 grams which was 1.3 grams (13.8 percent) heavier than the control line, and average daily gain from 3 to 6 weeks of age in the 3 lines selected on the basis of postweaning growth rate was 0.85 gram/day which was 0.15 gram/day (21.4 percent) higher than the control lines. Selection has effectively altered the genetic capabilities of the mice for rapid growth both preweaning and postweaning, respectively. Average daily gain from 3 to 6 weeks of age was essentially the same in the preweaning selection lines as the control line. However, the 3 week weight in the postweaning gain lines was 0.3 gram (3.2 percent) heavier than the control line indicating that selection for increased postweaning growth rate has also resulted in some genetic improvement for preweaning growth rate.

In order to determine if the total weight of a particular muscle system can be altered by selection, another study was initiated in which one line was selected on the basis of the heaviest weight of the hindleg muscle system and a second line was selected on the basis of the lightest hindleg muscle in the mature male mouse (12 weeks of age). After six generations of selection the total hindleg muscle weight was 2.82, 2.66

and 2.11 grams in the heavy-muscle, control and light-muscle lines respectively. Selection for heavy muscle weight resulted in a 6 percent increase over the control line, whereas selection for light muscle weight resulted in a 20.7 percent decrease from the control line which indicates that selection for reduced muscle weight was considerably more effective than selection to increase muscle weight.

The correlated response in live weight at 12 weeks (age at which muscle weight was determined) exhibited a very similar pattern in the selection lines as the change in muscle weight. Consequently, the ratio of muscle weight to 12-week live weight was similar in the heavy muscle and control lines. However, the ratio of muscle weight to 12-week live weight declined in the light muscle line and was significantly lower in generations 4, 5 and 6. Body composition analysis conducted in generation 5 showed that the percent protein, either extract, moisture and ash was essentially the same in the heavy muscle, light muscle and control lines. This indicates that selection based on hindleg muscle system weight has not resulted in an alteration in the body composition of the mice.

Publications

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Evaluation of the K^{40} Technique for the Determination of Muscle Potassium and Fat-Free Lean in Ground Meat

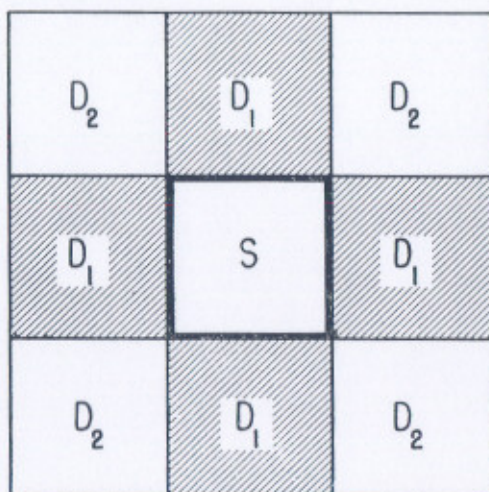
T. R. Carr, L. E. Walters, R. D. Morrison and R. F. Queener

Recent research concerning the element potassium and its relation to other body and carcass constituents has led to the development of whole-body K^{40} counting methods for determining differences in the lean content of live animals.

There are two properties of potassium that make its quantitative measurement in animals and their tissues both useful and practical. First,

the measurement of potassium is useful in live animal composition studies because potassium appears to be relatively independent of body fat and to make up a relatively constant proportion of the fat-free body when considered within species and age groups. Further, because a large proportion of the intracellular fluid occurs in the muscle and because of the high concentration of potassium in the intracellular fluid, potassium shows promise as an index of the amount of muscle present in an animal or a meat sample. Secondly, the measurement of potassium is possible because a small but constant proportion of potassium is radioactive. By measuring the amount of radioactivity arising, specifically from the potassium in an animal, instruments such as the O. S. U. whole-body counter have made it possible to measure the amount of potassium in meat animals and from these data to estimate the amount of muscle in the living animal with considerable accuracy.

