REPORT			
2021			



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Australasian Pork Research																
Institute Ltd APRIL																





WELCOME TO APRIL



MESSAGE FROM CHAIR



MESSAGE FROM CEO





RESEARCH REPORT – TRANSFORMATIONAL PROJECTS



RESEARCH REPORT - LEGACY PROJECTS



EDUCATION AND TRAINING REPORT



CORPORATE GOVERNANCE



STRATEGIC PLAN SUMMARY



COMMERCIALISATION REPORT



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RESEARCH REPORT – INNOVATION PROJECTS



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WELCOME TO APRIL

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 COMMERCIAL-ISATION OPPORTUNITIES

FOR THE BENEFIT OF THE AUSTRALASIAN PORK INDUSTRY THE AUSTRALASIAN PORK RESEARCH INSTITUTE LTD. (APRIL) OPERATED THE HIGHLY SUCCESSFUL CRC FOR AN INTERNATIONALLY COMPETITIVE PORK INDUSTRY FROM JULY 2005 TO JUNE 2011.

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 Australia and demonstrated the value of collaborative research investment to Australasian producers and ancillary businesses.

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.

The Industry has acknowledged the need for continued investment in collaborative research and development that complements Australian Pork Limited's work, and so APRIL will invest in and manage collaborative research and development, education and training and explore commercialisation opportunities for the benefit of the Australasian pork industry, using the significant intellectual capital and facilities established by the two CRCs.

VISION

Collaborative, timely and effective industry-funded and directed research, education and training, and commercialisation activities focused on priorities and deliverables that ensure the sustainability of Australasian pork production.

MISSION

Facilitation of high priority research, education and training programs, and commercialisation opportunities, allied to effective investment management to generate optimal returns for all pork industry stakeholders.



IN THIS REPORT, YOU'LL READ QUITE A LOT ABOUT OUR "TRANSFORMATIONAL" PROJECTS. THAT TITLE SIGNALS THE AMBITION OF THE AUSTRALASIAN PORK RESEARCH INSTITUTE. WE WANT TO DELIVER PROJECTS THAT FUNDAMENTALLY CHANGE THE WAY WE PRODUCE PORK. WE HAVE TO DO THAT FOR THE INDUSTRY TO REMAIN COMPETITIVE IN A MARKET THAT IS ALWAYS CHANGING. THE PRESSURES OF ANIMAL WELFARE, NEW PROTEIN SOURCES, EMISSION REDUCTION AND MANY OTHER FACTORS WILL DEMAND THAT THE INDUSTRY DOES MORE THAN "KEEP PACE".

THE CHA

The industry has done it before, aided by R&D. My own PhD, funded by the Pig Research Council and then the Pig R&D Corporation in the 1980s included some work on the interaction of dry sow stalls and seasonal infertility. Following stints at the Universities of Melbourne, Saskatchewan and the PRDC, I left the industry in 2000, returning through APRIL in 2018. It was unimaginable to me in 2000 that within a couple of decades, dry sow stalls would be gone from our industry. R&D was a big contributor to making that change possible.

That's why I am a strong supporter of setting some bold ambitions in our R&D and enabling transformations in the industry. Researchers shouldn't set the transformation agenda. We need to work hand-in-hand with industry, policy makers and the market to deliver meaningful changes. We balance the R&D portfolio with projects with shorter-term goals and, very importantly, developing the skills and capacity for industry to remain competitive.

I'm pleased with how APRIL has progressed against our bold agenda. A challenge will remain with the membership model of the organisation, and how members perceive the benefits they receive. As we move towards our second three-year strategic plan, ensuring members really value APRIL will be an important feature.

Our CEO, Dr John Pluske, made a very significant move during the reporting year, leaving Murdoch University after many years of service. A new contract arrangement with John is now in place. He and his team of Charlie Rikard-Bell and Geoff Crook do an excellent job delivering the APRIL program. Having worked in many other industries during my time away from the pork industry, I am always amazed by the skills, dedication and industry-orientation of Australia's pig industry researchers. APRIL sees that in our peer-reviewing processes, the design and conduct of the research and the delivery of reports and information. I would like to acknowledge that dedication.

Thanks are also due to the Board. With the pandemic, we have been unable to meet face-to-face during the reporting period. But we made the adjustment like most other companies around the world and have functioned very well. I am pleased to commend this Annual Report to you and thank our Members for their ongoing support.

Dr Tony Peacock

SINCE NOVEMBER 2020, APRIL HAS CONTINUED WITH ITS OVERALL PURPOSE OF INVESTING AND PARTICIPATING IN COLLABORATIVE, 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 PERIOD HAS BUILT UPON THE FOUNDATION OF THE MANY AND VARIOUS ACTIVITIES COMMENCED PREVIOUSLY, BUT ALSO HAS ADVANCED THE OVERALL OBJECTIVES OF APRIL.

THE CEC

Unfortunately, the continuing impacts of the Covid-19 pandemic have been experienced in some of APRIL's activities and functions. In particular, some projects have unavoidably experienced delays, some significant, associated with lockdowns, procurement issues, travel restrictions and staff and student-related matters. Nevertheless, and despite this multitude of challenges and obstacles, the researchers, technical/support staff and (or) students involved in APRIL-funded projects, are to be thoroughly commended and thanked for their efforts to keep everything going. Consistent with the 2019–2020 reporting period, we have continued to monitor projects impacted by Covid-19 and responded accordingly to requests for variations and extensions, wherever possible.

