

**WERA-1  
Fort Collins, CO  
June 18 - 19, 2009**

**Present:**

Mark Enns – Colorado State University \*  
Brent Buckley – University of Missouri \*  
Denny Crews – Colorado State University \*\*\*  
Lauren Hyde – North American Limousin Foundation \*  
Charles Gaskins – Washington State University \*\*\*  
Holly Neibergs – Washington State University \*  
Cody Moreshead – Leachman \*  
Kristi Cammack – University of Wyoming \*  
Bret Hess – University of Wyoming \*\*  
Milt Thomas – New Mexico State University \*  
Peter Burfening – CSREES / USDA \*\*  
David Schafer – University of Arizona \*  
Larry Keenan – Red Angus Association of America \*  
Matt Cronin – University of Alaska \*  
R. Mark Enns – Colorado State University \*  
Harvey Blackburn – ARS Germplasm Preservation \*\*\*

\*Member  
\*\*Advisor  
\*\*\*Invited

### **WERA-1 Expected outcomes and Impacts:**

1. Effective outreach and communication to beef producers through peer reviewed publications, bulletins, and direct interactions among beef producers, extension personnel, and scientists. This includes working closely with many breed associations and their members.
2. By developing the ability to conduct a phenomics focus, the group will share resources to efficiently maximize research efforts, training of students and extension personnel, as well as deliver improved tools to breeders. Most importantly, involvement in phenomics-based research fosters collaboration among scientists and increased productivity.
3. Focus on phenomics allows for information exchange and review of ongoing research to prevent duplication of efforts which maximizes use of limited research funds.
4. Involvement in phenomics research encourages cooperative research efforts that require scientists with varied expertise (i.e., quantitative and molecular genetics).
5. Collaborative/cooperative research efforts involving phenomics will lead to grant proposal development among committee members.
6. Information exchange will occur within the committee because of the knowledge of other members' academic and research activities. This knowledge will also facilitate cooperative efforts in research as well as student training and extension activities.
7. Attendance to the annual meeting will also yield detailed planning efforts for workshop/producer training efforts. This direct interaction allows the committee members to effectively discuss how to create programs to aid producer decision making relative to use genetic evaluations and (or) molecular markers for economically relevant and indicator traits.

## Meeting Summary

**June 18**

### **Introductions**

#### **Advisor Reports**

Peter Burfening

- Farm Bill – NIFA
- AFRI Programs and Deadlines
- Personnel Updates
- Budget Updates

Bret Hess

- Update on David Thawley
- Hatch Project
  - Formula Funds
- WERA-1
  - In 1<sup>st</sup> Year
  - Reports With Outcomes and Impacts Required Years 3 and 5
  - All Reports Require Minutes and Publications
  - Reports Due 60 d After Meeting

#### **Update on Cooperative Distance Education Program (Enns):**

- Graduate Education Grant / Higher Education Challenge Grant
- Virginia Tech, Colorado State University, Michigan State University, and Cornell
- 2 – year Program (4 modules / year)
- No Tuition Charge
- 15 -20 Institutions with Students in Courses
- Courses:
  - Introduction to Matrix Algebra (Year 1)
  - Genetic Simulation Game (Year 1)
  - Primer to Quantitative Genetics (Year 1)
  - Design of Animal Breeding Programs (Year 1)
  - Heterosis and Crossbreeding Systems (Year 2)
  - Linear Models (Year 2)
  - Genetic Prediction (Year 2)
  - Marker Assisted and Gene Assisted Selection (Year 2)
- Use of On-line Testing and Assignments

**June 19**

**Introductions**

**Discussion of Group Objectives (Thomas):**

\*\*M. Thomas will take the lead.

1. DNA Repositories - Update from Universities (Repository Collections): *First Priority*

NMSU, CSU, WSU, UN-Reno, Univ. Arizona, U. Alaska, UW

Storage Options:

Blood Cards

Buffy Coats

Tissues (-80C)

Ear Notches

Resources:

Universities

Breed Associations

2. Integration of Quantitative and Molecular Research Tools:

50K Data

Phenotype Selection / Traits / Data Sharing:

Growth Traits

GrowSafe Data (CSU, UW)

Reproduction Traits

Disease Traits

**2010 Location**

Host Possibilities:

1. Palmer, AK

2. Reno, NV

Dates: June (mid to late June)

## Station Report Summaries

### 1. New Mexico State University

**Agency(s) and Principal Leaders:** M.G. Thomas, D.W. Bailey, G.A. Silver, P. Luna-Nevarez, S.O. Peters, and K.L. DeAtley; Department of Animal and Range Sciences, New Mexico State University, Las Cruces.

