**Appendix – Selected Publications**

Collectively, these publications represent a significant advancement in methodologies, tools, and knowledge guiding the genetic evaluation and improvement of beef cattle. They span core areas including low-pass sequence data integration, genomic prediction accuracy in multi-breed and crossbred populations, strategies to incorporate novel traits (e.g., methane emissions, pulmonary arterial pressure, and fertility measures) into genetic evaluations, and rigorous data handling approaches (e.g., blockchain-based confidentiality, imputation, and analyses of selection signatures).

The studies demonstrate the successful application of single-step GBLUP and other genomic evaluation methods to complex traits and show the importance of environmental and physiological factors – such as feed intake, climate variables, and disease susceptibility – in shaping genetic evaluations. Work on converting breeding values to different scales and exploring traits like fertility, scrotal circumference, and semen quality provides foundational tools for more accurate and efficient breeding decisions.

These papers underscore the global and collaborative nature of modern cattle genetics research, with insights being leveraged across commercial, research, and educational platforms. The development and application of decision-support software such as iGENDEC, the creation of industry guidelines for trait measurement, and targeted educational outreach ensure that scientific advances translate into practical benefits for producers and the broader beef industry. Ultimately, this body of work contributes to more sustainable, productive, and economically viable beef production systems by enhancing the precision, relevance, and robustness of genetic evaluation protocols.

1. Ali, S., W. Banzhaf, C. Gondro, and Q. Yan. 2024. End-to-End Decentralized Tracking of Carbon Footprint using Internet of Things and Distributed Databases. In: Proceedings of CIoT 24 – 7th Conference on Cloud and Internet of Things.
2. Ali, S., C. Gondro, Q. Yan, and W. Banzhaf. 2024. A Distributed System for Optimization of Carbon Emitting Resource Consumption in Supply Chains. In: Proceedings of ISNCC 2024.
3. Batt, M.C., L.G. Venzor, K. Gardner, R.R. Reith, K.A. Roberts, N.J. Herrera, A.M. Fuller, G.A. Sullivan, J.T. Mulliniks, M.L. Spangler, S.J. Valberg, D.J. Steffen, and J.L. Petersen. 2024. An autosomal recessive mutation in PYGM causes myophosphorylase deficiency in Red Angus cross cattle. BMC Genomics 25:417. doi:10.1186/s12864-024-10330-1
4. Berry, D.P., and M.L. Spangler. 2024. The benefit of a national genomic testing scheme. Vet. Clin. North Am. Food Anim. Pract. 40:435-445. doi:10.1016/j.cvfa.2024.05.008
5. Carroll, A.L., M.L. Spangler, D.L. Morris, and P.J. Kononoff. 2024. Partitioning among-animal variance of energy utilization in lactating Jersey cows. J. Dairy Sci. 107:7734-7743. doi:10.3168/jds.2024-24740
6. Contreras-Mendez, L.A., J.F. Medrano, M.G. Thomas, R.M. Enns, S.E. Speidel, G. Luna-Nevarez, P.A. Lopez-Castro, F. Rivera-Acuna, and P. Luna-Nevarez. 2024. The Anti-Mullerian hormone as endocrine and molecular marker associated with reproductive performance in Holstein dairy cows exposed to heat stress. Animals 14. doi:10.3390/ani14020213
7. Culbertson, M.M., T.E. Engle, M.G. Thomas, R.M. Enns, and S.E. Speidel. 2024. Estimation of variance components due to direct and maternal effects for feed intake in Gelbvieh cattle. J. Anim. Sci. Submitted.
8. Cushman, R.A., M. Kaps, A.P. Snider, M.S. Crouse, B.L. Woodbury, B.N. Keel, and K.L. McCarthy. 2024. Relationship of length of estrous cycle to antral follicle number in crossbred beef heifers. Transl. Anim. Sci. 8:txae074. doi:10.1093/tas/txae074
9. Cuyabano, B.C.D., D. Boichard, and C. Gondro. 2024. Expected values for the accuracy of predicted breeding values accounting for genetic differences between reference and target populations. Genet. Sel. Evol. 56:15.
10. Dodd, G., C. Gondro, T.M. Taxis, M. Young, and B. Fragomeni. 2024. Identification of Educational Gaps in Data Science Training Across Agricultural Genomics. NACTA 68(1):45-63.