A major undertaking in the reporting period was the preparation and resubmission in March 2021 of a Cooperative Research Centre-Project (CRC-P) Round 11 application, *Eliminating pig tail removal to improve* welfare and industry sustainability. This is one of two Transformational Projects identified in the Strategic Plan, 2019–2022. A change in the Commonwealth's eligibility requirements for a CRC-P meant that APRIL could not be the Lead Applicant, with SunPork Pty Ltd. becoming the Lead Applicant and APRIL a project partner. Other project partners in the three-year application were 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. The project requested approximately \$2.89 million from the Commonwealth, supported by approximately \$1.64 million in cash from the project partners (\$750,000 from APRIL).

The other Transformational Project identified in the Strategic Plan addresses *Enhanced antimicrobial stewardship in the Australasian pork industry through targeted reduction of in-feed medications without adverse health consequences.* I mentioned in last year's Annual Report that a four-year project administered through The University of Queensland (with Chief Investigators Professor Eugeni Roura, Professor Frank Dunshea, Professor Mike Gidley, and Associate Professor Pat Blackall), How to make antimicrobials in pig feed redundant, naturally, was successful in receiving ARC-Linkage support. This project was officially signed-off in May 2021. We are all looking forward to the outcomes and industry implications.

A further ARC-Linkage grant was submitted in December 2020 through Murdoch University (Chief Investigators Associate Professor Sam Abraham, Murdoch University; Professor Darren Trott, The University of Adelaide) titled Novel approaches for combating critically important antimicrobial resistance development in pigs. All applications mentioned above are excellent examples of APRIL partnering with its Members and stakeholders to collaborate and apply for external funding for a major research project of critical industry-wide importance. We remain interested in hearing from individuals and organisations that might be interested in such an approach.

APRIL continues to receive an increasing number of Final Reports as projects funded in previous years come to an end. These are mentioned, and major outcomes from some projects highlighted, later in this report. Moreover, the reports 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.

Investing in education and training to assist in building human capacity for the Australasian pork industry is a key objective for APRIL. In the last 12 months, APRIL supported a number of undergraduate and postgraduate scholarship awards at Australian universities: a DVM Scholarship Award to Ryan Kristen (The University of Sydney), and a Postgraduate Research Scholarship 'Top-Up' Award to Elisabet Garcia Puig (The University of Queensland).

A number of undergraduate theses from students supported by APRIL were also completed in the reporting period, including Stephanie Shields from The University of Sydney for her Honours thesis titled *Data analysis to identify inherited conditions in an Australian commercial pig herd*, and Suzanna Jones from Murdoch University, for her Honours thesis titled *Aspects of antimicrobial resistance in Australian swine-origin* Pasteurella multocida.

In support of industry training, APRIL was pleased to announce Dr Maria Jorquera-Chavez as the third IPP recipient, joining Dr Jessica Craig at Rivalea (Australia) Pty Ltd. and Lauren Staveley (SunPork Group, South Australia). Dr Chavez has a Bachelor of Veterinary Medicine (University of Concepcion, Chillan, Chile), a Master of Animal Science (The University of Melbourne) and a PhD in Agricultural Sciences (The University of Melbourne), with her Masters and PhD research investigating the use of thermal and RGB (red, green, blue) cameras and computer-based techniques to remotely monitor disease and production outcomes in cattle and pigs. Dr Chavez wishes to keep learning and gaining more research and hands-on experience in the pork industry.

In a departure from previous years, to ensure the health and safety of members, Directors and staff and adherence to travel guidelines, the Stakeholders' Forum in November 2020 was held for the first time in a virtual/ remote format. Despite APRIL stakeholders not being able to meet and connect with each other for the event, the Forum still provided an excellent avenue for exchange and communication of APRIL's activities and future plans, with more than 80 registrants. Presentations from Associate Professor Sam Abraham (Murdoch University), Dr Louise Edwards (ex Ridley Agriproducts Pty Ltd.), Dr Fan Liu (Rivalea [Australia] Pty Ltd.) and

THE PROJECT REQUESTED APPROXIMATELY \$2.89 MILLION FROM THE COMMONWEALTH, SUPPORTED BY APPROXIMATELY \$1.64 MILLION

IN CASH FROM THE PROJECT PARTNERS Dr Darryl D'Souza (SunPork Group) highlighted four of APRIL's current projects. Their presentations provided researchers and industry with a variety of research outcomes and opportunities for the future.

Commercialisation remains a key priority and objective for APRIL, and the last 12 months has seen a refocus of efforts and activities in this important area. This has been assisted somewhat by the outcomes of several projects funded in previous years coming to fruition, helping to establish a pipeline of potential commercialisation opportunities. A comprehensive Commercialisation Report from Dr Charles Rikard-Bell (Manager, Commercialisation and Research Impact) can be found later in this Annual Report.

In this respect, APRIL now has two paths for people/ organisations interested in potential commercialisation opportunities. First, the Commercialisation Project scheme is open all year for applications, and second, the Commercialisation Advisory Panel, a 'shark-tank' type initiative, commenced earlier in the year. Please see Dr Rikard-Bell's report for further information.

In the year ahead, APRIL will continue our progress towards the core strategies in the Strategic Plan, in the knowledge that a new Strategic Plan will be implemented in early 2022 for a further three years. We will be encouraging even greater collaboration and initiative, with the Kickstart program, aimed at supporting the preparation and submission of a targeted and agreed major external funding application in partnership with APRIL and other partners, being renewed, and further funding calls for projects, ideas and commercialisation plans being announced.

As such, I would also like to invite feedback and the views and opinions of Members in the development of our new Strategic Plan. This will be an important platform for APRIL's activities and functions in the years ahead, and to assist the Australasian pork industry with its future challenges and endeavours.

A number of organisations ceased their memberships with APRIL during the reporting period. I would sincerely like to thank Windridge Farms Pty Ltd. and Blantyre Farms Pty Ltd., and Elanco Australasia, for supporting APRIL over the years. It is important that APRIL evolves with the changing landscape of the various environments it operates in, and I am sure this will feature as part of the new Strategic Plan.

