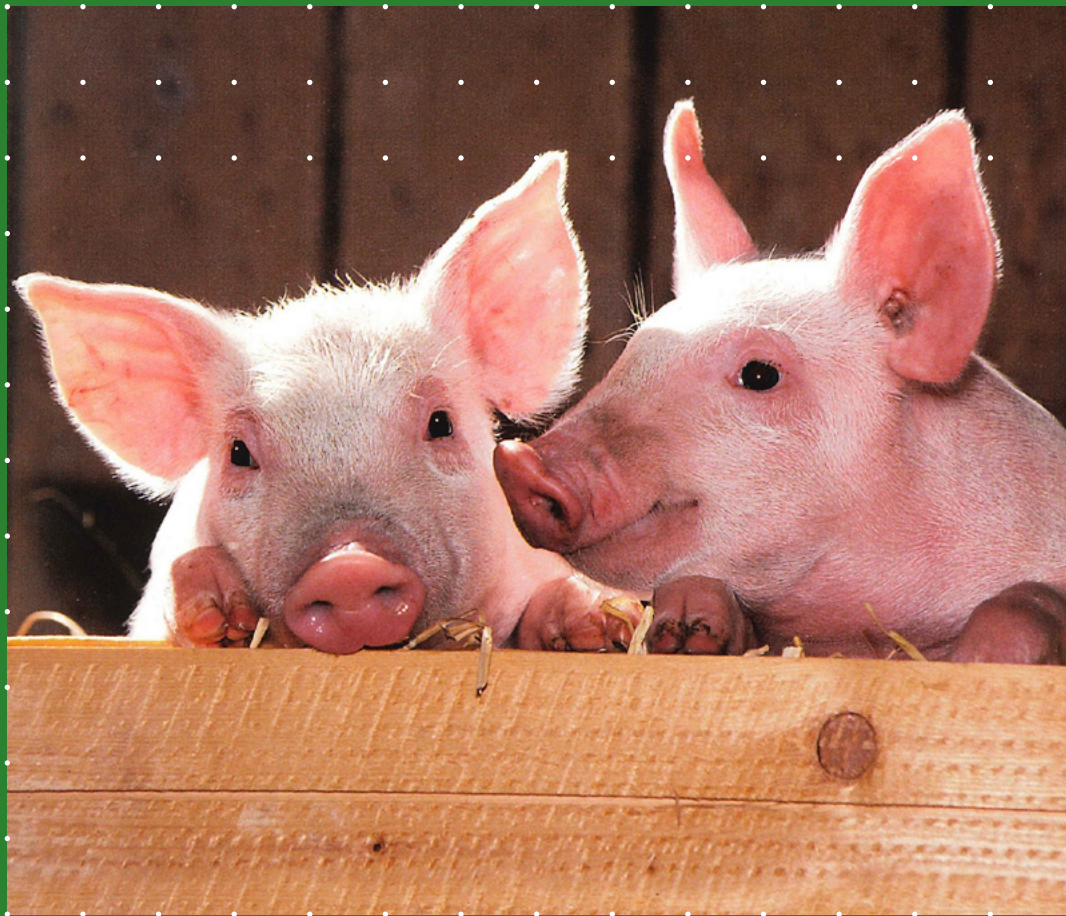


APRIL ANNUAL REPORT 2023



Australasian
Pork Research
Institute Ltd
APRIL

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WELCOME TO APRIL

THE AUSTRALASIAN PORK RESEARCH INSTITUTE LIMITED (APRIL) IS A NOT-FOR-PROFIT (TAX EXEMPT) COMPANY LIMITED BY GUARANTEE THAT OPERATED THE CRC FOR AN INTERNATIONALLY COMPETITIVE PORK INDUSTRY FROM JULY 2005 TO JUNE 2011. THIS WAS THEN SUCCEEDED BY THE CRC FOR HIGH INTEGRITY AUSTRALIAN PORK (PORK CRC LTD) THAT CEASED ITS ACTIVITIES ON 30 JUNE 2019.

BACKGROUND

APRIL was succeeded by the CRC for High Integrity Australian Pork (Pork CRC Ltd.), which completed its objectives on 30th June 2019.

The CRC for an Internationally Competitive Pork Industry and the CRC for High Integrity Australian Pork have delivered on research, education, training and commercialisation objectives to deliver a wide range of relevant research outcomes for the Australasian pork industry.

In total, these CRC programs represented a combined total investment of more than \$210 million into the pork industry. Their establishment reinvigorated pork industry research and development and education and training in Australasia and demonstrated the value of collaborative research investment to pork producers and allied businesses associated with the value chain.

In addition to research outcomes directly applicable on farm and post-farm gate, the CRCs have delivered numerous commercial outcomes that will generate financial returns to APRIL into the future.

In 2014, the Pork CRC Ltd. Board began discussions on a transition model after 30 June 2019. Industry acknowledged a need beyond the Pork CRC for continued investment in collaborative activities in research and development, education and training,

and commercialisation, to continue the legacy of the two Pork CRC programs and complement Australian Pork Limited's work.

Australian Pork Limited, representing Australian pork producers, along with the New Zealand Pork Industry Board, allied pork industry businesses, and tertiary and research organisations, determined that APRIL was an appropriate vehicle to continue these activities. As such, APRIL adds additional expertise and benefits to the Australasian pork industry through its diverse and broader base of membership that includes all sectors participating in the pork value chain.

Since 2019, associated with the Board's approval of APRIL's first Strategic Plan 2019–2022, APRIL has developed a solid collaborative investment portfolio that has been driven by end-users for the benefit of the Australasian pork industry. Resources associated with research and development, education and training, and commercialisation activities have been invested to ensure value chain sustainability and delivery. In turn, APRIL has successfully leveraged more money into the pork industry for these activities.

This document draws on outcomes of the consultation process to define the strategic directions for APRIL from 2022 until 2025. These directions pertain to key operational elements of the APRIL business as well as research, education and training, and commercialisation initiatives.



VISION

APRIL will be a vehicle for change and innovation in the Australasian pork industry by:

- Working collaboratively with its Members and stakeholders to propose, address and solve key issues of concern and relevance for the Australasian pork industry.
- Successfully delivering innovative solutions and outcomes for the Australasian pork industry.
- Contributing to successful education and training programs that sustain the Australasian pork industry and engage future generations.
- Creating and fostering commercialisation opportunities that enhance end-user benefits.
- Enriching its membership and investment portfolio to ensure future security in delivering its objectives.
- Supporting Australian Pork Limited and the New Zealand Pork Industry Board in building an industry shared vision to enable a thriving pork industry.

MISSION

Be a thought leader in the Australasian pork industry, to undertake new and high priority research and development, education and training, and commercialisation activities for the profitability and sustainability of the industry.

**THE PORK INDUSTRY HAS ACKNOWLEDGED
THE NEED FOR CONTINUED INVESTMENT IN
COLLABORATIVE RESEARCH AND DEVELOPMENT
SO APRIL WILL INVEST IN AND MANAGE:**

- **COLLABORATIVE RESEARCH AND DEVELOPMENT**
- **EDUCATION AND TRAINING**
- **EXPLORE COMMERCIALISATION OPPORTUNITIES**

**FOR THE BENEFIT OF THE AUSTRALASIAN
PORK INDUSTRY**

MESSAGE FROM THE CHAIR



HAVING A 'FIT FOR PURPOSE' APRIL AS A PART OF A VIBRANT AUSTRALASIAN PORK INDUSTRY ASSISTS IT IN DEALING WITH BOTH EXTERNAL AND INTERNAL PRESSURES, AS WELL AS THE OPPORTUNITIES, THAT PRESENT THEMSELVES. WE CONTINUE TO DO GOOD WORK ON BEHALF OF THE PORK INDUSTRY AND ARE A FUNDAMENTAL CONDUIT IN PROVIDING R&D, EDUCATION AND TRAINING, AND COMMERCIALISATION FOR THE INDUSTRY'S BENEFIT. I INVITE YOU TO READ THIS ANNUAL REPORT TO SEE HOW OUR PAST, PRESENT, AND FUTURE PROJECTS AND ACTIVITIES ARE POSITIVELY INFLUENCING OUR INDUSTRY.

Another challenging year has come and gone for the pork industry, and whilst previous industry shocks such as Japanese Encephalitis virus and floods were mostly absent during the reporting period, the industry needs to remain vigilant as to what the future may present. The omnipresent threats posed by Foot and Mouth Disease and African Swine Fever so close reminds us that consideration of the whole value chain is crucial for the future sustainability and viability of the pork industry.

I was pleased to be part of a joint APRIL-APL Board meeting in February 2023, where Directors met to charter ways forward for the benefit of the pork industry. I would like to thank everyone for attending and participating in the meeting, and in particular Margo Andrae, APL CEO, and Andrew Baxter, Chair of APL, for hosting the APRIL Board and staff. Agreement on the preparation of an industry "Green Paper" and a Working Group aimed at harmonising functions and efficiencies between APRIL and APL, were pleasing to see, and I look forward to seeing the outcomes of both.

As such, and as I mentioned in my report last year, we collectively need to be prepared and proactive in continuing to set an ambitious R&D agenda that keeps taking the industry ahead. The "Green Paper" is one such mechanism, but I will continue to encourage researchers, students, and industry personnel and bodies to seek ways to transform our pork industry so that it remains viable and profitable into the future. I see APRIL continuing to collaborate with all stakeholders to ensure that good decisions are made that benefit all.

In the reporting period, the Board continued to discuss ways in which the current operating model of APRIL may be adjusted to ensure it can operate effectively into the future. Currently, the Australasian Pork Research Institute Ltd. (APRIL) operates under a Membership model, and this has worked pretty well since APRIL's inception.

The APRIL Board thinks we can improve effectiveness and continue to build APRIL by moving to a more collaborative "Participants' Model", that should have greater scope to tailor specific participation levels to suit the needs of organisations that want to work with us. If you think of our current Members, they are pork processors and producers, the major industry body in APL, technical services companies, advocacy groups, and education and research organisations. What each wants out of APRIL obviously varies between the current Members. Having greater scope to cater to the individual needs of participating organisations will increase APRIL's value to those organisations, and attract greater participation. This is a key plank in the new Strategic Plan, 2022–2025, that sets APRIL on its next path and strives to ensure stakeholders can continue to support APRIL.

**HAVING GREATER
SCOPE TO CATER TO
THE **INDIVIDUAL NEEDS**
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ORGANISATIONS WILL
**INCREASE APRIL'S
VALUE TO THOSE
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ATTRACT GREATER
PARTICIPATION****

Thanks to the members of the Board who unreservedly provide good leadership and governance. At the Annual General Meeting in November 2022, which incidentally was the first face-to-face event for 3 years, Dr Robert van Barneveld (SunPork Group) and Professor Frank Dunshea (The University of Melbourne) were re-elected as Member-Nominated Directors to serve further terms on the APRIL Board. I am also pleased that Su McCluskey, Audit Committee chair, will serve a further term as an Independent Director on the Board.

I would like to thank Margo Andrae for her services and contributions on the APRIL Board over the last 3 ½ years. Margo was one of two APL-nominated Directors on the APRIL Board. We now welcome Professor Bronwyn Harch and Ms Gail Owen as the two APL-nominated Directors, and look forward to their contributions.

Thanks also to Dr John Pluske, Dr Charlie Rikard-Bell, Geoff Crook and Dr Sophie Ward, who continue to work as an excellent team delivering the APRIL program, and to APL for their ongoing support. We are also privileged to have excellent researchers, students, technicians and support staff who engage with us to seek outcomes to problems that continue to challenge the industry. I again acknowledge their dedication to Australia's pork industry.

Finally, but not least, the ongoing support of our Members is paramount to enable our future success. I am pleased to commend this Annual Report to you, and invite each of you to read it and see how our past, present and future projects and activities are influencing our industry.

Dr Tony Peacock



MESSAGE FROM THE CEO



THE REPORTING YEAR 2022–23 HAS SEEN APRIL CONTINUE WITH ITS OVERALL PURPOSES OF INVESTING AND PARTICIPATING IN COLLABORATIVE, INNOVATIVE, TIMELY AND EFFECTIVE RESEARCH AND DEVELOPMENT, EDUCATION AND TRAINING, AND COMMERCIALISATION ACTIVITIES FOCUSED ON PRIORITIES AND DELIVERABLES TO ENSURE THE SUSTAINABILITY OF AUSTRALASIAN PORK PRODUCTION.

The easing of Covid restrictions prior to 1 July throughout the country meant that several studies that were markedly impacted by Covid could commence/resume during the reporting period. This was very welcome news. The researchers, technical/support staff, and (or) students involved in these projects are to be thoroughly commended for their efforts to keep things happening, which allowed for a number of Final Reports to be completed and received by APRIL by 30 June 2023.

All Final Reports and Project Summaries are accessible through the website (available at <https://apri.com.au/research/project-reports/>) and will continue to be placed on there as and when they become available, subject to any confidentiality restrictions.

In February 2023, the Boards of both APRIL and APL came together in Canberra to discuss matters of mutual relevance, and to charter ways forward in these areas for the benefit of the pork industry. Of significance, the Boards agreed to move ahead with the preparation of an inaugural 'Green Paper' for identifying major issues confronting the industry that can be addressed through investments in research and development by both organisations. The Boards also agreed to form a Working Group, with representation from both organisations, to establish ways that maximise the benefits that APRIL and APL can both bring for the betterment of the industry.

An open and competitive call for Innovation Projects, with up to \$750,000 available, closed on 12 December 2022. A total of 17 proposals was received, and at its meeting in February 2023, the APRIL Board approved eight new Innovation Projects following recommendations put forward from the Research and Development Advisory Committee. These projects included the investigation of nutritional strategies to increase intramuscular fat, whether the provision of silage at weaning can improve sow welfare and subsequent reproduction, a study examining the automatic adjustment of gestating sow live weight in electronic sow feeders, and understanding the impact of climate on the boar and progeny through sperm non-coding RNA.

As with all APRIL-supported projects, we look forward to the outcomes and how they might benefit the pork industry.

To further build human capacity for the pork industry, a key goal for APRIL, alongside Australian Pork Limited, is investment in education and training. During the reporting period, APRIL continued to support a number of postgraduate scholarship awards at Australian universities. Following a call for applications in late 2022/early 2023, PhD 'top-up' award scholarships were granted to three University of Queensland students, being Abedin Abdallah (for PhD studies examining aspects of tail biting in pigs raised with intact tails), Xianyi Liu (for PhD studies investigating a novel feed formulation to ensure efficient feed digestion and nutrient absorption, and supporting gut microbiota development to reduce the incidence of post-weaning diarrhoea), and Viet Hai Tran (for PhD studies aiming to modulate the gut microbiota by designing diets to optimise early post-weaning feed intake and digestion). I wish these students all the best in their studies.

Several DVM (Doctor of Veterinary Medicine) project reports were received during the reporting period from students at The University of Sydney, both supervised by Associate Professor Ros Bathgate. Bianca Hatze conducted a project titled, *Alternate methods to detect and quantify urocanic*

acid in domesticated pig (Sus domesticus) blood serum, which explored alternate methods to detect and quantify cis- and trans- urocanic acid (UCA), a chemical associated with mechanisms of seasonal reproductive control in sows (and other animals). Ryan Kristen conducted a project titled, *Characterising farrowing and piglet viability using a modified APGAR scoring system to predict piglet performance*, which examined the use of an APGAR (Appearance, Pulse, Grimace, Activity and Respiration) scoring system to predict piglet survival and the effects on growth performance.

At The University of Adelaide, Honours' student Kaitlin Beltakis completed a project as part of her Bachelor of Health and Medical Sciences degree, titled *The effect of granulocyte-macrophage colony-stimulating factor on the fertility of extended boar semen*, which examined whether this compound could influence sperm function during this period.

The APRIL website allows student project reports to be accessed; please visit <https://apri.com.au/student-project-reports/>, if you are interested.

In support of industry training, APRIL was pleased to announce Samantha Sterndale (Westpork Pty Ltd.) as an additional Industry Placement Program (IPP) awardee, joining Dr Max Muller (The University of Queensland) and Dr Nandi van Wyk (Apiam Animal Health/Portec) in the program. The Board's continued support of the IPP assists with production- and science-based training for the benefit of the pork industry.

The Stakeholders' Forum in November 2022, in Melbourne, offered the first opportunity for stakeholders to come together in person for numerous years. As always, the Forum provided an excellent opportunity for exchange and communication of APRIL's activities and future plans, with more than 65 registrants attending. The forum was opened by APRIL Chair Dr Tony Peacock, who commented that it had been yet another challenging year with floods and outbreaks of Japanese Encephalitis Virus, reminding the audience that consideration to the whole value chain is crucial for the pork industry.

Presentations were then heard from David Henman [Rivalea (Australia) Pty Ltd.], Dr Valeria Torok (SARDI/Fight Food Waste-CRC), and Dr Megan Lucas (The University of Melbourne), who provided updates on current projects. Professor Sam Abraham (Murdoch University) delivered a timely update, *Antimicrobial resistance: where is the pork industry at?*, and this was followed by Dr Rebecca Athorn (APL) who gave registrants an overview of APL's current research and innovation portfolio.

Dr Maria Jorquera Chavez, an IPP awardee who commenced her placement in February 2021 as a Research Scientist at Rivalea (Australia) Pty Ltd., then provided a summary of her experiences and insights of being part of this program.

Continuing on from the theme set in 2021 with an extensive overview of some of APRIL's commercialisation activities, the next session featured Dr. Mathew Lucas (DCC), who spoke on Intellectual Property management, Dr Jamie Flynn (Hone), who provided a summary of the possibilities of hand-held NIR devices for grain quality assessment, and Dr Kate Plush (SunPork Solutions), who summarised a recent study

examining the impacts of pellet size for piglet enrichment. A comprehensive Commercialisation Report from Dr Charles Rikard-Bell (Manager, Commercialisation and Research Impact) can be found later in this Annual Report.

As mentioned in last year's Annual Report, a research consortium was successful in being awarded a Cooperative Research Centre-Project (CRC-P) from the Australian Government, *Eliminating pig tail removal to improve welfare and industry sustainability* (Tails CRC-P). Partners in the project, with SunPork Pty Ltd. as the Lead Applicant, include APRIL, Australian Pork Limited, The University of Melbourne, the University of New England, The University of Queensland, PIC Australasia Pty Ltd., Rivalea (Australia) Pty Ltd. and RSPCA Australia. At the 2022 Stakeholders' Forum, Dr Darryl D'Souza (SunPork), Dr Sophie Ward (APRIL), and Rutu Galea (The University of Melbourne), gave insights and updates on this important industry project.

This was followed by Dr Weicheng Zhao (The University of Melbourne) who discussed aspects of his PhD work investigating the effects of gestational heat stress in sows.

A new initiative from APRIL in 2022–23 was the APRIL Enterprise Award. This award was developed to promote innovation and excellence in one or more of the following themes, i.e., innovations resulting in new products, new methodologies, new services, the potential for accelerated adoption of an innovation to improve performance and efficiency, and the potential for commercialisation opportunities through APRIL.

Dr Bryony Tucker (PIRSA-SARDI) was the winner of the inaugural Enterprise Award for her sow lactation pump, a device that has potential to improve the ease of collecting colostrum and milk from a sow to assist piglet survival and growth.

A number of organisations ceased their memberships with APRIL during 2022–23. I would like to thank Anatara Lifesciences Ltd., New Zealand Pork, and the University of New England for supporting APRIL over the years. We look forward to continuing our relationships with current Members for 2023–24.

In this respect, it is important that APRIL continues to change and evolve such that it is able to contribute positively to the pork industry in the years to come. This was identified in the new Strategic Plan approved by the Board in April 2022, and will continue to be a focus in the coming reporting period.

Finally, I am highly appreciative to the APRIL staff in Dr Charles Rikard-Bell, Mr Geoff Crook (Company Secretary) and Dr Sophie Ward for their efforts to assist with APRIL's functions and objectives. I would also like to thank staff at Australian Pork Limited, and in particular Glenn Eppelstun, Kylie Chapman, Rebecca Davey, Kelly Goh, Dimitra Lyras and Margo Andrae, for their assistance and advice in assisting APRIL in 2022–23.

Many thanks, also, to the APRIL Chair Dr Tony Peacock and fellow Directors for their support, feedback and encouragement during the year.

Dr John Pluske
Chief Scientist and CEO, APRIL

**IN SUPPORT
OF INDUSTRY
TRAINING, APRIL
WAS PLEASED
TO ANNOUNCE
SAMANTHA
STERNDALE
(WESTPORK
PTY LTD.) AS
AN ADDITIONAL
INDUSTRY
PLACEMENT
PROGRAM (IPP)
AWARDEE, JOINING
DR MAX MULLER
(THE UNIVERSITY
OF QUEENSLAND)
AND DR NANDI
VAN WYK (APIAM
ANIMAL HEALTH/
PORTEC) IN
THE PROGRAM.
THE BOARD'S
CONTINUED
SUPPORT OF THE
IPP ASSISTS WITH
PRODUCTION- AND
SCIENCE-BASED
TRAINING FOR THE
BENEFIT OF THE
PORK INDUSTRY**

STRATEGIC PL

DURING THE YEAR, AFTER AN EXTENSIVE CONSULTATION PROCESS WITH STAKEHOLDERS, THE BOARD APPROVED A NEW STRATEGIC PLAN.

KEY OBJECTIVES OF APRIL

TO ACHIEVE APRIL'S VISION AND MISSION, APRIL HAS DEFINED THE FOLLOWING KEY OBJECTIVES THAT FORM THE FOUNDATIONS OF APRIL'S STRATEGIC PLAN (2022–2025):

Be a **thought leader, strategic enabler,** and **strategic co-funder** of research and development, education and training, and commercialisation activities for the benefit of the Australasian pork industry.

Act as a **catalyst for innovation** in the Australasian pork industry through **strategic investments** in research and development, education and training, and commercialisation activities.

Manage income arising from commercialisation activities, and **generate further** commercialisation activities and income.

Re-invest commercial income in research activities, and education and training, relevant to the Australasian pork industries.

Expand the total pool of funding available for research and development, education and training, and commercialisation.

Assist and be aligned with Australian Pork Limited in **growing the overall science, infrastructure, and human capacity base** in the industry.

AN SUMMARY

CORE VALUES OF APRIL

TO ACHIEVE THESE KEY OBJECTIVES, APRIL WILL APPLY THE FOLLOWING CORE VALUES:

INNOVATION

APRIL always look for industry solutions.

FOCUS

APRIL's members and the Australasian pork industry are its highest priorities.

EXCELLENCE

APRIL strives for the best quality in research and development, education and training, and commercialisation activities and opportunities.

NETWORKS

APRIL will collaborate locally, nationally and internationally to enhance capacity to solve local challenges and meet goals.

OPPORTUNITY

APRIL will take considered risks to achieve desired outcomes.

COMMUNICATION

APRIL will build strong relationships through open communications.

DEDICATION

APRIL staff and the APRIL Board are driven to deliver the APRIL Strategic Plan on behalf of the Australasian pork industry.

APRIL'S STRATEGIC PILLARS

**BASED ON APRIL'S KEY OBJECTIVES AND CORE VALUES,
THE FOLLOWING CORE STRATEGIES HAVE BEEN DEVELOPED:**

PILLAR 1: FURTHER DEVELOPING THE APRIL BUSINESS

ACTIVITIES	KEY OUTCOMES/DELIVERABLES	IMPLEMENTATION
Seek additional investment to deliver APRIL's activities	<ul style="list-style-type: none"> Leverage APRIL investment in research and commercialisation by stakeholder co-investment in applicable projects. Identify external opportunities for co-investment in APRIL activities and where feasible, and where appropriate, drive the bid process. Monitor major external funding programs and strategically apply for funds as an applicant or as a co-applicant with e.g., a member or members: <ul style="list-style-type: none"> Development/submission of at least two major Transformational Projects application (> 5:1 project leverage on APRIL funds) to an external funding body, per annum. Exploit APRIL's 'freedom to operate' and strong collaborative culture among members to seek investment in its project portfolio from non-traditional funding sources. Increase Member and non-Member revenue of APRIL: <ul style="list-style-type: none"> At least two new Ordinary Members by February 2024 (over December 2021 membership). Additional revenue (up to \$100,000 per annum) from non-membership activities, including from external strategic investment of cash reserves. 	<p>Ongoing</p> <p>Ongoing</p> <p>Ongoing</p> <p>Ongoing</p> <p>Ongoing</p>
Nurture and grow collaborative alliances	<ul style="list-style-type: none"> Review member benefits and expectations to ensure APRIL can deliver appropriately and sustain support. Grow relationships/partnerships with relevant investors to advance progress in mutually beneficial activities. 	<p>2022</p> <p>Ongoing</p>
Review operational capability to ensure management efficiency	<ul style="list-style-type: none"> Operational resources and staffing are adequate to ensure all activities can be implemented according to this Strategic Plan. Employees and consultants have effective and sustainable employment arrangements. Suppliers that deliver services to, or on behalf of APRIL, enhance APRIL's ability to operate effectively and without conflict. 	<p>Ongoing</p> <p>Ongoing</p> <p>Ongoing</p>

PILLAR 2: EFFECTIVE MANAGEMENT AND DELIVERY OF RESEARCH AND DEVELOPMENT AND EDUCATION AND TRAINING FOR THE AUSTRALASIAN PORK INDUSTRY

ACTIVITIES	KEY OUTCOMES/DELIVERABLES	IMPLEMENTATION
Review the APRIL R&D activities portfolio	<ul style="list-style-type: none"> Review research investment to ensure an appropriate portfolio of Transformational, Innovation, and Commercialisation Projects, with > 60% of the available funds for R&D directed to Transformational Projects. Ensure research investments are not duplicative, but complementary, with Strategic Plans of APL and NZPIB. Reassessed targets for investment after each funding round and adjust targets accordingly, e.g., balance strategic research domains with research opportunities, enable continuation of completed projects having high potential for industry outcomes, assessment of APRIL commercial income versus direct industry benefits. 	<p>2022, and then annually</p> <p>Annually</p> <p>Annually</p>
Initiate key Transformational Projects for the Australasian pork industry	<ul style="list-style-type: none"> Ensure at least four Transformational Projects, for longer-term, collaborative, inter- and multi-disciplinary 'big picture' projects, are prepared and submitted annually, with major external funding support sought where possible, in priorities to be determined. 	Ongoing
Support for Innovation Projects	<ul style="list-style-type: none"> Funding support annually (20–30% of applicable funds) for smart, innovative and 'out of the box' projects that stimulate change and innovation in the industry and can be a commercialisation pipeline. Change the Innovation Project guidelines to make the (potential) path to commercialisation clearer. 	Annually
Assist with human capacity building in the Australasian pork industry	<ul style="list-style-type: none"> Make annual investments into maintaining and building education and training for the industry, to support undergraduate and postgraduate students and the Industry Placement Program (IPP): <ul style="list-style-type: none"> Offer at least three full scholarship Masters or PhD awards per annum. Four undergraduate students completed an Honours project by June 2022, with at least two Honours students completing a project per year thereafter. Three DVM or BSc/BVMS students completed a project by June 2022, with at least two DVM or BSc/BVMS students completing a project per year thereafter. Four postgraduate students working on APRIL or APRIL-related projects being trained by 2022, and each year thereafter. A minimum of three IPP awardees embedded in industry organisations at any one time. 	Ongoing
Support for Facility Funding	<ul style="list-style-type: none"> Ongoing support for appropriate, diversified and cost-effective facility funding for the Australasian pork industry. 	Annually
Support for Kickstart program	<ul style="list-style-type: none"> Ongoing support for the Kickstart program, to provide funding to assist with the preparation and submission of a specific, targeted and agreed major external funding application (or applications) in partnership with APRIL and other partners. 	Annually
Support for APRIL Enterprise Award	<ul style="list-style-type: none"> Create an annual APRIL Enterprise Award to support on-farm creativity and innovation for practical application. 	Annually