11. Dressler, E.A., J.M. Bormann, R.L. Weaber, R.C. Merkel, and M.M. Rolf. 2024. A review of cashmere fiber phenotypes: Production, heritabilities, and genetic correlations. Small Rumin. Res. 240:107369. doi:10.1016/j.smallrumres.2024.107369
12. Dressler, E.A., J.M. Bormann, R.L. Weaber, and M.M. Rolf. 2024. Use of methane production data for genetic prediction in beef cattle: A review. Transl. Anim. Sci. 8:txae014. doi:10.1093/tas/txae014
13. Falchi, L., A. Cesarani, A. Criscione, J. Hidalgo, A. Garcia, S. Mastrangelo, and N. Macciotta. 2024. Effect of genotyping density on the detection of runs of homozygosity and heterozygosity in cattle. J. Anim. Sci. 102:1-12. doi:10.1093/jas/skae147
14. Forutan, M., E.M. Ross, A.J. Chamberlain, G. Fordyce, B.N. Engle, L.T. Nguyen, and B.J. Hayes. 2024. Selective sweeps for mutations increasing height impede identification of causative mutations for fertility and other correlated traits in cattle. Genet. Sel. Evol. Submitted.
15. Garduño-López, V.I., R.E. Martinez-Rocha, R. Núñez-Domínguez, R. Ramírez-Valverde, J. Domínguez-Viveros, A. Reyes-Ceron, and J. Hidalgo. 2024. Genome-wide scan for selection signatures in Mexican Sardo Negro Zebu Cattle. PLoS ONE 19(11). doi:10.1371/journal.pone.0312453
16. Gonzalez-Murray, R.A., M.G. Thomas, T.N. Holt, S. Coleman, R.M. Enns, and S.E. Speidel. 2024. Heterosis effects on preweaning traits in a multibreed beef cattle herd in Panama. Trop. Agric. Submitted.
17. Hess, M.K., A. Mersha, S.S. Ference, S.R. Nafziger, J.A. Keane, A.M. Fuller, S.G. Kurz, C.M. Sutton, M.L. Spangler, J.L. Petersen, and A.S. Cupp. 2024. Puberty classifications in beef heifers are moderately to highly heritable and associated with candidate genes related to cyclicity and timing of puberty. Front. Genet. 15:1405456. doi:10.3389/fgene.2024.1405456
18. Hidalgo, J., I. Misztal, S. Tsuruta, M. Bermann, K. Retallick, A. Garcia, F. Bussiman, and D. Lourenco. 2024. Transforming breeding values from observed to probability scale: how to make categorical data analyses more efficient. J. Anim. Sci. 102:1-11. doi:10.1093/jas/skae307
19. Hidalgo, J., S. Tsuruta, D. Gonzalez, G. de Oliveira, M. Sanchez, A. Kulkarni, C. Przybyla, G. Vargas, N. Vukasinovic, I. Misztal, and D. Lourenco. 2024. Converting estimated breeding values from the observed to probability scale for health traits. J. Dairy Sci. 101(11):9628-9637. doi:10.3168/jds.2024-24767
20. Londoño-Gil, M., R. López-Correa, I. Aguilar, C.U. Magnabosco, J. Hidalgo, F. Bussiman, F. Baldi, and D. Lourenco. 2024. Strategies for genomic predictions of an indicine multi-breed population using single-step GBLUP. J. Anim. Breed. Genet. 00:1–14. doi:10.1111/jbg.12882
21. Nawaz, M.Y., R.P. Savegnago, D. Lim, S.H. Lee, and C. Gondro. 2024. Signatures of selection in Angus and Hanwoo beef cattle using imputed whole genome sequence data. Front. Genet. 15:1368710.
22. Nayak, S.S., D. Rajawat, K. Jain, A. Sharma, A. Tarafdar, C. Gondro, T. Dutt, and M. Panigrahi. 2024. A comprehensive review of livestock development: insights into domestication, phylogenetics, diversity, and genomic advances. Mamm. Genome.
23. Raynor, E.J., A. Schilling-Hazlett, S.E. Place, J.J. Vargas, L.R. Thompson, M.K. Johnston, T.R. Jorns, M.R. Beck, L.A. Kuehn, J.D. Derner, and K. Stackhouse-Lawson. 2024. Snapshot of enteric methane emissions from stocker cattle grazing extensive semiarid rangelands. Rangeland Ecol. Manage. 93:77-80. doi:10.1016/j.rama.2024.01.001
24. Rodriguez-Borbon, A., J.F. Medrano, M.G. Thomas, R.M. Enns, S.E. Speidel, J.F. Torres-Simental, R. Rivera-Acuna, J.F. Hernandez-Chavez, and P. Luna-Nevarez. 2023. Polymorphisms within the IGF1 and IGF1R genes associated with superovulation-related traits in Holstein dairy cows managed in a semiarid environment. J. Anim. Behav. Biometeorol. 11. doi:10.31893/jabb.23029
25. Spangler, M.L., and D.P. Berry. 2024. Beef genetic evaluations. Vet. Clin. North Am. Food Anim. Pract. 40:357-367. doi:10.1016/j.cvfa.2024.05.002
26. Spangler, M.L., D.P. Berry, and L.A. Kuehn. 2024. Leveraging data from commercial cattle for genetic improvement – an international perspective. J. Anim. Sci. Accepted.