#### **Progress of work and results:**

##### Research supported by NM-AES and other supplements:

- P. Luna-Nevarez, D. VanLeeuwen, D. W. Bailey, R. M. Enns, S. A. Soto-Navarro, G. A. Silver, and M. G. Thomas. 2008. Altered growth curve characteristics and pregnancy rate levels in thirty-four years of Brangus cattle production in the Chihuahuan Desert. WSASAS proc papers prep for J. Anim. Sci.
- K. L. DeAtley, G. Rincon, C. R. Farber, J. F. Medrano, R. M. Enns, D. VanLeeuwen, G. A. Silver, and M. G. Thomas. 2009. Microsatellite ETH10 in the promoter of signal transducer and activator of signal transcription-6 gene predicts 205-d weight in Red Angus cattle. Abstract presentation WSASAS and n = ~8500 for admixed predictions of Angus and Brahman-influenced cattle.
- D. W. Bailey, M. G. Thomas, J. W. Walker, B. K. Witmore, and D. Tolleson. Effect of previous experience on grazing patterns and diet selection of Brangus cows in the Chihuahuan Desert. Range Ecol. Mgt. Accepted with Revision. Effort continuing with Angus, Brangus Brahman comparisons (2008 and 2009).
- M. G. Thomas, M. Amstalden, D. M. Hallford, G. A. Silver, M. D. Garcia, D. H. Keisler, and G. L. Williams. 2009. Assessment of third-ventricle cerebrospinal fluid concentrations of GHRH in cattle: correspondence with serum concentrations of GH and influences of appetite-regulating peptides. Domest. Anim. Endocrinol. (in press).

#### **Usefulness of findings:**

- A. Frequencies of DNA polymorphisms differ among Angus, Brangus, and Brahman cattle. Heterozygous genotypes appear advantageous in *Bos indicus*-influenced composites.
- B. DNA polymorphisms in genes of the GH axis or its transcriptional regulators appear to predict growth and or reproductive traits in Brangus bulls and heifers (CAUTION: original studies used single locus associations).
- C. SNP discovery efforts in candidate genes (fine mapping) are very productive. dbSNP limited.
- D. Identification of haplotype blocks and tag SNP appears to be a much more effective strategy within a pathway/candidate gene approach to MAS.
- E. Desert adaptation is measurable. Question is whether it is an effect of genetics and (or) environment (i.e., management, learned behavior, etc...)?

#### **Work planned for next year:**

- A. Continue collaboration with team at UCD with Juan Medrano and Gonzalo Rincon. Specifically, transcriptome sequencing, SNP discovery, and genotype to phenotype association studies.
- B. USDA-NRI fertility project, QTL association with heifer pregnancy and transcriptome identification of genes.

- C. Efforts continue to evaluate genetic and (or) environmental effects on desert adaptation of Brangus cattle (i.e., grazing distribution, etc.). Compare grazing distribution and diet selection of Angus, Brangus and Brahman.
- D. International collaboration for Genome Resource sharing (USDA-ARS-Thallman, Bennett and Snelling, CSIRO-U of NE, AU – Rachel Hawken, UA and UG of CA).

**Publications (2008 and 2009).**

**A. Refereed journal articles.**

- T. Smith, M. G. Thomas, T. D. Bidner, J. C. Paschal, and D. E. Franke. 2009. Single nucleotide polymorphisms in Brahman steers and their association with carcass and tenderness traits. *Genet. Mol. Res.* 8:39-46.
- A. J. Garrett, G. Rincon, J. F. Medrano, M. A. Elzo, G. A. Silver, and M. G. Thomas. 2008. Promoter region of the bovine growth hormone receptor gene: single nucleotide polymorphism discovery in cattle and association with performance in Brangus bulls. *J. Anim Sci.* 86:3315-3323.
- Decker, J. E., P. Luna-Nevarez, A. M. Encinias, R. M. Enns, and M. G. Thomas. 2008. Case study: scrotal circumference in beef bulls: prediction of measures at 365 days of age from measures at 240 days of age with data from the Tucumcari Bull Test. *Prof. Anim. Sci.* 24:1-6.
- Bailey, D.W. and D. Jensen. 2008. Method of supplementation may affect cattle grazing patterns. *Rangeland Ecol. Manage.* 61:131-135.
- Bailey, D.W., H.C. VanWagoner, R. Weinmeister, and D. Jensen. 2008. Evaluation of low-stress herding and supplement placement for managing cattle grazing in riparian and upland areas. *Rangeland Ecol. Manage.* 61:26-37.
- Bailey, D.W., H.C. VanWagoner, R. Weinmeister, and D. Jensen. 2008. Comparison of low-moisture blocks and salt for manipulating grazing patterns of beef cows. *J. Anim. Sci.* 86:1271-1277.

**B. Book chapter.**

- Bailey, D. W. and F. D. Provenza. 2008. Mechanisms determining large-herbivore distribution. *In: H. H. T. Prins and F. van Langevelde [EDS.]. Resource ecology: spatial and temporal dynamics of foraging.* Dordrecht, Netherlands: Springer. p. 7-28.