PILLAR 3: INDUSTRY RELEVANT COMMERCIALISATION ACTIVITIES FOR THE AUSTRALASIAN PORK INDUSTRY

ACTIVITIES	KEY DELIVERABLES	IMPLEMENTATION
Be the single point of contact, referral and guidance for commercialisation activity in Australia	<ul style="list-style-type: none"> Formalise an agreement and processes with Australian Pork Limited to become the single point of contact, referral and guidance for commercialisation activities in Australia 	Ongoing
Support a viable, innovative and expanding commercialisation business	<ul style="list-style-type: none"> Effectively continue to manage current commercialisation arrangements to ensure they are sustainable and providing a return to APRIL: <ul style="list-style-type: none"> Commercialisation income > \$450,000 per annum, by 2025. At least one new product/service successfully commercialised and generating revenue for APRIL, by 2025. Conduct a Product Development Scheme program in conjunction with commercial partners to enhance investment and product adoption into the industry, and permit an acceptable financial return to APRIL: <ul style="list-style-type: none"> Three new projects launched by 2025. Reinvest up to \$100,000 per annum into new product development. Maintain the operation and function of the Commercialisation Advisory Panel. Communicate a commercialisation report as a Standing item at each APRIL Board meeting. 	Ongoing
Ensure commercialisation processes are efficient and are generating optimal returns	<ul style="list-style-type: none"> Assess the commercialisation potential of relevant research activities or proposals and develop commercialisation plans for approved projects with commercial potential. Review all existing commercialisation projects and ensure markets with greatest potential are adequately resourced, including potential to exploit overseas markets: <ul style="list-style-type: none"> AusScan (China). Sow Block (USA, Europe). Lawsonia qPCR Test (USA, Europe). Reinvest commercial income from investment in product development in applicable APRIL activities. 	Ongoing
Support for Commercialisation Projects	<ul style="list-style-type: none"> Funding support on a continuous basis for projects that increase APRIL's commercialisation pipeline and lead to greater commercial returns to APRIL and potential benefits to industry. 	Ongoing
Continued engagement with growAG	<ul style="list-style-type: none"> Continue engagement with growAG to promote commercialisation opportunities arising from R&D activities and ad hoc commercial opportunities. 	Ongoing

PILLAR 4: CONNECTING WITH MEMBERS AND THE AUSTRALASIAN PORK INDUSTRY

ACTIVITIES	KEY DELIVERABLES	IMPLEMENTATION
Implement an effective and appropriate communication plan	<ul style="list-style-type: none"> Initiate an appropriate communication framework that effectively disseminates APRIL activities and associated outcomes. 	2022 and reviewed annually
Develop activities that are collaborative and inclusive across the member and stakeholder base	<ul style="list-style-type: none"> All projects to involve at least one Member organisation. Maintain the Board Director-Ordinary Member buddy system to enable one-on-one communication with Ordinary Members (4–5 times annually). Invite Members and key stakeholders to attend the APRIL Annual Stakeholder Day (and other events as appropriate) to extend latest results and receive direct feedback on outcomes and progress. Provide an APRIL update at APL Delegates' Forum events/annual joint APRIL–APL Board discussion (at least once annually). 	Ongoing
Present updates of APRIL's activities and progress at producer and scientific forums	<ul style="list-style-type: none"> Present on APRIL activities and outcomes to representatives of a wide member and producer base in Australia and New Zealand through industry seminars/meetings, and to international conferences and forums (where appropriate): <ul style="list-style-type: none"> Present at a minimum of one international conference per annum, from March 2022. Present at a minimum of two member-based conferences per annum, from March 2022. 	Ongoing
Participate in strategic sponsorship/partnerships	<ul style="list-style-type: none"> Raise and reinforce APRIL's contributions to the Australasian pork industry by providing strategic sponsorship or partnerships (e.g., APSA conference, State field/industry days, member events). 	Ongoing
Keep industry and stakeholders informed of APRIL's activities and outcomes	<ul style="list-style-type: none"> Provide timely and relevant media releases to the rural press including at least 10 articles per annum in the Australian Pork Newspaper/Pork Journal. Write a quarterly newsletter to all members. Conduct strategic/targeted scientific seminars and updates (two per year, from March 2022). Financial support for selected peer-reviewed publications in internationally recognised journals (up to five papers supported per year, to a total value of \$7,500). 	Ongoing
Maintain an independent website for information and promotion of APRIL activities	<ul style="list-style-type: none"> Maintain the APRIL website for communication of research, education and training and commercialisation outcomes, and APRIL news, and maintain links to the Pork CRC website. 	Ongoing
Review and dissemination of project success	<ul style="list-style-type: none"> For applicable projects and where appropriate and robust mechanisms exist, evaluate the return on investment into APRIL for the pork industry. 	Ongoing

COMMERCIAL REPORT



SATION



THE APRIL BOARD DIRECTS COMMERCIAL DECISIONS REGARDING IP AND STRATEGY, SUBSEQUENTLY THE COMMERCIALISATION AND ADOPTION ACTIVITIES ARE REPORTED DIRECTLY TO THE APRIL BOARD. IN TERMS OF COMMERCIALISATION REVENUE AND ACTIVITIES, THE FOLLOWING OUTCOMES AND OPPORTUNITIES WERE ACHIEVED AND/OR DEVELOPED IN THE REPORTING PERIOD:

AUSSCAN ONLINE

The AusScan Online usage in 2022/23 has continued to grow with the highest number of total scans recorded in a financial year to date since the launch in 2015/16. This reporting period, AusScan Online continues to produce value-adding customer reports on cereal grain characteristics for the new harvest. Studies to improve the layer (hen) apparent metabolisable energy (AME) calibration commenced, although the planned *in vivo* work on the pig digestible energy (DE) calibration at The University of Melbourne was further delayed due to the knock-on consequences of COVID-19. The assessment of the Hone Ag hand-held NIR device has progressed well and is expected to be validated in late 2023.

Unfortunately, in this reporting period, the AusScan Online team experienced much sadness with the passing of Chris Piotrowski, on 30 January 2023. Chris was the Director of AB Vista NIR Services, an invaluable member of the AusScan Online Board, and was part of the inaugural AusScan Online meeting held in March 2015 in Australia. A tribute to Chris was published in the March 2023 edition of Australian Pork News.

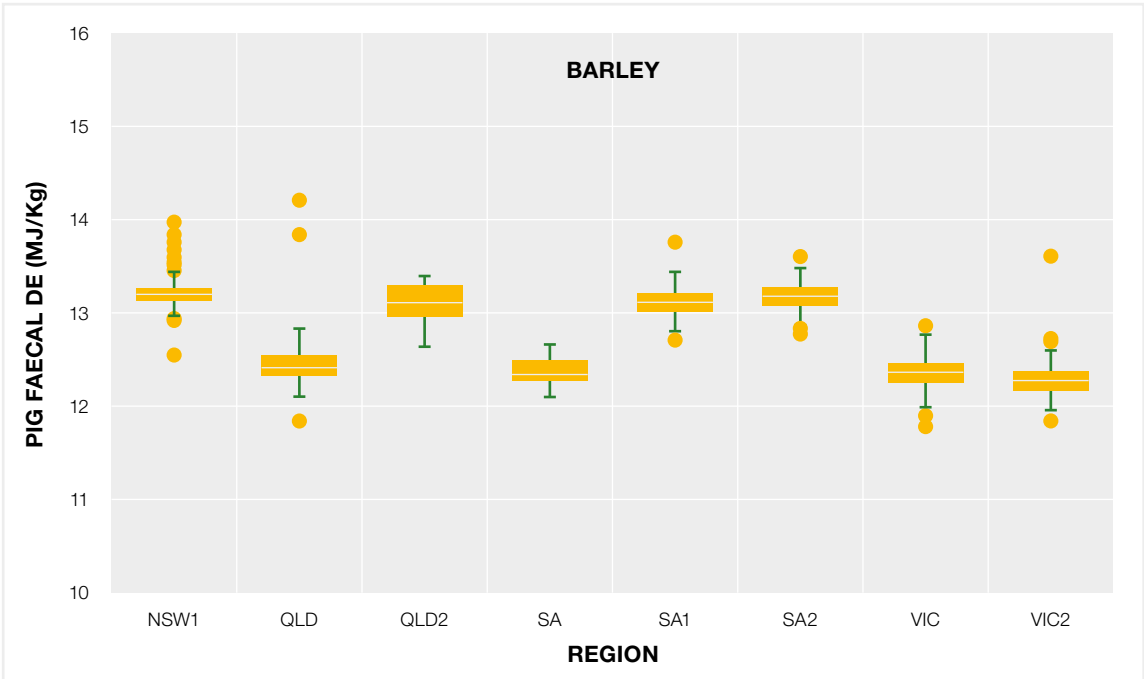
As such, AusScan Online delivered another consistent performance in 2022/23 and remains the major contributor to APRIL’s commercialisation income stream. The record number of scans for 2022/23 included 40,961 from Australian sub-licensors, which is the highest number of scans recorded from this group for the past 5 years exceeding both 2021/22 and 2020/21 by 4.4% and 19.0%, respectively. The global scan numbers reached 42,586, similar to 2021/22 scan numbers (99.0%) and 2020/21 (99.7%).

A strong and consistent feature with AusScan Online was the monthly publication and distribution of the Early Harvest Reports in Australian Pork News, from November 2022 through to April 2023. These reports provided the cereal grain energy values during the transition to new season’s grains. In this reporting period, the ileal:faecal energy ratio was added to the report to help highlight grains that are less efficiently digested and therefore may affect pig performance. The degree of variation for key grain parameters (Figure 1) have been analysed in this reporting period as part of the final summary for the Early Harvest Reports for 2022/23 season. This information provides valuable insights for nutritionists when considering grains from different harvest regions across Australia.

FIGURE 1

The range of pig faecal DE (MJ/kg) values for barley grown in different regions of Australia

Data source: AusScan Early Harvest Reports 2022–23



THE PROJECT INCLUDES FIVE EXPERIMENTS IN WHICH A TOTAL OF 68 GRAINS WILL BE TESTED, SOME OF WHICH ARE REPEATEDLY USED ACROSS THE FIVE EXPERIMENTS SERVING AS “CONNECTIVITY” GRAINS

Both the 2021/22 and the 2022/23 harvests were affected by prolonged periods of rain resulting in sprouting of the grain and subsequent downgrading to feed wheat. The high proportion of weather-damaged grain on the market is likely to be responsible for the recent increased scanning activity. The AusScan Online calibrations are robust and include weather-damaged samples, providing nutritionists with confidence when assessing weather damaged grains.

Additionally, outcomes from a small APRIL study involving 23 samples of wheat grain with varying degrees of sprouting indicated that weather-damaged samples have a similar nutritional value to normal wheat (Figure 2). The study entitled, “Does the falling-number value impact the adjusted digestible energy content of weather-damaged wheats for pigs?”, was submitted to the 2023 Recent Advances in Animal Nutrition in Australia conference, and will be reported in the 2023–24 Annual Report.

The South Australian Research and Development Institute (SARDI) has commenced AME and intake studies to upgrade the AusScan Online layer (hen) calibrations. The project includes five experiments in which a total of 68 grains will be tested, some of which are repeatedly used across the five experiments serving as “connectivity” grains.

The first of five experiments was completed in May 2023, Experiment 2 will be completed in late 2023, with the remaining three experiments to be completed in 2024.

In this reporting period, a comparative study involving the assessment of the Hone Lab Red hand-held NIR device (HLR) and conventional benchtop machines (Foss and Bruker) for accurate prediction of cereal grain energy progressed slower than originally anticipated. However, this will be completed by Q2 of 2024. Preliminary results indicate that the performance of the HLR compares favourably with benchtop machines when predicting

proximate values such as protein, moisture, fat, ash and starch content of grains. Assessing machine performance for grain energy predictions for pig faecal and ileal DE is more complex, but is worth pursuing. In addition to the comparative study, Hone and APRIL will work with the key mills to validate the HLR in a commercial setting.

BARASTOC SWINE BLOCK

In this reporting period there has been some timely changes to the block for 2022–23. The product has been reduced in weight from 20 kg to 15 kg for ease of handling, the packaging now contains attachment points for hanging, and the product has been renamed the Barastoc Swine Block. Sales continue to be strong with a record opening September quarter of 23.0 t, and a total of 46.2 t for the year, which is similar to the 47.0 t marketed in the previous reporting period.

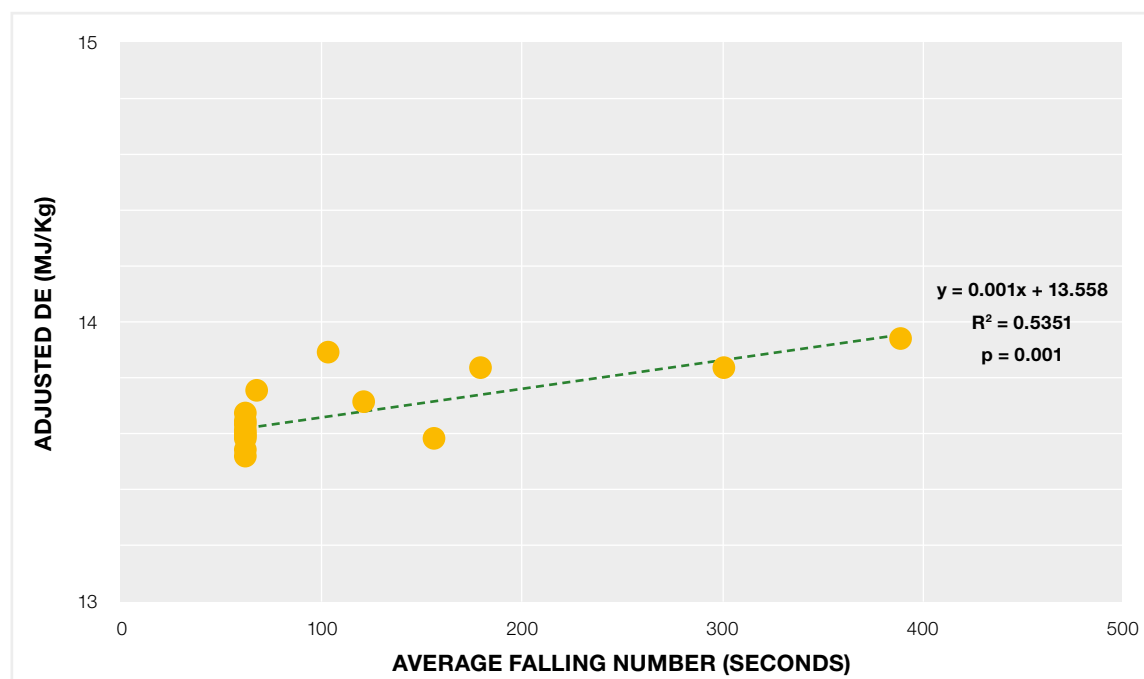
Early results are starting to emerge from the USDA enrichment block research conducted by Dr Jeremy Marchant at the Agricultural Research Station, West Lafayette, Indiana USA. The study used welfare measures on group-housed sows to compare a sow block treatment hung by a chain to a control group which had a suspended chain. The welfare measures included tear stains, lesion scores, bursitis, shoulder sores, respiratory and cleanliness scores. Sows receiving the enrichment block had smaller tear stains which may indicate reduced stress, lower injury scores and cleaner bodies indicating less aggression.

These early findings have been published in the American Society of Animal Science (ASAS) Midwest Section Meeting held in Madison, Wisconsin, in March 2023. Additionally, an abstract entitled, “The effects of a molasses block enrichment on behaviour and welfare of sows post-mixing” was accepted for the 56th Congress of the International Society of Animal Ethology (ISAE), Estonia

FIGURE 2

The calculated Adjusted DE¹ (MJ/kg) with a range of Falling Number values (seconds) for 23 sprouted wheat samples

¹Adjusted DE =
(ileal : faecal DE × DE) +
((DE – (ileal : faecal DE × DE))
× 0.75).



held in August 2023. There is also video analysis expected to be completed towards the end of 2023, which will assess any stereotypical behaviours in treatment and control pens.

Protecting the intellectual property (IP) of the enrichment block in Australasian, European, Canadian and US jurisdictions is a thorough, but slow process. APRIL filed for an international patent (PCT) in January 2016 and currently hold an Australian patent (AU 2016208983 B2, July 2017), and a US patent (US 11,129,396 B2, September 2021) for “product and method for providing enrichment facilitating expression of natural behaviours in pigs”. In this reporting period, APRIL was notified that the divisional patent lodged with the US patent office to include additional behaviour claims is approved, and was published in June 2023. The enrichment block patent is still under examination for the New Zealand, Canadian and European jurisdictions.

APRIL CONTINUES TO WORK WITH AGRIFUTURES TO PRESENT SOME OF OUR **COMMERCIAL PROJECTS AND OPPORTUNITIES** TO A WIDER NETWORK OF INVESTORS, UNIVERSITIES, START-UPS, AND GOVERNMENT AND INDUSTRY BODIES THROUGH THE AGRIFUTURES WEBSITE **GROWAG.COM**

LAWSONIA qPCR

Dr Hugo Dunlop (Apiam) presented updates on the field application of the Lawsonia qPCR test at the Australian Pig Veterinarians Conference in September 2022. Hugo's presentation included some case studies indicating the value of the test as a surveillance tool but also the benefits when applied to assess hygiene, sanitation programs and the efficacy of *L. intracellularis* medication programs. Apiam Animal Health have been providing the test across their clientele, with the test also being available through NSW DPI, Camden.

Use and income were similar to the 2021–22 reporting period.

THE APRIL PIPELINE

The APRIL pipeline has several projects that have potential to be patented and/or commercialised.

1. **Boar taint assessment commercialisation project.**

Boar taint is characterised by an unpleasant odour of cooked pork due to excess levels of androstenone, skatole and indole, typically accumulating in fat and is a significant problem for the pork industry in Australasia and globally. Immuno-castration is an effective management practice but does not fully eliminate the risk of tainted pork entering the market. Early work by the Pork CRC showed that near infrared (NIR) spectrometry technology could differentiate male and female carcasses and showed promise in quantifying the boar taint compounds skatole and androsterone in fat samples.

In June 2023, an APRIL Commercialisation Project (7C–004 *Assessing the use of rapid technologies for the detection of boar taint in carcasses*) commenced with AgResearch New Zealand and freshPork NZ, which was designed to assess the use of technologies including hyperspectral imaging (HIS), NIR, and rapid evaporative ionization mass spectroscopy (REIMS), as potential tools to rapidly detect boar taint compounds at processing, using boars that received or did not receive Improvac. Initial results are encouraging.

2. **Feeding large diameter creep pellets.** This reporting period, SunPork Farms conducted a validation study, 7C–006 *Easing the weaning transition: pellet form and size to reduce the post-weaning growth check*, designed to provide additional behavioural data towards the provisional patent application “Creep Feed Compositions and Uses Thereof”, which was lodged in November 2022. An earlier APRIL-supported project (Study 6A–103) showed positive behavioural changes towards larger pellets and improved intake on large semi moist extruded creep (SMEC) pellets. Validation of these observations will strengthen the case to proceed with a full patent application.

3. **NCG supplementation.** In February 2023, APRIL lodged a provisional patent application “Animal Supplement and Uses Thereof” due to the outcomes from Innovation Project 5A–105: *Oral means of increasing endogenous GH levels and enhancing the performance and carcass characteristics of growing pigs*. The study indicated that supplementation of N-carbamyl glutamate (NCG) to finishing pigs could be a novel strategy to reduce P2 backfat in lean genotypes.

For the patent application, there are data sets for boars and gilts but not Improvac™-treated boars. Commercialisation Project 7C–008 *Commercial evaluation of NCG supplementation on growth performance, carcass backfat and meat quality of finisher pigs*, will investigate the effect of NCG supplementation on growth performance, backfat and meat quality of finisher gilts and Improvac™-treated boars. The outcomes of this project will be added to the current provisional patent application to strengthen the data set. The study will be completed by the end of 2023.

Finally, APRIL continues to work with AgriFutures to present some of our commercial projects and opportunities to a wider network of investors, universities, start-ups, and government and industry bodies through the AgriFutures website **GrowAg.com**. This year we have had several contacts regarding the application of the AusScan Online calibrations from university research groups and the MLA, whilst APRIL presented the water quality research to the Danish Trade Institute.

The AgriFutures team are in regular contact with APRIL and continue to create connections with research bodies, marketing groups and potential partners that may enhance current and future commercial projects.

STRATEGIC PLAN DELIVERABLES

A summary of progress against the Strategic Plan deliverables is provided below:

PILLAR 3: INDUSTRY RELEVANT COMMERCIALISATION ACTIVITIES FOR THE AUSTRALASIAN PORK INDUSTRY

ACTIVITIES	KEY OUTCOMES / DELIVERABLES	2023 STATUS
Be the single point of contact, referral and guidance for commercialisation activity in Australia	Formalise an agreement and processes with Australian Pork Limited to become the single point of contact, referral and guidance for commercialisation activities in Australia.	● In progress
Support a viable, innovative and expanding commercialisation business	Effectively continue to manage current commercialisation arrangements to ensure they are sustainable and providing a return to APRIL:	● In progress
	<ul style="list-style-type: none"> Commercialisation income > \$450,000 per annum, by 2025. 	● Partly achieved this year – ongoing
	<ul style="list-style-type: none"> At least one new product/service successfully commercialised and generating revenue for APRIL, by 2025. 	● In progress
	Conduct a Product Development Scheme program in conjunction with commercial partners to enhance investment and product adoption into the industry, and permit an acceptable financial return to APRIL:	✓ Achieved for the year – ongoing
	<ul style="list-style-type: none"> Three new projects launched by 2025. 	● In progress
	<ul style="list-style-type: none"> Reinvest up to \$100,000 per annum into new product development. 	● Not achieved this year – ongoing
	Maintain the operation and function of the Commercialisation Advisory Panel.	✓ Achieved for the year – ongoing
	Communicate a commercialisation report as a Standing item at each APRIL Board meeting.	✓ Achieved for the year – ongoing
Ensure commercialisation processes are efficient and are generating optimal returns	Assess the commercialisation potential of relevant research activities or proposals and develop commercialisation plans for approved projects with commercial potential.	✓ Achieved
	Review all existing commercialisation projects and ensure markets with greatest potential are adequately resourced, including potential to exploit overseas markets:	● In progress
	<ul style="list-style-type: none"> AusScan (China). 	● In progress
	<ul style="list-style-type: none"> Sow Block (USA, Europe). 	● In progress
	<ul style="list-style-type: none"> Lawsonia qPCR Test (USA, Europe). 	● In progress
	Reinvest commercial income from investment in product development in applicable APRIL activities.	● Not achieved this year – ongoing
Support for Commercialisation Projects	Funding support on a continuous basis for projects that increase APRIL's commercialisation pipeline and lead to greater commercial returns to APRIL and potential benefits to industry.	✓ Achieved for the year – ongoing
Continued engagement with growAG	Continue engagement with growAG to promote commercialisation opportunities arising from R&D activities and ad hoc commercial opportunities.	✓ Achieved for the year – ongoing

COMMUNICATIONS REPORT

INTRODUCTION

APRIL has continued to develop a wide-ranging communication framework as part of its new Strategic Plan (2022–2025) to ensure that communications with all stakeholders provide relevant and timely information. During the reporting period, with the easing of travel restrictions associated with the SARS-CoV-2 pandemic, more extensive dissemination of information became possible again, such as through in-person presentations at producer and industry-related events and attendance at conferences and meetings.

Of note, the communications framework contains mechanisms for Members and other stakeholders to provide feedback to APRIL management and to the Board. The new Strategic Plan puts communication at the heart of APRIL's operations and extension agenda, with Pillar 4 devoted to connecting with our stakeholders.



THE KEY COMPONENTS OF THE COMMUNICATION FRAMEWORK ARE:

- **Maintain the Director-Ordinary Member buddy system.**
- **Convene an annual Stakeholders' Forum for APRIL Members and stakeholders.**
- **Arrange annual meetings with APRIL Members to understand needs and promote outcomes.**
- **Keep industry and stakeholders informed of research and development, education and training, and commercialisation activities and outcomes.**
- **Maintain an independent website as a repository for key information and promotion of APRIL activities.**
- **Present regular updates of APRIL's progress and outcomes at producer and scientific forums.**
- **Conference and events sponsorship.**
- **Publication of research in journals and conference proceedings.**

COMMUNICATION ACTIVITIES

MAINTAIN DIRECTOR-ORDINARY MEMBER BUDDY SYSTEM

The Director-Ordinary Member Buddy system is a standing agenda at each Board meeting, where Directors are expected to contact their allocated Ordinary Members to provide an opportunity for Members to raise any issues at Board level.

CONVENE AN ANNUAL STAKEHOLDER FORUM FOR APRIL MEMBERS AND STAKEHOLDERS

The Annual Stakeholders' Forum in November 2022, in Melbourne, offered the first opportunity for stakeholders to come together in person for numerous years. As always, the Forum provided an excellent opportunity for exchange and communication of APRIL's activities and future plans, with more than 65 registrants attending.

A detailed account of the 2022 Stakeholders' Forum is provided previously in the CEO Report. In brief, presentations were heard that provided project, education and training, and commercialisation updates from both APRIL and APL, a review of antimicrobial resistance in the pork industry was given, an introduction to the Tails CRC-Project was delivered, and the presentation of the inaugural APRIL Enterprise Award completed the Forum.

Registrants then enjoyed a networking function and dinner at the completion of the event.

ARRANGE ANNUAL MEETINGS WITH APRIL MEMBERS TO UNDERSTAND NEEDS AND PROMOTE OUTCOMES

During the reporting period, and coinciding with greater freedom to travel, APRIL staff, along with APRIL Chair Dr Tony Peacock, were able to engage more freely and regularly with APRIL Members and stakeholders. A more frequent number of meetings was able to be held with a representative (or representatives) from Members, resulting in more regular commentary and feedback being received. Feedback was also received through regular email and telephone communications.

KEEP INDUSTRY AND STAKEHOLDERS INFORMED OF RESEARCH, EDUCATION AND TRAINING, AND COMMERCIALISATION ACTIVITIES AND OUTCOMES

In conjunction with the activities listed above and those on the APRIL website, Dr John Pluske and Dr Charles Rikard-Bell achieve this through regular monthly articles in Australian Pork Newspaper (APN), email distribution (e.g., of completed projects), and (or) through the APRIL member and stakeholder Newsletter and APRIL Announcements. Four editions of the Newsletter and 12 articles in the APN were produced during the reporting



period. All contain information and updates of interest with regard to the research program (e.g., funded projects, project Final Reports, funding calls), education and training (e.g., student awards) and commercialisation (e.g., AusScan Online updates, Early Harvest Reports) activities and outcomes, a Research Snapshot from completed or ongoing projects, and news and events of relevance and importance to APRIL Members and other stakeholders.

MAINTAIN AN INDEPENDENT WEBSITE FOR PROMOTION OF APRIL ACTIVITIES

The APRIL website apri.com.au has continued to be updated and contains a significant amount of information regarding all APRIL's funding opportunities as well as results of APRIL research projects, students' theses, information pertaining to reporting and governance, and APRIL's new Strategic Plan. The website also holds the Final Reports from the two Pork CRC programs (2005–2019), as well as a host of other CRC content.

