Analyses of variance indicated that the within-year level of inbreeding of the calves did not affect calf weaning weight significantly in either inbred line. Examination of the yearling summary of the calf weaning weights for both lines portrays a general trend of decreasing weaning weight with increased level of inbreeding of calves. Level of inbreeding of calves is confounded with year effects, so an intricate evaluation of inbreeding is not possible with these data. The analyses of variance indicated that the effect of years on calf weaning weight was highly significant in both inbred lines.

The following within-year simple correlations were calculated for the Wernacre Premier line and Mercury line, respectively; birth weight of calf and average daily gain to weaning, .33 and .34; birth weight and weaning weight (adjusted for age of calf), .51 and .47; actual weaning weight and weaning score, .40 and .57. All of these correlation coefficients are highly significant.

The analyses reported on this purebred Shorthorn cattle breeding project are not conclusive and additional data will be collected as the project progresses. The preliminary findings discussed here indicate the problems involved in evaluating animal production data. None of the corrections used in this study for adjustment of calf weaning weight procedures is recommended for use by cattle breeders at this time.

The growth rate and feed consumption data for the project cattle are undergoing analyses currently. The results of these studies will be reported in the future.

Record of Performance Testing Program for Beef Cattle

Walter Smith and V. E. McAdams

Introduction

Performance in beef cattle includes all traits that contribute to the efficient production of beef with quality appeal to the consumer. The systematic measurement of economically important production traits and the use of such procedures comprise what is known as Record of Performance. The goal of these procedures is to identify the genetically superior individuals within a herd so that maximum genetic improvement can be made through their selection and breeding. Performance should be a guide to beef herd improvement in Kansas.

Principles of Record of Performance

Differences between individual animals are due to two major causes, genetic and environmental. The observed performance of an individual animal for each trait is the result of the heredity that it receives from both parents and the environment in which it is produced.

The inherited differences with regard to the ability of cattle to grow rapidly, mature early, convert feed to meat efficiently, reproduce efficiently, and to produce desirable carcasses provide the basis for selection for improvement through breeding methods.

Record of Performance is useful primarily to provide a basis for comparisons among cattle handled alike within a herd and not for comparing differences between herds. Genetic differences between herds do exist; however, uncontrollable environmental effects eliminate the possibility of an evaluation of these genetic differences in most instances. Minimum standards for level of performance with regard to the various production traits have been advocated in some broad-scale Record of Performance programs. Because of the tremendous variation in environmental conditions and production programs, standards of performance involving comparisons between herds are likely to be erroneous. Performance records are useful for selecting the high producers and for culling undesirable animals. Maintaining production records on cattle produced in a herd helps to identify the best performing individuals and gives information about the breeding value of the sires and dams that

produced them. The performance of all individuals should be measured in order to identify those that are above average in total merit.

The impact of Record of Performance for the entire beef cattle industry will depend mainly on its adoption by purebred breeders in the production of herd sires. Commercial beef breeders can make the most effective use of Record of Performance in the selection of herd bulls on the basis of records from within purebred herds that are on a systematic Record of Performance program. Commercial producers may use production records as a guide to cull cows or bulls and to select replacement heifers.

Attention That Each Trait Should Receive

Beef cattle breeders are concerned with the important problem of determining the emphasis placed on each trait in selection procedures. Generally speaking, the heritability, the relative economic importance, and the genetic association with other traits determine the attention which should be devoted to a given trait in a selection program. The number of traits undergoing selection limits the emphasis which may be placed on a given trait; therefore, the greater the number of traits selected for, the less intensely can selection be practiced for any single trait. Beef cattle production traits vary with regard to their individual heritability and economic value. Traits of high heritability respond more to selection than those of low heritability, and greater attention should be given to traits of higher economic value.

Rate of Improvement from Selection

The factors that determine the rate of breeding improvement as a result of selection are: (1) Heritability, (2) selection differential, (3) genetic association among traits, and (4) generation interval.