The search for a rapid, accurate method for determining muscle potassium and fat-free lean in ground meat samples has prompted the investigation of two new detector configurations in the O. S. U. K^{40} whole-body counter. The development of such a technique could result in considerable savings in chemical analyses, as well as to initiate the



D = Detector
S = Sample

Figure 1. Schematic of Tunnel K^{40} counting configuration.

development of technology in this area applicable to improved quality control methods in the meat industry.

Experiment I. These studies involve the use of eight detectors ($6\frac{1}{2}$ " X $6\frac{1}{2}$ " X 60") arranged in such a way as to create a tunnel in which samples can be placed for counting, Figure 1.

In this experiment only the D_1 detectors were used to monitor potassium radiation from the ground meat samples. Research is currently in progress in which all eight detectors are activated for monitoring and K^{40} counting.

Preliminary results using 40 pound sugar phantoms containing known concentrations of potassium (KCl) indicate that net K^{40} count is closely related to the concentration of KCl in the phantom as is shown in the plot of Logarithm-Net K^{40} counts versus potassium concentration, Figure 2.

Experiment II. A. In these studies, the phantoms were replaced by lean ground beef samples containing different levels of added fat and different concentrations of lean. A plot of the K^{40} counts (obtained when using the tunnel configuration described in Exp. 1) and ground beef composition is presented in Figure 3. These results also suggest a rather strong relationship between net K^{40} counts and lean concentration in the sample. Further work is necessary to more completely establish the counting efficiency of the system and to develop the necessary prediction equations for application to an analytical procedure.

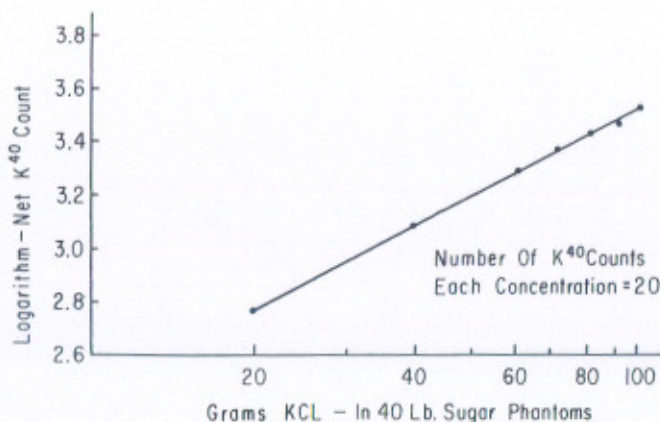


Figure 2. Logarithm-Net K^{40} count as related to potassium concentration.

Table 1. Composition of ground beef samples: Experiment II. A.

	Lbs. Lean Ground Beef	Lbs. Added Fat
Sample 1	30.0	10.0
Sample 2	32.5	7.5
Sample 3	35.0	5.0
Sample 4	37.5	2.5
Sample 5	40.0	0.0

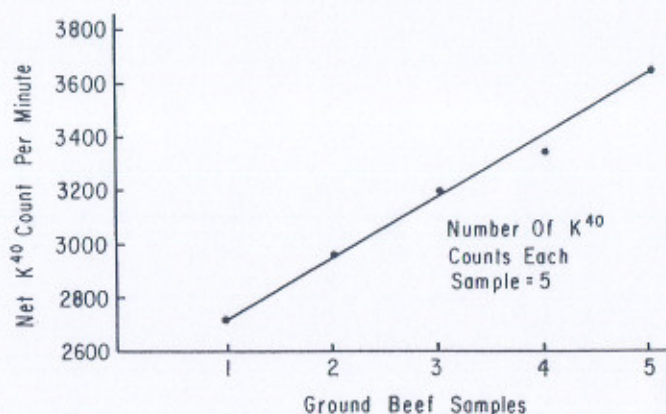


Figure 3. Net K⁴⁰ count as related to different lean concentrations in ground beef.

Experiment II. B. Another series of K⁴⁰ evaluations were made using different levels of fat added to lean ground beef. The plot of net K⁴⁰ counts and ground beef composition for this experiment is presented in Figure 4.

