

SUMMARY REPORTS ON OTHER PROJECTS

Cow-Calf

Problems Associated with Induced Superovulation and Superfetation in Beef Cows

E. J. Turman, D. B. Laster, D. F. Stephens and R. E. Renbarger

Four trials involving 55 cows and 80 yearling heifers have been completed during the year. All trials involved the study of the effect of two PMS injections and one HCG injection on ovulation rate as determined by laparotomy or slaughter. No cows were allowed to calve.

These trials have indicated that the best practical treatment for inducing multiple pregnancies may be: (1) synchronization of estrus by use of an oral progestogen; (2) all cows injected on the same day with 1500 iu PMS on the fifth day and 2000 iu PMS on the seventeenth day after the average date of estrus following withdrawal of the progestogen; (3) injecting 4000 iu HCG intravenously on day-3 following the second PMS injection. The percentages of 38 yearling heifers and 19 cows so treated that were in each ovulation rate group were, respectively: 0 or 1 egg, 37 and 26 percent; 2 or 3 eggs, 50 and 37 percent; 4 or more eggs, 13 and 37 percent. This treatment will be imposed on a group of cows this spring that will be allowed to calve to study its effectiveness in inducing multiple births.

Publications

- Laster, D. B., E. J. Turman, B. H. Johnson, D. F. Stephens and R. E. Renbarger. 1970. Effect of sex ration on degree of transformation and chimerism in freemartins. *J. Animal Sci.* 30:322 (abstr.)
- Laster, D. B., E. J. Turman, D. F. Stephens and R. E. Renbarger. 1970. Ovulation rate of beef heifers treated with PMS. *J. Animal Sci.* 30:323 (abstr.)
- Johnson, B. H., D. B. Laster, L. L. Ewing, E. J. Turman and D. F. Stephens. 1970. Hormonal steroid levels in peripheral plasma of freemartins. *J. Animal Sci.* 30:321. (abstr.)

The Effect of an Anthelmintic Upon Performance of Spring-Calving Cows Grazing Bermudagrass

J. E. McCroskey, S. L. Armbruster, D. F. Stephens and R. Renbarger

In view of the general feeling that cattle grazing bermudagrass continuously are often heavily parasitized, a study was conducted to determine the effect of an anthelmintic upon performance of beef cows. Forty-eight grade Hereford cows which had been divided into three level-of-wintering treatment groups were used in the study. One-half of the cows in each of the three level-of-wintering groups were treated with an anthelmintic (thiabendazole) bi-monthly from May, 1968 to October, 1969. One-half of the cows served as controls and were not treated. The treated cattle were given 5 gm. thiabendazole per 100 lb. body weight at 60-day intervals. All cows grazed together in the same pasture.

Thiabendazole treated cows were heavier at weaning time and their calves averaged two pounds heavier at birth than controls. However, there was no apparent beneficial effect upon winter weight loss, milk production or weaning weights of their calves.

The Influence of Level of Milk Production of Brood Cows on Productivity, Supplemental Feed Requirements, and Efficiency of Beef Production¹

Robert Totusek, J. E. McCroskey, D. F. Stephens,
L. E. Walters and J. V. Whiteman

Weaning weight is one of four major factors which influence profit from a cow-calf operation (the other three are percent calf crop, selling price per pound of calf, and annual cow cost). Research has shown a strong correlation between level of milk production of beef cows and weaning weight of the calves. Within the limits of milk produced by beef cows, each additional 10 pounds of milk produces approximately an additional pound of weaned calf weight.

¹ In cooperation with USDA, Agricultural Research Service, Animal Husbandry Research Division.

Today, considerable pressure is being exerted to increase milk production of range cows. Performance testing programs which emphasize weaning weight automatically result in selection for higher milk production. In addition, some cow-calf operators are infusing dairy breeding into their cow herd to rapidly increase milk production.

How much milk should a range cow produce? How much milk will a cow with a very high potential for milk production actually produce under range conditions? Will the capacity of a cow's calf limit her milk production? Will additional increments of milk production at high levels of milk yield be efficiently converted to calf weight? Will a heavy milking cow rebreed under range conditions? How much more supplement will a heavy milking cow need under range conditions, How will calves which are very heavy at weaning perform in the feedlot? What will be the carcass merit of calves which are very heavy at weaning time and consequently young at slaughter? What is the relationship between level of milk production and total efficiency of production of carcass beef, considering all feed consumed by the cow, by the calf before weaning and by the calf after weaning?