Heritability is generally defined as the proportion of the differences measured or observed between animals that is transmitted to their offspring. Theoretically, heritability for a trait may vary from 0 to 100%. Heritability estimates are obtained under carefully controlled environmental conditions, with adjustments being made for known major environmental sources of variation. The heritability value for a given trait may be expected to vary to some limited extent in different herds due to existing genetic variability and the uniformity of the environment. There have been many heritability estimates reported from studies made on data obtained on numerous different research herds. The estimates presented in Table 1 probably represent average expectations for many herds, provided the general environment is similar for all cattle within the herd. These estimates are recommended for reference to Kansas beef cattle breeders pursuing Record of Performance programs.

Table 1

Beef cattle: economically important traits

Trait	Heritability %
Calving interval (reproductive efficiency)	10
Birth weight	40
Weaning weight	30
Cow maternal ability	40
Feedlot gain	45
Pasture gain	30
Efficiency of gain	40
Final feedlot weight	60
Conformation score:	
Weaning	25
Slaughter	40
Carcass traits:	
Carcass grade	30
Rib eye area	70
Tenderness	60
Cancer eye susceptibility	30

Selection differential is the difference between the selected individuals and the average of all the animals in a herd from which they were actually selected. It is influenced by the proportion of the total selected, the number of traits selected for, and the prevailing variation present in the initial or total group. Selection differentials having high values can usually be obtained in sire selection because of the relatively low proportion of males selected for breeding purposes.

Genetic associations may or may not exist among traits. In the event of no association between two or more traits, the traits are inherited independently. On the other hand, a genetic association between traits may be either positive or negative. If positive, the rate of overall improvement is facilitated as the positive genetic association tends to lead toward an automatic improvement of those traits as selection is practiced for one or a larger proportion of them. Negative genetic associations hamper or decrease improvement rates under selection because selection in the desired direction for one of the related traits results in a degree of selection in an undesired direction for one or more other traits. In a sense, negatively genetically associated traits are antagonistic in selection procedures. Current beef cattle breeding research findings do not indicate major negative genetic associations among the various traits; however, more conclusive evidence regarding genetic associations among traits will become available in the future from results of extensive beef cattle selection experiments now in progress.

Generation interval is long in beef cattle. It averages nearly five years in most herds. Beef cattle also possess low reproductive rates as evidenced by the prevailing natural single birth, with percentage of calf crop weaned appreciably lower than 100% in most breeding herds.

Long generation interval, low reproductive rate, and the relatively large number of traits involved in beef cattle limit the amount of selection that can be practiced in the species. This means that the expected rate of genetic improvement in beef cattle is relatively slow. The primary encouraging factor is that most of the economically important traits possess reasonably high heritability values.

Heritability estimates may be interpreted to mean that they are the part of the difference between the selected individuals and the average of the population from which they were selected which is actually transmitted to the offspring. Heritability estimates in conjunction with selection differentials may be used to predict genetic improvement for a given generation interval. For example, if the selected bull and heifer calves were 30 pounds heavier than the herd average in weaning weight, their progeny would be expected to average nine pounds heavier than if no selection has been practiced for that trait. (heritability x selection differential or 30% x 30# = 9#)

Economically Important Traits

Traits important in the profitable production of desirable beef should be evaluated and considered in a Record of Performance Program. The traits generally included are:

(1) Fertility or reproductive performance.
(2) Mothering or nursing ability.
(3) Conformation as related to carcass desirability and structural soundness.
(4) Rate of growth.
(5) Efficiency of growth.
(6) Longevity.

Fertility or Reproductive Performance

The heritability of fertility in beef cattle is quite low. Fertility is a complex trait with both environmental and genetic influences as measured or observed in breeding herds. Improved measures of both female and male fertility are needed to evaluate fertility in breeding herds. Research is under way on this problem; however, immediate simplification is unlikely.

Because of the importance of reproductive performance in efficient production, attention must be given to it in breeding programs. The culling of open cows on some systematic basis is usually a sound economic practice which also provides some benefit to improving herd fertility; however, it certainly does not appear to be a complete, or even a satisfactory solution.