Finally, I am highly appreciative to the APRIL staff in Dr Charles Rikard-Bell and Mr Geoff Crook (Company Secretary) for their sterling efforts to assist with APRIL's functions and objectives. There have been some challenging and testing times. I would also like to thank staff at Australian Pork Limited, and in particular Dr Rob Smits, Glenn Eppelstun, Gemarie Luzaran and Rosa Li, for their assistance and advice in helping APRIL during the reporting period. Thanks, lastly, 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

STRATEGIC PL

STRATEGIC IMPERATIVES AND VALUES

TO ACHIEVE APRIL'S VISION AND MISSION, APRIL HAS DEFINED THE FOLLOWING STRATEGIC IMPERATIVES THAT FORM THE FOUNDATIONS OF APRIL'S STRATEGIC PLAN (2019–2022):



IN APPLYING THESE STRATEGIC IMPERATIVES, APRIL WILL APPLY THE FOLLOWING VALUES:

INNOVATION

APRIL always look for solutions

EXCELLENCE

APRIL strives for the best in research, management, education and training, and commercialisation activities

NETWORKS

APRIL will collaborate locally, nationally and internationally to enhance capacity to solve local challenges and meet goals **RELEVANCE** means APRIL must be robust, agile and current in developing its research, education and training, and commercialisation programs and initiatives.

Research should be a balance of applied versus basic and short versus long-term research, as well as meeting stakeholder expectations.

LEVERAGE means APRIL is a catalyst for innovation and will always seek to leverage its limited funds against additional investment in priority research, education and training, and commercialisation programs to achieve necessary scale.

ALIGNMENT means APRIL is aligned with Australian Pork Limited's activities and residual Pork CRC Ltd. functions to avoid overlaps and duplication.

INVESTMENT AND GROWTH means APRIL is not a final funder (it is a co-funder) and will only actively invest in programs whose objectives cannot be achieved without our support.

COLLABORATION means APRIL will ensure its activities are collaborative, inclusive and informed across the stakeholder base.

RETURNS means measurable returns to stakeholders through research outcomes.

FOCUS

APRIL's members and the pork industry are the highest priorities

OPPORTUNITY

APRIL strives for the best in research, management, education and training, and commercialisation opportunities

COMMUNICATION

APRIL will build strong relationships through open communications

AUSTRALASIAN PORK RESEARCH INSTITUTE LTD ANNUAL REPORT 2021

BASED ON APRIL'S STRATEGIC IMPERATIVES AND VALUES, THE FOLLOWING CORE STRATEGIES HAVE BEEN DEVELOPED:

AN SUMMARY

CORE STRATEGIES

1. Prepare a 3-year strategic plan for APRIL and

a base research and development investment framework	processes are efficient and are generating optimal returns
Target Date: 30 June, 2019	Target Date: Ongoing
Status: Achieved	Status: See Commercialisation Report
 3. Develop organisational and research management models that utilise existing APL resources while maintaining operational independence for APRIL Target Date: Ongoing Status: Achieved 	4. Seek additional investment in relevant research programs through strategic funding opportunities (e.g. Australian Research Council schemes; CRC-P program; State and Federal Regional Growth and Development Funds; international funding sources)
	Target Date: Ongoing Status: One CRC-P and two ARC-Linkage grant applications have been successful (total value \$12.8m)
 5. Initiate a communication framework that effectively disseminates the objectives of APRIL and the outcomes from relevant research programs Target Date: Ongoing Status: See Communication Report 	6. Develop research priorities and balance strategic research domains with innovative research opportunities, low and high-risk projects, and projects with high potential for APRIL commercial income versus direct stakeholder returns Target Date: Ongoing
	Status: See Research Reports
 7. Assist with human capacity building in the Australasian pork Industry Target Date: Ongoing Status: See Education and Training Report 	 8. Key deliverables and indicators to measure the overall performance of APRIL as a business and the effectiveness of the research program Target Date: Ongoing Status: Measures are in place and reviewed regularly

2. Ensure existing and future commercialisation

COMMERCIALI 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:

1. AUSSCAN ONLINE

AusScan Online continued to deliver a consistent income stream in the 2020/21 financial year and remains the main source of commercial income for APRIL. The total number of scans for 2020/21 was 43,164, which exceeded both 2018/19 and 2019/20 by 5.1% and 7.6% respectively, and is now the third consecutive year of over 40,000 scans.

The opportunity of an AusScan Agency providing the technology in China has suffered further setbacks in 2020/21, with Covid–19 impacts and the huge downturn in the Chinese pig market due to African Swine Fever (ASF). Therefore, to date there has been very little scanning activity. Strict biosecurity measures have made travel within China very restrictive impeding customer consultation with major feed manufacturers and pig and poultry integrators. It is expected the Chinese pig industry will begin to recover in mid-2022. The AusScan Agency in China is technically well supported by Aunir UK who have provided a Chinese web platform for the scanning process. We are hoping to relaunch the program in 2022 as the market improves and travel restrictions ease.

On the home front, the three integrated groups with sub-license agreements have consistently applied the calibrations throughout the year, with Ridley expanding the technology into their regional mills. Two new AusScan Online customers enrolled this year, namely Inghams Enterprises and Milne Agriculture in Perth WA, further expanding regions in which AusScan Online is applied.

A new initiative in 2020/21 was to utilise the energy scan data of new seasons grain and provide an Early Harvest Report to key customers. AusScan Online collates a significant number of scans from different regions across Australia every month. The report aids nutritionists in providing a rapid assessment of energy values for each grain type across different regions in Australia.

The Ingot Check quality assurance program provides a monthly assessment of the laboratory's NIR machine and calibration accuracies. The scheme has enrolled two more laboratories and there are now 11 laboratories with AusScan Online technology available.

