2002 ANNUAL REPORT OF COOPERATIVE REGIONAL RESEARCH PROJECT S-284

FINAL ANNUAL PROJECT REPORT

Project No. & Title: S-284, Genetic Enhancement of Health and Survival for Dairy Cattle

Date Project was activated: October 1, 1997
Date Project was terminated: September 30, 2002

Cooperating Stations and Agencies for 2002

Participating stations	Representative
Illinois	R. D. Shanks
Indiana	M. M. Schutz
Iowa	P. J. Berger
Maryland (USDA-ARS)	P. M. Van Raden, R. A. Powell, G. R. Wiggans
Minnesota	L. B. Hansen
Nebraska	J. F. Keown
New York	R. W. Blake, P. A. Oltenacu
North Carolina	B. T. McDaniel
Tennessee	G.W. Rogers
Virginia	B. G. Cassell
Wisconsin	G. E. Shook, K. A. Weigel
Administrative advisors	N. M. Cox
CSREES Representative	Richard Frahm

List-serve address: S284@crcvms.unl.edu

Accomplishments and Impacts:
Regional project S-284 has been highly productive. Most of the goals of the project have been met and many of the findings have been implemented by the dairy cattle breeding industry. Results from this project will help to reduce undesirable responses in health and survival in dairy cattle from selection for increased milk yield.

Enhancements to genetic evaluations for somatic cell score, productive life, and net merit have been made through the project. In addition, industry acceptance of the new approach to making selection decisions has been exceptional. Selection for health traits and improved survival is now a priority in the US.

Accomplishments for year 2002:

Objective 1. Develop genetic methods to improve immune function and resistance to mastitis.

Research in NY has shown that well managed herds may get more response from selection for lower somatic cell scores (SCS) than poorly managed herds. Herds we divided into categories based on management factors and practices rather than by measures of yield or variability of yield. Work by MD has led to the routine publication of SCS trends to help educate producers and the industry about changes in SCS over time. Work in NE has shown that selection for higher final score will improve udder conformations and udder health.

Objective 2. Identify genetic components of prepartum and postpartum complications associated with general health and reproduction.

Researchers in MD (USDA) provided the lead in developing a national genetic evaluation for cow fertility. Genetic evaluations for pregnancy rate will be published by USDA for the first time in February 2003. These evaluations will initially be based on an animal model that includes several important fixed effects. Dairy producers and breeding industry decision makers will have genetic evaluations on pregnancy rate to make selection decisions for the first time in the US as a result of this accomplishment. Cooperative work between MN and MD (USDA) has indicated that dairy form might be useful for increasing the accuracy of these genetic evaluations for pregnancy rate.

Work involving WI and NC collaborators indicates that the heritability of days to first service is around 0.04 to 0.05. Heritability of days to first service was not dependant on the variability of gestation length within and across herds.

Maryland (USDA) also took the lead to improve genetic evaluations for calving ease. Research this past year has lead to the enhancement of the genetic evaluation model for calving ease. Genetic evaluations for calving ease direct (calving ease as trait of calf) are now computed with increased accuracy and we now have available indirect calving ease genetic evaluations. These indirect calving ease genetic evaluations describe the genetic merit for calving ease as a trait of

the cow and allow us to select for females that are superior for maternal calving ease. IA showed that difficult calving has one of the largest impacts on early calf survival so reducing calving difficulties will likely reduce early calf mortality. Preliminary results from MN indicate that sires from European dairy breeds with excellent calving ease evaluations in Europe may compare favorably with excellent calving ease Holstein sires.

Cooperative work between TN and Holstein Association, USA found that body condition score was heritable at about 0.22. They also found that body condition score was strongly genetically correlated with dairy form (-0.72) and strength (0.69). Joint work between TN and IA found that genetic correlations were substantial between body condition score and displaced abomasums and between body condition score and metabolic disease.

Collaborators in TN, PA and NC estimated heritabilities for milk urea nitrogen collected through the Dairy Records Management Systems. Heritabilities for milk urea nitrogen were around 0.20 to 0.25 for data from labs using infrared machines. Heritabilities for milk urea nitrogen were around 0.10 to 0.20 for data from labs using wet chemistry.

Objective 3. Develop breeding indexes for improved health, survival and production.

A cooperative study involving IN, WI and Ontario compared genetic evaluations and sire rankings across grazing and confinement environments. Results from this work indicated only minimal change in the ranking of bulls for individual traits across the two environments. However, predicted transmitting abilities for production traits may slightly overestimate daughter performance in low producing, grazing herds.

Three improvements were made in the model for genetic evaluations of productive life in the US as a result of cooperative work between MD (USDA) and GA. New edits were implemented to better handle discontinued herds and embryo donors. As a result of GA and MD (USDA) collaboration, the genetic correlations used in the indirect prediction of productive life were changed to be more representative of the current population. As a consequence the genetic evaluations for productive life should be more accurate especially for bulls with low to moderate reliabilities.

Researchers at WI used a Weibell proportional hazards model to explore the opportunity to use survival analyses techniques for calculating genetic evaluations for survival. Heritability of survival on the original scale was around 0.18. This heritability is higher than currently used to calculate genetic evaluations for productive life in the US. Correlations between genetic evaluations from the survival model and from the current US linear model were considerably less than 1.0. In addition the genetic evaluations for sires from the survival analyses were better able to predict daughter survival in independent data sets than the genetic evaluations from the current linear model.

Research by VA showed that daughters of proven AI bulls generated $148 and $120 more lifetime net income in fluid markets and manufactured markets than daughters of non-AI bulls. Daughters of proven AI bulls also outperformed daughters of AI sampling sires.

Cooperative research between NY and Swedish scientists evaluated the effect of various maternal factors on newborn calf size, growth and diseases. High somatic cell counts in the dam, sickness of the dam in late pregnancy and retained placenta were undesirable risk factors for respiratory disease in the calf.

Impacts for year 2002:

New genetic evaluations for pregnancy rate will allow the dairy industry to select for improved reproductive performance and this improvement will save the dairy industry millions of dollars each year in the future.

The US dairy industry can now select for cows that have less calving difficulty which will save the dairy industry millions of dollars and improve the welfare of dairy cows.

Selection for reduced dairy form and increased body condition will improve the welfare of dairy cattle and reduce health and reproductive costs.

Improvements in the genetic evaluation of productive life will increase longevity of dairy cattle and reduce the cost of producing milk in the US.

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