If at all possible, herd bulls should be selected from parents which have known good fertility records. This procedure has a major handicap in that fertility is not completely expressed until maturity, which limits this selection to the progeny of older cows and bulls.

Mothering or Nursing Ability

There has been an increasing tendency for quite some period of years to slaughter beef cattle at younger ages. Weaning weight or pre-weaning growth has become more important because it now comprises a higher percentage of total growth.

Nursing or mothering ability of cows is reflected and evaluated in the weaning weight of calves.

The repeatability of the weaning weight of calves as a characteristic of cows is quite high, according to research findings. That justifies culling or selecting cows on the basis of single or limited calf production records. Although a single production record is by no means a perfect indicator of lifetime production, cows that rank in the lower one-fourth of the herd, on the basis of a single normal adjusted production record, will not likely be average or better on the basis of lifetime production.

Differences in mothering ability may be evaluated quite accurately at comparatively young calf ages; however, it is usually most convenient to weigh calves at the age they are weaned, which is approximately 200 days.

Several environmental factors affect calf weaning weights: age of calf, age of dam, sex of calf, location and management of herd, season of year, creep-feeding, and other miscellaneous factors. In most instances a breeder can effectively adjust for age of calf, age of dam, and sex of calf. Since there are no effective ways to correct for the other influences, comparisons in cow productivity should be restricted to a within-herd, within-season, and within-calf feeding management basis.

The weight of a calf at the time it is weaned is referred to as the calf's actual weaning weight. When the actual weight is corrected for age of calf, age of dam, and sex of calf, it is known as an adjusted weaning weight and may then be used to compare maternal abilities among cows within a herd.

The adjustment of calf weaning weights requires that each animal be identified and that essential records be maintained.

Individual cows must be identified by some permanent method. The following are satisfactory:

(1) Hide brand numbers (applied according to State Brand Laws).
(2) Horn brands (as used in purebred herds).
(3) Ear tattoos.
(4) Ear tags.
(5) Neck chains.

Cow identification is necessary to maintain individual cow production records and also to provide information relative to the age of dam in calf weaning weight adjustment procedures. The dam's age is usually expressed as the nearest year at the time the calf was born.

Calves should be identified with ear tattoos immediately after they are born. A record of each calf's sex, tattoo, birth date, and its dam's identification number must be maintained. New-born calves may also be identified with ear tags, in addition to tattoos, to facilitate identification, as tattoos are usually more difficult to read.

It is not necessary to weigh calves at birth, although actual birth weight may be used in computing pre-weaning average daily gain.

Sire identification of calves is generally not available under pasture breeding conditions in large commercial cow herds. Sire identification

should be included as part of the information on calf records when it is available. Sire records are maintained to compare calves by different bulls. This information provides a basis for establishing progeny-testing procedures in breeding herds.

At weaning time, a satisfactory scale is necessary to weigh each calf. Each calf's tattoo or identification number and actual weight should be recorded. The actual weaning weights must then be corrected for age of the calf, age of dam, and sex of calf. These corrections are not complicated and may be made while a calf is confined on the scale.

Calves should also be scored for type and conformation. The USDA feeder grade scoring system is satisfactory for this purpose.

Correcting Weaning Weight for Age of Calf

Calf ages are easily computed with a calendar chart. The standardized ages most commonly used are 200 days, 205 days and 210 days. If the actual age deviates more than 50 days from the standardized age, there is little justification for attempting to adjust for age. In most herds it will be necessary to wean the calves in more than one group according to age on separate dates to avoid large deviations between actual and standardized weaning ages.

The adjustment of weaning weight for age of calf may be made by using each calf's average daily gain from birth to weaning, multiplied by the calf's actual age deviation from standard. This correction value is then added to or subtracted from the calf's actual weaning weight, depending on whether the calf is younger or older than the standard age. This method of adjustment is probably the most acceptable recommendation for all herds that have not had calf age corrections developed for them.