These are questions being asked, and they are all related to the main question, "How much milk should a range cow produce?" There will may be several answers to this question. Under an adverse feed environment (such as sparse range) a relatively low level of milk production may be necessary to allow good reproduction, while under a plentiful feed environment (such as improved pasture) a very high level of milk production may be desirable.

To answer basic questions about level of milk production, an experiment has been initiated at the Oklahoma Experiment Station. Three levels of milk production will be established with three kinds of females: 1. Herefords 2. Hereford x Holstein crossbreeds 3. Holsteins. The females will be subjected to three levels of supplement, moderate, high and very high. The moderate level will consist of that amount of supplement which will allow Hereford females to be maintained in thrifty condition and reproduce at near maximum levels. The same amount of supplement will be fed to crossbreeds and Holsteins. The high level of supplement will consist of that amount necessary to maintain crossbreeds in a physiological condition comparable to moderate level Herefords. The high level of supplement will also be fed to Herefords and Holsteins. The very high level of supplement will consist of that amount necessary to maintain Holstein females in a physiological condition comparable to moderate level Herefords and high level crossbreeds. The very high level of nutrition will not be used for Herefords and crossbreeds.

One phase of the experiment will be conducted on the range to determine the actual performance of cows varying widely in milk produc-

tion potential, and to determine their response to differing levels of supplementation. Production traits of major interest will be percent calf crop and weaning weight of calves.

A second phase will be conducted entirely in drylot so that all feed consumed by both cows and calves can be measured. This will allow determination of total efficiency of feed utilization by the weaned calf, as influenced by level of milk production and level of nutrition of the dam.

Calves will be placed in the feedlot at weaning time, fed to slaughter finish and critically evaluated in the carcass. This will allow determination of the total efficiency of beef production as influenced by milk production of the cow, considering all feed consumed by the cow, and by the calf before weaning and in the feedlot.

One point should be emphasized. This research project is not a demonstration, because the results cannot be predicted. The question "How much milk should a range cow produce?" is a vital one to the beef cattle industry in charting the direction of future genetic change. This experiment is intended to help answer the question.

Females for this experiment were obtained in the fall of 1969, wintered under range conditions in the winter of 1969-70, and bred to calve in the winter of 1970-71.

Beef Cattle Selection Studies

R. R. Frahm

A selection study is being conducted at the Ft. Reno Livestock Research Station for the purpose of measuring how much increase can be realized from selection based on weaning weight and yearling weight performance under typical Oklahoma conditions. Of particular interest is the genetic relationship that exists between growth rate during the pre- and postweaning periods. If the genetic relationship is high between weaning weight and yearling weight, then selection of breeding stock can be made at weaning time and the breeder can be assured of selecting stock that are genetically superior for growth rate over the entire growing period.

To accomplish these objectives, 300 head of purebred Angus and Hereford cows are maintained in six different selection lines of 50 cows each. Two of the selection lines, one Hereford and one Angus, are being selected for increased weaning weight performance. Two other lines,

one Hereford and one Angus, are being selected for increased yearling weight. In these four lines, the herd sires and replacement females selected are those animals having the heaviest weaning weight or yearling weight depending on which line they are in. Another line of Angus cattle is being selected for weaning weight performance in which the bulls are selected based upon progeny test information. One line of Angus cattle is being maintained in which no selection is practiced. The purpose of this line is to serve as a control line to which the other lines will be compared as a basis for determining how much performance has been increased by selection.

Although this project is only in its early stages and it will be several years before conclusions can be reached concerning its primary objectives, the data collected to date have been used to answer other questions on problems confronting the beef industry.

Publications

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

- Frahm, R. R., L. E. Walters and G. V. Odell. 1969. Prediction of lean in yearling bulls by live K⁴⁰ count. *J. Animal Sci.* 30:2 (abstract)
- McLellan, C. R. Jr. 1967. Analysis of a permian potassium-40 counter as a predictor of lean in beef cattle. MS Thesis, Oklahoma State University.
- McLellan, C. R. Jr., J. V. Whiteman, L. E. Walters and G. V. Odell. 1969. Prediction of fat-free lean from live K⁴⁰ count. *J. Animal Sci.* 29:1 (abstract)
- Pherigo, D. L., J. V. Whiteman, R. L. Willham and D. F. Stephens. 1969. Association between day of birth and corrected weaning weight in beef cattle. *J. Animal Sci.* 29:1.
- Tanner, J. E. 1969. Sire-sex interactions and sex differences in growth and carcass traits of cattle and carcass traits of lambs. PhD Thesis, Oklahoma State University.
- Tanner, J. E., R. R. Frahm and J. V. Whiteman. 1969. Sire-sex interactions and sex differences in cattle. *J. Animal Sci.* 29:1 (abstract)
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Mouse Selection Studies