Calibration updates are an important component of the AusScan Online Strategic Plan, and this year



The University of Melbourne was awarded the tender to upgrade the pig digestible energy (DE) calibrations. The study will start in early 2022. With the expansion of AusScan Online into Latin American countries, North America and China, it has been highlighted that additional maize samples will strengthen the calibration in these overseas markets. Unfortunately, severe delays in importation of maize samples from the USA has resulted in the decision to sample Australian maize from a variety of regions and growing environments and provide the variation required for the pig DE study. The experimental design is complex and allows for continuous updating of the calibration to ensure the latest grains fed to pigs are included in the calibration.

Finally, a new NIR calibration was made available to AusScan Online users for the determination of faecal starch content in cattle and dairy cows. The calibration is considered as 'excellent', with a correlation of 0.99 between predicted and actual faecal starch content. Prior to the availability of this faecal starch calibration, Australian dairy and feedlot producers were required to use a calibration developed in the USA in order to determine faecal starch content.



The outlook for AusScan Online in 2021–22 is positive with the expected upgrade of the pig DE calibrations, a market awareness campaign for the faecal starch calibration, and a planned comparative study of a hand held NIR device alongside a Foss XDS benchtop NIR machine. If the hand-held device provides accurate energy assessment of grains as well as other quality parameters, then a much larger market potentially becomes available due to the versatility of the implement.

2. RIDLEY ENRICH

In this reporting period there has been consistent growth in Sow Block sales within the Australian pig industry. In 2019/20 sow block sales averaged 5.64 t a quarter with a total of 22.5 t sold in the period. In the 2020/21 period a growth of 222% over the previous year's sales occurred, with average quarterly sales of 12.5 t and an annual total of 50 t. The growth is due to the requirements of Coles suppliers, under APIQ Standards, to provide a form of enrichment to sows in the breeding cycle, and the enrichment is to be manipulable and rootable material. The block was launched in late 2016 and was thought to be ideal for producers to provide enrichment to sows housed in slatted and partially slatted pens where straw is unable to be provided as it blocks drains. Producers have been very innovative with application of the block with the preferred method being to hang the block from the ceiling to allow 360-degree access.

As reported in the previous year, APRIL have liaised with Dr Jeremey Marchant-Forde, a leading Animal Behaviourist within the USDA, who has agreed to conduct some research on the sow enrichment block at the Agricultural Research Station (ARS) Farm Animal Behaviour Laboratory, West Lafayette Indiana USA. As has been the case with most applied research during the Covid-19 pandemic, projects have unavoidably been delayed due to lockdowns experienced there. However, indications are that in late 2021 research studies will recommence and the experimental protocol has been approved by Purdue University and the USDA. It is expected that the data set from the USDA study will be invaluable for US producers to assess the Ridley Enrich block as animal welfare pressures continue to be applied to their industry. Furthermore, commercial studies should evolve from this basal sow study and Dr Marchant-Forde is interested in the opportunity to evaluate the Ridley enrichment block in grower-finisher studies.

For the next reporting period, Ridley are evaluating potential distributorships for key markets in Europe and the USA. The collective experiences in application of the sow block to reduce aggression at mixing will be invaluable as the product is launched into these markets.

3. PIGLET BUDDY (FEED ENHANCER)

Product sales have not recovered from the last reporting period partly due to the loss of a major client and ongoing issues related to Covid–19 and ASF in new markets of interest. However, BEC have continued the supply agreement with their Korean distributor who has maintained his customer base despite poor pig prices. BEC supply Korea with 2 t of product twice a year.

4. LAWSONIA QPCR

In this reporting period, Apiam Animal Health, in collaboration with Elizabeth Macarthur Agricultural Institute (EMAI), released the *Lawsonia intracellularis* qPCR diagnostic test to the Australian pig industry. The technology provides a more precise detection of *L. intracellularis* compared to existing diagnostic methods, and by doing so provides opportunity for improved production outcomes.

This year case studies conducted by Apiam Animal Health have shown that sub-clinical ileitis can be present in herds that have an existing control program for ileitis. In these cases, Lawsonia qPCR testing has helped to pinpoint risk periods of infection and subsequently refine control programs to alleviate sub-clinical disease and production losses. The test is also being used as a surveillance tool for *L. intracellularis* in high health farms with minimal antibiotic usage, as well as a tool to verify changes in health control programs have been effective in reducing clinical and subclinical ileitis. Gold standard testing protocols involve testing pooled faecal samples at 2–3 week age intervals from wean to finish.

The first samples were sent for analysis in October 2020 and Apiam project that under their awareness and surveillance program, a total of 40 samples per quarter will be processed. The Lawsonia qPCR test measures the amount of *Lawsonia* cell numbers within pooled faecal samples. The *Lawsonia* numbers have been standardised and correlate to level of clinical infection and by doing so can distinguish between subclinical and clinical infection. The EMAI produce the standards required for the test and have also developed standards which can be transported to overseas laboratories, enabling the technology to be expanded into larger markets.

THIS PROJECT **RESULTED IN** THE SUCCESSFUL **COLLECTION.** LABORATORY ANALYSIS AND SPECTRAL DATA **COLLECTION OF OVER 150 WATER** SAMPLES ACROSS FOUR DIFFERENT SPECTROMETERS. AND A TOTAL **OF 13 WATER PARAMETERS HAVE BEEN** PROPOSED FOR FURTHER CALIBRATION **DEVELOPMENT.**

5. THE APRIL PIPELINE

APRIL Innovation Project 5A-101 Real-time in Field Water Testing was carried out in 2020/21 to provide 'proof of concept' that a rapid, multi-parameter water test could be developed using a hand-held spectrometer and cloud-based machine learning software. The study was carried out by Dr Jamie Flynn from Hone Ag and supported by Dr Louise Edwards from Ridley. The Final Report was submitted in February 2021. This project resulted in the successful collection, laboratory analysis and spectral data collection of over 150 water samples across four different spectrometers, and a total of 13 water parameters have been proposed for further calibration development. The study also assessed the spectrometers' hardware characteristics as well as the ability to build 'viable' water parameter models from the spectra, and concluded the Raman spectrometer was the most appropriate instrument to continue the development of a multi-parameter water test.

