

BEEF CATTLE BREEDING AT OREGON STATE UNIVERSITY

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Beef cattle have made an important contribution to the agricultural economy of the Pacific Northwest for as long as the area has had an agricultural economy. Beef production now accounts for larger farm receipts than any other commodity in Oregon. OSU has about 706,000 cows and replacement heifers with some 75 percent located east of the Cascade Mountains. Over time, beef populations and beef production systems have changed in response not only to changing availability of land and other inputs but also to changes in available technology. This tendency is almost certain to continue and to accelerate in the foreseeable future. Factors influencing changes in beef production systems include:

- 1) Changing patterns of beef consumption caused by lower demand for roasts and greater demand for ground beef by fast food outlets. This has been accompanied by a de-emphasis on conformation in grade standards.
- 2) Changing price relationships among various producer inputs--capital, land, and feed grains, for example.
- 3) The recent availability of new breeds--largely continental European--which differ from traditional beef breeds in many important characteristics.

Producers are faced with a confusing array of choices as they attempt to anticipate the future, to define production constraints, and to evaluate alternate production systems. Our research in beef cattle breeding and management at Oregon State University is designed to help producers choose management and genetic alternatives for profitable and efficient production of beef that are acceptable to current and future consumer demand. The purpose of this report is to describe the status of some of that research.

CROSSBREEDING AT THE OSU SOAP CREEK RANCH

In the summer of 1978, approximately 200 Hereford, Angus and Angus X Hereford crossbred cows were divided at random into four groups, the groups being mated by artificial insemination to Tarentaise, Simmental, or Pinzgauer sires or to British breed bulls by natural service. The calves were born in March and April and were weaned in October 1979. Steer calves from these groups are involved in pasture and feedlot nutrition research at OSU; heifers were saved for replacement and will be mated this summer. During June and July 1979, the cows were again mated to the same sire breeds, so our second crop of Simmental, Tarentaise, Pinzgauer, and British breed and crossbred calves is now on the ground. Again, steers and excess heifers will be allotted to nutrition, management, or physiology research after weaning; heifers again will be saved as replacements. Our goal, over time, is to replace the cow herd with their crossbred daughters.

An interesting study has been superimposed onto this mating scheme by Lindsay Norman, one of our graduate students. During both the 1979 and 1980 calving season, blood samples have been collected from calves approximately 24 and 36 hours after birth. Blood and colostrum samples from cows also were collected within 12 hours of calving. The goals of the experiment are to determine whether there are differences among cows in the production of antibodies in the colostrum milk and whether differences exist among calves in their ability to absorb those antibodies from the first nursings. Differences in the amount of antibodies accumulated by calves could be reflected in differences in survival and vigor. If there are genetic differences in colostrum antibody production or absorption, as research in sheep and dairy cattle indicates might be the case, the trait could be included in selection schemes, particularly in the choice of sires for artificial insemination. This work is being done in cooperation with Dr. Keith Kelly in the Department of Animal Science at Washington State University.

As our crossbreeding study enters the second phase, when the exotic crossbred heifers enter production in the herd, females will be evaluated, at the appropriate stage of the life cycle, for as many of these characteristics as possible:

- 1) Age at first estrus.
- 2) Length and regularity of estrous cycles.
- 3) Calving difficulty and pelvic size.
- 4) Days from parturition to first estrus.
- 5) Services per conception.
- 6) Calving interval.
- 7) Milk production and composition.
- 8) Mastitis incidence.
- 9) Dominance, maternal, and grazing behavior.
- 10) Diet preference or composition.
- 11) Weight and weight change pattern over time.
- 12) Condition score and fat thickness.
- 13) Reasons for mortality and removal from the herd.

We eventually will be able to characterize the Simmental, Tarentaise, and Pinzgauer breeds for their relative strengths and weaknesses in the coastal Pacific Northwestern environment and to compare them, as crossbreds, for total production efficiency with Herefords and Hereford X Angus crossbreds. We also will be able to describe the importance of the traits listed above on total production efficiency.

