DECEMBER 2005

Fort Keogh Researcher

USDA-ARS-Livestock and Range Research Laboratory

IN COOPERATION WITH

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Introduction

Rod Heitschmidt
Research Leader

A lot of exciting events have taken place at Fort Keogh since our last newsletter. First and foremost is that it rained during this past growing season and we grew some much needed forage. I certainly am not ready to declare that the extended drought is over, but I think all can agree that this part of the world is in much better shape than the last few years. Here's hoping we continue to receive an abundance of moisture as that is one thing that makes all of us look like we are exceptionally smart ranchers and farmers!

We have had a number of personnel changes over the past few months. We have hired 2 new molecular genetics technicians, **Michelle Griffin** and **Kathy Neary**, and 2 farm/ranch technicians, **Justin Kiel** and **Lance Gierke**. Michelle and Kathy will be working with Dr. Lee Alexander in the molecular genetics laboratory, Justin will be a member of the farm/feedlot crew, and Lance will be a member of the physiology/nutrition crew. We are fortunate also to have been able to hire **Dr. Robyn Sapp**, a recent graduate of the University of Georgia, in a 2-year post-doc position in quantitative genetics. She will be working with Dr. Mike MacNeil in the further development of beef cattle economic selection indices. We had one retirement this past year, that being **Cody Taylor**, a 33-year farm/ranch technician. We are also excited to announce that the MSU Extension Service is in the process of hiring a new beef cattle extension specialist to be housed at Fort Keogh. This is the position originally filled by Dr. Rick Funston. This position has been vacant since Rick accepted a position with the University of Nebraska nearly 3 years ago. We consider this a key position at Fort Keogh as it provides us many opportunities to improve our technical outreach program in service to our many customers.

Another exciting event at Fort Keogh is

INTRODUCTION, CONTINUED

the on-going planning for the remodeling of our "old" office/ laboratory building. This is a much needed remodeling as the original building is almost 40 years old. We are scheduled to complete the design phase of this project by October 1, 2006.

Fort Keogh also had the honor of hosting a 2-day Bud Williams Stockmanship School September 30 and October 1, 2005. We had 66 people attend the school with 20 of those being Fort Keogh employees. I am extremely proud of what our crews have accomplished since that school in terms of the implementation of markedly improved, low-stress livestock management procedures. I expect Fort Keogh to be a leader in the development of low-stress management procedures and I have not been disappointed as we have made tremendous progress since the school. If anyone is interested in discussing either the school, the technology, or the implementation of the technology, please call Cody Molle, the MAES Assistant to the Superintendent.

Finally, allow me to wish each and everyone of you, on behalf of the entire staff, a Happy Holiday Season and a Happy and Prosperous New Year. We consider it a privilege to serve you.

Upcoming Events

Beef Cattle Extension Specialist Interviews—This position will be stationed at Fort Keogh.

January 10, 2006—Ken Olson

January 12, 2006—Jack Whittier

January 18, 2006—Jason Ahola

Each candidate will give a presentation and have a time for questions starting at 10:30 a.m. each day.

The public is encouraged to attend the seminars and ask questions.

Genetic Components of Maternal Quality in Beef Cows

Introduction: Milk production by beef cows has been positively related to overall efficiency of beef production in several studies. However, feed energy is required to produce milk and without sufficient feed energy to support the genetic potential for milk production, pregnancy rates may be reduced. Thus, beef producers may seek to match the milk production levels of their cow herds to the energy provided by the grazing environment.

Because milk production is not typically measured by beef producers, expected progeny differences (EPD) for maternal weaning weight are calculated from preweaning gain of beef calves. This EPD for maternal weaning weight is then used as an aid in selection to change milk production levels of beef cows. Despite decades of using the EPD for maternal weaning weight in this way, there remains an innate distrust of this statistical prediction on the part of some producers.

A concern also exists about whether or not selection for increased milk production leads to a deterioration of udder quality and as a result reduces herd life of the beef cow. Certainly, large teats and pendulous udders adversely affect ability of a calf to nurse and udder conformation thus motivates culling of beef cows. In dairy cattle, genetic correlations between udder type traits and milk production have been inconsistent with both favorable and unfavorable relationships reported. However, there are few reports of relationships between udder conformation and milk production in breeds with less genetic potential for milk production.