I. T. Omtvedt and R. R. Frahm

Project 1405 was initiated in 1969 to measure the direct and correlated response to selection for preweaning and postweaning rate of gain in mice. Growth rate is of considerable economic importance in all types of livestock and it is highly desirable in a breeding program to select animals at the earliest age possible. This project is designed to obtain information relative to the basic genetic relationship between early and late growth periods in mice which will provide a basis of application to other species.

Four different lines of breeding were crossed to form the foundation population from which six selected lines of 20 litters each (three lines selected on basis of individual weaning weight and three lines selected on basis of individual growth rate from three to six weeks of age) were formed. An additional 40 litters are maintained as a random mating control line for measuring genetic changes in the selection lines. Since the project is just in the first generation of selection, no results are available at this time.

Meats

The Desirability of Pork Products Processed Prior to Chilling

R. L. Henrickson, I. T. Omtvedt, and Robert Clary

High temperature curing of porcine muscle appears to have practical value for the meat industry. Data are available which support the view that muscle processed prior to chilling has a greater water-holding capacity than muscle processed post-chill. Total moisture, press fluid, and free fluids in the can all cause one to review rapid processing of meat with renewed vision. Pre-chilled processed muscle tended to take up the cure more rapidly and provided a more stable cured tissue as evident by nitrosopigment content. Shear force values indicated that pre-chilled canned muscle is not as tender as post-chilled muscle. This may be a practical advantage since canned ham is often over heated resulting in

poor texture. It is difficult at this time to predict the significance of tenderness in canned ham since it has not been possible to establish the desired tenderness level for this product. Studies concerned with the size and condition of the muscle fiber did not reveal great differences due to the processing treatment. However, there was some fiber variation between muscles.

The science of heat transfer has important applications to processing, storing, and transporting of commercial cuts of meat and meat products. The geometry index and prepared nomograph can be used to quickly calculate cooling time and temperatures. The forced convection equation can be used as a general expression for computing the heat transfer coefficient.

The Eating Quality of Beef as Influenced by Age and Muscle Difference

R. L. Henrickson, S. G. Reddy and W. A. Gillis

The beef carcass is composed of over 200 individual muscles. Muscles of the hindquarter are generally tender and used for steak. However, numerous other muscles, particularly in the frontquarter, may have utility as steak. A more efficient utilization of the beef carcass would be wise, particularly now as beef must meet competition from other protein sources.

Methods have been employed for the excision of individual muscles. Fiber size and variation in the degree of rigor have been investigated. Other factors evaluated were myofibril size, sarcomere length, collagen, elastin, and muco-proteins. These investigations provided the following:

1. Muscles and/or muscle systems can be more easily extracted from the warm carcass than from one chilled.
2. Muscles within a carcass are under varied levels of tension depending upon its location within the carcass and the chilling position.
3. Fiber diameter of muscles under 1000 gram tension were smaller than those with no tension.
4. No significant change was noted in muscles with additional levels of tension.

5. Both muscles studied exhibited less rigor fibers when the muscle was under 1000 gram tension than with no tension.

6. Muscles and muscle fibers varied in their response to rigor mortis.

In a study concerned with muscle size, individual muscle fibers were measured. The nuclei parameters and the area served by each nuclei suggests the need for more extensive work. The sartorius muscle possessed the least number of nuclei per 100 micron of fiber length. They ranged from 1.5 to 6.9 per 100 micron with a mean of 4.0. Muscles fibers of greater diameter generally possess more nuclei.

Intramuscular Variation in the Electrophoretic Characteristics of Bovine Muscle Proteins

J. J. Guenther

In this study a quantitative comparison of the electrophoretic patterns of proteins extracted from bovine longissimus dorsi, semitendinosus, and infraspinatus muscles was made. Samples were obtained from calves slaughtered at 8 and 14 months of age. A total of 50 half-sib hereford calves were tested. Muscle samples were extracted with 0.1M PO_4 buffer, pH 7.0, centrifuged and filtered. Aliquots of the filtrates were electrophoresed on polyacrylamide gels against a Tris-Glycine buffer, pH 8.4, in a Canalco Model 12 unit. Protein fractions obtained were quantitated via a specially modified photovolt Densitometer. Data were tabulated as a percentage of the total protein fractionated.