IDENTIFICATION OF TRAITS PREDICTIVE OF ECONOMIC MERIT

Many economically important traits in livestock populations are difficult to change by genetic selection because they are not practical to measure (longevity of beef cows, for example), because they are limited to expression in one sex (milk production in dairy cattle, for example), or because they are lowly heritable (reproductive traits in all classes of livestock). An alternative to direct selection or progeny testing for such traits is to find a highly heritable trait that is highly genetically correlated to the trait of interest, then practice selection upon that trait. In so doing, the population should change, in the desired direction, for the trait in which we actually are interested.

This identification of traits for indirect selection is easier said than done, but there are examples where it has been effective. For example, bulls with large testicles are more fertile and indications are that their daughters are more fertile as well. In mice, males with larger testicles sire daughters with higher ovulation rates and litter sizes; European research is being conducted to determine whether this is true in sheep as well. Our research on antibody level in young calves is this same type. We hope absorption of colostral antibodies is heritable and that it is highly correlated with calf vigor and survival.

Another of our graduate students, Steve Lukefahr, is conducting an experiment to determine whether the length of the midpiece in bull sperm cells is heritable and whether it is predictive of any important traits in cattle populations. Research conducted in Scotland found that midpiece length in mice was highly heritable and, what's more, that it was associated with growth rate. Since the midpiece is composed of mitochondria, the cellular organelles responsible for the generation of energy, it is reasonable to examine the relationship between midpiece length and traits dependent on energy metabolism.

Steve first ran a pilot trial using frozen semen from 39 Holstein bulls. (The semen was donated by American Breeders Service at DeForest, Wisconsin, assistance gratefully acknowledged.) In that trial, he found that midpiece length did vary among bulls but that midpiece length did not vary importantly between ampules of semen collected from the same bull at least six months apart. There was an indication from this trial that midpiece length was heritable. It was not related at all to the bulls' reproductive traits, but it was moderately negatively related to milk production of the bulls' daughters. That is, bulls above average for midpiece length tended to be slightly below average for predicted difference for milk.

This work is being extended to beef cattle. In cooperation with Colorado State University, we are collecting semen samples from some 300 gain-tested bulls at the San Juan Basin Experiment Station at Hesperus, Colorado in cooperation with USDA scientists, we are collecting approximately another 80 bulls at the Livestock and Range Research Station, Miles City, Montana. From these populations, we will estimate the heritability of sperm midpiece length and its association with economically important beef production traits.

MANAGEMENT ORIENTED RESEARCH

John Rosecrans, a graduate student working with Dr. Allen Nipper and me, is conducting a survey of western Oregon ranches using fall calving. Through visits and interviews, he is documenting advantages, disadvantages, problems, and potentials of the system. We also are seeking to identify primary research needs in that area.

In another project, we have attempted to foster newborn dairy calves onto beef cows at the time their own calf was born. These cows were asked to raise, but not to bear, twins. In our first small trial, each of four spring calving cows raised her own plus a Holstein bull calf. There were problems--two Holstein calves died--but these cows each weaned about 880 pounds of calf compared to about 500 pounds for contemporary controls with singles.

In a second trial with fall calving cows, we thought problems of acceptance of the alien calf might be lessened if each cow raised two new calves. Thus, our first cow to calve was given two Holsteins, the second received one Holstein plus the first cow's natural calf, etc. This seemed fairly successful, but later observation showed that many calves did not "mother-up" properly. They led a precarious existence of nursing any cow that would tolerate them. Nevertheless, we lost only one such "twin" calf, and as we enter the spring grazing season, twin versus single rearing cows have an average of 537 and 386 pounds of calf, respectively.

It is important to realize that this system, even if we are successful in working out the bugs, is not for everyone. First, it probably is feasible only if cows have a high inherent level of milk production and maternal instinct. Second, extra feed must be provided to cows and calves. Third, delayed rebreeding of cows could be a problem. The data on this are not in yet. Fourth, extra labor is required. We anticipate the system might allow a part-time or hobby farmer to increase beef production per cow and per acre but we do not visualize its adoption by large commercial ranches.

SUMMARY

Research in beef cattle breeding and management at Oregon State University is designed to compare breeds and mating systems for economical beef production in the coastal Pacific Northwest, to identify traits that will increase response in economically important traits from indirect selection, and to identify management techniques that will increase efficiency of production. The research is ongoing. In future programs such as this, I will communicate the results and applications of this work.