An extension to study 5A–101 was granted to Hone Ag by APRIL to re-examine the water dataset with a specific focus on transforming and modelling the spectral data sets for each chemical to be more suitable for the Raman spectrometer. The outcome of this work has validated the water parameters to take forward to the next stage of this research. Ridley will continue to partner with Hone Ag in this research and have supported a project proposal submitted to APRIL. The project will further development the water parameter data sets to produce more robust calibrations. The project has also attracted interest from prospective partners with interests to commercialise the technology.

APRIL is working closely with researchers from AgResearch Limited in New Zealand to prepare a commercialisation proposal comparing two rapid measurement techniques to detect the presence and concentration of boar taint compounds in pork at processing. The proposal will be building on the infrared spectroscopy base line data from Pork CRC study 3A–120, which indicated a calibration may be developed using NIR technology.

Finally, Commercialisation Project 7C-001, with Anatara LifeSciences, Ridley and Murdoch University, explored the application of BONIFF (a modified form of Detach) to semi-moist extruded creep (SMEC) feed under conditions of an enterotoxigenic E. coli challenge, in the presence or absence of dietary medicinal zinc oxide (ZnO). It was found that the BONIFF preparation was stable on SMEC pellets from the time of delivery to the end of the experiment, a period of 6-7 weeks, in March/April 2021. Stability studies beyond the trial period continue to demonstrate good stability of BONIFF. This indicates that post-extrusion coating of BONIFF is achievable and that the product could be commercially available via feed. Results from the study demonstrated good performance of the BONIFF-SMEC against a standard diet, and no negative impacts relative to medicinal ZnO.

STRATEGIC PLAN DELIVERABLES

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

CORE STRATEGY 2:	ТА
ENSURE EXISTING	
AND FUTURE	2.1
COMMERCIALISATION	co
PROCESSES ARE	an
EFFICIENT	ро

TASK	KEY DELIVERABLES	STA	TUS
2.1 Review all existing commercialisation projects and ensure those with greatest potential are adequately resourced	Allocation of adequate resources to ensure commercial income is realised in a reasonable timeframe	4	Achieved
	Targets: Commercial income available for reinvestment of \$650,000 by July 2020, \$750,000 by July 2021, \$1.0 million by July 2022	•	Delayed
2.2 Progress licensing of AusScan calibrations via Aunir in China	Capture a wider market using a Chinese base (i.e. Ao Bo Biotechnology Pte Ltd) and significantly increase income from AusScan technologies	•	On target
	Development of a strategic partnership in China for delivery of other research outcomes	•	Delayed
	Targets: More than 500 scans for DE and AME in cereals for pigs and poultry to Chinese customers by July 2021, and more than 3,000 reactive lysine scans for oilseeds for Chinese customers by July 2021	•	Delayed
2.3 Grow AB Vista business and extend service to one additional product	Scans generated by AB Vista increase 10% annually from June 2018	~	Achieved
	Agreement/licence for at least one other product by January 2021	~	Achieved
2.4 Develop a commercialisation pipeline and process from project submissions to project delivery and beyond	Clear understanding of commercialisation potential from the existing and future research program	~	Achieved
	Revised Commercialisation Project proposal (20% cash investment), to facilitate greater interest in commercialisation of research (and not just from the pork Industry)	~	Achieved
	Formal Commercialisation Report becomes a Standing item at each APRIL Board meeting	~	Achieved
2.5 Allocate some research resources towards product development with commercial partners	Commercial income of \$100,000 from investment in product development that can be reinvested in the APRIL R&D program (by June 2021)	•	Delayed

COMMUNICATI REPORT

INTRODUCTION

APRIL has developed an over-arching communication framework as part of the Strategic Plan to ensure communications with all stakeholders provide relevant information at the right time. The framework also contains mechanisms for Members and other stakeholders to provide feedback to APRIL management and Board.



THE KEY COMPONENTS OF THE COMMUNICATION FRAMEWORK ARE:

- Present regular updates of APRIL's progress at producer and scientific forums.
- Implement the Director-Ordinary Member buddy system.
- Convene an annual Stakeholder's Day for all APRIL Members.
- Arrange annual one-on-one meetings with APRIL Members to understand needs and promote outcomes.
- Conduct an annual membership survey to ensure APRIL research remains relevant.
- Keep industry and stakeholders informed of research, education and training, and commercialisation activities and outcomes.
- Establish an independent website for promotion of APRIL activities.

COMMUNICATION ACTIVITIES

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

The Covid-19 pandemic has dramatically reduced the number of face-to-face meetings and other networking opportunities available for APRIL staff to attend. Despite this, Chief Scientist Dr John Pluske attended the following events during the year:

- 5 Aug 2020: NSW Farmers' Pork Committee meeting (virtual)
- **4 Sep 2020:** Western Australian Pork Producers' Association Industry Day (face-to-face)
- 19 Nov 2020: APL Producers' Forum (virtual)
- **26 Mar 2021:** Western Australian Pork Producers' Association Industry Day (face-to-face)
- 7-8 Jun 2021: APL Delegates Forum (speaker) (virtual)
- **9–11 Jun 2021:** Recent Advances in Animal Nutrition in Australia conference (face-to-face).