Thus, objectives of this research were to: 1) confirm the usefulness of the EPD for maternal gain from birth to weaning as a predictor of genetic merit for milk production; and 2) evaluate the relationship between udder conformation and milk production in Line 1 Hereford cattle. The first objective is addressed by determining the genetic correlation between milk produced by cows measured using the weigh-suckle-weigh technique and maternal effects on preweaning gain of their calves. A genetic correlation of 0.8 or greater is commonly thought to indicate the two traits are one-in-the-same from a genetic perspective. The second objective is addressed by determining the genetic correlation between milk production and udder score assigned at calving using guidelines of the American Hereford Association Total Performance records program. A positive correlation indicates that as milk production increases udder quality also increases. Conversely, a negative correlation indicates that as milk production increases udder quality deteriorates.

Research Methods: Data used in this study came from the Line 1 Hereford population at Fort Keogh. Within 24 h of calving, calves were weighed and the udder of the cow assessed subjectively and scored using a pictorial reference to a 1 to 9 scale. Udder scores were recorded for all cows calving from 1995 through 2005.

Estimates of milk production were obtained using a weigh-suckle-weigh procedure throughout lactation. The weigh-suckle-weigh procedure measures milk production as follows. Cow-calf pairs are gathered to a central handing facility in early afternoon and the calves separated from their dams. At 6 PM the calves are reunited with their dams and allowed to nurse. After the calves have finished nursing, they are again separated from their dams and held apart overnight. At 6 AM the calves are weighed, reunited with their dams and allowed to nurse, then quickly weighed again. The difference in weights before and after nursing measures milk produced during the 12-hr period the pairs were separated. Four measurements of milk production for a cow during a year were totaled to indicate her production during that lactation.

All calves were weighed and weaned on a single day when their average age was approximately 180 d. Average daily gain from birth to weaning was calculated and multiplied by 180 to obtain the measure of gain from birth to weaning used in the subsequent analysis.

Data collected include 6835, 692, and 1686 observations of preweaning gain, milk production, and udder score. All data were analyzed using procedures similar to those used to calculate EPD in national cattle evaluation. Differences in year, sex of calf, age of cow, and inbreeding levels of calf and cow were accounted for in these analyses.

Results and Discussion: Average values for 180-d preweaning gain, total weigh-suckle-weigh milk production and udder score were 328 pounds, 21 pounds and a score of 5.4, respectively. The respective heritability estimates were 0.25 ± 0.04, 0.25 ± 0.06, and 0.23 ± 0.05. These estimates of heritability are consistent with previous work and indicate a reasonable opportunity improve these traits through selection.

The estimate of the genetic correlation between maternal effects on preweaning gain and milk production found here was 0.80 ± 0.08. This estimate is consistent with similar estimates of 0.80 from Karin Meyer and coworkers for Hereford and Wokalups in Australia and 0.76 from Steven Miller and Jim Wilton for Hereford and multibreed rotational cross cattle in Canada. Based on these collective results it is reasonable to conclude that the EPD for maternal gain from birth to weaning is a useful predictor of genetic differences in milk production. Selection based on the EPD for maternal preweaning gain may be nearly as effective in changing milk production as selection would be if milk production were actually measured. Thus, beef producers do not need to measure milk production to change it; using the maternal milk EPD from national cattle evaluation is sufficient.

Genetic correlations of maternal preweaning gain and milk production with udder score were -0.26 ± 0.17 and -0.36 ± 0.16, respectively. These results indicate a modest genetic antagonism between selection for increased milk production and udder quality. Robyn Sapp

and coworkers observed a slightly greater genetic antagonism in an analysis of data from the American Gelbvieh Association. Thus, one potentially undesirable consequence of selection to increase milk production is the degradation of udder quality, if not offset by simultaneous selection for udder conformation. As udder quality normally decreases with age and up to 10% of cows may be culled for having a poor udder, selection for increased milk production may decrease length of productive life.

Given these estimates of genetic parameters, it should be feasible to simultaneously improve both udder conformation and milk production. Most selection pressure is applied through the choice of sires. Thus, phenotypic selection for milk production and udder conformation relies solely on consideration of information from female relatives. In addition to the maternal milk EPD that is presently available, an EPD for udder score would provide breeders an evaluation of potential sires with optimal emphasis on the udder scores of ancestors and other collateral relatives.

Conclusions: Both milk production and udder conformation of beef cows have significant genetic components and can be changed through selection. Basing selection on the maternal milk EPD from national cattle evaluation will change milk production. Some caution is advised in selecting for increased milk production due to potential erosion of udder quality.

9—An ideal mammary system. Udder is held high up near the rear and is level in front. Teats are small.

8—Very good udder with level attachment in front and high attachment in the rear with desirable teats.

7—A sound and functional udder fairly level with small, good teats.

6—A very functional udder and teats. This is a problem free udder and teats, but will not have the balance of an udder scored 7, 8 or 9.