PRESENT REGULAR UPDATES OF APRIL'S PROGRESS AT PRODUCER AND SCIENTIFIC FORUMS

The APRIL CEO and Chief Scientist Dr John Pluske presented the following during the reporting period, or attended the following events. These events also provided opportunities to interact and discuss issues and matters pertaining to APRIL with Members and stakeholders:

1. **25–26 July 2022:** New Zealand Pork Conference, Christchurch ('APRIL Update' presentation to NZ Pork Board).
2. **16 August 2022:** presentation ('APRIL Update') to management and staff at Rivalea (Australia) Pty Ltd. (Corowa, NSW).
3. **24 August 2022:** invited presentation to 19th Asian-Australasian Association of Animal Production Congress (Jeju Island, Korea); "Porcine enterotoxigenic *Escherichia coli*: Antimicrobial resistance and control strategies for diarrhoea".
4. **16 September 2022:** presentation ('APRIL Overview and Update') at Feedworks Conference, Sunshine Coast.
5. **30 September 2022:** attendance at Western Australian Pork Producers' Association Industry Day.
6. **13 October 2022:** presentation ('APRIL Update') at APL Industry Benchmarking Meeting, Melbourne.
7. **19 October 2022:** APRIL Heat Stress and Seasonal Infertility Seminar (virtual).
8. **15 November 2022:** APRIL Stakeholders' Forum, Melbourne.
9. **8 December 2022:** presentation ('APRIL Update') at Queensland Pig Consultancy Group, Toowoomba.
10. **22 February 2023:** presentation ('APRIL Overview and Update') to joint meeting of APL and APRIL Boards, Canberra.

DURING THE REPORTING PERIOD, AND COINCIDING WITH GREATER FREEDOM TO TRAVEL, APRIL STAFF, ALONG WITH APRIL CHAIR DR TONY PEACOCK, WERE ABLE TO ENGAGE MORE FREELY AND REGULARLY WITH APRIL MEMBERS & STAKEHOLDERS

11. **1–2 March 2023:** CRC-P Tails Workshop, Melbourne.
12. **24 March 2023:** attendance at Western Australian Pork Producers' Association Industry Day.
13. **21–22 June 2023:** presentations ('APRIL Overview and Update') associated with APRIL Board meeting, South Australia.

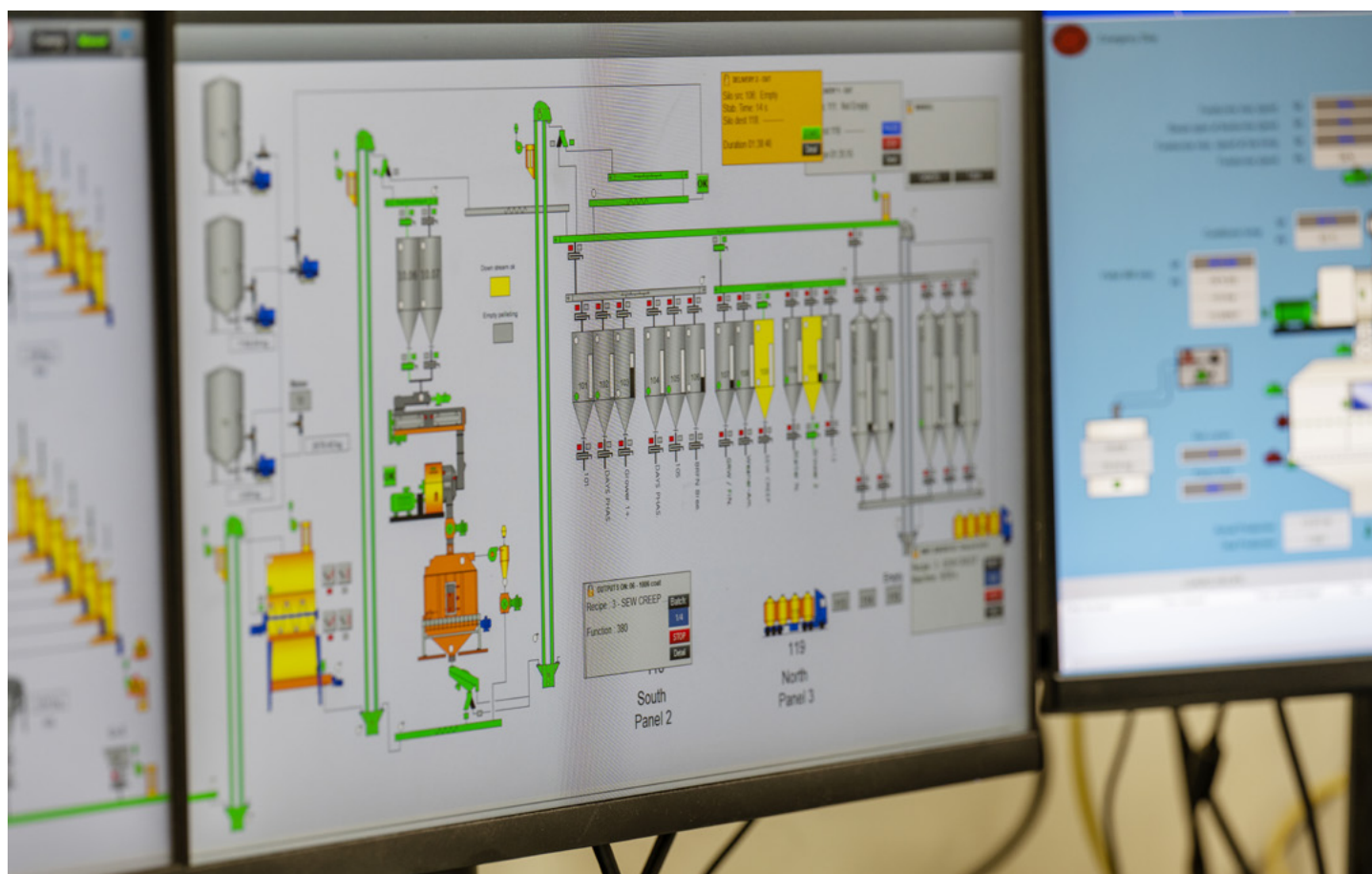
The APRIL Manager, Commercialisation and Research Impact, Dr Charles Rikard-Bell attended and (or) presented at the following events during the reporting period:

1. **17 August 2022:** Rawtech presentation: *Investigating the feasibility of utilising mixed human food waste in five regional pig production areas*. Fight Food Waste CRC (Virtual).
2. **18 August 2022:** Creating Value from Food Waste; Fight Food Waste Online Webinar (Virtual).
3. **7–9 September 2022:** Australian Pig Veterinarians' Conference; Geelong.
4. **14–16 September 2022:** Feedworks Conference; Sunshine Coast.
5. **19 October 2022:** Heat Stress and Seasonal Infertility Technical Forum (Webinar, hosted, virtual).
6. **15 November 2022:** APRIL Stakeholders' Forum Meeting, Melbourne.
7. **7–8 February 2023:** Australian Association of Animal Science (AAAS) Federal Council Meeting, Sydney.
8. **1–2 March 2023:** CRC-P Tails Workshop, Melbourne.
9. **24 April 2023:** Training Session for Emergency Animal Disease (EAD); Liaison Officer.
10. **1–5 May 2023:** visit to New Zealand AgResearch and freshPork NZ sites.
11. **16 May 2023:** Liaison Livestock Officer training for EAD, South Australia.
12. **21–22 June 2023:** presentations associated with APRIL Board meeting, South Australia.

CONFERENCE AND EVENTS SPONSORSHIP

A key mechanism to engage with Members and stakeholders and extend information on APRIL's various activities is the sponsorship of conferences and events.

During the reporting period, APRIL was able to offer support for a number of these including the New Zealand Pork Conference and the 2022 Feedworks Conference, and renewed its sponsorship as Co-Platinum sponsor (with APL) of the 19th biennial conference of the Australasian Pig Science Association (Inc.) to be held in Brisbane in November, 2023.



PUBLICATION OF RESEARCH IN JOURNALS AND CONFERENCE PROCEEDINGS

During the reporting period, the following publications arising from Pork CRC- or APRIL-supported research occurred:

1. Laird, T.; Jordan, D.; Pluske, J.; Mansfield, J.; Wilkinson, S.; Cadogan, D.; Abraham, S.; O'Dea, M. (2023). Development of an *In Vivo* Extended-Spectrum Cephalosporin-Resistant *Escherichia coli* Model in Post-Weaned Pigs and Its Use in Assessment of Dietary Interventions. *Animals* **13**: 959.
2. Liu, F., Gilmour, S., Brewster, C. and Henman, D. (2022). Effects of β -hydroxy methyl butyrate (HMB) supplementation on growth performance and carcass traits of finisher pigs between 50–110 kg. In *Proceedings of Nutrition Society of Australia Annual Scientific Meeting*. Perth, Australia.
3. Pluske, J.R., Murphy, K.J. and Dunshea, F.R. (2022). Pork nutritional value and relationships with human health. In *Reference Module in Food Science*: Elsevier (<https://doi.org/10.1016/B978-0-323-85125-1.00103-4>).
4. Sharif-Islam, M., Henryon, M., van der Werf, J.H.J., Sørensen, A.C., Chu, T.T., Wood, B. and Hermesch, S. (2023). A comparison between the use of pedigree or genomic relationships to control inbreeding in optimum-contribution selection. In *Proceedings of the Association for the Advancement of Animal Breeding and Genetics* **25**: 190-193.
5. Tomas, K., Savaglia, J., Plush, K.J., D'Souza, D.N., Fernandes, J.N., Butler, K.L., Hemsworth, P.H. and Tilbrook, A.J. (2022). Reduced maternal contact increases piglet behavioural stress during husbandry procedures at 3 days of age. *Animal Science in Australia* **34**: cxlii.
6. Van Kerschaver, C., Turpin, D.L., Michiels, J. and Pluske, J.R. (2023). Reducing weaning stress in piglets by pre-weaning socialization and gradual separation from the sow: A review. *Animals* **13**: 1644.
7. Vargovic, L., Athorn, R.Z., Hermesch, S. and Bunter, K.L. (2022). Improving sow welfare and outcomes in the farrowing house by identifying early indicators from pre-farrowing assessment. *Journal of Animal Science* **100**: skac294fan liu.
8. Zhao, W., Artaiz, O., Iqbal, Y., Le, H.H., DiGiacomo, K., Leury, B.J., Fothergill, L.J., Furness, J.B., Liu, F., Green, M.P., Finger, B.J., Navarro, M., Roura, E., D'Souza, D.M., Dunshea, F.J., Plush, K.J. and Cottrell, J.J. (2022). Heat stress of gilts around farrowing causes oxygen insufficiency in the umbilical cord and reduces piglet survival. *Animal* **16**: 100668.

STRATEGIC PLAN DELIVERABLES

A summary of progress against the Strategic Plan deliverables is provided below:

PILLAR 4: CONNECTING WITH MEMBERS AND THE AUSTRALASIAN PORK INDUSTRY

ACTIVITIES	KEY OUTCOMES/DELIVERABLES	2023 STATUS
Implement an effective and appropriate communication plan	Initiate an appropriate communication framework that effectively disseminates APRIL activities and associated outcomes (2022 and reviewed annually).	✓ Achieved for the year – ongoing
Develop activities that are collaborative and inclusive across the member and stakeholder base	All projects to involve at least one Member organisation.	✓ Achieved for the year – ongoing
	Maintain the Board Director-Ordinary Member buddy system to enable one-on-one communication with Ordinary Members (4–5 times annually).	✓ Achieved for the year – ongoing
	Invite Members and key stakeholders to attend the APRIL Annual Stakeholder Forum (and other events as appropriate) to extend latest results and receive direct feedback on outcomes and progress.	✓ Achieved for the year – ongoing
	Provide an APRIL update at APL Delegates' Forum events/annual joint APRIL-APL Board discussion (at least once annually).	✓ Achieved for the year – ongoing
Present updates of APRIL's activities and progress at producer and scientific forums	Present on APRIL activities and outcomes to representatives of a wide member and producer base in Australia and New Zealand through industry seminars/meetings, and to international conferences and forums (where appropriate):	✓ Achieved for the year – ongoing
	<ul style="list-style-type: none"> Present at a minimum of one international conference per annum, from March 2022. 	✓ Achieved for the year – ongoing
	<ul style="list-style-type: none"> Present at a minimum of two member-based conferences per annum, from March 2022. 	✓ Achieved for the year – ongoing
Participate in strategic sponsorship/partnerships	Raise and reinforce APRIL's contributions to the Australasian pork industry by providing strategic sponsorship or partnerships (e.g., APSA conference, State field/industry days, member events).	✓ Achieved for the year – ongoing
Keep industry and stakeholders informed of APRIL's activities and outcomes	Provide timely and relevant media releases to the rural press including at least 10 articles per annum in the Australian Pork Newspaper/Pork Journal.	✓ Achieved for the year – ongoing
	Write a quarterly newsletter to all members.	✓ Achieved for the year – ongoing
	Conduct strategic/targeted scientific seminars and updates (two per year, from March 2022).	✓ Achieved for the year – ongoing
	Financial support for selected peer-reviewed publications in internationally recognised journals (up to five papers supported per year, to a total value of \$7,500).	● Not achieved for the year – ongoing
Maintain an independent website for information and promotion of APRIL activities	Maintain the APRIL website for communication of research, education and training and commercialisation outcomes, and APRIL news, and maintain links to the Pork CRC website.	✓ Achieved for the year – ongoing
Review and dissemination of project success	For applicable projects and where appropriate and robust mechanisms exist, evaluate the return on investment into APRIL for the pork industry.	● In progress

PROGRESS AG

PILLAR 2

EFFECTIVE MANAGEMENT
AND DELIVERY OF RESEARCH
AND DEVELOPMENT AND
EDUCATION AND TRAINING
FOR THE AUSTRALASIAN
PORK INDUSTRY



AINST



APRIL'S PROGRESS AGAINST THE KEY OUTCOMES AND DELIVERABLES FROM PILLAR 2: EFFECTIVE MANAGEMENT AND DELIVERY OF RESEARCH AND DEVELOPMENT AND EDUCATION AND TRAINING FOR THE AUSTRALASIAN PORK INDUSTRY IS SET OUT BELOW, AND EXPLAINED FURTHER IN THE FOLLOWING RESEARCH AND EDUCATION AND TRAINING REPORTS.



PILLAR 2: EFFECTIVE MANAGEMENT AND DELIVERY OF RESEARCH AND DEVELOPMENT AND EDUCATION AND TRAINING FOR THE AUSTRALASIAN PORK INDUSTRY

ACTIVITIES	KEY OUTCOMES/DELIVERABLES	2023 STATUS
2.1 Review the APRIL R&D activities portfolio	Review research investment to ensure an appropriate portfolio of Transformational, Innovation, and Commercialisation Projects, with > 60% of the available funds for R&D directed to Transformational Projects.	● In progress
	Ensure research investments are not duplicative, but complementary, with Strategic Plans of APL and NZPIB.	✓ Achieved for the year – ongoing
	Reassessed targets for investment after each funding round and adjust targets accordingly, e.g., balance strategic research domains with research opportunities, enable continuation of completed projects having high potential for industry outcomes, assessment of APRIL commercial income versus direct industry benefits.	● In progress
2.2 Initiate key Transformational Projects for the Australasian	Ensure at least four Transformational Projects, for longer-term, collaborative, inter- and multi-disciplinary 'big picture' projects, are prepared and submitted annually, with major external funding support sought where possible, in priorities to be determined.	● Started – on hold
2.3 Support for Innovation Projects	Funding support annually (20–30% of applicable funds) for smart, innovative and 'out of the box' projects that stimulate change and innovation in the industry and can be a commercialisation pipeline.	✓ Achieved for the year – ongoing
	Change the Innovation Project guidelines to make the (potential) path to commercialisation clearer.	✓ Achieved

ENSURE AT LEAST FOUR TRANSFORMATIONAL PROJECTS ... ARE PREPARED AND SUBMITTED ANNUALLY, WITH MAJOR EXTERNAL FUNDING SUPPORT SOUGHT WHERE POSSIBLE, IN PRIORITIES TO BE DETERMINED



PILLAR 2: EFFECTIVE MANAGEMENT AND DELIVERY OF RESEARCH AND DEVELOPMENT AND EDUCATION AND TRAINING FOR THE AUSTRALASIAN PORK INDUSTRY *continued*

ACTIVITIES	KEY OUTCOMES/DELIVERABLES	2023 STATUS
2.4 Assist with human capacity building in the Australasian pork industry	Make annual investments into maintaining and building education and training for the industry, to support undergraduate and postgraduate students and the Industry Placement Program (IPP):	✓ Achieved for the year – ongoing
	• Offer at least three full scholarship Masters or PhD awards per annum.	● Not achieved for the year – ongoing
	• Four undergraduate students completed an Honours project by June 2022, with at least two Honours students completing a project per year thereafter.	● Not achieved for the year – ongoing
	• Three DVM or BSc/BVMS students completed a project by June 2022, with at least two DVM or BSc/BVMS students completing a project per year thereafter.	● Not achieved for the year – ongoing
	• Four postgraduate students working on APRIL or APRIL-related projects being trained by 2022, and each year thereafter.	✓ Achieved for the year – ongoing
	• A minimum of three IPP awardees embedded in industry organisations at any one time.	✓ Achieved for the year – ongoing
2.5 Support for Facility Funding	Ongoing support for appropriate, diversified and cost-effective facility funding for the Australasian pork industry.	✓ Achieved for the year – ongoing
2.6 Support for Kickstart program	Ongoing support for the Kickstart program, to provide funding to assist with the preparation and submission of a specific, targeted and agreed major external funding application (or applications) in partnership with APRIL and other partners.	● Not achieved for the year – ongoing
2.7 Support for APRIL Enterprise Award	Create an annual APRIL Enterprise Award to support on-farm creativity and innovation for practical application.	✓ Achieved for the year – ongoing

RESEARCH RE TRANSFORMAT PROJECTS

WHAT IS A TRANSFORMATIONAL PROJECT?

APRIL Transformational Projects address major issues for the Australasian pork industry that, if successfully implemented, are likely to result in a step-change. Transformational Projects are highly collaborative, multi-disciplinary, and by their very nature require considerable resources and time to execute. Consequently, Transformational Projects require significant external investment and are targeted at, but not restricted to, the Australian Research Council schemes and the Cooperative Research Centre-Project (CRC-P) scheme.

PORT TIONAL



KEY THEMES

In the previous Strategic Plan 2019–2022, APRIL identified two key themes for Transformational Projects as follows:

6.1.1 ENHANCED ANTIMICROBIAL STEWARDSHIP IN THE AUSTRALASIAN PORK INDUSTRY THROUGH TARGETED REDUCTION OF IN-FEED MEDICATIONS WITHOUT ADVERSE HEALTH CONSEQUENCES

Judicious use of antibiotics is a high priority for the Australasian pork industry. One of the best ways to reduce total use of antibiotics in pig production systems is to limit the use of in-feed medications. When antibiotics are included in feed, every pig on that feed receives a dose whether they need it or not, and dosage continues until the batch of feed is consumed. Arguably, this contributes to elevated overall use of antibiotics, an increased number of doses per pig and potentially an increase in the mg of active constituent administered per kg of pork produced. While antibiotic use in agriculture has not contributed significantly to antimicrobial resistance to date, the Industry does have an obligation to minimise any chance that application of antibiotics in pork production systems renders any registered agents or high or medium importance ASTAG (Australian Strategic and Technical Advisory Group on Antimicrobial Resistance)-classified antibiotics unsuitable for use in human medicine.

This priority has been identified as a transformational project because of the multidisciplinary nature of the challenge. Reduction of in-feed medications will potentially require a higher reliance on vaccines, novel use of other nutritional mechanisms to control disease, enhanced capacity to apply pulse water medications, better systems for disease surveillance, capacity for targeted individual pig treatments, better piggery hygiene, higher health status herds and sources of genetics and, if in-feed antibiotics are not used, systems that allow efficient and targeted application of other antibiotics.

6.1.2 ELIMINATION OF THE NEED FOR TAIL DOCKING IN AUSTRALASIAN PORK PRODUCTION SYSTEMS

Tail biting is an insidious and costly manifestation that can occur without warning and indiscriminately within commercial pork production systems. Occurrence extends across the entire industry. The cause of tail biting is not understood but is likely to be an interaction between behaviour, environment, management, nutrition, housing and health status, among others, with no one factor necessarily contributing more than another. Costs of tail biting extend to compromised pig welfare, negative behavioural traits, sub-optimal growth rates and feed conversion efficiency, carcass damage and loss of a potentially marketable product (i.e., the tail). Current interventions for the control of tail biting are generally effective yet inconsistent but involve the removal of a portion of the tail shortly after birth without the use of anaesthesia. Other invasive husbandry procedures such as teeth-clipping and ear notching have largely been eliminated from many production systems already, and there is increasing pressure to cease tail docking.

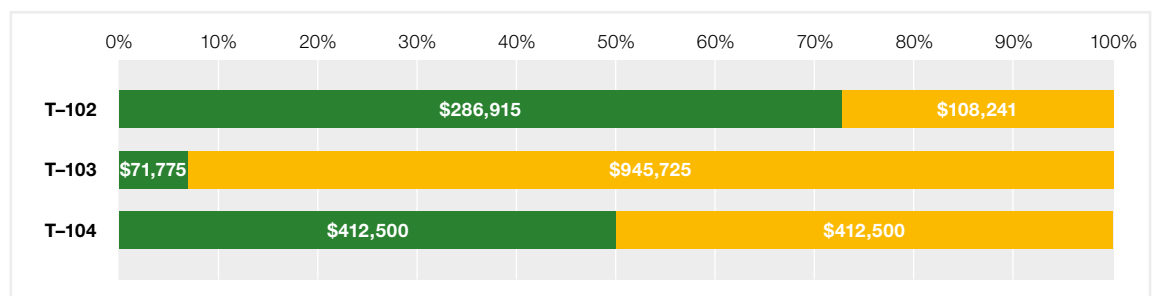
However, to date, the industry has resisted without any alternative approach to eliminate tail biting. As a priority, the pork industry should be focussed on understanding the causal factors and interactions that contribute to tail biting with a view to eliminating or managing these factors, as opposed to investing in research that justifies tail docking based on minimal pain responses or through the introduction of anaesthesia options. The significant current and future costs of tail biting and its management should not be underestimated, nor should the multi-faceted challenge of understanding the causal factors, which is why APRIL has identified elimination of the need for tail docking in commercial production systems as a transformational project.

PROJECTS

NO.	PROJECT NAME	LEAD PARTY
T-101	Pathways to rearing pigs with tails to maximise returns to pork producers	The University of Queensland
T-102	How to make antimicrobials in pig feed redundant, naturally	The University of Queensland
T-103	Novel approaches for combatting critically important antimicrobial resistance development in livestock	Murdoch University
T-104	Eliminating pig tail removal to improve welfare and industry sustainability	SunPork Pty Ltd

TRANSFORMATIONAL PROJECT COMMITMENTS

■ Paid
■ Future commitment



THE APPLICATION REQUESTED, AND RECEIVED, AN AUSTRALIAN GOVERNMENT CASH INVESTMENT OF \$2,892,374 OVER THREE YEARS ... WAS ABLE TO LEVERAGE AN ADDITIONAL \$3,345,078 OF COMBINED IN-KIND CONTRIBUTIONS FROM THE PARTNERS

T-101: PATHWAYS TO REARING PIGS WITH TAILS TO MAXIMISE RETURNS TO PORK PRODUCERS and T-104: ELIMINATING PIG TAIL REMOVAL TO IMPROVE WELFARE AND INDUSTRY SUSTAINABILITY

In March 2020, APRIL (as Lead Party) submitted a Round 9 CRC-P application *Pathways to rearing pigs with tails to maximise returns to pork producers*. The application involved researchers from The Universities of Queensland, Melbourne and New England, as well as strong industry involvement from Rivalea (Australia) Pty Ltd., SunPork Farms, and Australian Pork Limited. Unfortunately, the round was extremely competitive (8% success rate) and APRIL's application was unsuccessful.

APRIL met with the collaborators and determined that a new CRC-P application should be submitted. A new submission *Eliminating pig tail removal to improve welfare and industry sustainability* was made to the Round 11 CRC-P funding round led by SunPork Pty Ltd. We were informed on 7 September 2021 that this application was successful.

The application requested, and received, an Australian Government cash investment of \$2,892,374 over three years, which combined with the project partners' cash contribution of \$1,638,742 (\$750,000 plus GST from APRIL), was able to leverage an additional \$3,345,078 of combined in-kind contributions from the partners. This represents an overall leverage for APRIL of ~10.5:1. Partners in the project are APRIL, Australian Pork Limited, PIC Australasia P/L, Rivalea (Australia) P/L, RSPCA Australia, The University of Melbourne, The University of Queensland, and the University of New England.

This was a good outcome directly addressing one of APRIL's two Transformational Project themes for the Industry, and demonstrating again the value of APRIL in driving large scale industry collaborations. Several workshops were held during the reporting period to update all participants of progress and outcomes, as well as to share information and plan further work.

T-102: HOW TO MAKE ANTIMICROBIALS IN PIG FEED REDUNDANT, NATURALLY

In July 2020, the Australian Research Council (Linkage scheme) announced that it has supported The University of Queensland-administered project 'How to make antimicrobials in pig feed redundant, naturally'. Other organisations involved in the successful grant are The University of Melbourne, the SunPork Group, DSM Nutritional Products, and APRIL.

Chief Investigators in the project are Professor Eugeni Roura (The University of Queensland), Professor Frank Dunshea (The University of Melbourne), Professor Mike Gidley (The University of Queensland), and Associate Professor Pat Blackall (The University of Queensland).

Total cash funding for the four-year project was \$1,931,233, with the Australian Research Council contributing \$852,000 and partners contributing an additional \$1,079,233, of which \$359,223 derives from APRIL.

The total value of the project (cash plus in-kind contributions) was \$3,835,847.

Again, this is a great example of APRIL partnering with its members to successfully leverage external funding for a major research project of critical industry-wide importance. Research work in the project is progressing well, with there being regular management meetings between partners including updates from the PhD students involved in the program.

T-103: NOVEL APPROACHES FOR COMBATting ANTIMICROBIAL RESISTANCE IN AUSTRALIAN PIGS: EXPLORING NATURE'S ANTIMICROBIAL ARSENALS, NATURALLY DERIVED FEED ADDITIVES AND NATURAL BACTERIAL FLORA TO COMBAT RESISTANT BACTERIA

The overarching aim of this project, led by Professor Sam Abraham at Murdoch University, is to determine the origin, transmission pathways and public health impact of newly emergent, critically important antimicrobial-resistant (CIA-R) *Escherichia coli* in pigs in order to develop novel control strategies for the pork industry.

This project expects to use advanced high throughput robotics and genomics to understand the extent of the AMR in pigs, significantly maximising the impact of novel integrated control strategies based on nature's antimicrobial arsenal. Using naturally derived feed additives, phages, and natural bacterial flora, the outcomes will enhance our understanding of AMR in pigs and aid in the development of commercially viable solutions. The anticipated outcomes will address one of the most pressing and globally significant animal and public health issues at the moment, namely the development and dissemination of resistance to last-line human use antimicrobials in food-producing animals.

Partners in this 3-year project are Murdoch University, CHM Alliance Pty Ltd., Australian Pork Limited, Feedworks Pty Ltd., Rivalea (Australia) Pty Ltd. and Tecan Australia Pty Ltd.

TOTAL CASH FUNDING FOR THE FOUR-YEAR PROJECT WAS \$1,931,233, WITH THE AUSTRALIAN RESEARCH COUNCIL CONTRIBUTING \$852,000 AND PARTNERS CONTRIBUTING AN ADDITIONAL \$1,079,233, OF WHICH \$359,223 DERIVES FROM APRIL.

RESEARCH REPORT INNOVATION PROJECTS



WHAT IS AN INNOVATION PROJECT?

The overall purpose of APRIL Innovation Projects is for the support of “out of the box” ideas for smart, new approaches to tackle current and emerging challenges for the Australasian pork industry.