Manager, Commercialisation and Research Impact, Dr Charles Rikard-Bell attended the following events during the year:

- **5 Aug 2020:** NSW Farmers Virtual Pork AGM and Forum (virtual)
- 14-18 Sep 2020: AAAS SA Branch Webinar Series (virtual)
- **17 Sep 2020:** ASF Diagnostics Elanco International Webinar (virtual)
- 12 Nov 2020: Feed Grain Partnership AGM (virtual)
- 26 Feb 2021: SA Pig Industry Day (face-to-face)
- **25 May 2021:** AAAS SA Branch Seminar and Carcass Assessment (face-to-face/virtual).

IMPLEMENT 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 DAY FOR ALL APRIL MEMBERS

The annual Stakeholders' Day provides an opportunity for all APRIL stakeholders to join together and discuss APRIL progress and issues. Updates are provided from an industry perspective, from project leaders and students as well as APRIL management.

A highlight for APRIL in 2020 was the Stakeholders' Day on 20 November 2020. The Stakeholders' Day was held as an online only event because of Covid-19 restrictions and was attended by over 50 people. Attendees enjoyed presentations in relation to project updates, APRIL's commercialisation activities, an industry perspective from an Industry Placement Program awardee, an overview from APL, and a robust question and answer session at the end of the forum. Thanks to everyone who presented.

The next Stakeholder's Day will be held as a virtual meeting on 15 November 2021.

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

During the reporting period, Chief Scientist John Pluske met or communicated with a representative (or representatives) from all APRIL members either by telephone or Zoom. The ongoing travel restrictions caused by Covid-19 has made face to face meetings very difficult to arrange during the reporting period.

Chief Scientist John Pluske receives regular, high quality feedback from APRIL stakeholders through the buddy system reports and informal meetings. However, a more formal survey mechanism is scheduled to be undertaken in 2022.

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

In conjunction with the activities listed above and the APRIL website, Dr John Pluske and Dr Charles Rikard-Bell achieve this through regular articles in Australian Pork Newspaper and through the APRIL member Newsletter and APRIL Announcements. Four editions of the Newsletter and eight Announcements have been produced and each contains information and updates of interest with regard to the research program (e.g. funded projects, project Final Reports), education and training (e.g. student awards) and commercialisation (e.g. AusScan Online updates), a Research Snapshot from completed or ongoing projects, and provides news and events of relevance and importance to APRIL Members and associates.

ESTABLISH AN INDEPENDENT WEBSITE FOR PROMOTION OF APRIL ACTIVITIES

The APRIL website apri.com.au has been completely revamped and revitalised and contains a wealth of information regarding all APRIL's funding opportunities as well as results of APRIL research. The website also holds the Final Reports from the two Pork CRC programs (2005–2019), as well as a host of other CRC content.

STRATEGIC PLAN DELIVERABLES

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

CORE STRATEGY 5:	TASK	KEY DELIVERABLES	STATUS		
COMMUNICATION FRAMEWORK	5.1 Present regular updates of APRIL's progress at producer and scientific forums	Presentation of APRIL objectives and research outcomes to representatives of a wide pig producer base in Australia and New Zealand, and to international forums (where appropriate)	V F	Achieved	
		Present at a minimum of two member-based conferences, by November 2019	V F	Achieved	
	5.2 Implement Director-Ordinary Member buddy system	Established as Standing item on Board agenda (June 2018)	V F	Achieved	
	5.3 Convene an annual Stakeholder Day for all APRIL members	Direct contact with APRIL members to extend latest results and receive direct feedback on progress	V F	Achieved	
		First Stakeholder day convened November 2018	v F	Achieved	
	5.4 Arrange annual one-on-one meetings with APRIL members to understand needs and promote outcomes	Face-to-face meetings (Chair, Board members and (or) the Chief Scientist) convened with all members at least annually (commenced June 2018)	<u> </u>	Delayed	
	5.5 Conduct an annual membership survey to ensure APRIL research remains relevant	First annual membership survey completed by November 2021, requesting feedback on the performance of APRIL	• [Delayed	
		Refined priorities for use in development of new research programs	<u> </u>	Delayed	
	5.6 Keep industry and stakeholders informed of research, education	Bi- or tri-monthly column in Australian Pork Newspaper	✓	Achieved	
	activities and outcomes	Media releases (as appropriate)	v	Achieved	
		Quarterly newsletter to all members commencing June 2019	V F	Achieved	
	5.7 Establish an independent website for promotion of APRIL activities	APRIL website established and linked to the APL website in June 2018, for communication of research, education and training and commercialisation outcomes, and APRIL news	V F	\chieved	
		APRIL to maintain the Pork CRC website	V 4	Achieved	

(after July 2019)

THE NEXT STAKEHOLDER'S DAY WILL BE HELD AS A VIRTUAL MEETING ON 15 NOVEMBER 2021



RESEARCH RE TRANSFORMA 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 IONAL



KEY THEMES

APRIL has 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, carcase 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 all or 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 multifaceted 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.

T-101: PATHWAYS TO REARING PIGS WITH TAILS TO MAXIMISE RETURNS TO PORK PRODUCERS

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*

PROJECTS

NO.	Phoje								LEAD PA					
T-101	Pathway	/s to rearin	g pigs with	n tails to ma	iximise reti	urns to por	k produce	rs	APRIL					
T-102	How to	make antir	nicrobials i	n pig feed r	edundant,	naturally			The University of Queensland					
T-103	Novel ap develop	oproaches ment in liv	Murdoch University											
	0%	10%	20%	20%	40%	50%	60%	70%	80%	00%	100%			
	0%	10%	20%	30%	40%	50%	00%	70%	80%	90%	100%			
T-102 \$102,298 \$292,858							3							

PROJECT COMMITMENTS

TRANSFORMATIONAL

Future commitment

Paid

and industry sustainability was made to the Round 11 CRC-P funding round led by SunPork Ptv 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), has been 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 is an exceptional 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.