Table 2. Composition of ground beef sample: Experiment II. B.

	Lbs. Lean Ground Beef	Lbs. Added Fat
Sample 1	32.0	8.0
Sample 2	36.0	4.0
Sample 3	38.0	2.0
Sample 4	39.0	1.0
Sample 5	40.0	0.0

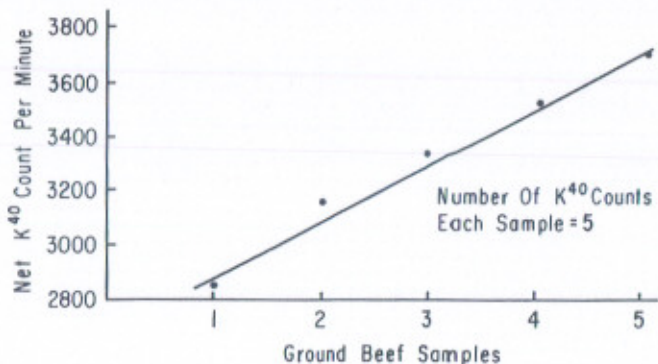


Figure 4. Net K⁴⁰ count as related to different lean concentrations in ground beef.

Both Figures 3 and 4 suggest a linear relationship between net K⁴⁰ count and known amounts of fat and lean in the ground meat samples. After further research and statistical analyses of the data, prediction equations may be developed which will perhaps enable one to estimate the fat-free lean percentages in ground meat samples by using the K⁴⁰ counter.

On the basis of these preliminary results, a "cube counter" has been constructed which will accommodate a seven pound ground meat sample and allow for K⁴⁰ monitoring through detector surfaces placed on all sides of the sample. This is in contrast to radiation monitoring from 4 sides of samples in the "tunnel" configuration described in Experiments 1 and 2 above. Thus, the "cube counter" more completely surrounds the sample with radiation detectors than is possible in the "tunnel" configuration. These studies are now in progress. The data will be analyzed statistically and a more complete report will be made at a later date.

A Characterization Of Myodegeneration Syndrome In Porcine Muscle

S. N. Falk, R. L. Henrickson, C. V. Maxwell and R. J. Panciera

Forty market weight Yorkshire hogs were used in this study. The animals were exercised on a treadmill and then slaughtered at which time the intramuscular temperature and pH of the muscle were determined. Histochemical evaluation involving the DPNH-TR technique was used to determine the oxidative potential of the muscle. Carcass evaluation included color, firmness, marbling of the loin, lean cut yield, carcass length, loin eye area and weight. Chemical evaluation of the Longissimus dorsi included moisture and fat analysis. Fiber diameter and degree rigor were also measured and compared with shear data obtained from the Warner-Bratzler shear instrument.

No relationship was found between live weight and susceptibility to Myodegeneration Syndrome between groups, however, hogs with low initial muscle pH exhibited pre-slaughter characteristics of previously reported syndromes and had higher post-mortem intramuscular temperatures than those with intermediate and high initial pH. Carcass evaluation revealed no differences in chilled side weights, however, the "susceptible animals" had a greater percentage of live and carcass lean cuts and were shorter and more compact than the "normal" animals.

Differences in quality were readily observable and agreed well with previous investigations of pale, soft, exudative pork (PSE). "Abnormal" and "intermediate" carcasses had larger Longissimus dorsi areas and weights. Also animals with low and intermediate initial pH had lower percentages of fat and higher percentages of moisture than those with high initial pH. Histological analysis revealed no differences in fiber diameter among groups, however, the degree of rigor (percent kinkiness) was higher when the initial muscle pH was low or intermediate and agreed well with shear data.

The histochemical analysis demonstrated that "abnormal" and "intermediate" animals had fewer red and more intermediate muscle fibers than did "normal" animals, while white fiber content was relatively consistent between groups. These data agreed well with previous investigations.