Innovation Projects must demonstrate originality, uniqueness and creativity, establish new concepts or challenge existing ones, address significant challenges or critical barriers to progress, and be able to improve or apply new theoretical concepts, methodologies or tools that will benefit industry.



PROJECTS

APRIL has invested in the following Innovation Projects, with the following aims:

5A-101 REAL TIME, IN-FIELD WATER TESTING

**PROJECT LEADER: DR LOUISE EDWARDS,
(EX) RIDLEY AGRIPRODUCTS PTY LTD**

- To determine if portable spectral-based hardware is compatible for the development of a real-time, in-field multi-parameter water testing device.

5A-102 INSECT MEAL FROM PORK PROCESSING DERIVED MATERIAL

**PROJECT LEADER: DR KRISTY DIGIACOMO,
THE UNIVERSITY OF MELBOURNE**

- To measure the growth performance of black soldier fly larvae (BSF) on a range of pork processing waste varying in nutrient content to optimise waste substrates for BSF bioconversion.
- To measure the nutrient composition of BSF and frass fertilizer derived from pork processing waste.
- To evaluate any microbial risks associated with insect meal derived from pork processing waste.
- To evaluate any chemical risks (such as heavy metals) associated with insect meal derived from pork processing waste.

5A-103 DEVELOPMENT OF A *STREPTOCOCCUS SUI*S VACCINE VIA MEASUREMENT OF IMMUNE RESPONSES TO FOUR DIFFERENT *STREPTOCOCCUS SUI*S VACCINE PREPARATIONS, USING AN AUSTRALIAN CPS2 ST25 STRAIN

**PROJECT LEADER: DR MARK O'DEA,
MURDOCH UNIVERSITY (NOW DPIRD, WA)**

- Produce the precursor to a vaccine combination targeting the major strains of *S. suis* associated with disease in Australia.
- Adopt serologic monitoring to better determine the effect of vaccines in a more robust manner than clinical signs alone.
- Determine the effectiveness of different bacterial inactivation methods, which have had little exploration in *S. suis* vaccine production, and which may have more effect in maintaining antigen structure and potency.

THIS PROJECT WILL DETERMINE THE RELATIONSHIP BETWEEN CIRCULATING CREATINE CONCENTRATIONS IN PREGNANT SOWS AND PIGLET BIRTHWEIGHT AND SURVIVAL

5A-104 LOW DOSE DIETARY STRATEGIES IN LATE GESTATION TO ENHANCE BORN ALIVE AND PIGLET SURVIVAL AND PERFORMANCE

**PROJECT LEADER: DR JESSICA CRAIG,
RIVALEA (AUSTRALIA) PTY LTD**

- To evaluate the effects of supplementation of 0.5% arginine and three novel feed additives, B-hydroxy β -methyl butyrate (HMB), N-Carbamylglutamate (NCG), and Calcium nitrate, on litter characteristics at birth when fed from day 90 of gestation.
- To assess each treatment for piglet vitality, number of still born, number born alive and weaned as well as subsequent reproductive performance of all sows.
- Provide the industry with effective strategies for improving the efficiency of reproduction and progeny performance.

5A-105 ORAL MEANS OF INCREASING ENDOGENOUS GROWTH HORMONE LEVELS AND ENHANCING THE PERFORMANCE AND CARCASS CHARACTERISTICS OF GROWING PIGS

**PROJECT LEADER: DR FAN LIU,
RIVALEA (AUSTRALIA) PTY LTD**

- Validate the effects of NCG and HMB supplementation at two levels (0.15% and 0.3%) when fed to finisher pigs from live weight 60–100 kg for feed intake, growth rate and feed efficiency.
- Validate the effects of NCG and HMB supplementation to enhance commercial carcass traits (carcass weight, dressing percentage, loin muscle depth and back fat thickness) and IGF-1 secretion.
- Determine whether NCG is more potent than feeding arginine itself in increasing blood arginine concentration by measuring arginine plasma levels in control; 1% arginine supplementation and the NCG treatments.
- Determine for treatments that significantly alter either increased growth, feed efficiency, loin eye depth or reduced backfat thickness the magnitude of change in plasma amino acid profiles, and urea nitrogen.

5A-107 USING ALGAL EXTRACTS TO IMPROVE WEANER GROWTH PERFORMANCE AND DIGESTIBILITY

**PROJECT LEADER: ROBERT PARKES,
RIDLEY AGRIPRODUCTS PTY LTD**

- Analyse the effect of supplementing weaner pig diets with different algal extracts on:
 1. Growth, feed efficiency and rate of digestion.
 2. The incidence of diarrhoea.
 3. The change in gut microbial populations and inflammation response markers, when compared to conventional weaner pig diets.

5A-108 WHAT SENSORY ATTRIBUTES ARE MOST CRITICAL FOR CONSUMER EVALUATION WITHIN AN AUSTRALIAN PORK EATING QUALITY PROGRAM?

PROJECT LEADER: PROFESSOR FRANK DUNSHEA, THE UNIVERSITY OF MELBOURNE

- Investigate what are the most critical sensory attributes influencing acceptability (overall liking) of Australian pork with Australian consumers.
- Identify what attributes should be used within an Australian pork eating quality program.
- Assess the effectiveness of the Check all that apply (CATA) rapid sensory method for discriminating sensory properties between six different Australian pork products.

5A-109 INVESTIGATING THE IMPACT OF CIRCULATING CREATINE CONCENTRATIONS IN GESTATION ON VITALITY AND SURVIVABILITY OF LOW BIRTH WEIGHT PIGLETS

PROJECT LEADER: DR TANYA NOWLAND, SARDI

In human pregnancies, maternal creatine levels correlate positively with foetal growth, with low levels linked to foetal growth restriction and reduced birthweight, due primarily to impaired placental blood flow and metabolism. Previously, it has been demonstrated that supplementing sows with creatine or guanidinacetic acid (GAA) in late gestation improved piglet viability, particularly when birthweight is below 1.1 kg. This project will determine the relationship between circulating creatine concentrations in pregnant sows and piglet birthweight and survival. The impact of increasing circulating creatine by dietary strategies on piglet birthweight, within litter variation in birthweight and piglet survival, will also be established.

5A-110 REAL TIME DETECTION OF DEEP TISSUE ABSCESSSES IN CARCASSES USING LEAN MEAT YIELD ESTIMATION

PROJECT LEADER: DR DARRYL D'SOUZA, CHM ALLIANCE PTY LTD (SUNPORK)

APRIL agreed to a request from the Lead Party to cancel this project in 2022 due to technical issues preventing the project from proceeding.

5A-111 ESCAPING THE DAILY GRIND – COARSER GROUND DIETS FOR IMPROVED FOETAL GROWTH

PROJECT LEADER: DR KATE PLUSH, CHM ALLIANCE PTY LTD (SUNPORK)

Diets are processed into fine particle sizes to increase digestibility. This is especially important for the growing pig where feed conversion ratio drives profitability, and in lactating sows where high dietary energy is required for milk production. However, there is a paucity of information on the impact of particle size in gestating sow diets.

A coarser grind size will enhance hind gut fermentation, a process which involves the production of butyrate. The impact of increased circulating butyrate concentrations in sows is unknown, but in rats it has been shown to improve foetal growth. This experiment has been designed to determine if a coarser grind size fed to sows throughout gestation improves foetal growth, improving piglet weight and reducing variation at birth.

5A-112 NOVEL ASPIRIN SUPPLEMENTATION DURING GESTATION TO IMPROVE FARROWING RATE AND PIGLET BIRTH WEIGHT OF SOWS MATED IN SUMMER

PROJECT LEADER: DR FAN LIU, RIVALEA (AUSTRALIA) PTY LTD

Sows mated in summer have an increased abortion rate and produce an increased percentage of born-light piglets (≤ 1.1 kg), which compromises the efficiency of the pig industry and affects supply and market compliance. We propose to trial the supplementation of a low-dose of aspirin (240 ppm; sodium salicylate), a pharmaceutical intervention commonly used for improving conception and foetal development in humans, during the first 80 days of gestation as a strategy to improve farrowing rate and piglet birth weight of multiparous sows mated in summer. If effective, aspirin supplementation could be developed as an economical intervention to alleviate summer infertility and improve piglet birth weight for the pig industry.

5A-113 BRAIN MEASURES OF POSITIVE WELFARE IN PIGS

PROJECT LEADER: PROFESSOR ALAN TILBROOK, THE UNIVERSITY OF QUEENSLAND

"Quality of life" is a central concept in the welfare of production animals. To determine an animal's quality of life, we must understand how the animal's brain processes life experiences. This project is the first attempt to identify objective indicators of brain function in pigs. The project will contribute to the assessment and improvement of pig welfare by providing quantitative biological measures (biomarkers) of brain function during positive and negative experiences. The project will enable development of non-invasive biomarkers, which the Australasian pork industry can use to inform day-to-day management decisions and continuously improve the welfare of pigs.

"QUALITY OF LIFE" IS A CENTRAL CONCEPT IN THE WELFARE OF PRODUCTION ANIMALS. TO DETERMINE AN ANIMAL'S QUALITY OF LIFE, WE MUST UNDERSTAND HOW THE ANIMAL'S BRAIN PROCESSES LIFE EXPERIENCES. THIS PROJECT IS THE FIRST ATTEMPT TO IDENTIFY OBJECTIVE INDICATORS OF BRAIN FUNCTION IN PIGS

PROJECT 5A–114 SMART SENSORS FOR ANIMAL WELFARE MONITORING

PROJECT LEADER: ASSOCIATE PROFESSOR ABEL SANTOS, THE UNIVERSITY OF ADELAIDE

This project builds on the findings of APRIL project A1–106 *A lab on a chip for real time pain and animal welfare biomarker measurement*, which successfully developed multiplexed, cheap, portable on-chip sensing technologies to rapidly detect and assess multiple pain and welfare biomarkers in pigs. The technology enables high-throughput label-free detection, quantification, and molecular fingerprinting of biomarkers in biological samples.

The objective of this project is to verify and assess measures from manufactured plasmonic chips relative to previously analysed samples obtained from pigs by the South Australian Research and Development Institute. This will permit optimisation of concentrations of relevant biomarkers of pain and welfare in pigs.

Objective quantification of relevant biomarkers in biological fluids reflecting welfare states is central to improving animal health and welfare standards. Such information has potential to provide the industry with an evidence-informed, decision-making approach for safe, economical, rational, and sustainable assessment of physiological and affective states in pigs related to pain and welfare.

PROJECT 5A–115: IMPROVING THE FERTILITY OF EXTENDED SEMEN

PROJECT LEADER: ASSOCIATE PROFESSOR MARK NOTTLE, THE UNIVERSITY OF ADELAIDE

Artificial insemination (AI) is used in more than 90% of the Australian pig herd. Successful AI involves the collection of semen which is then diluted with extender to produce multiple doses which is then used for up to 5 days. However, AI pregnancy rates are generally lower than natural mating. This is because semen extenders are relatively simple and do not mimic seminal plasma or the female reproductive tract, where sperm undergo their final maturation.

The aim of the present study is to improve boar sperm function by adding factors found in semen back to commercial extenders.

The project is measuring a range of sperm parameters for up to 5 days after collection to mimic the use of extended semen commercially. The more promising factors will then be examined *in vitro* to determine effects on fertilisation and embryo development. Those that show an effect will then be examined in small scale insemination studies, before progressing to larger on-farm trials.

Part of this work was undertaken by Ms Kaitlin Beltakis, an Honours Student at The University of Adelaide, who was awarded an APRIL Honours Scholarship.

PROJECT 5A–116 HEATING UP THE HOUSE: EVALUATING THE EFFECT OF NOVEL MONITORING AND HEATING SYSTEMS ON THE PRODUCTIVITY, WELFARE AND ECONOMICS OF FARROWING HOUSES

PROJECT LEADER: DR MARIA JORQUERA-CHAVEZ, RIVALEA (AUSTRALIA) PTY LTD

Investigation of novel ways to allow real time monitoring of pigs and innovative sustainable heating sources are required to ensure pork production systems are future proof. This project will further investigate the use of thermal imagery technology and FarrowCam (real time monitoring of farrowing) to evaluate health and welfare of sows and survival of piglets. These technologies will be implemented and tested in a project investigating the impact heat lamps have on the thermal comfort of sows and piglets, comparing the overall performance of the conventional heat lamps that are widely used in Australian piggeries, and two new heating-source options (ANIHEATER® and Hog Hearth® Heat Mats).

Due to the positive results reported in several countries, these two new heating methods are expected to provide better thermal conditions for piglets and sows, and to have a lower cost of maintenance than the conventional heat-lamps. This project will provide pork producers with detailed information about novel monitoring devices and more cost-effective heating-sources to be used in farrowing houses, ensuring increased productivity and sustainability.

PROJECT 5A–117 USE OF AN INHIBIN VACCINE TO INCREASE LITTER SIZE IN PIGS

PROJECT LEADER: PROFESSOR PAUL VERMA [AFFILIATE PROFESSOR (THE UNIVERSITY OF ADELAIDE) AND SCIENCE PROGRAM LEADER – PIGS AND POULTRY (SARDI)]

Average litter sizes born in Australia remain lower than those observed in other pork-producing countries, largely as a consequence of restrictions associated with germplasm importation. One method with demonstrated litter size increase in other species, such as sheep, is vaccination against inhibin. Attenuation of the biological activity of inhibin, that regulates the production of follicle stimulating hormone (FSH), leads to an increase in circulating FSH and, consequently, the ovulation rate.

Studies conducted previously in gilts reported marked improvements in reproductive performance following vaccination against inhibin. This project proposes to extend these preliminary results and further assess the efficacy of inhibin vaccination on aspects of reproductive outcomes, thereby offering a possible means to increase fecundity in the herd.

THE RELEVANT LITERATURE SUGGESTS THAT INGESTION OF THE PLACENTA MAY PROVIDE A RANGE OF BENEFITS FOR BOTH THE SOW AND HER PIGLET, VIA ENDOCRINE, ANALGESIC AND (OR) NUTRITIONAL EFFECTS. THE PROPOSED DISCOVERY STUDY AIMS TO BETTER UNDERSTAND THE INCIDENCE AND IMPACTS OF PLACENTOPHAGIA IN PIGS

PROJECT 5A-118: UNDERSTANDING THE IMPACT OF CLIMATE ON THE BOAR AND PROGENY THROUGH SPERM NON-CODING RNA

PROJECT LEADER: DR JEREMY COTTRELL, THE UNIVERSITY OF MELBOURNE

The expression of sperm small-noncoding RNAs (sncRNAs) is influenced by the environment. It is hypothesised that challenging events, such as seasonal heat stress, can influence sperm sncRNAs to compromise reproductive and progeny performance. Measurement of sncRNAs could potentially provide a useful selection tool for reducing the seasonality of reproductive performance.

This project will quantify seasonal variation in sperm sncRNAs between high genetic merit boars from a commercial nucleus facility in the summer and cooler months against progeny performance from single-sire matings. The anticipated outcomes of this project will be improved reproductive and progeny performance of the Australian pork industry.

PROJECT 5A-119: PLACENTOPHAGIA: INVESTIGATING ITS EFFECT ON SOW AND PIGLET PERFORMANCE IN CONFINED AND LOOSE HOUSING SYSTEMS

PROJECT LEADER: DR LAUREN HEMSWORTH, THE UNIVERSITY OF MELBOURNE

Placentophagia is a behaviour observed in most female terrestrial eutherian mammals, consisting of the ingestion of some or all of the placental components expelled during parturition. Although sows will consume the placenta if given the opportunity, intensive pig production systems often prevent ingestion of afterbirth due to either its removal following parturition or confinement housing systems that prevent the sow from accessing it.

The relevant literature suggests that ingestion of the placenta may provide a range of benefits for both the sow and her piglet, via endocrine, analgesic and (or) nutritional effects. These benefits may include greater maternal behaviour through increased sow-piglet interactions, improved postpartum sow recovery, increased milk production and piglet growth and survival. The proposed discovery study aims to better understand the incidence and impacts of placentophagia in pigs.

PROJECT 5A-120: NUTRITIONAL STRATEGIES TO INCREASE INTRAMUSCULAR FAT

PROJECT LEADER: PROFESSOR FRANK DUNSHEA, THE UNIVERSITY OF MELBOURNE

Selection for reduced fatness has inadvertently resulted in Australian pork having a very low concentration of intramuscular fat (IMF), with possible negative implications for pork eating quality. A meta-analysis identified that collagen concentration is negatively related to beef eating quality, and further work from this laboratory has also shown that collagen content is negatively related to objective pork tenderness, particularly in leg muscles.

Previous work supported by the Pork CRC demonstrated that dietary inulin, a polysaccharide (fructan) from chicory, increased visible marbling, whilst lecithin (glycerophospholipids) decreased collagen concentrations in loins from pork. The loin has similar IMF but lower collagen than leg muscles, hence, this project will use these two dietary strategies to improve the eating quality of a pork.

PROJECT 5A-121: AUTOMATIC ADJUSTMENT OF GESTATING SOW LIVE WEIGHT

PROJECT LEADER: DR DAVID CADOGAN, FEEDWORKS PTY LTD

The innovation in this project will be to use newly-developed software to automatically optimise sow weight during gestation depending on their parity and genotype, which will be conducted by using the ideal weight range set by the PIC genetic company. The optimisation of body weight is predicted to produce 1 pig per sow per year and improve number of sows retained in the herd by 10%.

5A-122: CAN THE PROVISION OF SILAGE AT WEANING IMPROVE SOW WELFARE AND SUBSEQUENT REPRODUCTION?

PROJECT LEADER: DR LAUREN STAVELEY, CHM ALLIANCE PTY LTD / SUNPORK FARMS

Weaning is arguably a stressful period for a sow, as not only is she separated from her piglets but is also mixed with numerous other sows in a new environment and fed a new diet, with feed intake often limited.

A potential strategy to lessen the negative welfare implications weaning can have on sows is to provide enrichment. This not only provides distraction but also induces satiety, which is proven to reduce aggression in gestating sows. Studies have shown that increased glucose and roughage offered prior to mating can have positive effects on reproductive outcomes. This project aims to identify if the provision of silage offered to sows at weaning improves both welfare and productive outcomes.

5A-123 MUM ISN'T HOME: IDENTIFYING GAPS IN KNOWLEDGE IN CREEP FEEDING AND DEVELOPING NOVEL SOLUTIONS TO IMPROVE POST-WEANING ADJUSTMENT IN PIGLETS

PROJECT LEADER: DR MARIA JORQUERA-CHAVEZ, RIVALEA (AUSTRALIA) PTY LTD

For pigs in commercial conditions, the abrupt weaning process not only involves the mother-piglet separation, but also a profound modification of piglets' feeding, feeding habits, environment, and social interactions. This complex period leads to stressful changes for piglets, becoming a great concern for producers and researchers. This project aims to investigate strategies to improve piglets' performance and wellbeing around weaning. This project will investigate (i) the main scientific gaps about the role that creep feeding has in the performance of piglets around weaning transition and its effect in their lifetime performance; and (ii) whether factors such as the characteristics of the creep feeding, the impacts of weaning age and parity, the farrowing environment (pen type etc.), and the time/frequency they offered to young piglets impact their survival and growth rate around weaning.

Ultimately, this project proposes an investigation about novel and inexpensive creep feeding techniques that could facilitate the learning process in piglets, which would consequently trigger eating behaviours that promote growth, reduce piglets' stress and improve their survival during the weaning transition. This would not only improve weaners' welfare, but also the productivity of piggeries. This project will provide science-based, industry-relevant information that could assist the management around weaning transition.

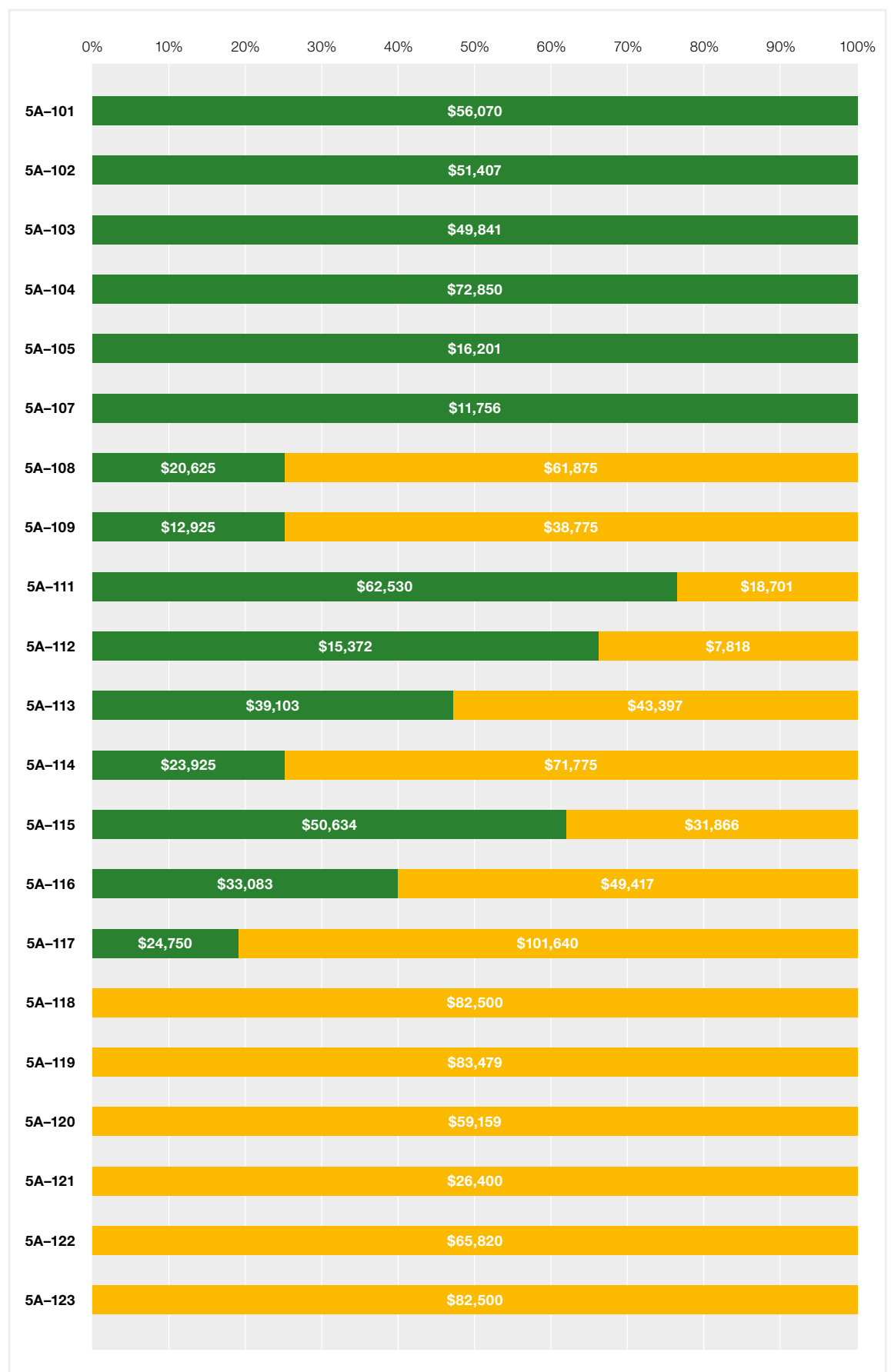


PART OF THIS WORK WAS UNDERTAKEN BY MS KAITLIN BELTAKIS, AN HONOURS STUDENT AT THE UNIVERSITY OF ADELAIDE, WHO WAS AWARDED AN APRIL HONOURS SCHOLARSHIP AND HOPES TO CONTINUE WORKING IN THE FIELD

NO.	PROJECT NAME	LEAD PARTY
5A-101	Real time, in-field water testing	Ridley Agriproducts Pty Ltd
5A-102	Insect meal from pork processing derived material	The University of Melbourne
5A-103	Development of a <i>Streptococcus suis</i> vaccine via measurement of immune responses to four different <i>Streptococcus suis</i> vaccine preparations, using an Australian cps2 ST25.strain	Murdoch University
5A-104	Low dose dietary strategies in late gestation to enhance born alive and piglet survival and performance	Rivalea (Australia) Pty Ltd
5A-105	Oral means of increasing endogenous GH levels and enhancing the performance and carcass characteristics of growing pigs	Rivalea (Australia) Pty Ltd
5A-107	Using algal extracts to improve weaner growth performance and digestibility	Ridley Agriproducts Pty Ltd
5A-108	What sensory attributes are most critical for consumer evaluation within an Australian Pork eating quality program?	The University of Melbourne
5A-109	Investigating the impact of circulating creatine concentrations in gestation on vitality and survivability of low birth weight piglets	SARDI
5A-110	Real time detection of deep tissue abscesses in carcasses using lean meat yield estimation	CHM Alliance Pty Ltd (SunPork Solutions)
5A-111	Escaping the daily grind – coarser ground diets for improved foetal growth	CHM Alliance Pty Ltd (SunPork Solutions)
5A-112	Novel aspirin supplementation during gestation to improve farrowing rate and piglet birth weight of sows mated in summer.	Rivalea (Australia) Pty Ltd
5A-113	Brain measures of positive welfare in pigs	The University of Queensland
5A-114	Smart Sensors for Animal Welfare Monitoring	The University of Adelaide
5A-115	Improving the fertility of extended semen	The University of Adelaide
5A-116	Heating up the house: Evaluating the effect of novel heating and monitoring systems on the productivity, welfare and economics of farrowing houses	Rivalea (Australia) Pty Ltd
5A-117	The use of inhibin vaccine to increase litter size in pigs	The University of Adelaide
5A-118	Understanding the impact of climate on the boar and progeny through sperm non-coding RNA	The University of Melbourne
5A-119	Placentophagia: investigating its effect on sow and piglet performance in confined and loose housing systems.	The University of Melbourne
5A-120	Nutritional strategies to increase intramuscular fat.	The University of Melbourne
5A-121	Automatic adjustment of gestating sow live weight	Feedworks Pty Ltd
5A-122	Can the provision of silage at weaning improve sow welfare and subsequent reproduction?	CHM Alliance Pty Ltd (SunPork Solutions)
5A-123	Mum isn't home: Using sows' vocalisations and artificial-sound stimuli as novel strategies to improve post-weaning adjustment in piglets.	Rivalea (Australia) Pty Ltd

**APRIL INNOVATION
PROJECT
COMMITMENTS**

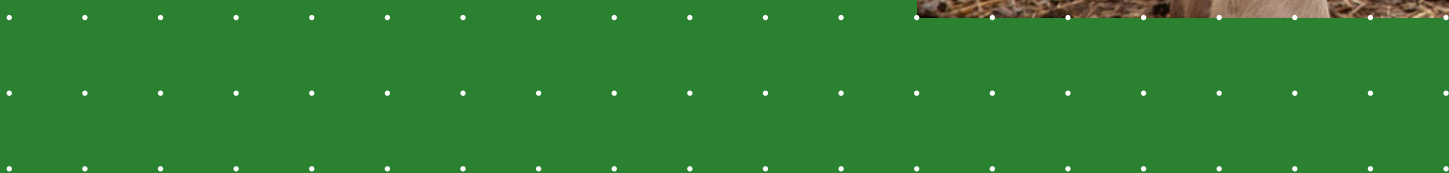
■ Future commitment
■ Paid



RESEARCH REPORT LEGACY PROJECTS

WHAT IS A LEGACY PROJECT?

Legacy projects fall into two main categories – Pork CRC projects contracted through APRIL because they were not due to finish before the close of the Pork CRC, and APRIL Investment Round 1 projects approved prior to adoption of the Strategic Plan in 2019. Industry Priority projects that addressed APRIL's strategic plan 2019–2022 have also been moved to this section.