Pre-weaning average daily gain is computed by subtracting the actual or assumed constant birth weight from the actual weaning weight and dividing the remainder by the actual age. Average birth weight is nearly 70 pounds for heifer calves and 74 for bull calves. Constant or assumed birth weight values should be near those if they are used. The main objection to using average daily pre-weaning gain to correct for age is that it necessitates individual computations, and they are not convenient when corrections are made while calves are confined on scales.

Weaning weight for age of calf may also be adjusted by use of herd regression coefficients (regression of weight of calf on age of calf). These regression coefficients indicate the average effect of one day of age on weaning weight within the range of ages existing among the calves that are weaned. Regression coefficients have been computed on a large volume of data provided by the Ramsey Commercial Angus herd at De Graff, Kansas. These data involved calves not creep-fed and those creep-fed.

The average effect on one day of age for calves noncreep-fed was 1.36 pounds; and that for creep-fed calves, 1.42 pounds. Corrections for age of calves may be computed by multiplying the value appropriate for the management by age deviations from standard.

Correcting Weaning Weight for Age of Dam

Ages of dams influence weaning weights of beef calves. Weaning weight tends to increase with age of dam until production maturity is reached at approximately 6 to 8 years. Following maturity, weaning weight of calves declines with advancing age. The effects of ages of dams must be corrected to compare weaning weights of calves from dams of differing ages.

The influence of age of dam was studied in data provided by the Ramsey Ranch under both noncreep-feeding and creep-feeding conditions. The two appeared to be quite different, so it is recommended that the appropriate adjustment value be used for each method of calf management.

Adjustment values follow:

Age of dam	Calves noncreep-fed, pounds	Calves creep-fed, pounds
2	+60	+96
3	+49	+54
4	+31	+33
5	+23	+28
6	0	+ 9
7	0	0
8	0	0
9 and older	+20	+20

These correction values are based on adjustment of calf weaning weight to "mature dam" equivalent and are recommended for use where individual herd adjustments are not available.

Correcting Weaning Weight for Sex of Calf

Sex of calves influences weaning weights. Bull calves tend to be heavier than steers, and heifers, lighter than steers. A correction for sex of calf is necessary to compare cow production records.

Commercial herds usually include steer and heifer calves, whereas the male calves in purebred herds are predominantly bulls. Commercial breeders usually adjust calf weaning weights to a "steer equivalent" basis and purebred breeders to a "bull equivalent." Evidence indicates that whether calves are creep-fed influences the adjustment for sex and the respective correction values to be used. Correction values based on studies made on the Ramsey herd records follow:

(1) Noncreep-fed calves

	"Bull equivalent," pounds	"Steer equivalent," pounds
Bulls	0	.....
Steers	+24	0
Heifers	+48	+24

(2) Creep-fed calves

	"Bull equivalent," pounds	"Steer equivalent," pounds
Bulls	0	.....
Steers	+40	0
Heifers	+80	+40

These corrections for sex of calf are recommended for Kansas beef cattle breeders. It is suggested that commercial breeders adjust to a "steer equivalent" basis and purebred breeders to a "bull equivalent."

Procedures of Adjusting Beef Cattle Weaning Weight and the Use of Weaning Weight Records

The general procedure for weaning calves is relatively simple. If calf weaning weights are to be compared, the actual weaning weights must be adjusted for age of calf, age of dam, and sex of calf, as previously discussed. Adopting a program involving calf weaning weight records also requires preliminary planning and establishing a method to identify individual animals. Records relative to calf birth dates, sex, and identification and age of the dams of calves are basic. A standardized weaning age near 200 days should be established and calves not deviating from it in excess of 50 days may be weaned in a single group.

When calves are weaned, groups should be handled uniformly with regard to time of gathering and period of holding in advance of grading and weighing. After separating the calves from their dams, the calves can be scored for feeder calf grade by dividing them into grade groups prior to weighing. Each grade group should be handled individually during weighing so that each calf's grade is known at the time it is identified and weighed. A calf's grade or conformation is thus accomplished without individual calf identification while the scoring is being done. Metal ear tags are often impossible to read on animals not confined in a chute. Scoring after weighing is a handicap because it neces-

sitates excessive physical movement of working personnel and slows down the working operation.