A total of 13 anionic protein fractions were obtained. Uniform characteristics of certain of these fractions permitted the partitioning of the fractions in groups as follows: $A_{1-2-3-4}$; $B_{1-2-3-4-5-6}$; C_{1-2} ; D_1 ; in order of increased electronegativity. Statistical analysis revealed a highly significant muscle difference, $P < .005$, in each of the 13 protein fractions. For the longissimus dorsi, 70% of the total protein components occurred in the A_1 through B_1 fractions and 30% occurred in the B_2 - D_1 fractions. The semitendinosus and infraspinatus muscles had 63 and 50 percent, respectively, of the total protein components in the A_1 - B_1 fractions and 37 and 50 percent, respectively, in the B_2 - D_1 fractions.

Purification of Bovin G-Actin and the Formation of Its Polymer

J. J. Guenther

Experimental material consisted of bovine longissimus dorsi muscle from which the myofibrillar protein, Myosin, had been previously extracted. Following a series of washings of this minced muscle residue with NaHCO_3 , distilled water, and n-butanol an acetone-dried muscle powder was obtained. Aliquots of the dried muscle powder were extracted with 2×10^{-4} M ATP solution. The resulting extract, which contained crude G-Actin, was clarified via high speed centrifugation (spinco model L, No. 30 rotor, 10,000 rpm., 60 min.). The G-Actin was then transformed into its polymer, F-Actin, by adding 2M KCl. After a series of washes with the ATP solution, each followed by ultracentrifugation (30,000 rpm. for 3 hours), purification was effected. G-Actin was recovered by depolymerizing the purified F-Actin. This was accomplished by dialyzing the F-Actin against aqueous ATP solution.

Sedimentation patterns obtained on the G-Actin preparation showed a single, sharp peak, indicating purity and molecular homogeneity. Chromatographic separation on Bio-Rad P-100 gel also suggested purity of the G-Actin preparation. Electropherograms, obtained on polyacrylamide gels, showed the G- and F-Actin preparations to consist of 9 and 8 electronegative components, respectively. Electrophoretically, G-Actin differed from its polymer only in that it contained an additional highly mobile, anionic component.

Beef Feeding

Improving the Nutritive Value of Milo for Fattening Beef Cattle

D. G. Wagner

Although milo and corn have quite similar chemical compositions, milo has only about 85 percent the feeding value of corn for fattening beef cattle. The lower efficiency appears to be due in part to a lower availability of the carbohydrate fraction in milo. It has now been demon-

strated that processing methods such as steam flaking, reconstitution, high moisture harvesting, and others are beneficial for improving the nutritive value of milo. Both feedlot and laboratory studies are currently in progress to determine the influence of processing factors on the nutritive characteristics of milo and to more fully elucidate the manner in which processing factors improve nutrient utilization.

Publications

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

- Franks, Larry G. 1969. The effect of milo processing method and type of grain on VFA production and feedlot performance. M.S. Thesis.
- White, Dennis. 1969. Feedlot performance, net energy and carcass merit as affected by high moisture vs. dry methods of processing milo. M.S. Thesis.
- White, Dennis, Robert Renbarger, James Newsom, Vincent Newhaus and Robert Totusek. 1969. High moisture and dry methods of processing sorghum grain. J. Animal Sci. 29:175. (Abstract)
- Newhaus, Vincent and Robert Totusek. 1969. Factors affecting *in vitro* digestibility of high moisture sorghum grain. J. Animal Sci. 29:167. (Abstract)

A Study of the Effect of Previous Plane of Nutrition and Compensatory Gain Upon Energetic Efficiency of Beef Steers Using Respiration Calorimetry

J. E. McCroskey, R. R. Johnson and D. G. Wagner

In order to get a critical measure of the effects of previous plane of nutrition and subsequent compensatory gain upon efficiency of energy utilization, respiration calorimetry is being employed to measure all of the losses of energy and energy stored in the body of steers. Twenty-four Hereford steer calves were divided into three equal groups on the basis of weight and are being fed a high energy ration in individual stalls. One group (Lot 1) will be full-fed for maximum gain to slaughter weight. Lot 2 will be fed to gain one pound per head per day for approximately 200 days then will be full-fed for the remainder of the

feeding period. Lot 3 will be fed at a maintenance level for approximately 200 days then will be put on full-feed.

