

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 } \longrightarrow 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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