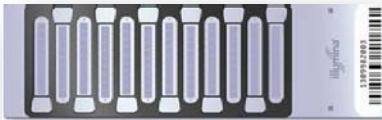


Scientists in the Genetics and Breeding Research Unit are working on high priority issues of the livestock industries in the U.S. such as:

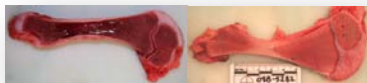
- **Genomics**
- **Marker Assisted Selection**
- **Breed Evaluation**
- **Utilization of Genetic Differences**

Genomics



BovineSNP50 Chip (Illumina, Inc.)

Normal bone Osteopetrosis



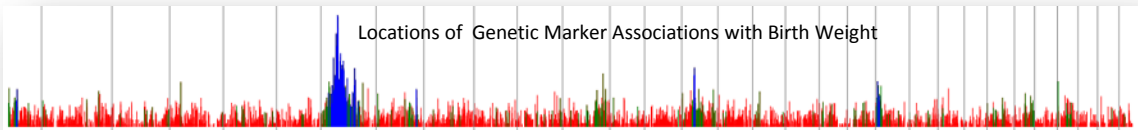
Scientists at USMARC were part of international collaborations that published the DNA sequence of cattle and developed an affordable genotyping chip for thousands of SNP. A state-of-the-art DNA sequencer, PacBio, will be delivered in December, 2010. It will enable DNA sequencing of individual animals, mixed communities of microbes, and pools with hundreds of animals at a dramatically lower cost. This new technology will identify pathogens associated with respiratory disease, associate virulence with microbial sources, and identify subtle effects of DNA variants on complex traits.



Pacific Biosciences SMRT™ System

Marker Assisted Selection

Genotyping chips of 50,000 and now 850,000 SNP are available. Cattle breeders want to know how to use them to improve cattle. Our research identified many markers associated with important traits such as feed intake, carcass traits, meat quality, growth, and disease resistance. An early success identified one mutation causing Marble Bone Disease leading to a commercial DNA test available to breeders within a year. Additional research is being done to identify how to use this information in selection. National and international collaborations are helping to determine and verify genetic marker associations and to develop the statistical methodology to use the information.



Breed Evaluation



Breeds Currently Sampled

Throughout the history of the U.S. Meat Animal Research Center, evaluation of cattle breeds has successfully provided research information on differences among breeds for many traits important to efficient beef production. In all, 36 breeds have been evaluated as crossbreds, and the beef cattle industry used this information to make dramatic changes. There is now less emphasis in the industry on evaluating new sources of breeds and more on genetic changes resulting from selection within breeds and genetic differences correlated with genetic markers. The structure of this important research project has been changed to emphasize evaluating genetic change within influential breeds and genetic marker associations.

Utilization of Genetic Differences

Sheep producers are often reluctant to use prolific breeds in pasture-lambing, low-input production systems because of the perception that such breeds require extra labor at lambing and that the increased prolificacy will be entirely offset by lower lamb survival. The experimental goal is to create, evaluate, and develop an easy-care maternal line of hair sheep for use in pasture-lambing, low-input production systems. The genetic strategy is to balance prolificacy and maternal ability in Romanov crossbred ewes to realize acceptable lamb survival.



White Dorper x Romanov Ewes with Lambs