Four steers in each lot will be brought in to the metabolism room at pre-determined time intervals and placed in open-circuit respiration chambers for digestion and energy balance trials to partition energy losses and energy gain.

The steers were started on trial in December, 1969 and the trial will be completed sometime in 1970. Results of the study will be presented in the 1971 Research Report.

Swine

Preparation of Milo and Wheat for Growing-Finishing Swine

W. G. Luce, I. T. Omtvedt and D. F. Stephens

The objective of Project 1420 is to evaluate various methods of preparation of milo and wheat fed to growing-finishing swine as related to daily gain, feed utilization, feed intake and certain carcass measurements.

Most grain utilization studies in the past with swine have involved corn. However, corn is not a major crop in Oklahoma and, therefore, is not used extensively as a feed for swine. Traditionally milo has been the chief feed for swine in Oklahoma. In recent years wheat has been competitively priced with other cereal grains to suggest its use as a feed for swine. Trials will be conducted to study methods of preparation to improve the feeding value of both these grains.

Previous research in this project has shown that wheat will tend to support similar gains as milo especially when equal amounts of supplemental protein were used. However, significantly more feed was required per pound of gain when wheat replaced all the milo. When only 50 percent of the milo was replaced with wheat, feed utilization was not appreciably affected.

The results obtained from 2 trials conducted to study the effect of particle size of grind and dry rolling of wheat and milo for growing-finishing swine is reported in this publication. No appreciable differences

were noted in performance among pigs fed diets of wheat ground through a hammer mill using a fine, medium or coarse grind or a close dry roll. However, pigs fed a fine grind or close dry roll milo ration required significantly less feed per pound of gain than pigs fed a medium or coarse grind.

Publications

The following articles were published from this project during the past year:

- Luce, W. G. and I. T. Omtvedt. 1969. Comparative values of wheat vs. milo for growing-finishing swine. *J. Animal Sci.* 28:140. (abstract)
- Luce, W. G., I. T. Omtvedt, D. R. Rule, D. F. Stephens and S. D. Welty. 1969. Wheat vs. milo for growing-finishing swine. *Okla. Agr. Exp. Sta. MP-82:88.*
- Luce, W. G. 1969. You can feed wheat. *Farm Journal.* November 1969: H16.
- Luce, W. G. 1969. Processing of milo and wheat for growing-finishing swine. *Proceedings of 11th Animal State Swine Short Course, Oklahoma City, Oklahoma,* pg. 5.
- Luce, W. G. and I. T. Omtvedt. 1970. Processing of milo and wheat for growing-finishing swine. *J. Animal Sci.* 30:334. (abstract)

Studies on Myodegeneration Syndrome in Swine

C. V. Maxwell, R. L. Henrickson and R. J. Panciera

Within the past several years an acute myodegeneration syndrome has been recognized in swine of the OSU Yorkshire herd. The relationship of this muscle disease to similar pathological conditions occurring in swine throughout the United States is not presently known; nor has the cause of any of the conditions been established. The disease, in each instance, occur primarily in heavily muscled swine and become evident when the live animal is exposed to stress such as exercise or adverse environmental factors.

The initial trials in this project were designated to establish a method to identify susceptible animals before the disease occurs. The relationship of several physiological factors and muscling to the development of the disease will also be investigated.

The Effect of Protein and Amino Acid Nutrition on the Reproductive Performance of Sows and Gilts

Charles Maxwell

This project will involve several studies with gilts and sows. The primary objectives are: 1. to study the effect of a low protein diet introduced before breeding on the normal estrus cycle of the gilt and on the growth and viability of the developing fetus. 2. to study the possibility of using plasma free amino acid levels as a response criteria to be used to determine the protein requirement of reproducing swine. 3. to study the effect of level of dietary protein during gestation on subsequent sow productivity. Data collected from the studies should aid in determining the optimum protein and amino acid requirements for maximum efficiency of reproduction in swine.

Study of the Calcium and Phosphorus Requirements of Young Pigs

C. V. Maxwell, James A. Coalson and J. C. Hillier

Two replicates were conducted in Trial 1 using calcium levels of 0.50, 0.65, 0.80, 0.95 and 1.10 percent with the phosphorus level held constant at 0.70 percent. There was a significant difference in weight gain. A linear response in weight gain was observed from 0.50 to 1.10 percent calcium. In trial 2 phosphorus levels of 0.50, 0.60, 0.70 and 0.80 percent were fed with calcium held constant at 0.95 percent. There were no significant differences in either body weight gains or feed utilization. Further analysis for both trials are being conducted and the data will be reported later.