Physical Properties of the Skeletal Muscle Fiber

R. L. Henrickson and J. C. Marsden

The shear force of muscle tissue has been extensively investigated, but rarely at the fiber level. Most studies have been concerned with cooked pieces of meat one-inch in diameter. This project involves an investigation of shear force and related physical properties of the muscle fiber. Continued research will determine the influence of these properties on tenderness.

The sartorius muscle from 18 sides of beef were excised hot at 2, 5, and 8 hours postmortem. Those from the opposite side were excised after the carcass had chilled at 32°F. for 48 hours. One hundred fibers from each muscle were appraised for shear force, fiber diameter, and degree rigor-mortis. Thus, the 1800 fibers from the hot excised muscles were compared to the 1800 fibers excised after the muscle had chilled.

Fiber diameter and degree rigor of fibers from the cold excised muscle showed little variation. For the muscles excised hot, the fiber diameter and degree rigor decreased as the holding period increased.

In terms of average shear force (g/u^2) for individual muscle fibers, the cold excised muscles showed a difference ranging from 1.74×10^{-3} to $1.83 \times 10^{-3} \text{ g}/\text{u}^2$. The fiber from the hot excised muscles ranged from 1.71×10^{-3} to $2.90 \times 10^{-3} \text{ g}/\text{u}^2$. In general, the shear force decreased as the holding time increased.

For fiber diameter, shear force, and degree rigor the holding time (2, 5, and 8 hours) treatment (hot or cold), and treatment holding time interaction were all significant at the ($p < .05$). Correlations and repeatability studies are in progress.

Fiber tensile strength investigations utilizing the Instron Universal Testing Machine have been accomplished using 25 fibers from each of 6 muscles.

Influence Of "Hot" Boning On Bovine Muscle

Curtis Lynn Kastner and R. L. Henrickson

The "hot" boning of bovine carcasses has received limited study, but "hot" processing of porcine muscle has been studied in detail. Processing of pork prior to chilling has proven advantageous; thus, it was hypothesized that the bovine carcass would also lend itself well to "hot" boning. Six Hereford steer carcass were assigned to each holding period. Each carcass was split and one side was "hot" boned while the other side was "cold" boned. Three post-mortem holding periods (two, five, and eight hours) for the "hot" boned sides were compared to a 48 hour conditioning period for the "cold" boned sides. Muscle quality and yield were compared for "hot" versus "cold" boning.

Yield was significantly less for "hot" boning as compared to the control in both the five and eight hour holding periods. The muscle moisture and fat percentages for "hot" and "cold" boning were not significantly different for all holding periods. The pressed fluid ratio was smaller for "hot" than "cold" boning in the two hour holding period, but the "hot" boned pressed fluid ratios were larger than the control in the five and eight hour holding periods.

Shear forces were statistically greater for "hot" boning than the control in the two and five hour holding periods, but conditioning for eight hours produced a non-significant difference in shear force for "hot" versus "cold" boning. Significant differences in color value scores for "hot" and "cold" boning were found for all holding periods. Even though significant color value differences were reported a color panel only detected the color difference between "hot" and "cold" boning in the two hour holding period.

A taste panel could not detect significant differences in flavor between "hot" and "cold" boning in all conditioning periods. Cooking loss percentages were not significantly different between "hot" boning and the control for each holding period. If muscles are excised "hot" at five to eight hours post-mortem, then "hot" boning is feasible considering the parameters evaluated in this study.

Procedure For Live Biopsy of Bovine Longissimus Dorsi Muscle

J. J. Guenther, T. R. Thedford and E. W. Jones

To study certain biochemical, physiological or structural characteristics of bovine muscle it is often necessary to obtain muscle samples from the live animal at various periods during the animal's growth cycle. The procedure to follow was developed to satisfy this need. (Note: As the longissimus dorsi is a convenient muscle to utilize in studies of this nature, the procedure is written for that muscle. However, it may be applied to other muscles as well.)

Preparation For Surgery

The animal is restrained either manually or via a squeeze chute. Clip or shave hair from area to be sampled. The T₁₂ to L₄ area of the L dorsi is a desirable sampling area. Cleanse area by washing with surgical soap, alcohol and finally, iodine.