**C. Invited academic and extension efforts.**

- M. Thomas continues effort as Chair of the IBBA Breed Improvement Committee ad-hoc group known as DNA technology committee. Effort becoming much more strategic and educational. How do we incorporate genetic markers into a multi-breed EPD? Branch Ranch, Lovington, NM. Developing DNA paternity testing program and within herd EPD system for an organization of 5 cow-calf operations and a feedlot. Assisting with NMSU-Ag Marketing project for Branch Ranch-Natural Beef of NM, LLC.

## 2. Washington State University

**Personnel:** C.T. Gaskins, Z. Jiang, H.L. Neiberger

### **Current Collaborative Projects:**

Wagyu EPDs – CTG

- Identification of candidate genes for fat deposition and fatty acid composition in beef cattle – ZJ, CTG
- Genomic standardized farming for high quality beef to benefit Washington agriculture and human health – ZJ
- Genome-wide DNA marker information transfer from cow to buffalo – ZJ
- Johne's disease – HLN
- BVD – HLN
- Wagyu diversity – HLN
- Residual feed efficiency and mitochondrial function – HLN

### **Publications:**

#### **Peer-reviewed journal articles**

- Settles, M., R. Zanella, S.D. McKay, R.D. Schnabel, J.F. Taylor, T. Fyock, R.H. Whitlock, Y. Schukken, J.S. Van Kessel, J. Karns, E. Hovingh, J.M. Smith, H.L. Neiberger. A whole genome association analysis identifies loci associated with *Mycobacterium avium* subsp. *paratuberculosis* infection status in US Holstein cattle. *Animal Genetics* (in press).
- Chen J, Guridi M, Fernyhough ME, Jiang Z, Guan LL, Hausman GJ, Dodson MV. 2009. Initial differences in lipid processing leading to pig- and beef-derived mature adipocyte dedifferentiation. *Basic and Applied Myology – European Journal of Translational Myology* (in press).
- Heaton, M.P., J.W. Keele, G.P. Harhay, J.A. Richt, M. Koohmaraie, T.L. Wheeler, S.D. Shackelford, E. Casas, D.A. King, T.S. Sonstegard, C.P. Van Tassell, H.L. Neiberger, C.C. Chase, Jr., T.S. Kalbfleisch, T.P.L. Smith, M.L. Clawson, W.W. Laegreid. Prevalence of the prion gene E211K variant in U.S. cattle. 2008. *BMC Veterinary Research*. 4:25 (14 Jul 2008). <http://www.biomedcentral.com/1746-6148/4/25>
- Chen J, Guridi M, Fernyhough ME, Jiang Z, Guan LL, Hausman GJ, Dodson MV. 2009. Clonal mature adipocyte production of proliferative-competent daughter cells requires lipid export prior to cell division. *International Journal of Stem Cells* 2:76-79.
- Xu XL, Xu XW, Pan PW, Li K, Jiang Z, Yu M, Rothschild MF, Liu B. 2009. Porcine skeletal muscle differentially expressed gene CMYA1: isolation, characterization, mapping, expression and association analysis with carcass traits. *Animal Genetics* 40: 255 - 261.
- Jiang Z, Rokhsar DS, Harland RM. 2009. Old can be new again: HAPPY whole genome sequencing, mapping and assembly. *International Journal of Biological Sciences* 5:298-303
- Wang XX, Xue CY, Wang XN, Liu HL, Xu YX, Zhao RQ, Jiang Z, Dodson MV, Chen J. 2009. Differential display of expressed genes reveals a novel function of *SFRS18* in regulation of intramuscular fat deposition. *International Journal of Biological Sciences* 5: 28 - 33.

- Wibowo TA, Gaskins CT, Newberry RC, Thorgaard GH, Michal JJ, Jiang Z. 2008. Genome assembly anchored QTL map of bovine chromosome 14. *International Journal of Biological Sciences* 4:406 – 414.
- Jiang Z, Michal JJ, Tobey DJ, Daniels TF, Rule DC, MacNeil MD. 2008. Significant associations of stearoyl-CoA desaturase (*SCDI*) gene with fat deposition and composition in skeletal muscle. *International Journal of Biological Sciences* 4:345 – 351.
- Jiang Z, Wu X-L, Zhang M, Michal JJ, Wright Jr. RW. 2008. The complementary neighborhood patterns and methylation-to-mutation likelihood structures of 15,110 single nucleotide polymorphisms in the bovine genome. *Genetics* 180:639-647.
- Jiang Z, Michal JJ, Tobey DJ, Wang Z, MacNeil MD, Magnuson NS. 2008. Comparative understanding of *UTS2* and *UTS2R* genes for their involvement in type 2 diabetes mellitus. *International Journal of Biological Sciences* 4:96-102.