Calves must be identified when they are weighed. In most instances calves can be conveniently placed in a squeeze chute individually prior to weighing. It is convenient to vaccinate calves if a squeeze chute is used in the weaning operation.

After the calves are identified individually, they should be weighed. The scale weight is referred to as the actual weaning weight. After correcting for age of calf, age of dam, and sex of calf, the weaning weight is said to be adjusted and different calves or cow production records may be compared. These comparisons should be restricted to a within-year, within-herd, within-season, and within-calf management basis, as previously described, because environmental influences attributable to these sources cannot ordinarily be adjusted or corrected.

The adjustment of weaning weight for age of calf should be done as previously described. Correcting on the basis of average daily pre-weaning gain is the most satisfactory method for herds not analyzed for individual herd adjustment values. The corrections derived from the Ramsey Ranch data are applicable to Angus herds in which calves are noncreep-fed or creep-fed.

After correcting weaning weight for age of calf, it should be adjusted for age of dam and sex of calf. The adjustments computed on the Ramsey herd data are recommended. Separate corrections must be used for noncreep- and creep-feeding conditions.

Weaning weight or cow production records may be used for purposes of culling cows and in the selection of replacement heifers and bulls.

In most herds that are being held constant or increased with regard to cow numbers there is limited or no opportunity to cull cows on the basis of production records. If production culling is practiced, it increases the replacement rate, which is an added production cost. Additionally, actual and adjusted production records are not identical and the former is directly related to profitability. Mature cows which calve early in season contribute immensely to high actual production. Calf weaning weight is a trait which should be given consideration in the selection of breeding replacements in cattle herds. The selection of heifers in many herds is based largely upon weanling characteristics, as the excess is marketed at that time.

The amount of selection or the selection differential which can be achieved for any given trait in heifers is relatively small, because of the high percentage which must be retained for breeding replacements. In most cow herds the percentage of the total which are culled because of reasons of age, injury, or disease, failure to reproduce, and death loss is approximately 20% under conditions where cow numbers are being maintained constant. This removal rate in conjunction with normal calf sex ratios and percent of calf crop necessitates the keeping of approximately 50% of the heifers for replacements under these conditions.

Weaning weights and USDA feeder calf grades among calves within a herd are not perfectly correlated, although the two traits appear to be positively related. This means that some calves with heavy adjusted weaning weights will be culled because of unacceptable type or feeder calf grade.

Some calves having comparatively high adjusted weaning weights also will not be selected because of low actual weaning weights, which may be due to the age of the calves or the age of their dams. The light-weight weanling heifer has the penalty of inadequate size for breeding as a yearling and the production of a calf at approximately two years of age.

Beef cattle breeders can achieve large selection differentials for specific traits such as calf weaning weight, in selecting sires. This is due to the relatively lower percentage of bull calves needed for breeding purposes. Selection differentials for production traits in the case of sires should be at least twice as large as those for heifers in most herd selection procedures. This means that beef cattle breeding improvement depends mainly on sire selection. Heifer selection and cow culling procedures are certainly secondary to it as selection techniques.

Growth Rate

Size in beef cattle, which is a function of growth rate, is an economically important trait because of its association with feed efficiency or economy of gain and with fixed costs that are regulated on a per head or unit of time basis. In most instances growth rate is measured in time constant, post-weaning feeding tests. Research findings indicate that this trait can be appraised thus satisfactorily. The level of nutrition used for feeding tests can vary with different production systems; however, the feeding management must be standardized at specific locations where the growth records of animals are compared. A post-weaning period of at least 140 days is required to measure growth rate. This minimum time requires rather uniform initial weights, condition, ages, and previous treatments with regard to the cattle involved. Experimental results show that final weight at 12 to 18 months, standardized for age differences, is a better measure of growth rate than any individual component of final weight because the components, such as birth weight, pre-weaning gains, and post-weaning gains, are likely to possess a previous treatment effect type of relationship to each other, even as associated in an individual animal. These component relationships are usually balanced or cancelled out in the total-yearling or long-yearling weight.