KEY THEMES

PORK CRC PROJECTS

Pork CRC projects followed the Pork CRC program structure:

- Program 1 – Reduced confinement of sows and piglets
- Program 2 – Herd health management
- Program 3 – Healthy pork consumption
- Program 4 – Carbon conscious nutrient inputs and outputs
- Commercialisation projects.

APRIL INVESTMENT ROUND 1 PROJECTS

APRIL Investment Round 1 projects were structured into three programs, as follows:

PROGRAM 1 – RESILIENCE

Under the Resilience program, APRIL sought proposals on the more judicious use of antibiotics targeted at:

- Reduction in the use of in-feed medications or more conservative delivery of in-feed medications (pulse medication post-feed mixing, in line blending of medications).
- Non-antibiotic alternatives (i.e. vaccines, nutritional strategies, microbiome, effective additives, and “natural” products).
- Elimination of critical antibiotics from the production system.
- Reduction in antimicrobial resistance.
- Development of “sentinel” pig systems that provide alerts to the early onset of disease or give an indication of the overall immune status of the herd.
- Novel diagnostics.

APRIL SOUGHT NEW SCIENCE AND TECHNOLOGIES TO ENHANCE THE REPRODUCTIVE PERFORMANCE OF AUSTRALIAN SOWS WITHOUT THE NEED TO IMPORT FOREIGN GENETICS





PROGRAM 2 – COST

Under the Cost program, APRIL sought proposals which will help the Australasian industry reduce its reliance on the more conventional feed ingredients and help divorce the industry from the global grain and soybean markets.

This encompassed ideas on, but not limited to:

- Enhancing our capacity to utilise grain alternatives including milling co-products and pulses. Maintaining development of NIR calibrations for DE and available lysine in cereals and oilseeds, respectively.
- Developing effective means of measuring feed intake and wastage in pigs through all production phases.
- Enhancing methods for recovery of waste phosphorus and other high-demand nutrients. Improving application of enzyme and other feed additive technologies to conserve nutrients.
- Developing nutrient profiling and feeding practices of alternative or novel feed sources.

PROGRAM 3 – RETURN ON ASSETS

Program 3 was further divided into two sub-programs – Program 3A – Reproduction, and Program 3B – Progeny

Reproduction

APRIL sought new science and technologies to enhance the reproductive performance of Australian sows without the need to import foreign genetics.

New ideas and science were sought but not limited to the following areas:

- Optimisation of intake during lactation and management of sow body condition to maximise/enhance subsequent reproduction.
- Relationship between seasonal fertility versus infertility.
- Quantification of methods to control seasonal market supply through breeder management.
- Investigate and review new reproductive technologies and nutrient requirements that optimise piglets weaned/sow and reduce litter weight variability.
- Develop alternatives to importation of genetics to facilitate faster rate of genetic gain in Australasia.

Progeny

APRIL sought new science and technology to improve the efficiency and survival of pigs from weaning to sale. New ideas and science were sought but not limited to the following areas:

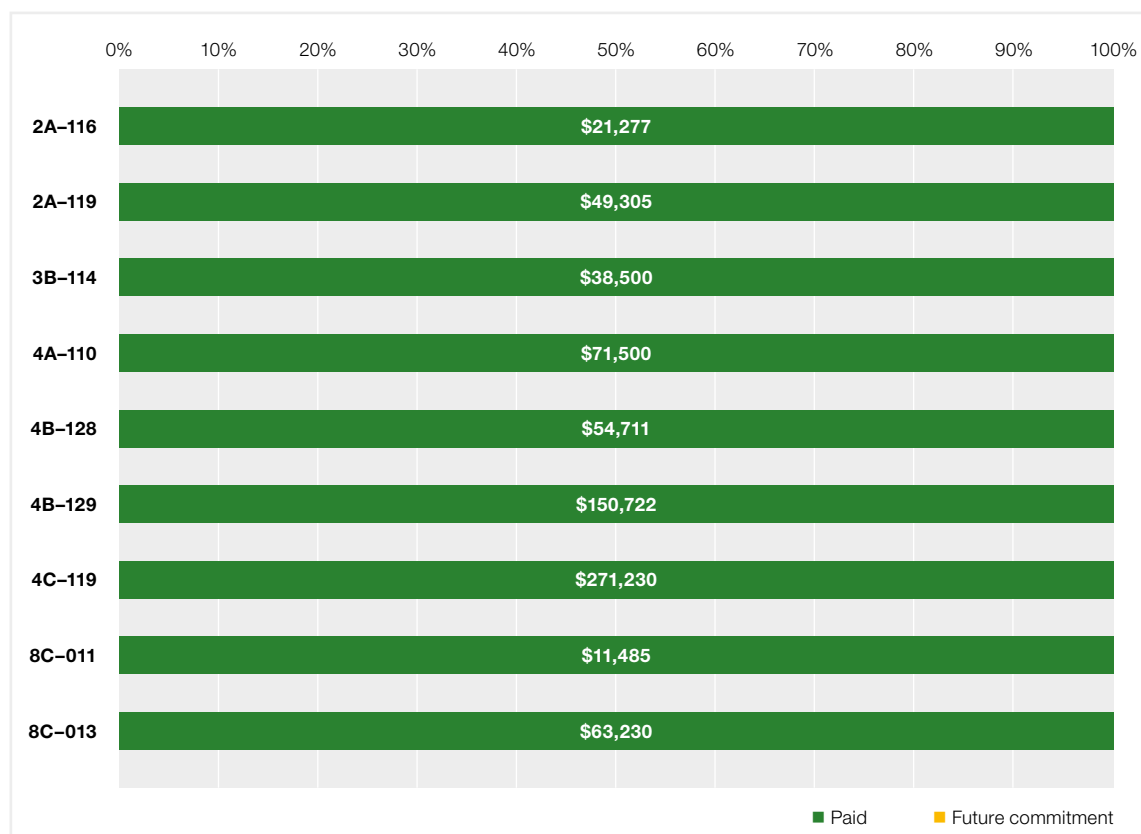
- Growth enhancement to improve inherent feed efficiency.
- Manipulation and monitoring of feed intake.
- Control and manipulation of carcass quality and variability.
- Measurement and reduction of feed wastage.
- Early detection of health challenges and improved control of sub-clinical health issues.
- Appropriate revision of nutrient requirements.

PROJECTS

PORK CRC PROJECTS

NO.	PROJECT NAME	LEAD PARTY
2A-116	Pre-farrowing health and welfare assessment of sows	Animal Genetics and Breeding Unit
2A-119	Development of a quantitative PCR test for swine dysentery	Murdoch University
3A-119	On line lean meat yield measurement of pig carcasses – commercial validation	Australian Pork Limited
3B-114	Development of a 'healthy pork' resource for use by consumers, health professionals and regulatory bodies: summary and dissemination of Pork CRC human nutrition research	The University of South Australia
4A-110	Integrated wastewater treatment plant (iWWTP) data collection	Flinders University
4B-128	The use of 15N as a biomarker for feed conversion efficiency (FCE) in pigs using blood and hair samples	The University of Melbourne
4B-129	Grain collection, storage and distribution, and data management for 4B subprogram projects	The University of Sydney
4C-119	Bio-upgrading piggery biogas by growing algae, for value-add end uses	The University of Queensland
8C-011	The provision of a curative supplemental block provides enrichment, reduces mutilation and reduces the negative impact on production performance caused by tail and ear bite mutations in growing pigs [cancelled due to technical issues]	CHM Alliance Pty Ltd (SunPork)
8C-013	An assessment of an attenuated live streptomycin-dependent <i>Actinobacillus pleuropneumoniae</i> (APP) vaccine (serovar 15) delivered either intranasal or as a combination of intranasal and intramuscular injection	Rivalea (Australia) Pty Ltd

PORK CRC PROJECT COMMITMENTS

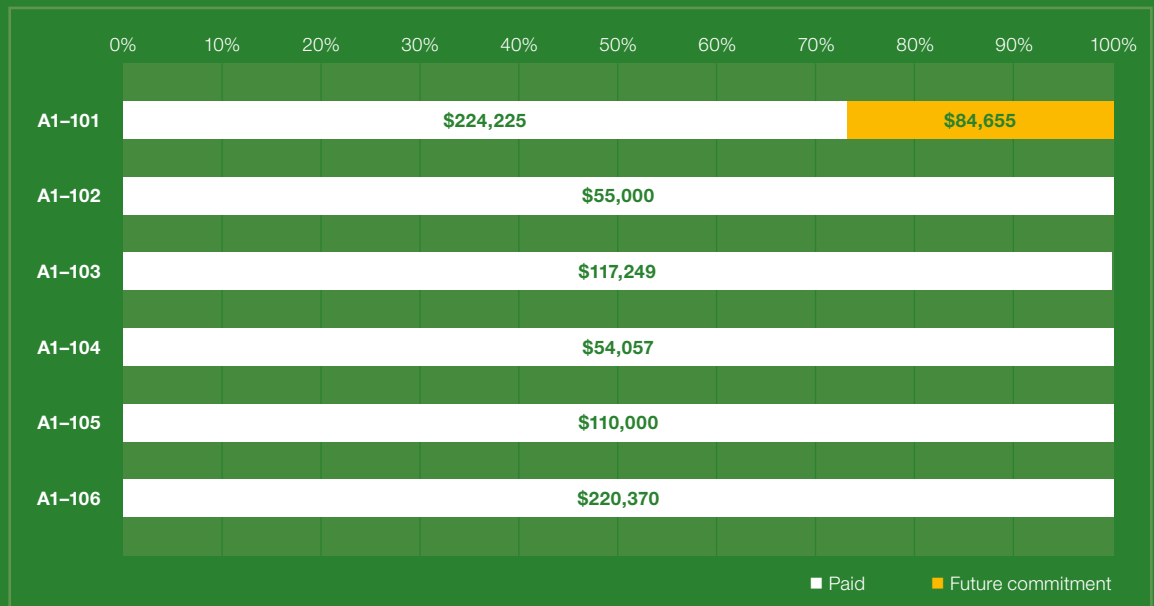


PROJECT COMMITMENTS

APRIL ROUND 1 PROGRAM 1

APRIL ROUND 1 PROGRAM 1 PROJECT COMMITMENTS PROGRAM 1 – RESILIENCE

NO.	PROJECT NAME	LEAD PARTY
A1-101	Novel approaches for reducing antimicrobial resistant and pathogenic Gram-negative bacteria in the porcine gut	Murdoch University
A1-102	Proof of concept: Oral Fluids and quantitative assessment for Porcine Chronic Respiratory Disease (PCRD) in Australian field conditions	Rivalea (Australia) Pty Ltd
A1-103	Improving enteric health, understanding impact on gut microbiome and weaner performance through the use of protease enzymes	CHM Alliance Pty Ltd (SunPork)
A1-104	Developing remote monitoring methods for early detection of respiratory disease in pigs	The University of Melbourne
A1-105	Early stress experiences and stress resilience and emotionality in pigs	The University of Melbourne
A1-106	A lab on a chip for real time pain and animal welfare biomarker measurement	The University of Adelaide





FEATURE PROJECT A1-101

NOVEL APPROACHES FOR REDUCING ANTIMICROBIAL RESISTANT AND PATHOGENIC GRAM-NEGATIVE BACTERIA IN THE PORCINE GUT

PROJECT LEADER:
Professor Sam Abraham
(Murdoch University)

PROJECT PARTICIPANTS:
Professor Sam Abraham, Dr Rebecca Abraham, Dr Tanya Laird (Murdoch University); Dr Mark O'Dea (DPIRD, WA); Dr David Cadogan and Dr Stuart Wilkinson (Feedworks Pty Ltd.)

PROJECT STATUS:
Completed

AIMS AND OBJECTIVES

This project had the following three major aims:

1. Evaluate the effect of specialised dried yeast ferments and specialised dried lactobacillus ferments in reducing the severity of enterotoxigenic *E. coli* (F4-ETEC) infections in post-weaned pigs (relative to ZnO).
2. Evaluate the effect of specialised dried yeast ferments and specialised dried lactobacillus ferments in reducing antimicrobial resistant bacteria, focusing on critically important antibiotics (CIAs), in the gastrointestinal tract of the post-weaned pig.
3. Evaluate the impact of specialised dried yeast ferments and specialised dried lactobacillus ferments on overall performance and indices of 'gut health' in post-weaned pigs.

EXPERIMENTAL DESIGN

Three experiments were conducted in this project:

1. Examine the production and microbiological effects of postbiotics, in the form of *Lactobacillus acidophilus* fermentation products (LFP) and *Saccharomyces cerevisiae* fermentation products (SFP), on weaner pigs challenged with an F4 ETEC strain.
2. Explore the effects of LFP or SFP, alone or in combination, on the carriage of ESC (extended-spectrum cephalosporin)-resistant *E. coli* using an ESC-resistant *E. coli* challenge model.
3. Study the dynamics of antibiotic-resistant *E. coli* carriage in weaner pigs on a commercial farm using the Robotics Antimicrobial Susceptibility Platform (RASP), to quantify the effects of postbiotics' supplementation on ESC-, ciprofloxacin- and tetracycline-resistant *E. coli* and on production.

DIETARY SUPPLEMENTATION WITH LFP AND SFP IMPROVED GROWTH PERFORMANCE IN PIGS CHALLENGED WITH F4-ETEC AND POSITIVELY INFLUENCED THE FAECAL MICROBIOTA

KEY FINDINGS

- Dietary supplementation with LFP and SFP improved growth performance (Figure 3) in pigs challenged with F4-EETEC and positively influenced the faecal microbiota. This suggests that these postbiotics may have a role in managing porcine ETEC.
- An experimental model was successfully used to analyse strategies against extended-spectrum cephalosporin (ESC)-resistant *E. coli*. The model can be employed for other intervention studies aimed at decolonising resistant bacteria (Figure 4).
- In the established *in vivo* model, successful colonisation of ESC-resistant *E. coli* was detected in weaner pigs, but there was a reduction in shedding over time. However, the postbiotics had no significant effect on this reduction rate or on the growth performance of pigs.
- In a commercial nursery, high levels of tetracycline, ciprofloxacin, and ESC-resistant *E. coli* were found at weaning but naturally declined over the next four weeks. The postbiotic supplementation had no significant effect on the reduction rate or on growth performance.

APPLICATIONS TO INDUSTRY

Despite continued bacterial shedding, the use of LFP and SFP postbiotic products in ETEC-inoculated post-weaned pigs showed promising benefits in terms of performance and faecal ('gut health') characteristics. This may be attributed to the increase in the diversity of intestinal microbiota in pigs with postbiotic-supplemented diets.

Methods to remove CIA-resistant bacteria, once established in a herd, are needed. A combination approach of decolonisation, using competitive excluding clones, target-specific bacteriophages, nutritional additives, and/or removal of co-selection pressure, is worthy of consideration.

FURTHER INFORMATION

For further information please see the Final Report at: <https://apri.com.au/research/project-reports/>

NOVEL APPROACHES FOR REDUCING ANTIMICROBIAL RESISTANT AND PATHOGENIC GRAM-NEGATIVE BACTERIA IN THE PORCINE GUT

FIGURE 3

Mean effect of dietary treatments on liveweight at day 27 after weaning. Data are estimated by generalised additive models fitting smoothing splines to non-linear changes in liveweight over time. Confidence intervals (bars) are given for each diet.

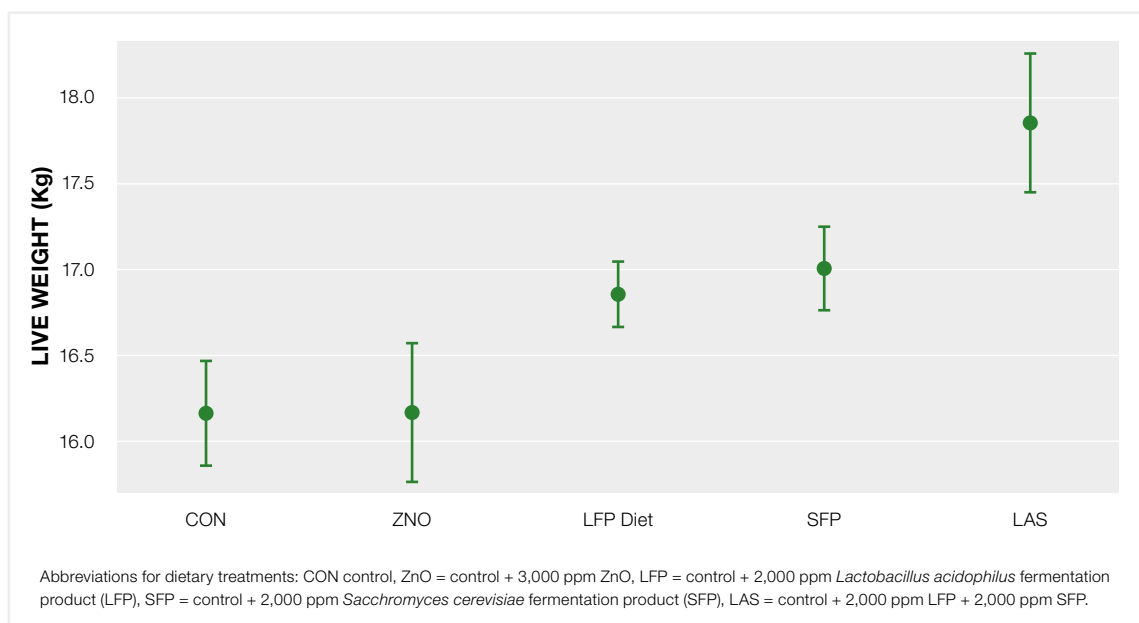
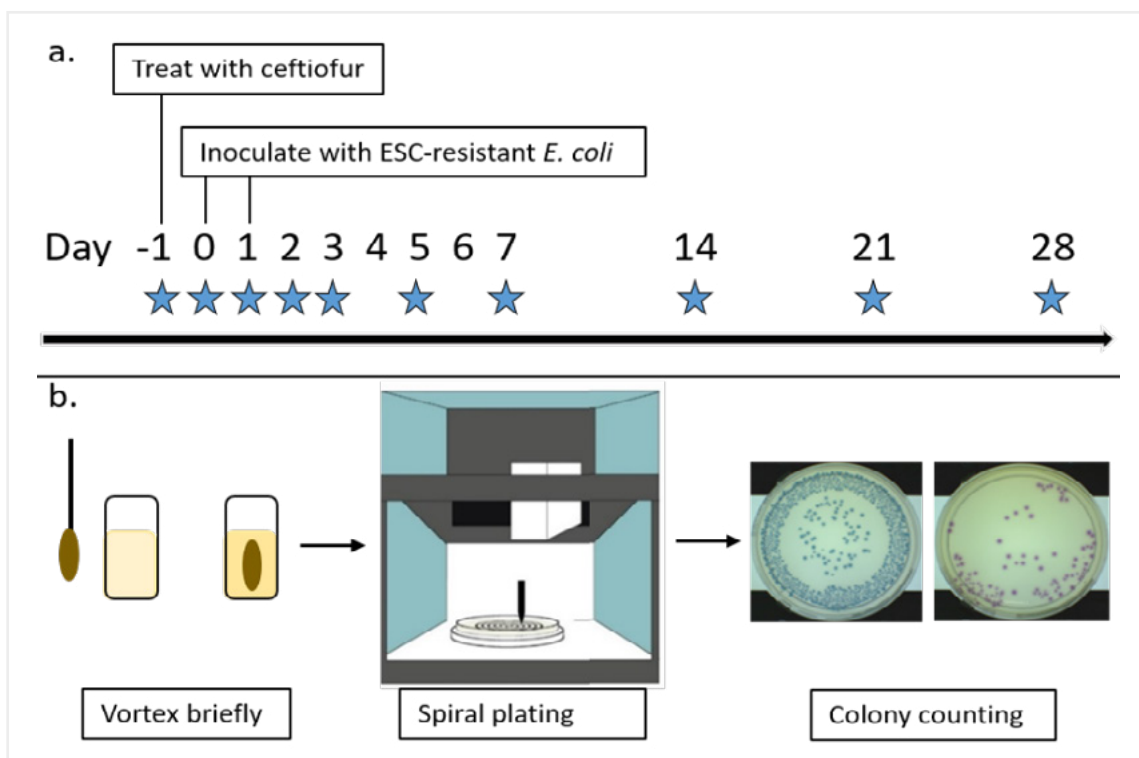


FIGURE 4

An overview of in vivo model for assessing effect of novel strategies on ESC-resistant *E. coli*.

a. The first inoculation with ESC-resistant *E. coli* was day 0 (i.e., 7 days after weaning). Blue stars represent days rectal swabs were collected.

b. Laboratory processing of samples for quantification of total *E. coli* and ESC-resistant *E. coli* from rectal swabs. Blue colonies represent *E. coli* on CHROMagar™ ECC agar while pink colonies represent ESC-resistant *E. coli* on CHROMagar™ ESBL agar.





FEATURE PROJECT A1-105

EARLY STRESS EXPERIENCES AND STRESS RESILIENCE AND EMOTIONALITY IN PIGS (AUSTRALIAN RESEARCH COUNCIL-LINKAGE PROJECT (LP180100218))

PROJECT LEADER:

Professor Paul Hemsworth
(The University of Melbourne)

PROJECT

PARTICIPANTS:

Professor Alan Tilbrook
(The University of Queensland); **Dr Jeremy Marchant-Forde** (USDA – Agricultural Research Service, USA); **Associate Professor Roger Rassool** (The University of Melbourne); **Professor Jean-Loup Rault** (University of Veterinary Medicine, Vienna)

PARTNER

ORGANISATIONS:

Australasian Pork Research Institute Ltd.; **Rivalea (Australia) Pty Ltd.**; **SunPork Pty Ltd.**

PROJECT STATUS:

Ongoing

AIMS AND OBJECTIVES

The overall aim of this project is to examine the long-term effects of early human contact, sow maternal behaviour, and housing during lactation, on stress resilience of pigs both early and later in life (Figure 5).

KEY FINDINGS TO DATE

Part 1 – Early human contact and housing

1. Positive handling early in life improved the ability of pigs to cope with stressors such as processing during lactation and weaning, as well as isolation later in life.
2. The effects of early positive human contact diminished over time with subsequent handling. However, some evidence remained of sustained effects of this early life experience on stress resilience later in life.
3. There was no evidence that rearing piglets in farrowing crates affected their behavioural reactivity to husbandry procedures, including vaccination and piglet processing, fear responses to novelty and unfamiliar humans, or the cortisol response to weaning and isolation.
4. Limited evidence existed that daily positive human contact for the first 4 days of life resulted in similar fear responses to novelty and humans at 3 weeks of age as positive human contact for 5 days per week during lactation.

Part 2 – Early human contact and sow maternal behaviour

1. In comparison to rearing in a conventional farrowing crate, piglets reared in a modified farrowing crate, which reduced piglet and sow contact in the front of the crate, showed evidence of reduced stress resilience.
2. Reduced maternal contact increased behavioural reactivity and cortisol response to piglet processing, and there was limited evidence of increased fear responses to novelty.
3. Early positive human contact did not affect behavioural reactivity and cortisol response to piglet processing. However, it improved stabilisation of behaviours following weaning, along with reducing aggression.
4. Positive human contact reduced fear of humans.

5. Restricting maternal contact that piglets received did not affect subsequent carcass and pork quality at 21 weeks of age. However, positive handling early in life reduced the rate of pH decline and resulted in a higher ultimate pH, two major characteristics of better eating quality of meat.

MAJOR CONCLUSIONS

Overall, this project has indicated that early human handling and housing can have both immediate and longer-term consequences on the stress resilience of pigs. This research substantially contributes to a growing body of work on the importance of the pig's early environment on its immediate and long-term welfare.

As a source of enrichment, positive human interactions provide several advantages: close interactions with piglets usually occur several times daily, positive interactions can be combined with routine checks, human interactions invariably provide variability in their predictability which will minimise habituation, and positive interactions may not require additional physical environmental enrichment resources, such as foraging material.

This research reinforces that humans are a key determining factor in shaping the development of stress coping mechanisms in pigs and thus their subsequent welfare.

APPLICATIONS TO INDUSTRY

The benefits of understanding the influence of early experience on ameliorating stress range from the opportunity to minimise stress associated with practices imposed either in the interests of the animal or humans, through to the situation where alternative practices are either unavailable or have not yet been satisfactorily developed.

Early rearing strategies to enhance stress resilience would provide the pork industry with an opportunity to enhance stress resilience and welfare in animals under their care. Furthermore, public concerns and policy debates about animal production often involve the conditions that guarantee animal welfare. Animal welfare is a high priority to the Australian pork industry and the community, as well as governments. It is also one of international significance.

EARLY STRESS EXPERIENCES AND STRESS RESILIENCE AND EMOTIONALITY IN PIGS
(AUSTRALIAN RESEARCH COUNCIL-LINKAGE PROJECT (LP180100218))

Many argue that there are conflicts between animal welfare and efficient farming. However, there is increasing evidence that improved animal welfare can increase profits through reduced morbidity and mortality (through reduced stress and improved disease resistance), improved product quality, lower risk of zoonoses and foodborne diseases, and potentially, price incentives.

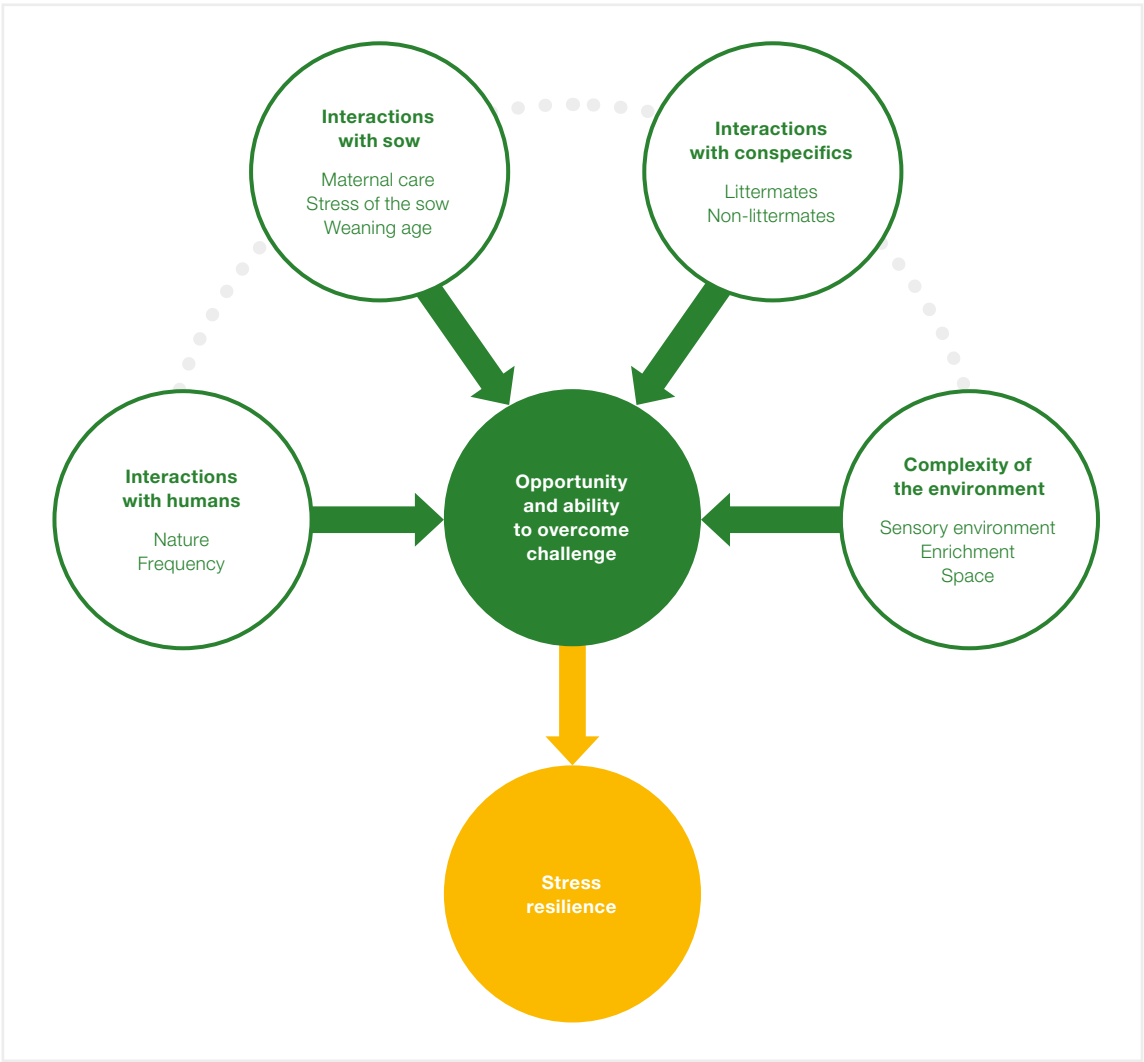
OUTPUTS

This project has supported a number of peer-reviewed publications and conference publications, a number of submitted publications to peer-reviewed journals, the opportunity for conference presentations, and two PhD theses.