**Book chapters:**

- Neiberger, H.L., R. Zanella. Genomics of reproductive diseases in cattle and swine *in* Reproductive Genomics in Domestic Animals. Z. Jiang and T. Ott, editors. Wiley-Blackwell, Ames, IA (in press).

**Abstracts:**

- Decker, JD, J.C. Pires, G.C. Conant, S. D. McKay, M.P. Heaton, J. Vilkki, K. Chen, A. Cooper, C.M. Seabury, A.R. Caetano, G.S. Johnson, R.A. Breneman, O. Hanotte, L.L. Coutinho, M.E. Babar, L.S. Eggert, P. Wiener, J.-J. Kim, K. Suk Kim, T. S. Sonstegard, C.P. Van Tassel, H.L. Neiberger, R.D. Schnabel, J.F. Taylor. Divergence times and signatures of selection from phylogenomic analysis of Pecoran species. 2009. Plant & Animal Genome XVII, San Diego, California
- Zanella, R., M. Settles, R.H. Whitlock, S.D. McKay, R.D. Schnabel, J.F. Taylor, T. Fyock, Y. Schukken, J. Van Kessel, J. Karns, E. Hovingh, J.M. Smith, H.L. Neiberger. Identification of loci associated with tolerance to Johne's disease in Holstein cattle. 2009. Plant & Animal Genome XVII, San Diego, California.
- Zanella, R., M. Settles, T. Fyock, R. Whitlock, Y. Schukken, J. Van Kessel, J. Karns, E. Hovingh, J. Smith, C. Van Tassel, C. Gaskins, H. Neiberger. Heritability of genetic tolerance to Johne's disease. 2008. Joint American Dairy Science Association- American Society of Animal Science Annual Meeting, Indianapolis, Indiana.
- Settles, M., R. Zanella, S. McKay, R. Schnabel, J. Taylor, T. Fyock, R. Whitlock, Y. Schukken, E. Hovingh, J. Van Kessel, J. Karns, J.M. Smith, H. Neiberger. Whole genome association study of Johne's disease in cattle. 2008. International Symposium on Animal Functional Genomics, Edinburgh, UK. ISAFG-Poster 93.
- Settles, M., R. Zanella, S. McKay, R. Schnabel, J. Taylor, T. Fyock, R. Whitlock, Y. Schukken, E. Hovingh, J. Van Kessel, J. Karns, J.M. Smith, H. Neiberger. Identification of loci associated with tolerance to Johne's disease in Holstein cattle. 2008. Johne's Disease Integrated Program Meeting, East Lansing, Michigan.
- Heaton, M.P., J.W. Keele, G.P. Harhay, J.A. Richt, M. Koohmaraie, T.L. Wheeler, S.D. Shackelford, E. Casas, D.A. King, T.S. Sonstegard, C.P. Van Tassel, H.L. Neiberger, C.C. Chase, Jr., T.S. Kalbfleisch, T.P.L. Smith, M.L. Clawson, W.W. Laegreid. Prevalence of the prion gene E211K variant in U.S. cattle. 2008. Plant & Animal Genome XVI, San Diego, California.



- Heaton, M.P., Keele, J.W., Harhay, G.P., Richt, J.A., Koohmaraie, M., Wheeler, T.L., Shackelford, S.D., Casas, E., King, D.A., Sonstegard, T.S., Van Tassell, C.P., Neibergs, H.L., Kalbfleisch, T.S., Clawson, M.L., Laegreid, W.W. 2008. Prevalence of the prion gene E211K variant in U.S. cattle.
- Settles, M., Zanella, R., McKay, S., Schnabel, R., Taylor, J., Fyock, T., Whitlock, R., Schukken, Y., Van Kessel, J., Karns, J., Hoving, E., Smith, J., Neibergs, H. 2008. Whole Genome Association Study of Johne's Disease.
- Zanella, R., M. Settles, T. Fyock, R. Whitlock, Y. Schukken, J. Van Kessel, J. Karns, E. Hoving, J. Smith, C. Van Tassel, C. Gaskins, H. Neibergs. 2008. Heritability of Genetic Tolerance to Johne's Disease
- Zanella, R., Settles, M., Whitlock, R.H., McKay, S.D., Schnabel, R.D., Taylor, J.F., Fyock, T., Schukken, Y., Van Kessel, J., Karns, J., Hoving, E., Smith, J.M., Neibergs, H.L. 2009. Identification of loci associated with tolerance to Johne's disease in Holstein cattle.
- Decker, J.E., J. C. Pires, G. C. Conant, S. D. McKay, M. P. Heaton, J. Vilkki, K. Chen, A. Cooper, C. M. Seabury, A. R. Caetano, G. S. Johnson, R. A. Brenneman, O. Hanotte, L. L. Coutinho, M. E. Babar, L. S. Eggert, P. Wiener, J. Kim, K. Suk Kim, T. S. Sonstegard, C. P. Van Tassell, H. L. Neibergs, R. D. Schnabel, J. F. Taylor. 2009. Divergence times and signatures of selection from phylogenomic analysis of Pecoran species.