27. Thallman, R.M., C. Gondro, B.N. Engle, W.M. Snelling, J. Borgert, J.W. Keele, and L.A. Kuehn. 2024. A vision of how low-pass sequence data should contribute to genetic evaluation in the future. J. Anim. Sci. Submitted.
28. Upshaw, K.W., J.W. Keele, T.G. McDaneld, L.A. Kuehn, J.M. Bormann, R.L. Weaber, W.M. Snelling, R.M. Thallman, B.R. Jensen, L.K. Giess, and M.M. Rolf. 2024. Utilizing DNA pooling to predict cancer eye, ocular squamous cell carcinoma, in Hereford cattle. J. Anim. Sci. Submitted.
29. Valasek, H.F., R.M. Lewis, B.L. Golden, and M.L. Spangler. 2024. Impact of planning horizon length on traits in an economic breeding goal and ranking of selection candidates in beef cattle. Transl. Anim. Sci. doi:10.1093/tas/txae090
30. Wilson, R.A., B.J. Johnson, J.O. Sarturi, W.L. Crossland, K.E. Hales, R.J. Rathmann, C.L. Bratcher, M.E. Theurer, R.G. Amachawadi, T.G. Nagaraja, S.E. Speidel, R.M. Enns, M.G. Thomas, B.A. Foraker, M.A. Cleveland, and D.R. Woerner. 2024. Identification of blood-based biomarkers for detection of liver abscess in beef x dairy heifers. Appl. Anim. Sci. 40:386-397. doi:10.15232/aas.2023-02504
31. Zaabza, H.B., M.H. Ferdosi, I. Strandén, B.C.D. Cuyabano, M. Neupane, I. Misztal, D. Lourenco, and C. Gondro. 2024. Challenges in the use of sequence data in animal breeding. J. Anim. Sci. Submitted.

**Selected Conference Proceedings, Invited Talks and Producer Meetings**

1. Cuyabano, B.C.D., Gondro, C., & Rovere, G. (2024). The effect of correlated herd effects on their variance component estimate. [Presentation]. *EAAP 2024*.
2. Dressler, E. A., Bormann, J. M., Weaber, R. L., & Rolf, M. M. (2024). Characterization of the number of visits required for quantification of gas fluxes and metabolic heat production using a GreenFeed. [Poster presentation]. *Beef Improvement Federation Research Symposium and Convention*, Knoxville, TN.
3. Dressler, E., Bormann, J. M., Weaber, R. L., & Rolf, M. M. (2024). Number of spot samples required when using the GreenFeed System in grazing beef cows. *Journal of Animal Science, 102*(S1), 77–78. https://doi.org/10.1093/jas/skae019.090
4. Engle, B. N., Thallman, R. M., Snelling, W. M., Wheeler, T. L., Shackelford, S., King, D. A., & Kuehn, L. A. (2024). Genetics – how long does it take for genetics to improve carcass characteristics? *Journal of Animal Science, 102*(Suppl. 3). [Abstract]
5. Enns, R. M., Hurst, C., Place, S., & Stackhouse-Lawson, K. (2023). Genetics of sustainability. [Presentation]. *American Hereford Association Annual Convention*, Kansas City, MO.
6. Enns, R. M., Speidel, S. E., & Holt, T. (2023). Genetic prediction for PAP. [Presentation]. *American Simmental Fall Focus*, Denver, CO.
7. Enns, R. M., Speidel, S. E., & Holt, T. N. (2023). Selecting sires to use at high elevation. [Presentation]. *ASBRC*, Cheyenne, WY.
8. Enns, R. M., Speidel, S. E., & Holt, T. N. (2024). Updates on genetic prediction for PAP and heart score. [Presentation]. *Colorado Cattlemen’s Association Meeting*, Denver, CO.
9. Enns, R. M., Speidel, S. E., Stackhouse-Lawson, K., Place, S., Thomas, M., Huffhines, C., & Hurst, C. (2023). Evaluating the genetic components of greenhouse gas emissions and reactive nitrogen produced by Hereford seedstock for deriving systems, selection tools, and documented trends to achieving carbon neutrality in the US beef industry. [Presentation]. *Young Hereford Breeder Tour*, Fort Collins, CO.
10. Giess, L. K., Speidel, S. E., Upperman, L. R., Boldt, R. J., Shafer, W. R., & Enns, R. M. (2024). Cross-validation of breeding values and future phenotypes for heifer pregnancy in Red Angus cattle using the LR Method. *Journal of Animal Science, 102*(Suppl. 3).