FIGURE 5

Key early life housing, human and social experiences that can affect the development of stress resilience in piglets

Source: Lucas, M.E., Hemsworth, L.M. and Hemsworth, P.H. (2023). Early life piglet experiences and impacts on immediate and longer-term adaptability. *Animal* 100889.



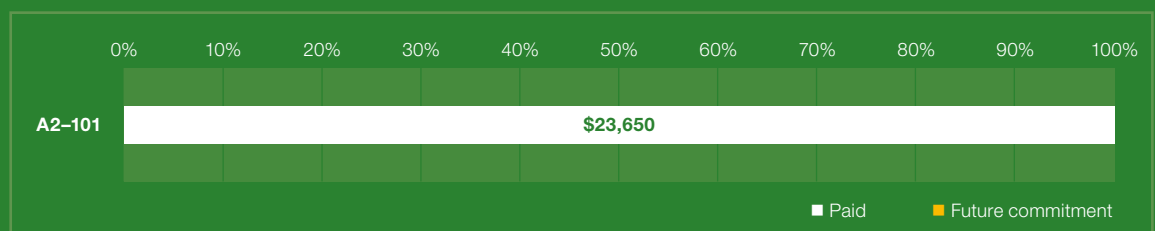
PROJECT COMMITMENTS

APRIL ROUND 1 PROGRAM 2

APRIL ROUND 1 PROGRAM 3A

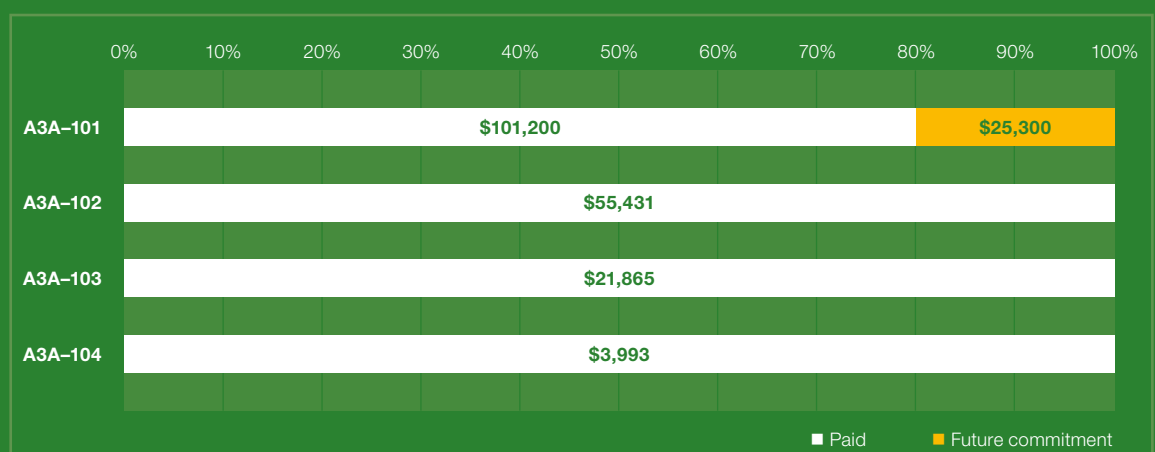
APRIL ROUND 1 PROGRAM 2 PROJECT COMMITMENTS PROGRAM 2 – COST

NO.	PROJECT NAME	LEAD PARTY
A2-101	Protected vitamin and mineral premixes maintain performance of commercial pigs at reduced inclusion rates	CHM Alliance Pty Ltd (SunPork)



APRIL ROUND 1 PROGRAM 3A PROJECT COMMITMENTS PROGRAM 3A – REPRODUCTION

NO.	PROJECT NAME	LEAD PARTY
A3A-101	Improved feed efficiency, control of P2 back fat and maintenance of pork quality in finishing pigs fed bitter extracts	The University of Queensland
A3A-102	Review relationship between energy intake and protein deposition in 60–110 kg pigs with modern genetics using DXA scanner	Rivalea (Australia) Pty Ltd
A3A-103	Feeding a single diet to pigs in the grower/finisher stage to reduce feed costs and improve feed efficiency	Pork Innovation WA
A3A-104	Base-Funded Experiment: Feeding a single diet versus phase feeding to pigs in the growing-finishing stage	CHM Alliance Pty Ltd (SunPork)
A3A-105	Base-Funded Experiment: Feeding a single diet versus phase feeding to pigs in the growing-finishing stage	Rivalea (Australia) Pty Ltd

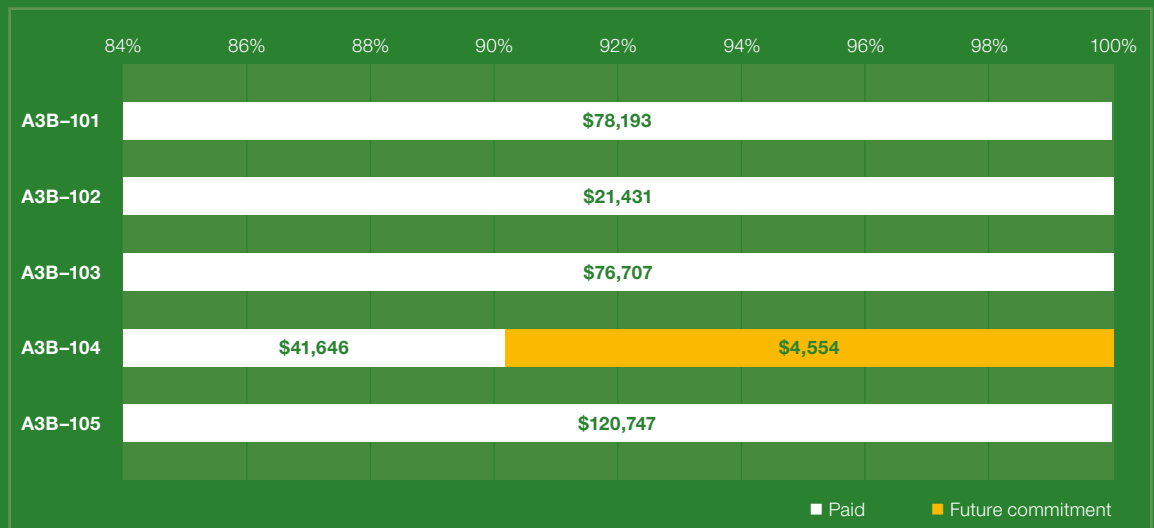


PROJECT COMMITMENTS

APRIL ROUND 1 PROGRAM 3B

APRIL ROUND 1 PROGRAM 3B PROJECT COMMITMENTS PROGRAM 3B – PROGENY

A3B-101	Using GnRH analogues for fixed-time AI and pregnancy support to address seasonal infertility in sows	The University of Adelaide
A3B-102	Nutritional supplementation to increase the number of pigs weaned and fertility of sows which farrow and are mated during summer / early autumn	The University of Adelaide
A3B-103	Identifying reciprocal chromosomal translocations to reduce early embryo mortality	CHM Alliance Pty Ltd (SunPork)
A3B-104	Seasonal fertility: a novel approach to alleviating seasonal infertility in sows	CHM Alliance Pty Ltd (SunPork)
A3B-105	Effects of negative DCAD and vitamin D in transition diets to increase piglet weaning numbers, improve piglet weaning weight, and minimise sow condition loss during lactation	J.A.Braun Investments Pty Ltd





FEATURE PROJECT A3B-105

EFFECTS OF NEGATIVE DCAD (DIETARY CATION-ANION DIFFERENCE) AND VITAMIN D IN SOW TRANSITION DIETS TO INCREASE PIGLET WEANING NUMBERS, IMPROVE PIGLET WEANING WEIGHT, AND MINIMISE SOW CONDITION LOSS DURING LACTATION

PROJECT LEADER:
Dr Alice Weaver
(SARDI)

PROJECT PARTICIPANTS:
Adjunct Professor Ian Lean (Scibus and The University of Sydney), Tom and Jeff Braun (Myora Farm), Dr Elliot Block (Arm and Hammer Animal Nutrition)

PROJECT STATUS:
Completed

AIMS AND OBJECTIVES

The general aim of this project was to investigate the use of sow transition diets that delivered acidogenic feeds and a vitamin D metabolite, calcidiol, to improve the health, well-being and production of sows. Transition diets were compared to an industry standard practice of feeding a lactation diet, and were compared for optimal performance within transition diets.

This project addressed three major research questions:

1. Will feeding a negative dietary anion cation difference (DCAD) transition diet from late in gestation to early lactation improve production outcomes?
2. Is there evidence that skeleton regulates energy metabolism in the pig as it does in other species as indicated by changes in blood metabolites?
3. Is there a positive interaction of both DCAD and the inclusion of calcidiol in a transition diet?

EXPERIMENTAL DESIGN

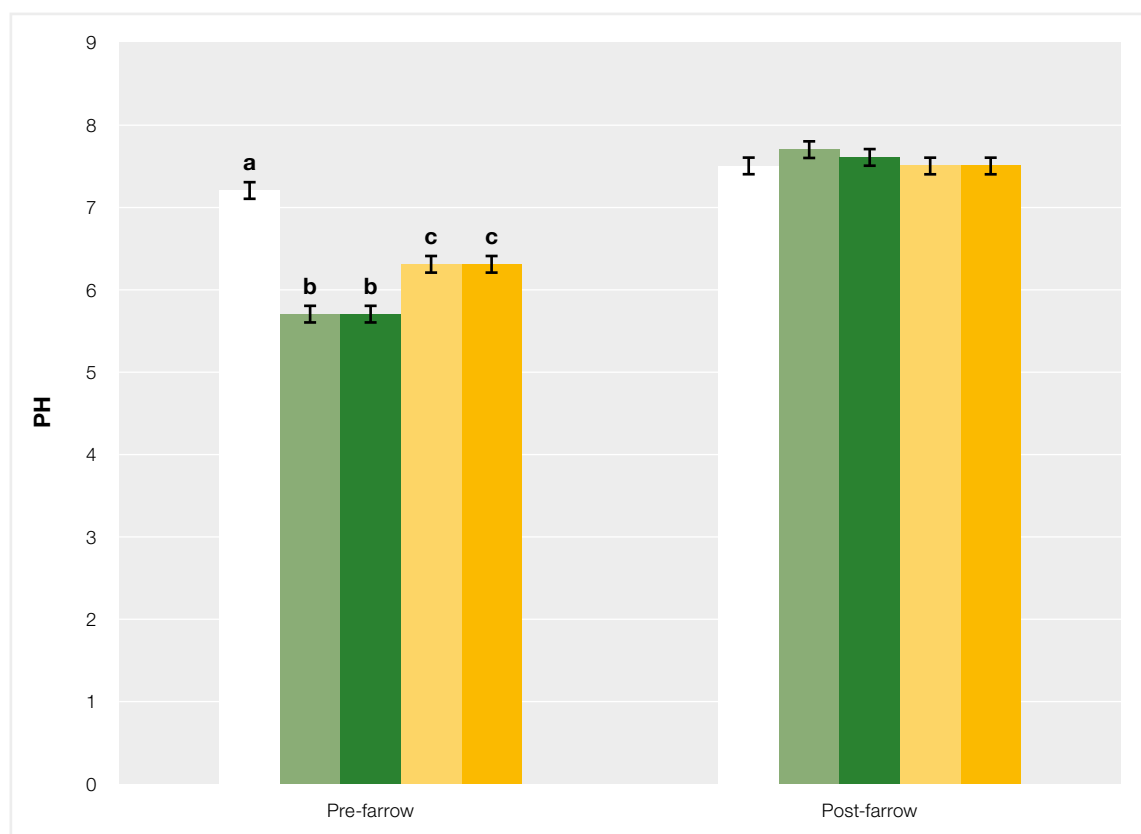
This study used 413 purebred Large White and Landrace primiparous and multiparous sows (parity 1 to 8; Myora Genetics) allocated to receive either a control diet (dry sow ration until entry to farrowing house then a lactating sow ration until weaning, n = 85), or one of four transition diets fed from day 103 of gestation until day three post-farrow

1. Negative DCAD.
2. Negative DCAD + calcidiol (50 µg/kg of Rovimix HyD®; DSM-Firmenich).
3. Positive DCAD.
4. Positive DCAD + calcidiol.

All diets contained cholecalciferol (1000 IU/kg).

FIGURE 6

Sow urine pH prior to farrowing and after farrowing of control sows, and sows that received either a positive or negative DCAD diet, and with or without calcidiol. Different superscripts within a timepoint indicate $P < 0.01$.



□ Control
■ Negative DCAD
■ Negative DCAD + calcidiol
■ Positive DCAD
■ Positive DCAD + calcidiol



EFFECTS OF NEGATIVE DCAD (DIETARY CATION-ANION DIFFERENCE) AND VITAMIN D IN SOW TRANSITION DIETS TO INCREASE PIGLET WEANING NUMBERS, IMPROVE PIGLET WEANING WEIGHT, AND MINIMISE SOW CONDITION LOSS DURING LACTATION

KEY FINDINGS

1. A significant reduction in stillbirths was observed in the negative DCAD + calcidiol and positive DCAD treatment groups compared to control sows fed the lactating sow ration.
2. There was a significant reduction in mortality ($\downarrow 4\%$) to day 120 of piglets offered the negative DCAD + calcidiol diet compared to piglets offered the control or positive DCAD + calcidiol diets.
3. There was a (statistical) tendency for more than 0.9 additional piglets to be born in the subsequent litter for the negative DCAD and both positive DCAD groups compared to control sows.
4. Urinary pH responses of sows to diets formulated to provide a positive DCAD diet indicated that there was acidification occurring in both positive and negative DCAD treatments. It is possible that the rapidly available starch in barley and wheat, that comprised approximately 50% of the diets, generated enough volatile fatty acids to reduce urinary pH (Figure 6).
5. There were minimal differences in sow body condition. However, negative DCAD + calcidiol-fed sows lost significantly less backfat during lactation than control-, negative DCAD- and positive DCAD + calcidiol-fed sows.
6. Milk fat and protein contents, piglet weight, and the number of piglets weaned were statistically similar for all five treatment groups. The lack of a significant effect on number of piglets weaned despite reductions in stillbirths and piglet mortalities was likely influenced by fostering.
7. There were statistical differences reflected in blood gas, mineral and metabolite concentrations that are consistent with feeding of a negative DCAD diet, providing more evidence that negative DCAD diets may influence energy metabolism.

THERE WAS A SIGNIFICANT REDUCTION IN MORTALITY ($\downarrow 4\%$) TO DAY 120 OF PIGLETS OFFERED THE NEGATIVE DCAD + CALCIDIOL DIET

APPLICATIONS TO INDUSTRY

A separate transition diet for sows that incorporates increased fibre content and an ability to induce metabolic acidification is recommended for Australian pork producers.

Further research is required to define the optimal period of transition feeding, investigate the effects in gilts, determine the optimal urine pH to target for outcomes, and characterise the effects of carbohydrate fractions in the diet on urinary pH and metabolic acidification.



RESEARCH REPORT INDUSTRY PRIORITY PROJECTS

WHAT IS AN INDUSTRY PRIORITY PROJECT?

APRIL has prioritised several industry challenges that if solved will assist in improving Australasian pork production. Industry Priority Projects are shorter-term, more focussed projects directed at solving these challenges through investments in collaborative research projects.





THE PRIORITY CHALLENGES THAT APRIL IDENTIFIED IN THE STRATEGIC PLAN 2019–2022 ARE:

- **Effective monitoring of foreign disease incursions in Australasia.**
- **Novel approaches to allow increased use of food wastes in pig diets.**
- **Making pigs more tolerant to heat.**
- **Improved water quality for use/re-use on-farm and in processing facilities.**
- **Alternate methods to control/eradicate endemic diseases.**
- **Development of real time monitoring and surveillance technologies under commercial conditions.**
- **Detecting sow reproductive state more efficiently and effectively.**
- **Establish pork as an integral part of a healthy lifestyle.**
- **Reducing variation in lifetime performance.**
- **Biodegradable packaging solutions for pork products.**
- **Heavier carcasses.**

PROJECTS

APRIL has invested in the following projects addressing the “Making pigs more tolerant to heat”, “Reducing variation in lifetime performance”, “Development of real time monitoring and surveillance technologies under commercial conditions”, “Detecting sow reproductive state more efficiently and effectively” and “Novel approaches to allow increased food wastes in pig diets” priorities:

6A–101 HEAT TOLERANCE (HT) IN LACTATING SOWS: DIETARY STRATEGIES, METABOLIC BIOMARKERS AND MICROBIOME SIGNATURE

PROJECT LEADER: PROFESSOR EUGENI ROURA, THE UNIVERSITY OF QUEENSLAND

- Test selected dietary supplements to increase the heat tolerance of the lactating sow.
- Identify individual variations in metabolism between heat tolerant and less heat tolerant sows during lactation (metabolic and microbiome markers in resilient compared to the most vulnerable individuals).

6A–102 HOT AND BOTHERED! LONG TERM IMPACTS OF LATE PREGNANCY HEAT STRESS ON SOWS AND PROGENY

PROJECT LEADER: DR KATE PLUSH, SUNPORK FARMS

- Demonstrate that heat stress results in a longer duration of farrowing.
- Identify the impacts longer farrowing duration has on (a) the sow and (b) the piglet, and how this impacts long term performance.
- Test dietary/water additives for reducing farrowing duration during times of heat stress and determine the production advantages at a commercial level.
- Conduct a cost:benefit analysis and assessment of farrowing room cooling in the hotter months.





6A-103 EASING THE WEANING TRANSITION: LARGE PIGLETS FROM LARGE PELLETS

**PROJECT LEADER: MR ROBERT HEWITT,
SUNPORK FARMS**

- Reduce weight variability around weaning through combining two complimentary technologies, large pellets and semi-moist extruded feed, to improve feed intake in the period immediately post-weaning, sustaining weight gain.

6A-104 USE OF THERMOGRAPHIC TECHNOLOGY TO DETECT REPRODUCTIVE STATE IN SOWS AND IMPROVE PIGLET PERFORMANCE IN A COMMERCIAL FARROWING HOUSE

**PROJECT LEADER: DR JESSICA CRAIG,
RIVALEA (AUSTRALIA) PTY LTD**

- Identify the optimum position on the sow for surface temperature measurements in order to predict success in lactation of sows, their health status, as well as the viability of their piglets at birth.
- Early detection of at-risk piglets, farrowing difficulties, and/or MMA to provide producers with the tools for early intervention for sows and piglets at risk.

6A-105 FOOD WASTE TO PIG FEED – SAFE AND BIO-SECURE

PROJECT LEADER: DR VALERIA TOROK, SARDI
JOINT PROJECT WITH THE FIGHT FOOD WASTE CRC

- Address novel approaches to allow increased use of food wastes in pig feed.
- Identify food safety/biosecurity risks and strategies to mitigate perceived risks of utilising food waste streams into pig feed.
- Identify waste streams with the least variability in quality and quantity.
- Determine the economic feasibility of utilising food waste for pig feed in key regional production areas.

6A-106A PRECISION MONITORING OF REPRODUCTIVE STATE VIA DEVELOPMENT OF PEN SIDE MUCUS TESTING AND CONTINUOUS REMOTE MONITORING

**PROJECT LEADER: PROFESSOR PAUL VERMA,
SARDI**

6A-106B PRECISION MONITORING OF REPRODUCTIVE STATE VIA DEVELOPMENT OF PEN SIDE MUCUS TESTING AND CONTINUOUS REMOTE MONITORING

**PROJECT LEADER: ASSOCIATE PROFESSOR
ROS BATHGATE, THE UNIVERSITY OF SYDNEY**

These studies will be conducted in parallel and both projects will contribute to two priority areas: detection of sow reproductive state and development of real-time monitoring technologies.

There are three aims to the projects, namely:

1. In sows and gilts, to determine whether oestrus and ovulation are accurately identifiable by:
 - i. changes in the concentration of ions in cervical mucus using Near InfraRed Spectroscopy (NIRS)
 - ii. the use of accelerometers
 - iii. alterations in the glycomic profile of cervical mucus using liquid chromatography-mass spectrometry.
2. To devise and implement an innovative oestrous detection protocol using NIRS cervical mucus analysis to compare conception and farrowing rates with conventional oestrus detection following either double or single dose artificial insemination.
3. In sows, to determine whether the glycomic profile of cervical mucus accurately detects:
 - i. seasonal infertility
 - ii. pregnancy status prior to 28 days post-insemination
 - iii. the onset of parturition.

6A-107 DEVELOPING HIGH-THROUGHPUT MOLECULAR SCREENING TECHNIQUES TO DETECT RECIPROCAL TRANSLOCATION IN BOARS

PROJECT LEADER: PROFESSOR TARIQ EZAZ, THE UNIVERSITY OF CANBERRA

This project aims to identify diagnostic DNA markers associated with Reciprocal Chromosomal Translocations (RCTs) in boars. It will use new methodologies to identify single nucleotide polymorphisms and Presence-Absence markers linked with chromosome rearrangements and therefore associated with boar infertility.

The primary objective is to enable detection of RCTs cheaply in a high-throughput manner, enabling the widespread adoption of this technology, and reducing the incidence of low litter size. A secondary objective will see an expansion of the original screening conducted in APRIL project A3B-103 to additional genetic suppliers to detect the incidence of RCTs in the wider boar population.

6A-108 HOW LOW CAN YOU GO? OPTIMISING THE USE OF CALCIUM NITRATE (CAN) IN GESTATING SOW DIETS TO REDUCE PIGLET BIRTHWEIGHT VARIATION AND IMPROVE THEIR LIFETIME PERFORMANCE

PROJECT LEADER: DR JESSICA CRAIG, RIVALEA (AUSTRALIA) PTY LTD

This project will investigate the use of calcium nitrate (CAN) in sow diets to improve piglet birth weights and reduce variation in birth weight and lifetime performance.

Following on from a previous APRIL project (5A-104), the current project will aim to optimise strategies for the practical use of CAN and investigate three different timings of CAN supplementation in gestation (i.e., throughout gestation, late gestation from day 90 until farrowing, and the pre-farrowing transition period from entry to the farrowing house until farrowing), to discover the most cost-effective strategy for producers.

The use of a low-dose, low-cost feed additive in the form of CAN, over a relatively short period of time, is anticipated to increase birth weights and reduce birth weight variability. In turn, this is expected to reduce variation in carcass weights and result in heavier carcasses overall, reducing cost of production and improving profitability.

6A-109 REVIEW: IDENTIFYING KNOWLEDGE GAPS AND STRATEGIES TO IMPROVE PROGENY UNIFORMITY OF PIGS

PROJECT LEADER: DR FAN LIU, RIVALEA (AUSTRALIA) PTY LTD

Carcass weight and fatness are the two most important factors that determine the carcass value in the Australasian pig industry. Improving the uniformity of carcass weight at a given slaughter age and the uniformity of backfat at a given carcass weight can reduce sorting required for marketing, shorten the selling duration of a progeny batch and improve carcass compliance, thereby improving profitability.

The variation of carcass weight and backfat in a progeny batch are a reflection of different lifetime tissue deposition rates among individual pigs. The individual variation in tissue deposition rate of progeny pigs originates from multiple factors in the foetal, preweaning, weaner, and grower/finisher phases (Figure 7).

A Literature Review will be conducted to explore the key physiological and nutritional factors during the prenatal, neonatal, or postnatal phase that are associated with the individual variation of tissue growth. The outcome of the review will facilitate the potential development of a research program to reduce the within-batch variation of progeny pigs.

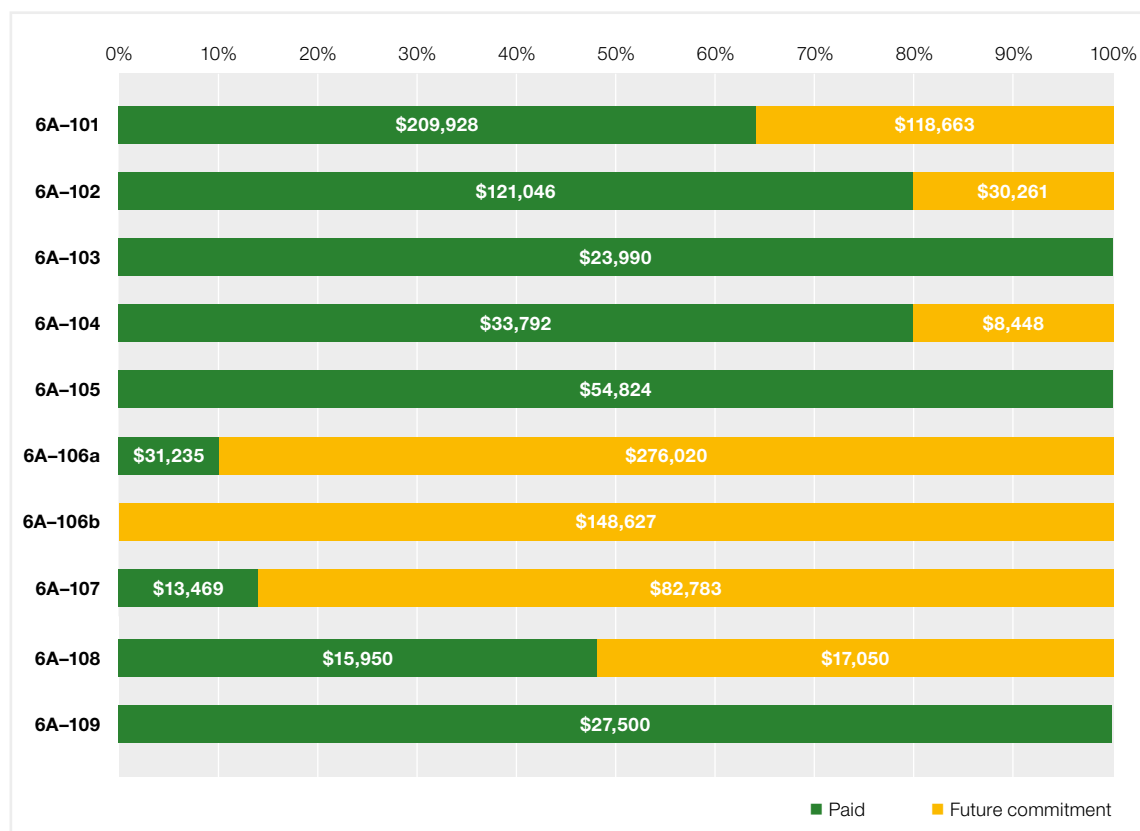
FIGURE 7

Sources of within-batch variation in pig carcasses



NO.	PROJECT NAME	LEAD PARTY
6A-101	Heat Tolerance (HT) in lactating sows: dietary strategies, metabolic biomarkers and microbiome signature	The University of Queensland
6A-102	Hot and Bothered! Long term impacts of late pregnancy heat stress on sows and progeny	CHM Alliance Pty Ltd (SunPork)
6A-103	Easing the transition: large piglets from large pellets	CHM Alliance Pty Ltd (SunPork)
6A-104	The use of thermographic technology to detect reproductive state in sows and improve piglet performance in a commercial farrowing house	Rivalea (Australia) Pty Ltd
6A-105	Food waste to pig feed – Safe and Bio-secure	Fight Food Waste CRC
6A-106a	Precision monitoring of reproductive state via development of pen side mucus testing and continuous remote monitoring	SARDI
6A-106b	Precision monitoring of reproductive state via development of pen side mucus testing and continuous remote monitoring	The University of Sydney
6A-107	Developing high throughput molecular screening techniques to detect reciprocal translocation in boars	The University of Canberra
6A-108	How low CAN you go?: Optimising the use of calcium nitrate (CAN) in gestating sow diets to reduce piglet birthweight variation and improve their lifetime performance	Rivalea (Australia) Pty Ltd
6A-109	Review: Identifying knowledge gaps and strategies to improve progeny uniformity of pigs	Rivalea (Australia) Pty Ltd

APRIL INDUSTRY PRIORITY PROJECT COMMITMENTS





FEATURE PROJECT: 6A-109

REVIEW: IDENTIFYING KNOWLEDGE GAPS AND STRATEGIES TO IMPROVE PROGENY UNIFORMITY OF PIGS

PROJECT LEADER:
Dr Fan Liu

PROJECT PARTICIPANT:
Rivalea (Australia)
Pty Ltd

PROJECT STATUS:
Completed

AIMS AND OBJECTIVES

This Literature Review aimed to:

1. Increase understanding of the factors contributing to carcass weight and fatness variation within a production batch of pigs.
2. Provide background information for developing effective strategies to improve carcass uniformity in pigs.