### 3. Colorado State University

#### Personnel

R. Mark Enns, Associate Professor  
Denny H. Crews, Professor  
Scott E. Speidel, Research Associate  
Brian W. Brigham, Research Associate  
Chase McAllister, Graduate Student  
Cory Pendley, Graduate Student  
Amanda Pepper, Graduate Student  
Mike Moon, CSU Beef Improvement Center Manager  
Duane Wood, CSU Beef Improvement Center Cow Manager

#### Impacts and Accomplishments

We have developed and released to the beef industry a new methodology for calculating stayability EPDs that utilizes early-life indicators to improve the accuracy of those EPD. Traditional stayability EPD represent the probability that an animal's daughters will remain in the productive herd until 6 years of age. Given this definition sires are at least 8 years old before their daughters ever have an observation for stayability. Using a new methodology we incorporate information on stayability from earlier ages in a female's productive life.

#### Publications

- Crews, D. H., Jr. and R. M. Enns. 2008. Models for genetic evaluation of scrotal circumference in Red Angus. *Professional Animal Scientist* 24:128-135.
- Crews, D. H., Jr., R. M. Enns, J. M. Rumph, and E. J. Pollak. 2008. Genetic evaluation of retail product percentage in Simmental cattle. *J. Anim. Breed. Gen.* 125:13-19.
- Enns, R. M., and G. B. Nicoll. 2008. Genetic change results from selection on an economic breeding objective in beef cattle. *J. Anim. Sci.* 86: 3348-3357.
- Renken, W.J., L. D. Howery, G. B. Ruyle, R.M. Enns. 2008. Cattle generalize visual cues from the pen to the field to select initial feeding patches. *Applied Animal Behaviour Science* 109:128-140.
- Crews, D. H., Jr. and **R. M. Enns**. 2008. Genetic improvement of heifer pregnancy and performance in beef cattle. *Proceedings, Robert E. Taylor Memorial Symposium (2008): Applied Reproductive Strategies in Beef Cattle, Fort Collins, CO.* pp 187-194.
- Enns, R. M.** and D. H. Crews, Jr. 2008. New trait development and economic relevance in national cattle evaluation. *Proceedings, 40th Beef Improvement Federation Research Symposium and Annual Meeting, Calgary, AB.* pp. 40-43.
- Crews, D. H., Jr., S. S. Moore, and **R. M. Enns**. 2008. Optimizing traditional and marker assisted evaluation in beef cattle. *Proceedings, 40th Beef Improvement Federation Research Symposium and Annual Meeting, Calgary, AB.* pp. 44-49.
- Brigham, B. W., **R. M. Enns**, R. L. Weaber, H. Van Campen, G. H. Loneragan, J. L. Salak-Johnson, C. C. L. Chase, J. J. Wagner, C. M. McAllister, and E. J. Pollak. 2008. Effect of processing stress on feedlot cattle sickness. *Journal of Animal Science. E-Supplement 2. Vol 86:593 (abstract).*

- Lewis, R. M., B. B. Lockee, M. S. Ames, **R. M. Enns**, J. M. Rumph, T. W. Wilkinson, and E. J. Pollak. 2008. Graduate education utilizing distance learning. JAS E-supplement-1. 86:165 (abstract).
- Marquez, G. C., **R. M. Enns**, M. D. Grosz, and M. D. MacNeil. 2008. QTL with dominance effect affecting residual feed intake on BTA6. Journal of Animal Science. E-Supplement 2. Vol 86:362 (abstract).
- McAllister, C. M., B. W. Brigham, **R. M. Enns**, R. L. Weaber, H. Van Campen, G. H. Loneragan, J. L. Salak-Johnson, C. C. L. Chase, J. J. Wagner, and E. J. Pollak. 2008. Effect of receiving weight on predicted days to onset of respiratory disease in feedlot steers. Journal of Animal Science. E-Supplement 2. Vol 86:592 (abstract).
- Pepper, A. R., **R. M. Enns**, R. L. Weaber, H. Van Campen, G. H. Loneragan, J. L. Salak-Johnson, C. C. L. Chase, J. J. Wagner, and E. J. Pollak. 2008. The effect of exit velocity at receiving and re-implant on average daily gain and weight at re-implant. Journal of Animal Science. E-Supplement 2. Vol 86:593 (abstract).
- Speidel, S. E., **R. M. Enns**, R. L. Weaber, H. Van Campen, G. H. Loneragan, J. L. Salak-Johnson, C. C. L. Chase, J. J. Wagner, C. M. McAllister, and E. J. Pollak. 2008. Effect of daily ambient temperature and wind speed on sickness of feedlot cattle. Journal of Animal Science. E-Supplement 2. Vol 86:593 (abstract).
- Weaber, R. L., **R. M. Enns**, H. Van Campen, G. H. Loneragan, J. L. Salak-Johnson, C. C. L. Chase, J. J. Wagner, and E. J. Pollak. 2008. Correlations among measures of temperament, weight and gain of steers at placement and reimplant in a commercial feed yard. Journal of Animal Science. E-Supplement 2. Vol 86:592 (abstract).