Anesthesia

Five milligrams per pound of body weight of Surital[®] are injected intravenous via the jugular vein. Concentration of the solution is 10 percent, primarily due to ease of injecting. The anesthesia should be given rapidly. Surgical anesthesia is attained in 1-1.5 minutes and will be maintained about 10-15 minutes. The animal will normally be able to sit up in about 20-25 minutes after anesthetizing and should be placed on its sternum at this time. The animals will be able to stand in about 35-45 minutes. (Note: Any additional administration of the drug should be made cautiously and experienced personnel should be on hand to revive animal.) Animals should be off feed 24 hours prior to anesthesia.

Surgery

A lateral incision through the skin, about 10 cm., is made, transverse to the muscle. The fascia and fat are not disturbed. Skin is retracted via allis tissue forceps to allow admission of biopsy device. Biopsy device consists of a stainless steel corer powered by an electric hand drill. A 1.0-2.5 cm. diameter corer is used, depending upon sample size desired. The corer is admitted slowly, but steadily, to deep border of muscle. Curved scissors are employed to clip sample at deep end. Wound is dust-

ed with Furacin[®]. Closure is made with 3 vertical mattress sutures of Vetafil. Sutures should be removed 10-14 days post-surgery.

All instruments, including the stainless steel corer are sanitized by autoclaving, then stored in a 1:4000 solution of Nolvasan. The biopsy size is normally 10-15 grams. Animals slaughtered 4 weeks post-surgery show almost complete tissue recovery.

Swine

The Effect of Ration Ingredient Change on Pig Performance

W. G. Luce and C. V. Maxwell

Two trials have been conducted involving 128 growing-finishing swine to measure the effect of ration ingredient change on pig performance.

Treatments involved in both trials were (1) a basal milo-soybean meal ration fed throughout the trials; (2) the cereal grain portion of the rations (milo, corn, and wheat) was rotated every 7 days; (3) the protein source (all soybean meal, $\frac{1}{3}$ meat and bone scraps and $\frac{2}{3}$ soybean meal, and $\frac{1}{3}$ peanut meal and $\frac{2}{3}$ soybean meal) was rotated every 7 days; (4) both the cereal grain and protein sources, as outlined in Treatments 2 and 3, were rotated every 7 days (9 different combinations). Average daily gains, average daily feed intake, feed efficiency, and probed backfat thickness appeared to be similar for all treatments.

The data are presently being analyzed further and will be published at a later date.

Genetic Evaluation Of Purebred And Crossbred Performance For Three Breeds of Swine

I. T. Omtvedt, R. K. Johnson, C. E. Addison,
Steve Welty and Tom Williams

A total of 182 litters were produced at Fort Reno during 1971 to evaluate the differences between purebreds and 2-breed crosses. Two papers are included in this publication giving the results obtained thus far. Feedlot performance and carcass data were available for only the spring pig crop, but both spring and fall farrowed litters were included in the productivity study. Although this phase of Project 1444 will be repeated during 1973 and the data now available are too limited to make many definite conclusions regarding differences in combining ability among Durocs, Hampshires and Yorkshires, marked increases in productivity were realized when Duroc and Hampshire gilts were mated to boars of different breeds to produce 2-breed cross litters.

During the winter of 1971, 210 purebred and 2-breed cross gilts were mated to produce 2-breed and 3-breed cross litters. One-third of these gilts were slaughtered 30 days after breeding to evaluate differences in ovulation rate and early embryo development. The remainder of the gilts will start farrowing in March. Another group of purebred and 2-breed cross gilts will be selected from the fall 1971 pig crop and bred during May and June to produce 2-breed and 3-breed cross litters in the fall. These matings will provide information on differences between purebred and crossbred dams and between 2-breed and 3-breed cross pigs, and information on the importance of maternal influence in determining the recommended crossing sequence.