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).

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

Total cash funding for the four-year project is \$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) is \$3,835,847.

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.

T-103: NOVEL APPROACHES FOR COMBATTING CRITICALLY IMPORTANT ANTIMICROBIAL RESISTANCE DEVELOPMENT IN LIVESTOCK

During the year, APRIL agreed to be a partner in an ARC - Linkage project application by Associate Professor Sam Abraham (Murdoch University). The Project sought to:

- Identify the role of co-selection in persistence of critically important antimicrobials (CIA) -resistant bacteria.
- Clarify public and animal health impact of emerging CIA- resistant clones in pigs.
- Identify risk factors and exposure pathways on-farms for invading CIA-resistant E. coli clones.
- Quantify the level of spill over of CIA-resistant E. coli that happens between humans and pigs and other sources.
- Evaluate effectiveness of antimicrobial stewardship in reducing CIA-resistant bacteria.
- Assess the influence of dietary supplements, bacteriophages, pre and probiotics in decolonising and reducing CIA-resistant E. coli.

The Project involved collaboration with APRIL members SunPork Pty Ltd., FeedWorks, Rivalea (Australia) Pty Ltd., Murdoch University and The University of Adelaide. The project sought \$1,198,614 from the Australian Research Council, and the Partner Organisations, Murdoch University and The University of Adelaide collectively provided \$1,170,000 cash (including \$420,000 from APRIL) and \$1,202,932 in-kind contributions to this project.

Unfortunately, the application was not approved but was ranked in the top 10% of unsuccessful applications, which has encouraged APRIL to start work to develop a smaller scope study, based on the ARC-Linkage application.

STRATEGIC PLAN DELIVERABLES

A summary of progress against the strategic plan deliverables is provided below:

CORE STRATEGY 6: RESEARCH **PRIORITIES** 6.1.1 Enhanced antimicrobial Outcomes from this research portfolio will result On target stewardship in the Australasian in a demonstrable and sustained reduction pork industry through targeted in the number of in-feed doses of antibiotics TRANSFORMATIONAL reduction of in-feed medications administered by the Australasian pig industry without adverse health consequences each year PROJECTS 6.1.2 Elimination of the need for Outcomes from this research will include a On target tail docking in Australasian pork detailed understanding of the causal factors that production systems interact to induce tail biting (and arguably be able to demonstrate that tail biting can be induced experimentally), mechanisms to predict and control tail biting, total elimination of the need for routine tail docking in commercial production systems, enhanced pig welfare, growth rates and feed conversion, and increased carcase yield

6.1:

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.



KEY THEMES

The priority challenges that APRIL has identified in the strategic plan 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", "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:

- 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.
- 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 apply both DArTseq[™] and DArTreseq 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.

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	SunPork Farms
6A-103	Easing the transition: large piglets from large pellets	SunPork Farms
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



APRIL INDUSTRY PRIORITY PROJECT COMMITMENTS

STRATEGIC PLAN DELIVERABLES

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

CORE STRATEGY 6: RESEARCH	TASK	KEY DELIVERABLES	STATUS		
PRIORITIES 6.2: INDUSTRY PRIORITY PROJECTS	6.2.1 Effective monitoring of foreign disease incursions in Australasia	Develop new diagnostics and tools / adapt existing diagnostic and tools, to reduce risks of foreign diseases entering commercial herds	 Delayed 		
		Joint funding applications with Australian Government/APL	Delayed		
	6.2.2 Novel approaches to allow increased use of food wastes in pig diets	Establish sustainable and cost-effective methods for recovery of energy and nutrients from human food waste streams	 On target 		
		Better application of manufacturing / additive technologies to generate and (or) conserve energy and nutrients from food waste streams	On target		
		Maintenance and (or) improvement in feed conversion efficiency	 On target 		
		Joint funding applications with the CRC Fight Food Waste/other partners	 Achieved 		
	6.2.3 Making pigs more tolerant to heat	Enhanced resilience of pigs (especially sows) to heat	 Achieved 		
		Enhanced productivity and welfare of pigs (especially sows and litters) caused by greater heat tolerance	 Achieved 		
	6.2.4 Improved water quality for use/re-use on-farm and in processing facilities	Establish optimum water quality standards for better productivity and health under commercial conditions	On target		
		Optimise the quality of water as a delivery mechanism for water soluble additives	 On target 		
	6.2.5 Alternate methods to control/ eradicate endemic diseases	Alternative management methods/technologies to reduce the presence of economically significant diseases in commercial herds	 Delayed 		
	6.2.6 Development of real time monitoring and surveillance technologies under commercial conditions	More efficient feeding/management systems and (remote) monitoring of the environment, performance, feed consumption (and waste), and health and welfare of pigs	 On target 		
		Early detection of health and welfare challenges	 On target 		
	6.2.7 Detecting sow reproductive state more efficiently and effectively	Establish/validate new methods/technologies that reliably and cost effectively confirm reproductive state in sows	 Achieved 		

TASK	KEY DELIVERABLES	STATUS			
6.2.8 Establish pork as an integral part of a healthy lifestyle	Greater awareness of the role of pork as a key food component in a healthy lifestyle	Delayed			
6.2.9 Reducing variation in lifetime performance	Establish/validate new reproductive and (or) management technologies, strategies and nutrient requirements that reduce weight variability from birth to finish	 On target 			
	Improved feed conversion efficiency	 Achieved 			
6.2.10 Biodegradable packaging solutions for pork products	Develop cost-effective, biodegradable packaging products for pork	Delayed			
6.2.11 Heavier carcasses	Optimising the value of carcasses from heavier pigs	Delayed			
	Establishing customer acceptance and value pathways for rind-off products, larger primals and export competitive pieces	Delayed			



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, 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 SUIS VACCINE VIA MEASUREMENT OF IMMUNE RESPONSES TO FOUR DIFFERENT STREPTOCOCCUS SUIS VACCINE PREPARATIONS, USING AN AUSTRALIAN CPS2 ST25 STRAIN

PROJECT LEADER: DR MARK O'DEA, MURDOCH UNIVERSITY

- 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.