#### 4. University of Nevada – Reno

##### **Personnel**

L. Gomez-Raya, Associate Professor  
D. Thain Assistant Professor  
W. M. Rauw, Assistant Professor  
M. Teglas, Assistant Professor  
B. Bruce, Associate Professor  
T. Wuliji, Associate Professor

##### **Ranch Managers**

Kevin Piper

##### **Impacts and Accomplishments**

We have developed methods for inferring sire's genotypes when DNA from the sires is not available. It will help to carry out Quantitative Trait Loci mapping in range populations. We have also arrived to the conclusion that DNA paternity programs can be economically efficient. Dr. Rauw has edited a book just published on feed efficiency.

##### **Publications for 2008 and 2009**

- Gomez-Raya, L. Inferring unknown genotypes of sires at codominant deoxyribonucleic acid markers in half-sib families. 2009. *Journal of Animal Science* 87: 1872-1882.
- Gomez-Raya L., M.S. Amoss, Y. Da, C. W. Beattie, D. Smith, O. Ash, and W. M. Rauw. 2009. Role of Inbreeding, Selection on the incidence of Cutaneous Malignant Melanoma in Sinclair Swine. *Journal of Animal Breeding and Genetics* 126:242–249.
- Lallias D., L. Gomez-Raya, C.S. Haley, I. Arzul, S. Heurtebise, A.R. Beaumont, P. Boudry, and S. Lapègue. 2009. Combining two-stage testing and interval mapping strategies to detect QTL for resistance to bonamiosis in the European flat oyster *Ostrea edulis*. *Marine Biotechnology* (in press).
- Bigelow, JP., WM. Rauw, and L. Gomez-Raya. 2009. Observations concerning reproductive temperature requirements of captive Lahontan cutthroat trout. *North American Journal of Aquaculture* 71:252–255.
- W. M. Rauw, S. Hermes, K. Bunter, and L. Gomez Raya. 2009. The relationship between growth, mature and lactation food intake in a mouse model. *Livestock Science*. 123:249–254.
- W.M. Rauw (Ed.) 2009, "Resource Allocation Theory Applied to Farm Animal Production" CABI Publishing, Wallingford, UK .
- Robinson M.L., L. Gomez-Raya, W.M. Rauw, M.M. Peacock. 2008. Fulton's body condition factor K correlates with survival time in a thermal challenge experiment in juvenile Lahontan cutthroat trout (*Oncorhynchus clarki henshawi*). *Journal of Thermal Biology* 33:363– 368.
- Gomez-Raya L., K. Priest, W. M. Rauw, M. Okomo-Adhiambo, D. Thain, B. Bruce, A. Rink, R. Torell, L. Grellman, Narayanan, R, and C. Beattie. 2008. The value of DNA paternity identification for free range beef cattle in Nevada. *Journal of Animal Science*. 86: 17-24.

Gomez-Raya, L. 2008. A large family size is required to detect sexual heterogeneity of the recombination fraction using dominant and codominant DNA-markers. *Span Jour. Agric. Res.* 6:116-123.