The Effects of Season and Exogenous Hormones on the Reproductive Performance of Swine

E. J. Turman, C. V. Maxwell and J. C. Hillier

The results of one trial studying the effects of season on semen quality of boars is reported elsewhere in this booklet. Two additional trials have been completed. Twelve Yorkshire boars were either collected or collection was attempted three times weekly for one year. Nine of the boars were rested for three months and then were continued for an additional six months with collections attempted twice weekly.

Boars collected three times weekly did not maintain regular production. Only 40 percent of the attempted collections during the second six months of the trial were successful compared to 90 percent during the first six months. There was less decline in successful collections with twice weekly collections. Semen quality was highest during the coolest part of the year and lowest during the late summer and early fall months. Access to a small air conditioned house was not effective in preventing the decline in semen quality during the summer. The best summer shelter was a shade with a sprinkler. In the winter, the semen quality was poorest in boars in lots with the least protection from the cold.

A total of 120 gilts were used over a period of two years to test the estrus synchronizing potential of varying levels of six experimental compounds. Three of the compounds tested would not consistently inhibit estrus and ovulation at any level tested. Of the three compounds that would completely inhibit estrus and ovulation at one or more levels, none were satisfactory for use in estrus synchronization. In all cases, the return to estrus following discontinuance of feeding was too erratic and completely unpredictable.

Publications

- Johnson, Bryan H. 1969. The evaluation of estrus inhibiting compounds in swine. Ph.D. Thesis. Oklahoma State University Library.
- Warren, Ralph L. 1969. Environmental factors associated with frequency of collection and semen characteristics of Yorkshire boars. M.S. Thesis. Oklahoma State University Library.

Influence of High Ambient Temperatures on Reproductive Performance in Swine

I. T. Omtvedt, E. J. Turman, D. F. Stephens and
G. W. A. Mahoney

Since reduced reproductive efficiency is most prevalent during summer months, Project 1399 was initiated to determine the influence of exposing sows to high ambient temperatures before breeding, at breeding, in early pregnancy, in mid-pregnancy and in late pregnancy on their reproductive performance.

The results obtained for early, mid and late pregnancy are included in this publication. It appears that sows are most susceptible to heat stress in early and in late pregnancy but are more resistant in mid-pregnancy. Based on one trial, heat stress prior to breeding had no marked influence on performance.

Publications

The following articles were published from Project 1399 during this past year:

Nelson, R. E., I. T. Omtvedt, E. J. Turman and D. F. Stephens. 1970. Heat stress in mid and late pregnancy in gilts. *J. Animal Sci.* 30:325 (abstract)

Omtvedt, Irvin T. 1969. Effects of heat stress in late pregnancy. Proceedings of 11th Annual State Swine Short Course, Oklahoma City, Oklahoma. Page 15.

Genetic Evaluation of Purebred and Crossbred Performance of Three Breeds of Swine

I. T. Omtvedt

Project 1444 was initiated in the fall of 1969 to evaluate the purebred performance and the combining ability of three breeds of swine (Duroc, Hampshire and Yorkshire) in 2-breed and 3-breed crosses. Although it is estimated that approximately 90 percent of the pigs marketed in the United States are of crossbred origin, and it is fairly well established as to which traits are expected to yield the greatest response to crossbreeding, information on how to achieve maximum performance through crossbreeding is not available. Information pertaining to the combining ability of the breeds that are presently used in the industry under current management conditions is needed in order to develop more effective breeding programs.

Most of the results available on crossbreeding in swine are based on early investigations involving inbred lines and breeding stock typical of that time under management conditions quite different from those recommended today. Also, since the influence of crossbreeding on ovulation rate and prenatal survival have not been studied, and the fact that most of the investigations available in the literature did not evaluate postweaning performance or carcass merit, crossbreeding studies involving the evaluation of all the traits of major economic importance to the producer should be initiated.

The demand for this type of information is intensified today because of the necessity for greater efficiency in livestock operations and because of the increased size of individual commercial units, thus making even relatively small differences in performance of considerable economic importance to the individual producer.