METHODS OF THE REVIEW

This review summarised and discussed the aetiology of causes of variation in tissue deposition rate within a progeny batch, covering the physiological and nutritional factors during the pre-mating, prenatal, pre-weaning and post-weaning phases (Figure 8).

The studies conducted in pigs and published in peer-reviewed journals were reviewed and the effectiveness of the strategies that attempted to reduce this variation were analysed. Novel candidate strategies are proposed for the development a potential future research program to address this issue.

KEY FINDINGS

For **pre-mating** factors, the protein content loss from the previous lactation and different ovulation timing of follicles are two novel factors influencing the within-litter coefficient of variation (CV) of foetal development.

Grouping progeny pigs born to the sows with a widespread weaning-to-oestrus interval (WOI) can expand age-related carcass variation. Technologies that can standardise WOI would help reduce between-litter age variations and age-related carcass variation.

Among **prenatal** factors, the non-uniform foetal development amongst littermates is a key source for the variation in the predisposition of tissue growth. Myofibre proliferation during the foetal phase is associated with lifetime muscle deposition and lean percentage.

Placental vascularity contributes to within-litter uniformity, but the direct association has not been validated in sows. The effective strategies to improve placental vascularity and uteroplacental blood flow in sows remain to be investigated.

In the **pre-weaning** phase, the within-litter growth variation is affected by colostrum/milk consumption during lactation. Providing milk supplements to born-light piglets can temporarily increase weaning weight, but the advantage diminishes after weaning and does not lead to increased slaughter weight.

Increasing myonuclear accretion through stimulating satellite cell proliferation during the neonatal phase may be a novel strategy to restore the inferior muscle deposition of born-light progeny. However, fundamental research is required to quantify the contribution of satellite-cell-derived myofibers to muscle deposition.

Post-weaning factors, such as insufficient feeder space and low health status during the grower-finisher phase, can increase the pig-to-pig variation of growth rate in a production batch. Sorting pigs by weight at the grower phase and custom feeding the lightweight subgroups can improve the within-batch uniformity. Catch-up growth of born-light piglets requires sufficient predisposition factors such as myofibre number and digestive function.

Emerging evidence showed a causal role of the gut microbiota in the tissue growth of pigs, highlighting a new area for understanding the aetiology of variation of carcass traits.

APPLICATIONS TO INDUSTRY

The current review reiterated the importance of within-batch carcass uniformity in pork production and its financial implications. The literature summarised in this review provides excellent background knowledge for guiding future research and development initiatives and strategies for improving carcass uniformity in the future.

FURTHER INFORMATION

For further information please see the Final Report at: <https://apri.com.au/research/project-reports/>

REVIEW: IDENTIFYING KNOWLEDGE GAPS AND STRATEGIES TO IMPROVE PROGENY UNIFORMITY OF PIGS



FIGURE 8

Pre-mating, prenatal, pre-weaning and post-weaning factors causing pig-to-pig variation of carcasses within a production batch

EMERGING EVIDENCE SHOWED A CAUSAL ROLE OF THE **GUT MICROBIOTA** IN THE TISSUE GROWTH OF PIGS, HIGHLIGHTING A NEW AREA FOR UNDERSTANDING THE AETIOLOGY OF VARIATION OF CARCASS TRAITS

EDUCATION AND TRAINING REPORT





APRIL EDUCATION AND TRAINING PROGRAM

APRIL is committed to helping build skilled human resources for the benefit of industry, whether it be through supporting tomorrow's researchers through undergraduate projects (e.g. Honours) and postgraduate support such as PhD scholarships and Doctor of Veterinary Medicine projects, or training highly skilled staff in pork production through the Industry Placement Program.

During the reporting period, APRIL established the Post-Doctoral Fellowship Scheme which provides support to Universities to employ an early career research scientist focused on pork industry research.

APRIL has a dedicated Education Advisory Committee that ensures APRIL's education and training programs are relevant and operating efficiently to meet these goals.

TOMORROW'S RESEARCHERS

As at 30 June 2023, APRIL has supported scholarships for the following undergraduate and postgraduate students:

...THE PHD STUDENTS INVOLVED IN THESE PROJECTS ARE WORKING ON REAL-WORLD ISSUES ON COMMERCIAL PRODUCTION UNITS...

STUDENT	UNIVERSITY	QUALIFICATION	STATUS
Brittany Silva	Murdoch University	DVM	Completed
Ryan Kristen	The University of Sydney	DVM	Completed
Bianca Hatze	The University of Sydney	DVM	Ongoing
Eva Vidacs	The University of Melbourne	Honours	Completed
Suzanna Jones	Murdoch University	Honours	Completed
Stephanie Shields	The University of Sydney	Honours	Completed
Kaitlin Beltakis	The University of Adelaide	Honours	Completed
Emma Goode	University of New England	MSc	Completed
Tanya Laird	Murdoch University	PhD	Completed
Elisabet Puig-Garcia	The University of Queensland	PhD	Ongoing
Abedin Abdallah	The University of Queensland	PhD	Ongoing
Katelyn Tomas	The University of Queensland	PhD	Ongoing
Rutu Galea	The University of Melbourne	PhD	Ongoing
Md Shariful Islam	University of New England	PhD	Ongoing
Soraya Haynes	Murdoch University	PhD	Ongoing
Viet Hai Tran	The University of Queensland	PhD	Ongoing
Xianyi Liu	The University of Queensland	PhD	Ongoing

In addition, a number of projects involving APRIL funding also provide student support. Examples include the Australian Research Council-Linkage projects involving APRIL as a Partner Organisation, titled *Early stress experiences and stress resilience and emotionality in pigs* and *How to make antimicrobials in pig feed redundant*,

naturally. The nature of these projects, directly involving industry, means that the PhD students involved in these projects are working on real-world issues on commercial production units, meaning not only do they gain a PhD but also are well equipped to enter the workforce having a greater understanding and appreciation of production.

INDUSTRY PLACEMENT PROGRAM

APRIL supports an Industry Placement Program (IPP), similar to that successfully initiated in the Cooperative Research Centre for High Integrity Australian Pork. The Pork CRC's IPP placed more than a dozen highly credentialed young people in industry positions where they leveraged their academic skills and qualifications to add value to their workplaces, and APRIL seeks to continue this valuable legacy.

As part of an IPP Award, APRIL will provide the successful business applicant with \$75,000 over the first two years to help cover salary and other costs associated with training the awardee for three years.

As at 30 June 2023, APRIL has supported the following IPP students:

AS PART OF AN IPP AWARD, APRIL WILL PROVIDE THE SUCCESSFUL BUSINESS APPLICANT WITH \$75,000 OVER THE FIRST TWO YEARS TO HELP COVER SALARY AND OTHER COSTS ASSOCIATED WITH TRAINING THE AWARDEE FOR THREE YEARS.

AWARDEE	EMPLOYER	STATUS
Sofie Pridgeon	CHM Alliance Pty Ltd (SunPork)	Completed
Dr Jessica Craig	Rivalea (Australia) Pty Ltd	Completed
Dr Lauren Staveley	CHM Alliance Pty Ltd (SunPork)	Ongoing
Dr Maria Jorquera-Chavez	Rivalea (Australia) Pty Ltd	Completed
Dr Nandi van Wyk	Apiam Animal Health Ltd/ Portec	Ongoing
Dr Maximiliano Muller	The University of Queensland	Ongoing
Samantha Sterndale	Westpork Pty Ltd	Ongoing



FOCUS ON PHD STUDENT SUPPORT: KATELYN TOMAS

Katelyn is currently a PhD student at The University of Queensland, commencing her PhD in August 2020 on the topic of *Early life stress and subsequent stress resilience and emotionality in pigs*. Her supervisors are Professor Alan Tilbrook, The University of Queensland, Dr Darryl D'Souza and Dr Kate Plush, SunPork Solutions/CHM Alliance, and Professor Paul Hemsworth, The University of Melbourne.

Katelyn completed her Bachelor of Science (Animal Science) at The University of Adelaide, during which she was awarded the Undergraduate Industry Placement Award from Australian Pork Limited and spent 2 weeks working at Myora Farm Piggery in Mt Gambier. This piqued her interest in pigs, and from there completed an Honours in Animal Science project focusing on maternal creatine supplementation to young sows pre- and post-induced farrowing to improve piglet viability. Katelyn was also awarded the Ronald J. Lienert Memorial Scholarship during her Honours year, a highly prestigious award in the South Australian pork industry.

In her PhD, supported by APRIL through a 'top-up' scholarship, Katelyn is investigating the impacts in piglets of early life experiences of maternal contact, as well as positive human contact, to improve their stress resilience to ultimately improve welfare outcomes, especially associated with piglet processing and in the peri-weaning period, and lifetime performance.

Information to date, some of which has been presented at national and international scientific meetings, suggests that positive human contact aids the development of stress resilience in pigs. These pigs displayed fewer stress behaviours and markers of impaired physiology during stressful events such as weaning and at slaughter. Positive maternal contact also shows importance for piglet development, particularly growth and reducing fear during lactation. As part of her PhD studies, Katelyn is also assessing biomarkers in the brain, in work supported by APRIL.

Katelyn plans to submit her PhD thesis in 2024.

CORPORATE GOVERNANCE





STRUCTURE

The Australasian Pork Research Institute Ltd ("APRIL") is a tax exempt Australian public not-for-profit company limited by guarantee.

At 30 June 2023, APRIL has 11 Ordinary (voting) Members, two (non-voting) Associate Members, and one (non-voting) Supporting Member.

There has been no change to this structure during the year under review.



GOVERNANCE

Board membership consists of:

- An independent Chairperson and one other independent Director nominated by the Board and appointed by vote of Ordinary Members at a general meeting.
- Two Directors appointed by Australian Pork Limited (APL).
- Four Directors appointed by vote of Ordinary Members at a general meeting from nominations provided by Ordinary Members.

All nominees must add skills to the Board in one or more of the following areas:

- a. As a member of the Australian Institute of Company Directors or other appropriate qualifications or accreditations to be a Director.
- b. Pork production and processing.
- c. Business management.
- d. Finance and accounting and/or auditing.
- e. Corporate governance.
- f. Marketing.
- g. Administration and commercialisation of research and development.
- h. Environment.
- i. Animal science and welfare.
- j. Education.
- k. Any other skills determined by the Directors from time to time.

The Board has approved the Governance Manual and Code of Conduct which set out the expectations and responsibilities of Directors under APRIL's governance framework.









Individual Directors have a right to obtain information necessary for them to discharge their duties from executives employed by APRIL.

Directors may seek independent professional advice, at the expense of the company if any Director wishes to do so, subject to prior agreement of the Chairperson.

THE BOARD IS RESPONSIBLE FOR DECISIONS RELATING TO THE INVESTMENT OF APRIL FUNDS, THE RESEARCH PROGRAM, PROTECTION AND COMMERCIALISATION OF INTELLECTUAL PROPERTY, AS WELL AS MANAGEMENT OF APRIL

BOARD MEMBERS

APRIL's Board members are:

INDEPENDENT DIRECTORS		APL APPOINTED DIRECTORS	
DR TONY PEACOCK (CHAIRPERSON)		PROFESSOR BRONWYN HARCH [appointed 5 August 2022]	
SU MCCLUSKEY		GAIL OWEN [appointed 5 April 2023]	
MEMBER NOMINATED DIRECTORS			
	PROFESSOR ROBERT VAN BARNEVELD	PROFESSOR FRANK DUNSHEA	NEIL FERGUSON
	DAVID HENMAN		Details of each Director's skills and experience can be found in the Directors' report on page 80

BOARD COMMITTEES

APRIL has constituted the following Board Advisory Committees:

- Research and Development Advisory Committee
- Education Advisory Committee
- Audit Committee

Further detail on the functions of these committees is provided below.

RESEARCH AND DEVELOPMENT ADVISORY COMMITTEE

Clause 38.6 of APRIL's constitution requires the Directors to establish a Research and Development Advisory Committee, and also permit each Ordinary Member to appoint a member of the committee by notice to the Company Secretary.

The Committee advises and assists the Board of APRIL to oversee and advise on all matters relating to the establishment of Projects undertaken by or on behalf of the company.

The members of the committee as at 30 June 2023 are:

- Dr Tony Peacock (Chair)
- Professor Sam Abraham, Murdoch University
- Dr David Cadogan, Feedworks P/L
- Dr Sam Weekes, Westpork P/L
- Dr Jeremy Cottrell, The University of Melbourne
- Dr Darryl D'Souza, CHM Alliance Pty Ltd (SunPork)
- Dr Hugo Dunlop, Apiam Animal Health Ltd
- Dr Rebecca Morrison, Rivalea (Australia) P/L
- Dr Ricardo Esquerro, Ridley Agriproducts P/L
- Dr John Pluske, APRIL (CEO/Chief Scientist)
- Professor Eugeni Roura, The University of Queensland
- Dr Rebecca Athorn, Australian Pork Limited
- Professor Paul Verma, SARDI

The committee held one meeting during 2022/23 on 10 February 2023.

EDUCATION ADVISORY COMMITTEE

The Education Advisory Committee is established under clause 38.1(b) of the APRIL constitution as an Advisory Committee to advise and assist the APRIL Board in discharging its activities in relation to Education and Training within APRIL.

The members of the committee as at 30 June 2023 are:

- Professor Frank Dunshea, The University of Melbourne (Chair)
- Dr Rebecca Athorn, Australian Pork Limited
- Dr Tony Peacock, APRIL
- Dr John Pluske, APRIL (CEO/Chief Scientist)
- Professor Eugeni Roura, The University of Queensland
- Dr Stuart Wilkinson, Feedworks P/L

The committee held two meetings during 2022/23 on 5 August 2022 and 9 February 2023.

AUDIT COMMITTEE

The Audit Committee is established under clause 38.1(b) of the APRIL constitution as an Advisory Committee to advise and assist the APRIL Board in discharging its responsibility for the general oversight of APRIL affairs in the areas of financial accounting and reporting, Government reporting, governance, risk management, and the underlying internal control environment.

The members of the committee as at 30 June 2023 are:

- Su McCluskey (Chair)
- Neil Ferguson
- Sandra Di Blasio

The CEO and Company Secretary also attend all Audit Committee meetings.

The committee held five meetings during 2022/23 on 8 September 2022, 1 November 2022, 7 February 2023, 11 April 2023 and 2 June 2023.

MANAGEMENT

CEO/CHIEF SCIENTIST



M 0410 436 871
E j.pluske@april.org.au

DR JOHN PLUSKE
BSc (Agric) (Hons), PhD (UWA),
RAnNutr., R. Anim. Sci.

Dr John Pluske is the Chief Scientist and CEO of The Australasian Pork Research Institute Limited (APRIL), and an Honorary Professorial Fellow at The University of Melbourne. His research career, including many years as a Pork CRC Subprogram Leader and Board member, has focused on nutrition-gut disease interactions in pigs, growth and development, feed and ingredient evaluation, and alternatives to dietary antimicrobial compounds.



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MANAGER, COMMERCIALISATION AND RESEARCH IMPACT

DR CHARLES RIKARD-BELL
BSc.Agr, MSc, PhD

As Manager, Commercialisation and Research Impact for APRIL, Dr Rikard-Bell is responsible for the commercialisation of intellectual property (IP) generated by the company. Charles worked in UK, Belgium and USA as a pig geneticist before returning to Australia to work with a multinational animal health company for 11 years, holding technical, sales and marketing roles in Australia and Asia Pacific. Charles gained his PhD in nutrition and biology through the CRC for an Internationally Competitive Pork Industry.



COMPANY SECRETARY

MR GEOFF CROOK
BSc (Hons), FCA

Geoff has over 19 years' experience in senior financial roles in Australia. Geoff is currently the Fight Food Waste CRC CFO and previously worked for the CRC for High Integrity Australian Pork as Business Manager, and as CEO for the final year of the CRC's operations. Prior to that Geoff held the roles of Business Manager and Company Secretary with the CRC for an Internationally Competitive Pork Industry, Finance and Compliance Manager with the Grape and Wine Research and Development Corporation and Chief Financial Officer and Company Secretary of an ASX listed software company.

MEMBERS

FOUNDATION MEMBERS

- Apiam Animal Health Ltd
- Australian Pork Limited
- Feedworks Pty Ltd
- Murdoch University
- Ridley Agriproducts Pty Ltd
- Rivalea (Australia) Pty Ltd
- South Australian Research and Development Institute
- CHM Alliance Pty Ltd (SunPork)
- The University of Melbourne
- The University of Queensland
- Westpork Pty Ltd

ASSOCIATE MEMBERS

- Jefe Australia Pty Ltd
- DSM Nutritional Products Pty Ltd

SUPPORTING MEMBER

- RSPCA Australia

STRATEGIC PLAN DELIVERABLES

APRIL's achievements against Pillar 1: Further Developing the APRIL Business of the new strategic plan are set out below:

PILLAR 1: FURTHER DEVELOPING THE APRIL BUSINESS

ACTIVITIES	KEY OUTCOMES/DELIVERABLES	2023 STATUS
1.1 Seek additional investment to deliver APRIL's activities	Leverage APRIL investment in research and commercialisation by stakeholder co-investment in applicable projects.	✓ Achieved for the year – ongoing
	Identify external opportunities for co-investment in APRIL activities and where feasible, and where appropriate, drive the bid process.	✓ Achieved for the year – ongoing
	Monitor major external funding programs and strategically apply for funds as an applicant or as a co-applicant with e.g., a member or members: – Development/submission of at least two major Transformational Projects application (> 5:1 project leverage on APRIL funds) to an external funding body, per annum.	● Started – on hold
	Exploit APRIL's 'freedom to operate' and strong collaborative culture among members to seek investment in its project portfolio from non-traditional funding sources.	● In progress
	Increase Member and non-Member revenue of APRIL: <ul style="list-style-type: none"> At least two new Ordinary Members by February 2024 (over December 2021 membership). Additional revenue (up to \$100,000 per annum) from non-membership activities, including from external strategic investment of cash reserves. 	● In progress
1.2 Nurture and grow collaborative alliances	Review member benefits and expectations to ensure APRIL can deliver appropriately and sustain support.	● In progress
	Grow relationships/partnerships with relevant investors to advance progress in mutually beneficial activities.	● In progress
1.3 Review operational capability to ensure management efficiency	Operational resources and staffing are adequate to ensure all activities can be implemented according to this Strategic Plan.	✓ Achieved for the year – ongoing
	Employees and consultants have effective and sustainable employment arrangements.	✓ Achieved for the year – ongoing
	Suppliers that deliver services to, or on behalf of APRIL, enhance APRIL's ability to operate effectively and without conflict.	✓ Achieved for the year – ongoing



AUSTRALASIAN PORK RESEARCH INSTITUTE LIMITED
ANNUAL REPORT FOR THE YEAR ENDED 30 JUNE 2023



DIRECTORS' REPORT

30 JUNE 2023

YOUR DIRECTORS PRESENT THEIR REPORT, TOGETHER WITH THE FINANCIAL STATEMENTS FOR AUSTRALASIAN PORK RESEARCH INSTITUTE LIMITED, FOR THE FINANCIAL YEAR ENDED 30 JUNE 2023 AND THE AUDITOR'S REPORT THEREON.

The following persons were Directors of the Company during the financial year and are at the date of this report, except as otherwise stated:

APL APPOINTED DIRECTORS

MARGO ANDRAE
[resigned 24 February 2023]
PGCertMgt, MAICD

Margo joined APL as CEO on 1 August 2019. Prior to commencing with APL, Margo held positions with Cattle Council of Australia, CSIRO, University of NSW (UNSW), Rural Industries Research and Development Corporation and QLD Local Government. She has extensive experience and networks across primary industries, regional Australia and research environments through these roles.

Margo has extensive experience in stakeholder engagement, marketing, communications, business development, operations and resource management and has a Graduate Certificate in Management from the Australian Graduate School of Management, UNSW.

Margo was a former Director of Agricultural Innovation Australia (AIA).

PROFESSOR BRONWYN HARCH
[appointed 5 August 2022]
BSc/Hons (ENV), PhD (Biometrics),
FTSE, FQA, FAICD

Professor Bronwyn Harch has significant research and higher education leadership experience and is passionate about innovation that makes our communities more secure, resilient, and sustainable.

In the recent role of Interim Queensland Chief Scientist (Oct 2022 to May 2023), Bronwyn worked across government departments in progressing science and research strategy and policies, championing science for study and careers, and working with teams focused on developing large-scale science and research initiatives of relevance to the government's priorities and objectives.

Bronwyn, as The University of Queensland's Deputy Vice-Chancellor and Vice-President (Research & Innovation 2018 to 2022) was responsible for enhancing the University's performance and reputation in research, commercialisation and innovation, research training, and research and innovation collaboration with external stakeholders, nationally and internationally. She led the bid for the recently successful Federal Government's Trailblazers Commercialisation Program for the Food and Beverage Accelerator (FaBA).

Whilst Executive Director of the QUT Institute for Future Environment (2014 to 2018), Bronwyn led digital transformation projects in the agrifood sector as bid co-lead and Research Director for the Food Agility CRC. She developed engagement and commercialisation strategies with governments and industry.

Bronwyn also worked as a researcher and research leader at CSIRO (1995 to 2014). Her own research has focused on the statistical design of landscape-scale sampling protocols and monitoring programs, as well as the statistical modelling of complex systems, particularly agricultural and environmental systems.

Bronwyn's more recent board experience has included membership of Queensland's Innovation Advisory Council, the Cooperative Research Centres Advisory Committee, AgResearch NZ's Science Advisory Panel, Australian Pork Limited and CSIRO.

GAIL OWEN
[appointed 5 April 2023]
OAM, BA LLB(Hons), LLM, FAICD

Ms Owen is an experienced chairperson and Board member, a Fellow of the Australian Institute of Company Directors, and an Order of Australia medal recipient. Gail is a lawyer specialising in commercial and energy law. Ms Owen is Independent Chair of the Victorian Institute of Teaching's Audit, Risk Management and Finance Committee. In her role on the APL Board, Ms Owen is Chair of the Audit, Risk and Corporate Governance and a member of the Industry Integrity Committee. Ms Owen has also held the position of Chair of the Victorian Fisheries Authority.

INDEPENDENT DIRECTORS

DR TONY PEACOCK **FTSE FAICD** **Independent Chair**

Dr Tony Peacock is a passionate advocate for applied research. A reproductive scientist by training, Tony has worked at the Universities of Sydney, Melbourne and Saskatchewan. He has a high media profile with regular spots on ABC Radio speaking on innovation. Tony holds a Diploma of the Australian Institute of Company Directors; Bachelor of Science Hons Agriculture and PhD Veterinary Science, University of Sydney. He is a Fellow of the Australian Institute of Company Directors, a Fellow of the Academy of Technology and Engineering, and is an Adjunct Professor at the University of Canberra.

Tony is considered an expert in collaboration between the public and private sectors on innovation. Tony has served on the Board of a number of start-up biotechnology companies and environmental groups, his current research interests are in science communication, research leadership and effective innovation systems. He is a Director of Peacock Consulting Pty Ltd, the Woodlands and Wetlands Trust, ACT, the Marine Bioproducts CRC and the CRC for Solving Antimicrobial Resistance in Agribusiness, Food and Environments. He is the Chairman of Wintermute Biomedical Inc., Wintermute Biomedical Australia Pty Ltd., Ten Carbon Chemistry Pty Ltd. He has an outstanding track record as a manager of the Pig Research and Development Corporation (1996–2000), the Pest Animal Control Cooperative Research Centre (2001–2005), the Invasive Animals CRC (2005–2010) and most recently the Cooperative Research Centres Association (2010–2020).

He was a 2014 Monash University Churchill Fellow, investigating the relationship between business and research in the USA, the UK, Germany and Singapore. He has consulted to the Governments of Taiwan and Vietnam on innovation models and has represented Australian innovation in Japan, New Caledonia, Sweden, Denmark, the Netherlands, Germany, France and the UK. In 2013 he received the University of Sydney Alumni Award for Community Service and in 2010 the Australian Government Eureka Prize for Improving the Public Understanding of Science.



SU MCCLUSKEY **F CPA, B.Com, MAICD**

Su is a Director of Australian Unity, AWN Rural Pty Ltd, LiveCorp Ltd and a Commissioner for International Agricultural Research, and is the Special Representative for Australian Agriculture for the Australian Government. Su was a Commissioner on the National Covid-19 Commission Advisory Board, a member of the Charities Review, the NSW Review of the Regulatory Framework and the Small Business Digital Taskforce. She was also a member of the Independent Review Panel for CPA Australia, the Harper Review of Competition Policy and the Regional Telecommunications Independent Review. Su was previously a director of Energy Renaissance, the Foundation for Young Australians and the NSW Rice Marketing Board.

Su was the CEO of the Regional Australia Institute and the Council of Rural Research and Development Corporations and the Executive Director of the Office of Best Practice Regulation. Su has held senior positions with the Business Council of Australia, the National Farmers' Federation and the Australian Taxation Office. She was named the Westpac/Australian Financial Review Regional Women of Influence in 2013 and received the Women in Agribusiness award in 2014 for outstanding contribution to policy development. Su is also a beef cattle farmer at Yass, NSW.

MEMBER NOMINATED DIRECTORS

PROFESSOR ROBERT VAN BARNEVELD

B.Agr.Sc. (Hons), PhD, RANutr, FAICD

Professor van Barneveld is Group CEO and Managing Director of the SunPork Group of Companies which includes SunPork Farms, SunPork Fresh Foods, Swickers Kingaroy Bacon Factory and SunPork Solutions. In addition, Professor van Barneveld is a Non-Executive Director of the Ridley Corporation, and Chair of Autism CRC Ltd. He is a former Director of Australian Pork Ltd, Roseworthy Piggery Pty Ltd, Social Skills Training Pty Ltd and Porkscan Pty Ltd. Professor van Barneveld has a PhD in pig nutrition and formerly worked as a consultant scientist and nutritionist in Australia and overseas for more than 27 years.