In this project all the purebred boars and gilts used to produce the purebred and 2-breed cross litters at Fort Reno come from the seedstock herds at the Experimental Swine Farm at Stillwater. New bloodlines and rigid selection was practiced during 1971 to keep the genetic base as broad as possible and to change the composition of the herds. Eight boars and 54 gilts from each of these three breeds will be selected and taken to Fort Reno from each of the two farrowings in 1972.

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Dairy

Feed Flavors In Milk

M. S. Borges, O. P. Pryor and J. B. Mickle

Undesirable flavors in milk cause large monetary losses to Oklahoma dairy farmers each year. Among the most prevalent of these are feed flavors (including those caused by wheat pastures), oxidation (often called flat, cardboard, or metallic), and rancidity (called fishy or bitter). Lipase, an enzyme present in cows' blood and milk, has long been thought to cause rancid flavors; and recent evidence in the literature indicates that this enzyme might also be related to oxidized flavor and perhaps to feed flavors as well (1).

The purpose of the present study was to relate changes in the energy level of a cow's feed to the lipase activity in her milk. These feed changes also were studied in relation to changes in the charge on the milk proteins as measured by fractionation on DEAE cellulose. In preliminary work involving one Holstein cow, the animal first was fed a ration calculated at 100 percent of her "normal" energy requirements according to Morrison's Standards in a restricted roughage ration. This ration consisted of 28 lb of concentrate and 15 lb of average quality alfalfa hay. After two weeks, the cow was changed to a "maintenance" ration containing about 60 percent of her energy requirements. This ration consisted of 16 lb of concentrate and 20 lb of hay. After about three weeks on this ration, the milk developed a strong odor with a flavor sometimes described as "oxidized" and at other times as "strong feed." During this time, lipase

activity in the milk decreased from 3.4 to 1.7 units per ml; and the charge on the separable proteins changed markedly—compare Figures 1 and 2.

The cow's ration then was increased, and she was allowed to eat as much as she wanted—which consisted of approximately 32 lb of concentrate and 20 lb of hay—or about 120 percent of her normal energy requirements. After the change, the protein pattern of the milk changed immediately (Figure 3), but the undesirable flavors persisted for 24

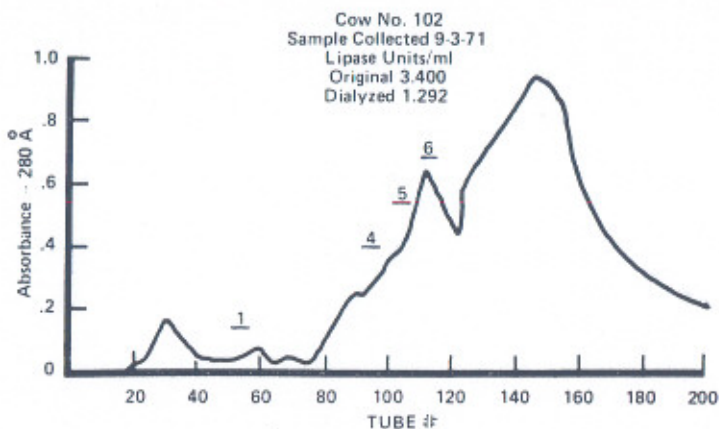


Figure 1. Chromatograph of milk protein on DEAE cellulose when Holstein Cow 102 was on a "normal" ration.

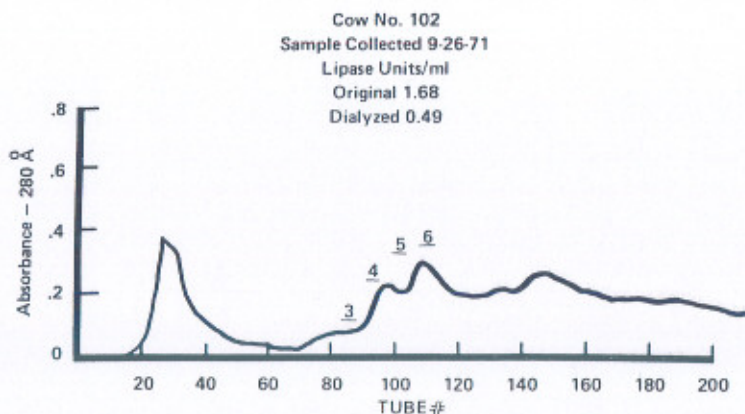


Figure 2. Chromatograph of milk protein on DEAE cellulose after Holstein Cow 102 had been on a "maintenance" ration for 24 days.

