- Angus Australia -

Research and Development Collaboration

Research and Development (R&D) collaboration involving Angus Australia has led to the availability of world-leading innovative genetic improvement methods and tools for the Australian beef industry. Angus Australia is committed to leading and participating in ongoing R&D which is vital for the future advancement of beef production in Australia.

Angus Australia and our members highly value collaboration with many leading research organisations, particularly in the development and improvement of genetic knowledge, tools and technologies. This collaborative research is largely focussed on the utilisation of Angus Australia's comprehensive phenotype, pedigree and genotype database, harnessing additional benefit from the collective investment of Angus Australia members over time, and specific projects such as Angus Sire Benchmarking program.

The following outline lists current research priority areas, R&D collaborators along with their areas of research, acknowledgment of co-funding and in-kind contributions and examples of related scientific publications.

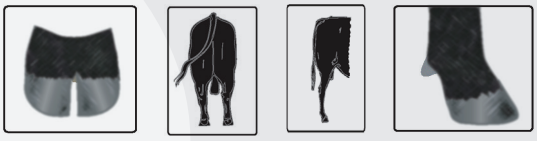
Current priority areas of R&D for enhanced understanding and application

Breeding Female Productivity Including:

Fertility

Longevity

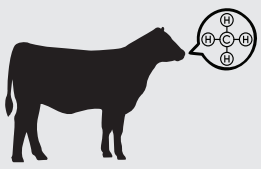
Body Composition



Structural Soundness

Eating Quality

Health, Welfare and Immune Competence



Methane Emissions

Climate Resilience and Adaptation

Global Benchmarking of Angus Genetics Across Countries

Optimal Use of Genomic Technology

Australian Angus Reference Population Program

The Australian Angus Reference Population Program, also referred to as the Angus Sire Benchmarking Program (ASBP), is the major research initiative of Angus Australia.

The objective of the program is to:

"Grow the comprehensive phenotype and genotype reference population on contemporary Australian Angus animals, particularly for hard-to-measure traits, for enhanced genetic evaluation, collaborative research and innovative development."

The program commenced in 2010 with the resulting data underpinning much of the collaborative R&D undertaken by Angus Australia. The program aims to join between 30 and 40 Angus sires a year to approximately 2,000 Angus cows using fixed time artificial insemination. The Angus cows are located across several commercial focussed co-operator herds spanning Northern to Southern New South Wales and Victoria.

The Angus sires that enter the program are nominated by Angus breeders and selected based on estimated breeding values, genetic diversity and influence on the Australian Angus population.

Their progeny are genotyped and comprehensively phenotyped from birth to slaughter in the steer progeny and birth to first parity in the heifer progeny. The phenotypes cover the areas of calving ease, growth, temperament, immune competence, heifer reproduction, structure, coat type, feed efficiency, abattoir carcase and beef quality attributes.

AngusSire™ Benchmarking Program

R&D co-funding and in-kind contributions

Angus Australia acknowledges much of the R&D would not be possible without co-funding and/or in-kind contributions provided by various collaborating R&D organisations or industry bodies.

Examples include the co-funding provided through the Meat and Livestock Australia Donor Company (MDC) for the Angus Sire Benchmarking Program (P.PSH.0528 and P.PSH.1172), And the Enhancing Technology Adoption Through the Angus Genetic Improvement Pipeline (P.PSH.1063) project which includes education resource and tool development for enhanced genetic gain.

Angus Australia also acknowledges the significant contributions from Angus breeders particularly for the provision of data that is included in many of the research projects.

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MEAT & LIVESTOCK AUSTRALIA

Research and Development Collaborators

Following is a list of current R&D collaborators and their areas of research.

AbacusBio

- Development of selection Indexes for Angus commercial heifer and steer selection tools

Agricultural Business Research Institute (ABRI)

- Genome wide association study of carcase quality traits in Australian Angus beef cattle

American Angus Association (AAA)

- Development of Angus Beef Tenderness Genetic Evaluation
- Development of Combined Genetic Evaluation of Foot Score for Angus Cattle in America, Canada, Australia and New Zealand
- Development of International Genetic Evaluation of Growth and Carcase Traits for Angus Cattle in America, Canada, Australia and New Zealand

Charles Sturt University (CSU)

- Evaluating 'days to conception' as an indicator of fertility in beef cattle for genetic improvement.
- Investigating the relationship between marbling score, muscling and meat yield in Angus cattle.
- Investigating factors influencing health, performance and welfare of Australian beef cattle, and application of faecal microbiome profiling in production systems.

NSW Department of Primary Industries (NSW DPI)

Phenotypic and genetic relationships between retail beef yield, live animal and carcase traits.

University of Adelaide

Addressing key issues affecting compliance rates of pasture fed cattle in Southern Australia.