PROFESSOR FRANK DUNSHEA

B.Agric. Sci., PhD, FNSA, FAPSA, FAAAS, FIUNS, RegAnimSci

Frank Dunshea is a Redmond Barry Distinguished Professor and Chair of Agriculture at The University of Melbourne and Professor of Animal Growth and Development at the University of Leeds. He has had a research career spanning almost 40 years in farm animal and biomedical research. His area of expertise is in growth physiology and nutrition and understanding the interactions between the animal and the animal's environment. His research has had a high scientific impact and the results of much of his research have been rapidly adopted by industry. He has maintained a balanced approach to research, combining fundamental with applied research, providing commercial and public good outcomes. Frank is committed to ensuring that all animal industries operate in a responsible and sustainable manner and much of his work has focused on improving efficiency through reducing inputs and outputs while maintaining product quality and consumer health.

MR NEIL FERGUSON

BBus. (Agric)

Mr Ferguson is currently the Chief Executive Officer for Westpork Pty Ltd. and has had 23 years' experience in the pig industry. Mr Ferguson is an Australian Pork Limited Delegate, Chair of Agricultural Produce Commission of Western Australia – Pork Producers' Committee, and a member of Pork Innovation Western Australian and Pork Industry Training WA.

MR DAVID HENMAN

BScAgr., MSc.Vet.Sc., RANutr.

Completing his Agriculture Science degree at The University of Sydney, David began his career in the pig industry with PIC in 1987 as part of their management training program involved in the development of Auspig with the PIC genotype, and then moved to Colborn Dawes in Wagga Wagga as a nutritionist and support for the Format feed formulation system in Australia.

David has been nutritionist at Rivalea (Australia) Pty Ltd/ QAF/Bunge Meat industries since 1991 and since 1995 involved in developing research objectives for internal research, as well as being principal investigator for research work conducted on behalf of other commercial companies and pig industry research bodies. David obtained a Master of Science in Veterinary Science from The University of Sydney in 2004. As the Manager of Research and Innovation for the feed milling business, he is responsible for the formulation of 240,000 t/year for its internal pig business and 100,000 t/year for external clients across all species. With roles in the company across all of Rivalea's pig production systems over 27 years, David is very aware of the problems facing pig enterprises. David has also developed a worldwide network of commercial and academic contacts to collaborate with on projects to benefit the Australian pig industry.

DIRECTORS MEETINGS

The number of Directors' meetings (including meetings of Board Committees) and number of meetings attended by each of the Directors of the Company during the financial year are:

DIRECTOR		BOARD OF DIRECTORS	AUDIT COMMITTEE	R&D ADVISORY COMMITTEE	EDUCATION ADVISORY COMMITTEE
Margo Andrae	Eligible	2	–	–	–
	Attended	2	–	–	–
Professor Bronwyn Harch	Eligible	4	–	–	–
	Attended	3	–	–	–
Gail Owen	Eligible	2	–	–	–
	Attended	2	–	–	–
Dr Tony Peacock	Eligible	4	–	1	2
	Attended	4	–	1	2
Su McCluskey	Eligible	4	5	–	–
	Attended	4	5	–	–
Professor Robert van Barneveld	Eligible	4	–	–	–
	Attended	4	–	–	–
Professor Frank Dunshea	Eligible	4	–	–	2
	Attended	4	–	–	2
David Henman	Eligible	4	–	–	–
	Attended	4	–	–	–
Neil Ferguson	Eligible	4	5	–	–
	Attended	2	5	–	–

PRINCIPAL ACTIVITIES AND OBJECTIVES OF THE COMPANY

The Company's objectives are focussed on enhancing the Australasian Pork Industry by investing in research, development, education and training, and commercialisation activities focused on priorities and deliverables that ensure the sustainability of Australasian pork production.

PERFORMANCE MEASUREMENT

The Company evaluates its performance against objectives, milestones and targets as set out in the strategic plan (available at [APRIL Strategic Plan 2022–2025](#)), and against the uptake of research outcomes, where appropriate, by Industry. Progress against activities is reported to Members annually.

MEMBERSHIP

The Company is limited by guarantee. As at 30 June 2023, 11 organisations continue as Ordinary Members, two organisations continue as Associate Members, and one

organisation continues as a Supporting Member of the Company. In the event of a winding up where there are insufficient assets to pay all liabilities, each of the members are required to contribute \$10 each which would result in total additional funds of \$140.

LEAD AUDITOR'S INDEPENDENCE DECLARATION

The lead auditor's independence declaration is set out on the following page and forms part of the Directors' Report for the financial year ended 30 June 2023.

This report is made in accordance with a resolution of the Directors:



Dr Tony Peacock
Chair

20 October 2023
Canberra

INDEPENDENCE DECLARATION

30 JUNE 2023



RSM Australia Partners

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AUDITOR'S INDEPENDENCE DECLARATION

As lead auditor for the audit of the financial report of Australasian Pork Research Institute Ltd for the year ended 30 June 2023, I declare that, to the best of my knowledge and belief, there have been no contraventions of:

- (i) the auditor independence requirements of the *Corporations Act 2001* in relation to the audit; and
- (ii) any applicable code of professional conduct in relation to the audit.

A handwritten signature in black ink that reads 'RSM'.

RSM AUSTRALIA PARTNERS

A handwritten signature in black ink that reads 'GED STENHOUSE'.

GED STENHOUSE
Partner

Canberra, Australian Capital Territory
Dated: 21 October 2023

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STATEMENT OF INCOME AND RETAINED SURPLUS

FOR THE YEAR ENDED 30 JUNE 2023

	NOTE	2023	2022
		\$	\$
Revenue	2	2,415,427	2,477,641
Expenses			
Research programme and other costs		(1,646,624)	(1,312,368)
Management expenses	3	(545,978)	(528,353)
Other expenses	4	(303,481)	(279,620)
(Deficit) / Surplus from operating activities		(80,656)	357,300
Financial income		162,449	12,973
Net financial income	5	162,449	12,973
Surplus before income tax		81,793	370,273
Tax expense		-	-
Surplus for the period		81,793	370,273
Retained surplus brought forward		4,156,710	3,786,437
Retained surplus carried forward		4,238,503	4,156,710

The above statement of income and retained surplus should be read in conjunction with the accompanying notes

STATEMENT OF FINANCIAL POSITION

AS AT 30 JUNE 2023

	NOTE	2023	2022
		\$	\$
ASSETS			
Current assets			
Cash and cash equivalents	7	5,208,258	4,022,826
Trade and other receivables	8	404,235	344,471
Investments	9	-	751,426
Other assets	10	240,740	211,020
		5,853,233	5,329,743
Total assets		5,853,233	5,329,743
LIABILITIES			
Current liabilities			
Trade and other payables	11	765,606	568,483
Unearned income	12	773,449	551,705
Provisions	13	37,343	21,162
		1,576,398	1,141,350
Non-Current liabilities			
Provisions	13	38,332	31,683
		38,332	31,683
Total liabilities		1,614,730	1,173,033
Net assets		4,238,503	4,156,710
Equity			
Retained surplus		4,238,503	4,156,710
Total equity		4,238,503	4,156,710

The above statement of financial position should be read in conjunction with the accompanying notes

STATEMENT OF CASH FLOWS

FOR THE YEAR ENDED 30 JUNE 2023

	NOTE	2023	2022
		\$	\$
CASH FLOWS FROM OPERATING ACTIVITIES			
Cash receipts from members and customers		2,789,229	2,728,947
Payments to suppliers and employees		(2,517,672)	(2,315,832)
Net cash from operating activities		271,557	413,115
CASH FLOWS FROM INVESTING ACTIVITIES			
Interest received		162,449	12,973
Purchase of Term Deposits		751,426	(751,426)
Net cash investing activities		913,875	(738,453)
Net (decrease) / increase in cash and cash equivalents		1,185,432	(325,338)
Cash and cash equivalents at beginning of financial year		4,022,826	4,348,164
Cash and cash equivalents at end of financial year	7	5,208,258	4,022,826

The above statement of cash flows should be read in conjunction with the accompanying notes

NOTES TO THE FINANCIAL STATEMENTS

FOR THE YEAR ENDED 30 JUNE 2023

NOTE 1. SIGNIFICANT ACCOUNTING POLICIES

Australasian Pork Research Institute Limited is a public company incorporated and domiciled in Australia. The financial statements are presented in Australian dollars, which is Australasian Pork Research Institute Limited's functional and presentation currency.

The Company is a not-for-profit entity.

The financial report was authorised for issue by the Directors on the date the report is signed.

The principal accounting policies adopted in the preparation of the financial statements are set out below. These policies have been consistently applied to all the years presented, unless otherwise stated.

NEW OR AMENDED ACCOUNTING STANDARDS AND INTERPRETATIONS ADOPTED

The company has adopted all of the applicable new or amended Accounting Standards and Interpretations issued by the Australian Accounting Standards Board ('AASB') that are mandatory for the current reporting period.

Any new or amended Accounting Standards or Interpretations that are not yet mandatory have not been early adopted.

BASIS OF PREPARATION

These general purpose financial statements have been prepared in accordance with Australian Accounting Standards – Simplified Disclosures and Interpretations issued by the Australian Accounting Standards Board ('AASB') and the Corporations Act 2001, as appropriate for not-for-profit oriented entities.

Historical cost convention

The financial statements have been prepared under the historical cost convention.

GOODS AND SERVICES TAX ('GST') AND OTHER SIMILAR TAXES

Revenues, expenses and assets are recognised net of the amount of associated GST, unless the GST incurred is not recoverable from the tax authority. In this case it is recognised as part of the cost of the acquisition of the asset or as part of the expense.

Receivables and payables are stated inclusive of the amount of GST receivable or payable. The net amount of GST recoverable from, or payable to, the tax authority is included in other receivables or other payables in the statement of financial position.

Cash flows are presented on a gross basis. The GST components of cash flows arising from investing or financing activities which are recoverable from, or payable to the tax authority, are presented as operating cash flows.

Commitments and contingencies are disclosed net of the amount of GST recoverable from, or payable to, the tax authority.

CURRENT AND NON-CURRENT CLASSIFICATION

Assets and liabilities are presented in the statement of financial position based on current and non-current classification.

An asset is classified as current when: it is either expected to be realised or intended to be sold or consumed in the company's normal operating cycle; it is held primarily for the purpose of trading; it is expected to be realised within 12 months after the reporting period; or the asset is cash or cash equivalent unless restricted from being exchanged or used to settle a liability for at least 12 months after the reporting period. All other assets are classified as non-current.

A liability is classified as current when: it is either expected to be settled in the company's normal operating cycle; it is held primarily for the purpose of trading; it is due to be settled within 12 months after the reporting period; or there is no unconditional right to defer the settlement of the liability for at least 12 months after the reporting period. All other liabilities are classified as non-current.

EMPLOYEE BENEFITS

Short-term employee benefits

Liabilities for wages and salaries, including non-monetary benefits, annual leave and long service leave expected to be settled wholly within 12 months of the reporting date are measured at the amounts expected to be paid when the liabilities are settled.

Other long-term employee benefits

The liability for annual leave and long service leave not expected to be settled within 12 months of the reporting date are measured at the present value of expected future payments to be made in respect of services provided by employees up to the reporting date using the projected unit credit method. Consideration is given to expected future wage and salary levels, experience of employee departures and periods of service. Expected future payments are discounted using market yields at the reporting date on national government bonds with terms to maturity and currency that match, as closely as possible, the estimated future cash outflows.

Wages and salaries

Liabilities for wages, salaries and annual leave that are expected to be wholly settled within 12 months of reporting date, represent present obligations resulting from employee's services provided to reporting date, are measured as the undiscounted amounts based on remuneration wage and salary rates that the Company expects to pay as at reporting date including related on-costs.

Non-accumulating non-monetary benefits are expensed based on the net marginal cost to the Company as the benefits are taken by the employees.

PROVISIONS

A provision is recognised in the Statement of Financial Position when the Company has a present legal or constructive obligation as a result of a past event, and it is probable that an outflow of economic benefits will be required to settle the obligation. Provisions are determined by discounting expected future cash flows at a pre-tax rate that reflects current market assessments of the time value of money of the risks specific to the liability.

RESEARCH PROJECT COSTS

Expenditure on research activities, undertaken with the prospect of gaining new scientific or technical knowledge and understanding, is recognised in the Statement of Income and Retained Surplus as an expense as incurred.

FOREIGN CURRENCY TRANSLATION

Foreign currency transactions and balances

Foreign currency transactions are translated into the functional currency of the Company, using the exchange rates prevailing at the dates of the transactions (spot exchange rate). Foreign exchange gains and losses resulting from the settlement of such transactions and from the re-measurement of monetary items at year end exchange rates are recognised in profit or loss.

NOTES TO THE FINANCIAL STATEMENTS

FOR THE YEAR ENDED 30 JUNE 2023

NOTE 1. SIGNIFICANT ACCOUNTING POLICIES (continued)

FAIR VALUE MEASUREMENT

When an asset or liability, financial or non-financial, is measured at fair value for recognition or disclosure purposes, the fair value is based on the price that would be received to sell an asset or paid to transfer a liability in an orderly transaction between market participants at the measurement date; and assumes that the transaction will take place either: in the principal market; or in the absence of a principal market, in the most advantageous market.

Fair value is measured using the assumptions that market participants would use when pricing the asset or liability, assuming they act in their economic best interests. For non-financial assets, the fair value measurement is based on its highest and best use. Valuation techniques that are appropriate in the circumstances and for which sufficient data are available to measure fair value, are used, maximising the use of relevant observable inputs and minimising the use of unobservable inputs.

CRITICAL ACCOUNTING JUDGEMENTS, ESTIMATES AND ASSUMPTIONS

The preparation of the financial statements requires management to make judgements, estimates and assumptions that affect the reported amounts in the financial statements. Management continually evaluates its judgements and estimates in relation to assets, liabilities, contingent liabilities, revenue and expenses. Management bases its judgements, estimates and assumptions on historical experience and on other various factors, including expectations of future events, management believes to be reasonable under the circumstances. The resulting accounting judgements and estimates will seldom equal the related actual results.

NOTE 2. REVENUE

	2023	2022
	\$	\$
Research and project co-funding	134,250	80,719
Membership fees	1,955,000	2,075,000
Commercialisation income	300,833	321,922
Other contribution and government grant	25,344	–
	2,415,427	2,477,641

ACCOUNTING POLICY

Grants

Grant revenue is recognised in profit or loss when the company satisfies the performance obligations stated within the funding agreements.

If conditions are attached to the grant which must be satisfied before the company is eligible to retain the contribution, the grant will be recognised in the statement of financial position as a liability until those conditions are satisfied.

Research and project co-funding and commercialisation revenue

Revenue is recognised at an amount that reflects the consideration to which the company is expected to be entitled in exchange for transferring goods or services to a customer. For each contract with a customer, the company: identifies the contract with a customer; identifies the performance obligations in the contract; determines the transaction price which takes into account estimates of variable consideration and the time value of money; allocates the transaction price to the separate performance obligations on the basis of the relative stand-alone selling price of each distinct good or service to be delivered; and recognises revenue when or as each performance obligation is satisfied in a manner that depicts the transfer to the customer of the goods or services promised.

Membership revenue

Membership fees comprise annual subscription fees, application fees, fees upon cessation of membership and contribution fees.

NOTE 3. MANAGEMENT EXPENSES

	2023	2022
	\$	\$
Management fees	545,978	528,353
	545,978	528,353

Australian Pork Ltd and SciEcons Consulting charges the Company management fees on a reimbursement basis which is calculated based on the time spent by each of the organisation's employees on providing corporate services to the Company.

NOTE 4. OTHER EXPENSES

	2023	2022
	\$	\$
Legal fees	36,283	7,979
Directors fees	75,685	73,250
Travel	31,716	14,360
Bad debt provision	(21,114)	21,114
Communication costs	255	4,545
Commercialisation costs	110,751	95,035
Other	69,905	63,337
	303,481	279,620

NOTES TO THE FINANCIAL STATEMENTS

FOR THE YEAR ENDED 30 JUNE 2023

NOTE 5. FINANCIAL INCOME

	2023	2022
	\$	\$
Interest income from investments and cash and cash equivalents	162,449	12,973
	162,449	12,973

ACCOUNTING POLICY

Interest income is recognised in the Statement of Income and Retained Surplus as it accrues, using the effective interest method.

NOTE 6. INCOME TAX EXPENSE

The Company is a non-profit scientific institution and as such the Company's constitution prohibits the distribution of income and assets to members except as bona fide compensation for services or goods provided to, or expenses incurred on behalf of, the Company. Accordingly, the Company is not subject to income tax.

NOTE 7. CASH AND CASH EQUIVALENTS

Cash at bank	2,161,933	1,821,730
Term deposits – original maturity date of 3 months or less	3,046,325	2,201,096
	5,208,258	4,022,826

The Company holds term deposits with interest rates of between 4.35% and 5.05%.

ACCOUNTING POLICY

Cash and cash equivalents comprise cash balances, at call deposits and term deposits with an original maturity of 3 months or less. Bank overdrafts that are repayable on demand and form an integral part of the Company's cash management are included as a component of cash and cash equivalents for the purpose of the Statement of Cash Flows.

NOTE 8. TRADE AND OTHER RECEIVABLES

	2023	2022
	\$	\$
Trade receivables	113,314	227,926
Other receivables	290,921	137,659
Less: Bad debt provision	–	(21,114)
	404,235	344,471

ACCOUNTING POLICY

Receivables are stated initially at their fair value and subsequently measured at their amortised cost less for any allowance for expected credit losses.

NOTE 9. INVESTMENTS

	2023	2022
	\$	\$
Term deposits	–	751,426
	–	751,426

The company did not hold a term deposit with a term exceeding 3 months as at 30 June 2023 (2022: \$751,426).

NOTE 10. OTHER CURRENT ASSETS

Prepayments	240,740	211,020
	240,740	211,020

NOTE 11. TRADE AND OTHER PAYABLES

Trade and other payables	765,606	568,483
	765,606	568,483

ACCOUNTING POLICY

Trade and other payables are initially measured at fair value and subsequently measured at amortised cost. Trade payables are normally settled on 30 days term.

NOTE 12. UNEARNED INCOME

	2023	2022
	\$	\$
Current		
Contract liabilities	773,449	551,705
	773,449	551,705

ACCOUNTING POLICY

Contract liabilities

Contract liabilities represent the company's obligation to transfer goods or services to a customer and are recognised when a customer pays consideration, or when the company recognises a receivable to reflect its unconditional right to consideration (whichever is earlier) before the company has transferred the goods or services to the customer.

NOTES TO THE FINANCIAL STATEMENTS

FOR THE YEAR ENDED 30 JUNE 2023

NOTE 13. PROVISIONS

	2023	2022
	\$	\$
Current	37,343	21,161
Non-current	38,332	31,683
	75,675	52,844

NOTE 14. REMUNERATION OF AUDITORS

During the financial year the following fees were paid or were payable for services provided by RSM Australia Pty Ltd, the auditor of the company.

Compensation

The aggregate compensation made to directors and other members of key management personnel of the company is set out below:

Audit services – RSM Australia Pty Ltd		
Audit of the financial statements	16,791	13,943
	16,791	13,943

NOTE 15. KEY MANAGEMENT PERSONNEL DISCLOSURES

The following were key management personnel of the Company for the entire reporting period, unless otherwise stated:

Directors

1. Ms Gail Owen – BA, LLB (Hons), LLM FAICD
2. Dr Tony Peacock – BScAgr(Hons), PhD, FAICD, FTSE – Independent Chair
3. Ms Su McCluskey – FCPA, B.Com, MAICD
4. Professor Robert van Barneveld – B. Agr.Sc. (Hons), PhD, RAnNutr, FAICD
5. Professor Frank Dunshea – B. Agric. Sci, PhD, FNSA, FAPSA, FASAP, RAnNutr
6. Mr Neil Ferguson – B.Bus (Agric)
7. Ms Bronwyn Harch – BSc/Hons (Env) PhD (Biometrics) FTSE FQA FAICD
8. Mr David Henman – BScAgr., MSc.Vet.Sc., RAnNutr.
9. Ms Margo Andrae (resigned 24 February 2023) – PGCertMgt, MAICD

Executives

10. Dr John Pluske – Chief Executive Officer, BSc (Agric) (Hons), PhD (UWA), RAnNutr, R. Anim.Sci

KEY MANAGEMENT PERSONNEL TRANSACTIONS WITH THE COMPANY

During the year the Company transacted with entities for which key management persons hold positions that result in them having control or significant influence over the financial or operating policies of these entities. The terms and conditions of the transactions with key management personnel and their related parties were no more favourable than those available, or which might reasonably be expected to be available, on similar transactions to non-key management personnel related entities on an arm's length basis.

Compensation

The aggregate compensation made to directors and other members of key management personnel of the company is set out below:

	2023	2022
	\$	\$
Aggregate compensation	272,810	266,587
	272,810	266,587

NOTE 16. RELATED PARTY DISCLOSURES

Transactions with key management personnel related entities. In the following table, superscripts refer to the key management personnel affiliations (from the numbered list of directors in Note 15) with each related party. Net transactions with the Company by director related entities were as follows:

Project and program expenditure		
Australian Pork Limited (1,7,9)	168,880	85,497
SunPork Group (4)	598,009	511,317
The University of Queensland (4)	207,718	295,050
The University of Melbourne (5)	9,900	33,334
Australasian Pig Science Association (5,9)	10,000	10,450
Rivalea (Australia) Pty Ltd (8)	288,755	269,188
Ridley Agriproducts Pty Ltd (4)	0	34,473
SciEcons Consulting (9)	152,750	193,462
The University of New England (4)	8,771	–
University of Canberra (2)	12,245	–
Westpork Pty Ltd (6)	1,639	–
Current receivables		
Trade receivables from related parties	38,242	37,754
Current payables		
Trade payables to related parties	208,831	219,573

Transactions with key management personnel related entities consist of the receipt of membership fees and commercialisation income, and the payment of research costs, consultancy fees and costs related to the Company's Industry Placement Program.

Terms and conditions

All transactions were made on normal commercial terms and conditions and at market rates.

NOTES TO THE FINANCIAL STATEMENTS

FOR THE YEAR ENDED 30 JUNE 2023

NOTE 17. COMMITMENTS

The Company has entered into Research and Development contracts which require the Company to make future cash payments to counterparties once certain obligations have been performed by those counterparties.

At 30 June 2023 these commitments (exclusive of GST) total \$3,632,352 (2022: \$1,788,866) and will be funded by cash balances and future receipts from member and research participant contributions.

In addition, the Company has approved, but not contracted, research project commitments totalling \$591,957 (2022: \$Nil).

NOTE 18. SUBSEQUENT EVENTS

No matter or circumstance has arisen since 30 June 2023 that has significantly affected, or may significantly affect the Company's operations, the results of those operations, or the Company's state of affairs in future financial years.

NOTE 19. REGISTERED OFFICE

The address of the Company's registered office is LEVEL 2, 2 BRISBANE AVENUE, BARTON, ACT 2600.

DIRECTORS DECLARATION

IN ACCORDANCE WITH THE RESOLUTION OF THE DIRECTORS OF AUSTRALASIAN PORK RESEARCH INSTITUTE LIMITED MADE PURSUANT TO SECTION 295(5)(A) OF THE CORPORATIONS ACT 2001, THE DIRECTORS DECLARE THAT:

- the attached financial statements and notes comply with the Corporations Act 2001, the Australian Accounting Standards – Simplified Disclosures, the Corporations Regulations 2001 and other mandatory professional reporting requirements;
- the attached financial statements and notes give a true and fair view of the company's financial position as at 30 June 2023 and of its performance for the financial year ended on that date; and
- there are reasonable grounds to believe that the company will be able to pay its debts as and when they become due and payable.

On behalf of the Directors



Dr Tony Peacock
Chair

20 October 2023
Canberra



Ms Su McCluskey
Audit Committee Chair

20 October 2023
Canberra



RSM Australia Partners

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INDEPENDENT AUDITOR'S REPORT TO THE MEMBERS OF AUSTRALASIAN PORK RESEARCH INSTITUTE LTD

Opinion

We have audited the financial report of Australasian Pork Research Institute Ltd (APRIL), which comprises the statement of financial position as at 30 June 2023, the statement of comprehensive income, the statement of changes in equity and the statement of cash flows for the year then ended, and notes to the financial statements, including a summary of significant accounting policies, and the directors' declaration.

In our opinion, the accompanying financial report of APRIL is in accordance with the Corporations Act 2001, including:

- (i) giving a true and fair view of APRIL's financial position as at 30 June 2023 and of its financial performance for the year then ended; and
- (ii) complying with Australian Accounting Standards *Simplified Disclosures* under AASB 1060 *General Purpose Financial Statements – Simplified Disclosures for For-Profit and Not-for-Profit Entities*.

Basis for Opinion

We conducted our audit in accordance with Australian Auditing Standards. Our responsibilities under those standards are further described in the *Auditor's Responsibilities for the Audit of the Financial Report* section of our report. We are independent of APRIL in accordance with the auditor independence requirements of the Corporations Act 2001 and the ethical requirements of the Accounting Professional and Ethical Standards Board's APES 110 *Code of Ethics for Professional Accountants* (the Code) that are relevant to our audit of the financial report in Australia. We have also fulfilled our other ethical responsibilities in accordance with the Code.

We confirm that the independence declaration required by the Corporations Act 2001, which has been given to the directors of APRIL, would be in the same terms if given to the directors as at the time of this auditor's report.

We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our opinion.

Other Information

The directors are responsible for the other information. The other information comprises the information included in APRIL's annual report for the year ended 30 June 2023, but does not include the financial report and the auditor's report thereon.

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Our opinion on the financial report does not cover the other information and accordingly we do not express any form of assurance conclusion thereon.

In connection with our audit of the financial report, our responsibility is to read the other information and, in doing so, consider whether the other information is materially inconsistent with the financial report or our knowledge obtained in the audit or otherwise appears to be materially misstated.

If, based on the work we have performed, we conclude that there is a material misstatement of this other information, we are required to report that fact. We have nothing to report in this regard.

Responsibilities of the Directors for the Financial Report

The directors of APRIL are responsible for the preparation of the financial report that gives a true and fair view in accordance with Australian Accounting Standards – *Simplified Disclosures* under AASB 1060 *General Purpose Financial Statements – Simplified Disclosures for For-Profit and Not-for-Profit Entities* and the Corporations Act 2001 and for such internal control as the directors determine is necessary to enable the preparation of the financial report that gives a true and fair view and is free from material misstatement, whether due to fraud or error.

In preparing the financial report, the directors are responsible for assessing the ability of APRIL to continue as a going concern, disclosing, as applicable, matters related to going concern and using the going concern basis of accounting unless the directors either intend to liquidate APRIL or to cease operations, or have no realistic alternative but to do so.

Auditor's Responsibilities for the Audit of the Financial Report

Our objectives are to obtain reasonable assurance about whether the financial report as a whole is free from material misstatement, whether due to fraud or error, and to issue an auditor's report that includes our opinion. Reasonable assurance is a high level of assurance, but is not a guarantee that an audit conducted in accordance with the Australian Auditing Standards will always detect a material misstatement when it exists. Misstatements can arise from fraud or error and are considered material if, individually or in the aggregate, they could reasonably be expected to influence the economic decisions of users taken on the basis of this financial report.

A further description of our responsibilities for the audit of the financial report is located at the Auditing and Assurance Standards Board website at: http://www.auasb.gov.au/auditors_responsibilities/ar4.pdf. This description forms part of our auditor's report.

RSM AUSTRALIA PARTNERS

GED STENHOUSE
Partner

Canberra, Australian Capital Territory
Dated: 21 October 2023

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