### **ASAS Presentations 2009 and 2008**

- Gomez-Raya, L. Construction of LD maps for SNPs linked to susceptibility loci (oral presentation). Joint ADSA-CSAS-ASAS Meeting. 2009, Montreal, Quebec, Canada. (oral presentation).
- J. P. Bigelow, W. M. Rauw, and L. Gomez-Raya. Acclimation to salinity and survival of Lahontan cutthroat trout *Oncorhynchus clarki*. Joint ADSA-CSAS-ASAS Meeting. 2009, Montreal, Quebec, Canada. (oral presentation).
- J. P. Bigelow, M. M. Peacock, W. M. Rauw, and L. Gomez-Raya. Effects of female holding temperature and post-ovulatory oocyte ageing on egg survival in Pilot Peak Lahontan cutthroat trout, *Oncorhynchus clarki henshawi*. Joint ADSA-PSA-AMPA-ASAS Meeting. Indianapolis, Indiana. USA. 2008. (oral presentation).
- W. M. Rauw, S. Hermesch, K. Bunter, and L. Gomez Raya. Relationship between feed intake during growth and lactation in a mouse model. Joint ADSA-PSA-AMPA-ASAS Meeting. Indianapolis, Indiana. USA. 2008. (oral presentation).
- L. Gomez-Raya, M. Miller, C. S. Ho, V. Kirchoff, D. M. Smith, W. M. Rauw, D. Thain, A. Rink, and C. W. Beattie. Linkage disequilibria of the SLA region loci with malignant melanoma in Sinclair swine. Joint ADSA-PSA-AMPA-ASAS Meeting. Indianapolis, Indiana. USA. 2008. (oral presentation).
- W. M. Rauw, S. Hermesch, K. Bunter, and L. Gomez Raya, Relationship between feed intake during growth and lactation in a mouse model. Joint ADSA-PSA-AMPA-ASAS Meeting. Indianapolis, Indiana. USA. 2008. (oral presentation).
- L. Gomez-Raya, M. Miller, C. S. Ho, V. Kirchoff, D. M. Smith, W. M. Rauw, D. Thain, A. Rink, and C. W. Beattie. Linkage disequilibria of the SLA region loci with malignant melanoma in Sinclair swine. Joint ADSA-PSA-AMPA-ASAS Meeting. Indianapolis, Indiana. USA. 2008. (oral presentation).
- J. P. Bigelow, M. W. M. Rauw, M. Peacock, and L. Gomez-Raya. Effects of female holding temperature and post-ovulatory oocyte ageing on egg survival in Pilot Peak Lahontan cutthroat trout, *Oncorhynchus clarki henshawi*. Joint ADSA-PSA-AMPA-ASAS Meeting. Indianapolis, Indiana. USA. 2008. (oral presentation).
- T. Wuliji, T. Borda, H. Glimp, L. Gomez-Raya, and W. Rauw. A single fleece test method improves premium wool traits in range sheep flock. Joint ADSA-PSA-AMPA-ASAS Meeting. Indianapolis, Indiana. USA. 2008. (poster presentation).

## 5. University of Wyoming

### Personnel:

#### *Lead Scientist:*

Kristi Cammack

#### *Collaborators:*

Steve Paisley (University of Wyoming)  
Bill Lamberson (University of Missouri)  
Jerry Taylor (University of Missouri)  
David Ledoux (University of Missouri)  
Ken Olson (South Dakota State University)  
Kathy Austin (University of Wyoming)  
Cody Wright (South Dakota State University)  
Patricia Johnson (South Dakota State University)  
Bret Hess (University of Wyoming)  
Brenda Alexander (University of Wyoming)  
Rebecca Cockrum (University of Wyoming)  
Sheila Rustemeyer (University of Wyoming)  
Katie Kessler (University of Wyoming)

### Ongoing Relevant Research:

#### **Differential Gene Expression as an Indicator of Tolerance to High-Sulfate Water in Steers**

*University of Wyoming (Kessler, Austin, Cammack)*

*South Dakota State University (Olson, Wright, Johnson)*

#### **Differential Gene Expression in Ewes Divergent for Response to Nitrate Toxicity**

*University of Wyoming (Cockrum, Austin, Cammack)*

*University of Missouri (Taylor)*

### Recent Publications:

**Cammack, K.M.**, M. Thomas, and M. Enns. 2009. Genetic analysis of reproduction traits in livestock: a review. PAS. Under review.

Cockrum, R.R., K.A. Austin, P.A. Ludden, and **K.M. Cammack**. 2009. Effect of subacute dietary nitrate on production parameters in Suffolk ewes. *Animal*. Accepted.

**Cammack, K.M.**, E. Antoniou, L. Hearne, and W.R. Lamberson. 2009. Testicular gene expression in male mice divergent for fertility after heat stress. *Theriogenology*. 71:651-661.

Alexander, B.M., P. Singh, K.J. Austin, R.R. Cockrum, **K.M. Cammack**, B.W. Hess, G.E. Moss, P.W. Nathanielsz, and S.P. Ford. 2008. Effect of maternal fatness on fetal steroids and semi-quantitative real-time PCR expression of receptor genes in sheep. *Anim. Reprod. Sci.*

### Recent Abstracts:

Cockrum, R.R., K.A. Austin, J.F. Taylor, P.A. Ludden, and **K.M. Cammack**. 2009. Effects of subacute dietary nitrate on production and gene expression in Suffolk ewes. Midwest ASAS. Des Moines, IA.