Animal Genetics & Breeding Unit (AGBU)

- Trans-Tasman Beef Cow Profitability Project
- The genetic improvement of eating quality and yield through Advanced Livestock Measurement Technologies (ALMTech)
- Calculation of SNP Allele Frequencies for Use in "Breed Composition" QA Checks
- Testing Improved Single Step Genetic Evaluation Models
- Transition to Single Step Methodology for Threshold Traits
- Testing dam effects for gestation length in the BREEDPLAN evaluation
- Testing Improvements to Genomic Quality Control Software
- Developing a New Reproductive Model by Incorporating AI Conception Rate
- Investigation into optimum polygenic and genomic weights and associated variance components in the TransTasman Angus Cattle Evaluation
- Re-estimating genetic parameters for the Trans-Tasman Angus Cattle Evaluation

Commonwealth Scientific and Industrial Research Organisation (CSIRO)

- Immune Competence Definition, Genetic Parameters and Research Breeding Values for Australian Angus Cattle
- Cost effective DNA pooling strategies to drive genetic gain in the livestock industries
- ImmuneDEX: Update GEBVs with Cohort 7 Carcase Data and Cohort 8 and 9 Immune Competence Data
- Genomic based Decision Support Tool for feeder cattle drafting, selection and management involving Immune Competence, Growth and Carcase Traits
- Development of SteerSELECT and HeiferSELECT Genomic Products
- Development of an ultra-small SNP panel for unique genotype profile
- Development of Angus breed verificationcgenomic tool
- Methods to include commercial data in the Angus Australia genomics reference population

University of New England (UNE)

- Understanding and Improving Genetics for Meat Quality in Beef Cattle
- Micro-environmental sensitivity in extensive beef systems
- Development of Mature Body Condition and Mature Cow Height Research Breeding Values
- Development of Coat Type Research Breeding Values.
- Development of Female Longevity Research Breeding Values.
- Development of efficient genomic imputation pipelines.

University of Queensland (UQ)

Assessing Angus Fertility Genetics in Northern Australian Environments.

Scientific Publications

Angus Australia encourages collaborative research, where appropriate, to be presented at relevant conferences and submitted to prestigious scientific publications, which importantly includes rigorous peer review processes. Following are references to recently published papers based on collaborative R&D with Angus Australia.

C J Duff, J H J van der Werf, P F Parnell, S A Clark, **Comparison of two live-animal ultrasound systems for genetic evaluation of carcass traits in Angus cattle**, Translational Animal Science, Volume 5, Issue 1, January 2021, txab011, https://doi.org/10.1093/tas/txab011

Brad C Hine, Amy M Bell, Dominic D O Niemeyer, Christian J Duff, Nick M Butcher, Sonja Dominik, Aaron B Ingham, Ian G Colditz, **Immune competence traits assessed during the stress of weaning are heritable and favorably genetically correlated with temperament traits in Angus cattle**, Journal of Animal Science, Volume 97, Issue 10, October 2019, Pages 4053–4065, https://doi.org/10.1093/jas/skz260

Brad C Hine, Amy M Bell, Dominic D O Niemeyer, Christian J Duff, Nick M Butcher, Sonja Dominik, Laercio R Porto-Neto, Yutao Li, Antonio Reverter, Aaron B Ingham, Ian G Colditz, **Associations between immune competence phenotype and feedlot health and productivity in Angus cattle**, Journal of Animal Science, Volume 99, Issue 2, February 2021, skab016, https://doi.org/10.1093/jas/skab016

Antonio Reverter, Brad C Hine, Laercio Porto-Neto, Yutao Li, Christian J Duff, Sonja Dominik, Aaron B Ingham, **ImmuneDEX: a strategy for the genetic improvement of immune competence in Australian Angus cattle**, Journal of Animal Science, Volume 99, Issue 3, March 2021, skaa384, https://doi.org/10.1093/jas/skaa384

Torres Vázquez, JA, Duijvesteijn, N, van der Werf, JHJ, Clark, SA. **Longitudinal analysis of body weight and average daily feed intake during the feedlot test period in Angus cattle**. J Anim Breed Genet. 2020; 137: 281– 291. https://doi.org/10.1111/jbg.12439

José Antonio Torres-Vázquez, Julius H J van der Werf, Samuel A Clark, **Genetic and phenotypic associations of feed efficiency with growth and carcass traits in Australian Angus cattle**, Journal of Animal Science, Volume 96, Issue 11, November 2018, Pages 4521–4531, https://doi.org/10.1093/jas/sky325

Herd R. M., Arthur P. F., Hegarty R. S., Bird-Gardiner T., Donoghue K. A., Velazco J. I. (2020) **Predicting metabolisable energy intake by free-ranging cattle using multiple short-term breath samples and applied to a pasture case-study**. Animal Production Science 61, 381-389. https://doi.org/10.1071/AN20162

Alvarenga F. A. P., Bansi H., Dobos R. C., Austin K. L., Donaldson A. J., Woodgate R. T., Greenwood P. L. (2020) **Performance of Angus weaner heifers varying in residual feed intake-feedlot estimated breeding values grazing severely drought-affected pasture**. Animal Production Science 61, 337-343. https://doi.org/10.1071/AN20152

Hebart M. L., Lee S. J., Pitchford W. S. (2020) **The benefits of carcass estimated breeding values for pasture-finished cattle are not as great as for long-fed cattle**. Animal Production Science 61, 326-332. https://doi.org/10.1071/AN20153

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Interested to know more including opportunities to collaborate?

If you are interested to know more about Angus collaborative R&D programs, including opportunities to partner in R&D initiatives, please contact Christian Duff, Strategic Project Manager, P: 02 6773 4620, M: 0457 457 141 or E: christian@angusaustralia.com.au

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