Final weight at a standard age of approximately 18 months appears to be a satisfactory measure of growth rate for most purebred herd managerial practices. Bulls being performance tested under those age specifications can be fed a low level of concentrates during the initial wintering period and a high level of concentrates either on grass or in the drylot during their yearling summer. This procedure develops bulls at a high enough level of feeding and over a long enough period of time for genetic differences in growth rate to be expressed for fairly accurate appraisal. This management also parallels most phases of that applied to the commercial production of slaughter cattle. Final weight and grade near normal market age in beef cattle seem to be of appreciable interest to industry. The use of post-weaning gain information as a single measure of growth could favor poor pre-weaning environment because poor environment in one period tends to be followed by increased rate of gain under improved environment in the next phase.

The use of a higher level and shorter feeding period is an alternative program for measuring growth rate in bulls. The length of the feeding period may vary from five to six months, but it must be standardized at specific locations. In this program the ration should consist of 50 percent or more concentrates and the final adjusted age will be near 365 days.

Research indicates that reasonably high levels of nutrition are desirable to appraise growth rate accurately. If lower levels of nutrition are employed, the growth period measured should be longer.

In general, feedlot feeding at high levels of nutrition is applicable for performance testing of prospective herd sire replacements. Because such a high percentage of heifers must be kept for breeding replacements, there is not much opportunity to select among heifers for differences in growth rate. Additionally, a high percentage of commercial breeding herd heifer replacements must be selected at the time of weaning because the excess is disposed of or marketed shortly thereafter. It appears that very little can be gained from feeding heifers at high levels of nutrition as an aid in performance testing.

Economy of Gain

Economy of gain is an important trait in the profitable production of beef cattle. It is a difficult trait to measure, as it requires individual feeding; neither research workers nor cattle breeders have practical techniques that are not costly in evaluation of cattle gain composition.

Current available information on the production of beef cattle indicates that economy of gain is desirably related to rate of gain in cattle of the same general size. At present it appears that rate of gain is a reliable indicator of economy of gain, so breeders should depend on rate of gain to evaluate economy of gain instead of resorting to individually feeding young bulls.

Research work indicates that the more rapidly gaining individuals among cattle in a feedlot tend to make the most economical gains; however, there is not conclusive information relative to variable mature sizes of cattle to justify recommendations with regard to total production merit.

The details of the techniques employed in a program that entails measuring and evaluating growth rate in beef cattle are not of great importance; however, they should be standardized on a farm or ranch location, generally a single herd where individuals are compared. The restrictions on justifiable comparisons are practically the same for both growth rate and mothering ability in beef cattle. The standardization of method does not remove a large portion of the environmental effects due to location, season, years, and differences in feed composition.

Conformation

Conformation in beef cattle is related to carcass desirability, structural soundness, and longevity. Production traits other than these, which have a direct relationship with conformation, should be measured by the indicators previously discussed rather than by items of conformation. Basically, maximum attention is given to longevity, and beefiness or meat cuts, in regard to conformation.

Considerable research is in progress to develop new techniques in measuring differences in proportions of fat and muscling in beef cattle. Research may present some new tools that will result in improved techniques for conformation; however, at this time it is recommended that cattle breeders use the best current procedures to appraise the major items of conformation.

It is recommended that conformation scores be used. Skeletal structural soundness, beefiness or thick natural fleshing, and satisfactory finish or condition at specified ages should be given consideration.

Scores for conformation should be obtained at the time of weaning and at 12 to 18 months. The yearling score is probably the most important, so greatest emphasis should be placed on it.

A scoring system may be simple or include considerable detail. Simple scoring techniques tend to group individuals of equal desirability without indicating items of superiority or inferiority. The detailed system indicates individual conformation merit better. A breeder should use a systematic scoring system, choosing a method which most effectively serves him in evaluating conformation in his herd.

Scoring can be done by an individual person or a committee consisting of several. In the event that a committee is used, its average score should be considered the final measurement value and it is important that each person work independently during the scoring process.