Purebred herds of the three breeds were established at the Experimental Swine Farm at Stillwater and these will serve as the seedstock for the project. The basic project design for each replication is outlined in the following table:

There will be four replications of each phase. Gilts will be slaughtered 30 days postbreeding to determine ovulation rate and embryo survival. Sow productivity will be evaluated at birth, 21 days and 42 days. Postweaning growth rate, feed efficiency, probe backfat thickness and carcass data will also be obtained. Phase I litters for the first replication will be farrowed in March and April, 1970.

Phase:	No. I	No. II	No. III
Station: Sow Farrowed: Sows Slaughtered:	Stillwater 66 (22 each)	Ft. Reno 90 (10 each) 45 (5 each)	Ft. Reno 96 (8 each) 48 (4 each)
Mating Scheme Illustration:		<u>Each Duroc Boar Mated To:</u> 3D 3H 3Y	<u>Each Duroc Boar Mated To:</u> 3H 3Y 3(HY) 3(YH)
Basic Mating Types:	DD } 5 boars each HH } —————→ YY } 45 gilts each	DD HH YY } 4 boars each DH HD YD } 24 gilts each DY HY YH } 12 gilts each	DH HD YD DY HY YH D(HY) H(DY) Y(DH) D(YH) H(YD) Y(HD)

Selection for Crossing Ability in Swine

I. T. Omtvedt

The basic objective of Project 808 is to study the feasibility of selecting purebreds on the basis of their ability to cross. Sow productivity traits generally exhibit considerable hybrid vigor in crossbreeding studies, but unfortunately, these traits are lowly heritable and show very little response to direct selection. The hybrid vigor obtained in crossbreeding is "one-shot improvement" and breeders cannot expect to obtain increased performance due to additional heterotic response each generation. In this project an effort is made to make continued improvement in two-breed crossbred gilts by selecting the two parent lines on the basis of their crossing ability. The basic procedure is to select the Duroc and Beltsville boars and gilts for breeding on the basis of their Duroc-Beltsville crossbred half-sisters' productivity (litter size and 21-day weight).

The project is currently in the sixth generation of selection. Productivity of the crossbreds has been very desirable but continual improvement in the crossbreds over the controls each generation is not readily apparent at this time. This procedure is widely used in plant breeding and research with laboratory organisms indicated that it may have application in swine breeding, but results to date are not very encouraging. This project will be phased out at the end of sixth generation.

Publications

The following articles were published from this project during the past year:

- Arganosa, V. G., I. T. Omtvedt and L. E. Walters. 1969. Phenotypic and genotypic parameters of some carcass traits in swine. *J. Animal Sci.* 28:168.
- Cunningham, P. J. An investigation of selection indexes in swine populations. Ph.D. Thesis. May, 1969.
- Edwards, Ronnie L. and I. T. Omtvedt. 1970. Genetic parameters in a control population of swine. *J. Animal Sci.* 30:319 (abstract)
- Edwards, Ronnie L., I. T. Omtvedt and J. A. Whatley. 1970. Performance of swine control population. *J. Animal Sci.* 30:318 (abstract)
- Luce, W. G. and I. T. Omtvedt. 1969. Comparative values of wheat vs. milo for growing-finishing swine. *J. Animal Sci.* 28:140 (abstract)
- Luce, W. G. and I. T. Omtvedt. 1970. Processing of milo and wheat for growing-finishing swine. *J. Animal Sci.* 30:334 (abstract)
- Moss, Mike and I. T. Omtvedt. 1970. Association between sow condition scores and productivity. *J. Animal Sci.* 30:324 (abstract)

- Omtvedt, I. T. 1969. Criteria for assessing sow productivity and nutritional adequacy. 61st Annual Meeting of American Society of Animal Science, Purdue University, August 4, 1969.
- Omtvedt, I. T. 1969. Pork quality likely to decline if ignored. National Hog Farmer. September 1969:62.
- Omtvedt, I. T. 1970. Genetic considerations for improving production and carcass traits. Proceedings of American Pork Congress, Des Moines, Iowa, March 5, 1970.
- Omtvedt, Irvin T. 1969. Antibiotic supplementation during farrowing and gestation. Proceedings of 11th Annual State Swine Short Course, Oklahoma City, Oklahoma, pg. 17.
- Omtvedt, I. T., V. G. Arganosa and L. E. Walters. 1969. Some genetic aspects of pork quality. Okla. Agr. Exp. Sta. MP-82-83.
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