- Cockrum, R.R., K.A. Austin, P.A. Ludden, J.F. Taylor, J.W. Kim, S.C. Fahrenkrug, J.R. Garbe, and **K.M. Cammack**. 2009. Differential gene expression in Suffolk ewes exposed to subacute dietary nitrate. National ASAS. Montreal.
- Cockrum, R.R., K.A. Austin, K.L. Kessler, S.M. Rustemeyer, W.J. Murdoch, and **K.M. Cammack**. 2009. Breeding performance of Suffolk ewes administered subacute levels of dietary nitrate. Western ASAS. Fort Collins, CO.
- Kessler, K.L., K.C. Olson, C.L. Wright, K.J. Austin, P.S. Johnson, and **K.M. Cammack**. 2009. Effects of high-sulfur water and clinoptilolite on growth performance and gene expression of steers fed forage-based diets. Midwest ASAS. Des Moines, IA.
- Kessler, K.L., K.C. Olson, C.L. Wright, K.J. Austin, K. McInnerney, R.R. Cockrum, P.S. Johnson, and **K.M. Cammack**. 2009. Effects of high-sulfur water on growth performance and gene expression of steers fed forage-based diets. National ASAS. Montreal.
- Rustemeyer, S.M., W.R. Lamberson, D.R. Ledoux, and **K.M. Cammack**. 2009. Effects of dietary aflatoxin on performance of growing barrows. National ASAS. Montreal.
- Austin, K.J., R.R. Cockrum, A.M. Kaiser, and **K.M. Cammack**. 2009. Differential gene expression in the testis of adult male mice following treatment with Aflatoxin B1. National ASAS. Montreal.

## **6. University of Arizona – V Bar V Ranch**

Ranch Personnel: David W. Schafer  
Keith G. Cannon  
Debra L. Pearson  
Wade W. Woodbury  
Margaret M. Woodbury  
Doug Tolleson  
John Kava

Researchers: S. Peder Cuneo  
John A. Marchello  
Jim E. Sprinkle

Feedlot Personnel: James English  
Keith O. Cannon

Graduate Students: R. Dean Fish

### **CURRENT BEEF CATTLE PROJECTS**

Evaluation of composite and/or purebred cow productivity and profitability under stressful environmental conditions and subsequent progeny performance in the feedlot. D.W. Schafer and J.A. Marchello.

Effects of a long-acting, trace mineral, reticulorumen bolus on range beef cow productivity and performance. J.E. Sprinkle, S.P. Cuneo, R.M. Enns and D.W. Schafer.

### **PUBLICATIONS**

Bailey, C.R., G.C. Duff, S.R. Sanders, J.L. Treichel, L.H. Baumgard, J.A. Marchello, D.W. Schafer, C. P. Murphy. 2008. Effects of increasing crude protein concentrations on performance and carcass characteristics of growing and finishing steers and heifers. Anim. Feed. Sci. & Tech. 142 (2008) 111-120.



## 7. North American Limousin Foundation

### 2008 Publications

#### *Manuals*

NALF. 2008. International Limousin Genetic Evaluation Manual. Fall ed. North American Limousin Foundation, Englewood, CO. Available: <http://www.nalf.org/programs/programs.html>.  
NALF. 2008. International Limousin Genetic Evaluation Manual. Spring ed. North American Limousin Foundation, Englewood, CO.

#### *Magazine Articles*

Andersen, K. J., and L. R. Hyde. 2008. NALF announces genetic evaluation service provider. Bottom Line. Spring:5.  
Andersen, K. J., and L. R. Hyde. 2008. NALF announces genetic evaluation service provider. Limousin World. April:106.  
Andersen, K. J., and L. R. Hyde. 2008. Vision Quest 2 demonstrates Limousin, Lim-Flex carcass merit.. Limousin World. January:18-20.  
Hyde, L. R. 2008. Too high? Too low? Percentile tables help you decide. Bottom Line. Spring:15.  
Hyde, L. R. 2008. Visions Quest brings instrument grading into focus. Bottom Line. Winter:12-13.

### 2009 Publications

#### *Manuals*

NALF. 2009. International Limousin Genetic Evaluation Manual. Spring ed. North American Limousin Foundation, Englewood, CO.

#### *Magazine Articles*

Hyde, L. R. 2009. Genetic trends demonstrate breed improvement. Bottom Line. Spring:11.  
Hyde, L. R. 2009. Limousin breeders tackle temperament; genetic trend shows power of selection. Bottom Line. Winter:17,20.

**8. University of Hawaii**

- Decline in Livestock Numbers
  - Angus Breed

**9. University of Alaska – Fairbanks**

- 20 Cows – Herd Size
- DNA Resources – Limited
  - Galloway, University Herd, Chirikof Island
- Wildlife Research – Conservation Issues

**10. Red Angus Association of America Research – Idaho (400 head)**

- Extension Component of NRI-funded Project
  - RFI – Cow Efficiency, Carcass Merit, Etc.

**11. Leachman Cattle**

- 500 Head – Feed Efficiency Data
- Blood Samples
  - 25% Angus
  - 25% Red Angus
  - 50% Stabilizer