11. Gondro, C. (2024). Climate change adaptation and mitigation in livestock production systems. [Invited presentation]. *2024 Korean Animal Big Data Research Initiative Symposium*.
12. Gondro, C. (2024). Enviromics and traceability for genetic evaluation and production in livestock. [Invited presentation]. *Breeding for Resiliency – 2024 RDGP Symposium*.
13. Gondro, C. (2024). Genetic evaluation with sequence data: Where do we go from here? [Invited presentation]. *4th CNU International Conference on Convergence and Innovation Technology*.
14. Griffin, M. L., Speidel, S. E., Place, S. E., Stackhouse-Lawson, K. R., Holt, T. N., Giess, L. K., Zuvich, M. L., & Enns, R. M. (2024). The relationship between pulmonary arterial pressure phenotypes and oxygen consumption in beef cattle. *Journal of Animal Science, 102*(Suppl. 3).
15. Kukor, I. R., Enns, R. M., Holt, T. N., Cleveland, M., Sardella, G., Holland, B. P., Word, A. B., Ellis, G., Theurer, M., & Speidel, S. E. (2024). Breed differences within heart scores of fattening feedlot cattle. *Journal of Animal Science, 102*(Suppl. 3).
16. Lee, H., Lourenco, D., Bussiman, F., Misztal, I., & Hidalgo, J. (2024). Genomic prediction accuracy for crossbred animals using different reference populations. In *Proceedings of the Beef Improvement Federation*.
17. Lindholm-Perry, A. K., Kuehn, L. A., Freetly, H. C., Oliver, W. T., Neville, B. W., Crouse, M. S., Thorson, J. F., Wells, J. E., & Keel, B. N. (2024). Why are some cows skinny? An evaluation of stress and immune factors. *Journal of Animal Science, 102*(Suppl. 3):88. [Abstract]
18. Shaffer, W., Moreno, J. A. H., Bello, N. M., Weaber, R., Bormann, J., & Rolf, M. M. (2023). Modelling phenotypic plasticity relative to a temperature humidity index as an indicator of adaptability in beef cattle. In *Proceedings of the 12th World Congress on Genetics Applied to Livestock Production (WCGALP)* (pp. 1701–1704). Wageningen Academic Publishers, Rotterdam, the Netherlands.
19. Shaffer, W., Moreno, J. A. H., Bello, N., Noland, R., Bormann, J., Weaber, R., Krehbiel, C., Calvo-Lorenzo, M. S., Richards, C., Place, S. E., DeSilva, U., Kuehn, L. A., & Rolf, M. M. (2023). Genetic parameters for dry matter intake in beef cattle as a function of water restriction: Insights into environmental sensitivity and genetic-by-environment interactions. *Journal of Animal Science, 101*, 349–350. [Abstract]
20. Speidel, S. E., Enns, R. M., Thomas, M. G., Kukor, I. M., & Holt, T. N. (2023). Genetic prediction for bovine congestive heart failure. [Presentation]. *American Simmental Fall Focus*, Denver, CO.
21. Stackhouse-Lawson, K. R., Place, S. E., Raynor, E. J., Carvalho, P. H. V., Mesa, I., Derner, J. D., Kuehn, L. A., Johnston, M., Enns, R. M., Schilling-Hazlett, A. K., & de Vargas, J. J. (2024). What we have learned and are still learning about enteric methane emission measurements in extensive grazing environments. *Journal of Animal Science, 102*(Suppl. 3).
22. Temp, L., Brunes, L., Magnabosco, C., Hidalgo, J., Lourenco, D., & Baldi, F. (2024). Impact of the use of metafounders and unknown parent groups on prediction accuracy in reproductive traits in Nellore cattle. In *Proceedings of the Beef Improvement Federation*.
23. Torres-Quijada, I. F., Speidel, S. E., Bryant, T. C., Retallick-Riley, K. J., Szasz, J. I., & Enns, R. M. (2024). The relationship of heart score with hot carcass weight and fat depth in Angus cattle. *Journal of Animal Science, 102*(Suppl. 3).
24. Trujano, Z., Hidalgo, J., Retallick, K. J., Garcia, A., Lourenco, D., & Misztal, I. (2024). Impact of genomic selection for growth on feet and leg structure in Angus cattle. *Journal of Animal Science, 102*(Suppl. 3):49–50.
25. Zuvich, M. L., Enns, R. M., Wilson, R., Woerner, D. R., Theurer, M., Cleveland, M., & Speidel, S. E. (2024). Preliminary heritability estimates of liver abscess incidence in beef-on-dairy heifers. *Journal of Animal Science, 102*(Suppl. 3).