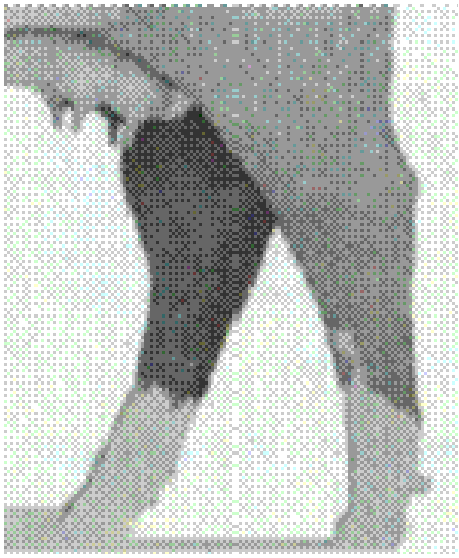
5—A functional udder and teats and labor free. Udder and teat scores of 5 or better should be "Labor Free".

4—An udder that could become a problem because of attachments and/or shape and size of teats.

3—A problem udder and teats. The udder will show tendencies of breaking down and teats are too large and balloon shaped.

2—A definite problem udder and teats. The udder is poorly attached in the front and back with weak suspension and teats are large and balloon shaped.

1—A very pendulous udder and balloon teats. These udders will cause frequent labor problems.



Udder score = 8

Udder score =5

Udder score =2

RECENT PUBLICATIONS

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Perry, G.A., M.F. Smith, M.C. Lucy, J.A. Green, T. E. Parks, **M.D. MacNeil, A.J. Roberts**, and **T.W. Geary**. 2005. Relationship between follicle size at insemination and pregnancy success in beef cattle. Proceedings of the National Academy of Sciences 102:5268-5273.

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RETIRED SCIENTIST RECEIVES FELLOW AWARD

American Society of Animal Science Names 2005 Fellow (Research Category): R.E. (Bob) Short

Savoy, IL - Dr. Robert E. (Bob) Short has been named a 2005 Fellow of the American Society of Animal Science (ASAS) in the research category. Dr. Short was awarded such honor on July 25 at an ASAS awards ceremony, held as a part of that society's annual meetings.

Dr. Short recently retired from his position as Research Physiologist with the Fort Keogh Livestock and Range Research Laboratory, USDA, ARS at Miles City, Montana. He was born and raised on a grain and livestock farm in North Central Iowa, where he was active in 4-H and FFA. He obtained degrees from Iowa State University (B.S., 1962; animal science), University of Nebraska (M.S., 1963; animal science), and University of Wisconsin (Ph.D., 1967; animal science and reproductive endocrinology). Following graduation from Wisconsin, Dr. Short took his Fort Keogh position.

Dr. Short conducted research on postpartum anestrus, pine needle abortion, puberty, dystocia, estrous synchronization, and management alternatives and genetic control of lean beef production. His research efforts were highly integrated with other disciplines at Fort Keogh as well as with many other experiment stations.

Dr. Short authored or coauthored over 400 research and popular publications during his career and enjoyed sharing these research findings with colleagues and producers.

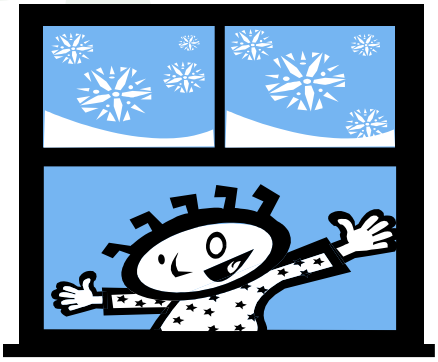
Dr. Short has been an active member of ASAS since 1963, is a lifetime member of the Council for Agricultural Science and Technology, and is a member of the British Society of Animal Science.

Dr. Short has been active in his church and community throughout his career, having served on the local school board as well as the Montana School Boards Association and the local Habitat for Humanity affiliate, where he served as Charter President.

Robert E. Short

Retired Physiologist

Dr. Short and his wife are now residing in Laurel, Montana.



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2005 RESEARCH UPDATE AVAILABLE

The new Research Update is now available. You can download it from **www.ars.usda.gov/npa/ftkeogh**, send us a request at **reprint@larrl.ars.usda.gov** or give us a call at **406-874-8200**. New results from research conducted at Fort Keogh Livestock and Range Research Laboratory between 2003 and May 2005 are reported along with a list of publications produced by the laboratory's scientists during the same period. Papers are organized by research disciplines at Fort Keogh: genetics, physiology, nutrition, and rangeland research. A description of the history and resources of Fort Keogh, a list of cooperating authors, and a personnel directory are included.

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2005 Research Update

USDA-Agricultural Research Service
in cooperation with the
Montana Agricultural Experiment Station