hours. After 48 hours, the protein patterns of the milk were back to normal, and the undesirable flavors had disappeared (Figure 4). Later work indicated that undesirable milk flavors were often associated with a change in energy level of the ration rather than with the composition

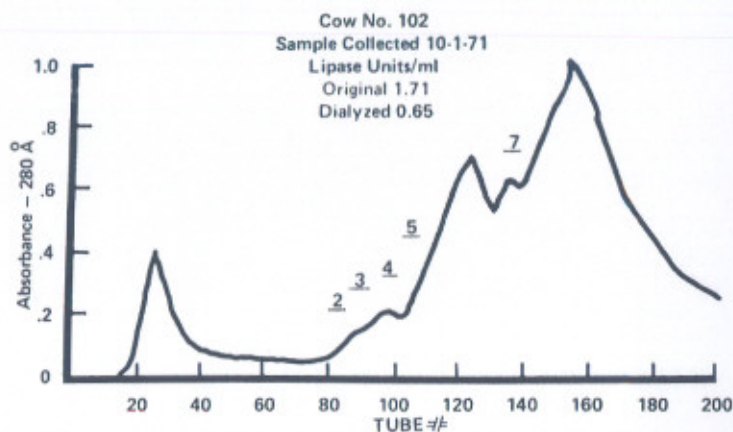


Figure 3. Chromatograph of milk protein on DEAE cellulose the day that Holstein Cow 102 was changed from a maintenance ration (60 percent of normal) to one containing 120 percent of the energy in a normal ration.

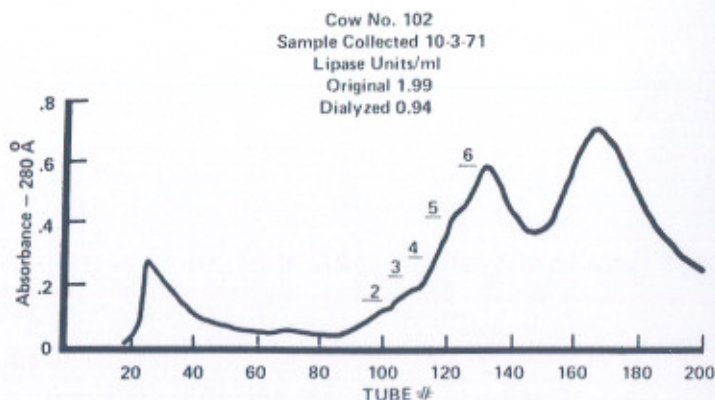


Figure 4. Chromatograph of milk protein on DEAE cellulose 48 hours after Holstein Cow 102 had been on a ration containing 120 percent of the energy in a normal ration.

of the ration itself. This work is continuing using other cows in an effort to learn more about the exact causes of these undesirable flavor changes in milk.

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Emulsifiers In Foods

J. B. Mickle

The studies concerning emulsifiers in foods at Oklahoma State University have developed several new food products during the last decade. These include low calorie spreads as well as solid and liquid cake shortenings. At present the research is aimed at developing a new type of candy base incorporating milk products.

Candy products are now on the market which can be used as bases for fudge-type candies. These bases contain all the ingredients necessary for this type of candy except the flavoring—the nuts or chocolate, etc. However, the products presently on the market do not include milk fat or any other milk ingredient.

Current research is aimed at determining the proper ingredient ratios using milk powder and fat together with the appropriate processing temperatures for the product. Emulsifiers appear to improve the texture of the candy, though there are problems with flavor; and the optimum amounts of these ingredients have yet to be worked out. It will be necessary to study the flavor, texture, and hardness of these products under various storage conditions over a period of time before it can be determined whether this type of candy base has commercial applicability.

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