Many carcass traits can be measured only by observing carcasses. It is apparent that progeny test data must be relied on to select those traits. Comparing bulls with regard to genetic transmitting ability on the basis of desirability of carcass traits among their steer progeny is the only reliable technique available at present.

Record of Performance as an Additional Tool

Record of Performance procedures can lead to more economical production and improved consumer desirability of beef through the breeding improvement of beef cattle. Progress should not be expected to be rapid because of biological principles involved. Some breeders are unable and others are not willing to participate in the adoption of systematic programs. Record of Performance, as a technique for the industry, will establish its position or functional status through its trial adoption and observed usefulness by both the purebred and commercial cattle interests.

The basic goals of Record of Performance are not realistically different from those that have long been sought by leading breeders. The techniques involved are not to be regarded as "revolutionary" substitutes for outdated practices, but instead as an additional tool to facilitate the

progress of production objectives. The principal features of a desirable Record of Performance program follow:

1. All individual animals be given equal opportunity to demonstrate their productivity.
2. Systematic, recorded information be maintained on all animals in a herd.
3. Records be adjusted for major environmental influences, where procedure is applicable, so that individuals can be compared.
4. Production records be used to select replacement breeding stock and to cull on the basis of performance.
5. Nutritional and other managerial practices be both practical and compatible with those of commercial beef production.

This discussion does not involve extensive or numerous specific recommendations. It has been prepared to explain principles and to describe basic limitations of the principles. Maintaining records on animals does not alter their breeding or transmitting merit, nor is environmental advantage transmitted. Records must identify genetically superior individuals if breeding improvement is to be accomplished.

An Orally Active Progestin[1] for Estrus Control in Beef Heifers.

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An orally active progestin (provera) was fed to 66 feedlot heifers for 20 days. The seven lots (10 per lot in five lots and 8 per lot in two lots) were assigned to treatments of no-hormones (10 heifers), 150 mgs. per head per day (20 heifers), or 210 mgs. per head per day (36 heifers). The hormone was fed once a day in 20 pounds of supplement per lot. Grain was kept before the heifers at all times. For 70 days before, during, and following the hormone feeding, the heifers were observed twice daily for heat and their ovaries were examined once weekly by rectal palpation for follicular development and ovulation. Provera inhibited ovulation during treatment in 88% (49/56) of the heifers. There was no difference in the number of heifers ovulating during treatment due to dosage level fed (150-mg. level 10% [2/20] vs. 210-mg. level 13% [5/36]). Five of the seven heifers that ovulated during treatment did so before the sixth day following the start of feeding, suggesting the hormone may not have blocked all ovulations where treatments began late in the cycle. Seventy percent (14/20) of the heifers on the 150-mg. level returned to heat within six days post feeding vs. 65% (13/20) of the heifers on the 210-mg. level. Most of the heifers that returned to heat did so between two and five days following feeding; however, 8 of 40 were not observed in heat during 30 days following provera feeding. Also, one of the 10 untreated heifers was not detected in heat during a 70-day period. However, examination of the ovaries at slaughter indicated these heifers were cycling, and that one of the biggest problems involved was detecting heat. This was also indicated by a failure to observe nearly 75% of the heifers in heat during 21 days before provera feeding, although rectal palpation indicated they were cycling.

All heifers were bred 48 hours after hormone feeding and again at the time they were detected in heat. Slaughter near 3 and 25 days post breeding indicated fertility was extremely poor in both hormone-treated and nonhormone-fed heifers; therefore, little can be concluded in this study regarding fertility following hormone feeding. Fat feedlot heifers may tend to have poor conception rates; however, the association between fat at the 12th rib (taken from carcass at slaughter) and conception rate was nil in this study ($r = .033$).

The experimental design also permitted a comparison of certain reproductive traits for heifers fed no supplemental protein (basic ration provided 9% digestible protein), ½ pound supplemental protein, and 1

1. Provera generously supplied by the Upjohn Co., Kalamazoo, Mich.
2. Dept. of Animal Husbandry, K.S.U.
3. Dept. of Dairy Science, K.S.U.