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.

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

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.
 - 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 guanidinoacetic 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 ABSCESSES IN CARCASES USING LEAN MEAT YIELD ESTIMATION

PROJECT LEADER: DR DARRYL D'SOUZA, SUNPORK SOLUTIONS

Vaccine and injectable medication related deep tissue abscesses predominantly in the neck/shoulder region are difficult to identify on the slaughter line. Rapid and real time detection of abscesses is currently not possible. Our proposed hypothesis is that shoulder primals with deep tissue abscesses will have lower lean meat yield (LMY%) compared to normal primals. This project seeks to develop a novel methodology to use an online ultrasound-based carcase lean meat yield classification system to identify shoulder primals with deep tissue abscesses. Identifying these at-risk carcases before they enter the boning room will reduce the significant costs associated with this issue and may avert major reputational/brand damage by preventing discovery by the customer/consumer.

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

PROJECT LEADER: DR KATE PLUSH, SUNPORK SOLUTIONS

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 noninvasive biomarkers, which the Australasian pork industry can use to inform day-to-day management decisions and continuously improve the welfare of pigs.

THIS PROJECT SEEKS TO DEVELOP A NOVEL METHODOLOGY TO USE AN ONLINE ULTRASOUND-BASED CARCASE LEAN MEAT YIELD CLASSIFICATION SYSTEM TO IDENTIFY SHOULDER PRIMALS WITH DEEP TISSUE ABSCESSES. IDENTIFYING THESE AT-RISK CARCASES BEFORE THEY ENTER THE BONING ROOM WILL REDUCE THE SIGNIFICANT COSTS ASSOCIATED WITH THIS ISSUE AND MAY AVERT MAJOR REPUTATIONAL/BRAND DAMAGE BY PREVENTING DISCOVERY BY THE CUSTOMER/CONSUMER

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 carcases using lean meat yield estimation	SunPork Solutions
5A-111	Escaping the daily grind – coarser ground diets for improved foetal growth	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



APRIL INNOVATION PROJECT COMMITMENTS



FEATURE PROJECT: 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)

PROJECT PARTICIPANTS: Dr Rob Smits (Australian Pork Limited, formerly Rivalea), Mr Chris Brewster (Rivalea), Dr Rebecca Morrison (Rivalea), Dr Roger Campbell (RG Campbell Advisory)

PROJECT STATUS: Completed

AIMS AND OBJECTIVES

The main objective of this project was to investigate the effects of dietary supplementation of 0.15% β-hydroxy β-methyl butyrate (HMB), 0.15% N-carbamylglutamate (NCG) and 0.1% Ca(NO₃)₂ (calcium nitrate; CAN) to sows in late gestation on their litter performance and subsequent reproductive performance in order to evaluate their suitability as alternatives to L-arginine supplementation, which is often expensive, requires high inclusion rates, has a short half-life, and may reduce sow feed intake. It was hypothesised that supplementation of these additives would increase piglet vitality at birth and therefore their overall performance to weaning, increasing the number and/or proportion of live piglets born and weaned.

EXPERIMENTAL DESIGN

The experiment was conducted at Rivalea's R&I/Module 1 facility from February to May 2020. A total of n = 537 sows was allocated to one of five dietary treatments at day 90 of gestation balanced for sow parity (multiparous sows, parities 2–7) and body weight at day 90. The five diets consisted of:

- CON A basal (control) diet (common gestation diet with no supplemental arginine; n = 108)
- ARG The basal diet + 0.5% added arginine (n = 101)
- HMB The basal diet + 0.15% added β-hydroxy
 β-methyl butyrate (n = 107)
- NCG The basal diet + 0.15% N-carbamylglutamate (*n* = 113) or
- CAN The basal diet + 0.1% Ca(NO₃)₂ (n = 108).

Sows entered the farrowing house at approximately day 108 of gestation and continued on their experimental diets until the day of farrowing. Sow body weight, P2 backfat, feed intake, total piglets born (TB) and born alive (BA), stillbirth percentage, individual birth weights, and litter weights at birth, day 7 and day 25 of lactation were measured for each litter. Subsequent sow reproductive performance was also assessed.

IT WAS HYPOTHESISED THAT SUPPLEMENTATION OF THESE ADDITIVES WOULD INCREASE PIGLET VITALITY AT BIRTH AND THEREFORE THEIR OVERALL PERFORMANCE TO WEANING, INCREASING THE NUMBER AND/OR PROPORTION OF LIVE PIGLETS BORN AND WEANED

KEY FINDINGS

The main outcomes of the study were:

- Supplementation of CAN improved birth weights of piglets and reduced the proportion of piglets born < 1.1 kg.
- Piglets born to sows supplemented with CAN had a higher pre-weaning survival chance.
- Supplementation of HMB improved the growth performance of suckling piglets from birth to weaning.
- Subsequent sow reproductive performance was not impacted.

APPLICATIONS TO INDUSTRY

Calcium nitrate and HMB showed promise as feed additives for sows in late gestation, as they may improve birth weight of piglets and their survival chance to weaning in the case of CAN. Therefore, these additives may represent a costeffective alternative to L-arginine in late gestating sow diets. Further research is required to confirm the optimal feeding time and inclusion rates of these additives. From these improvements it was shown from a cost-benefit analysis that HMB and CAN were the most cost effective of the additives investigated.




The proportion of total piglets born weighing <1.1 kg when various supplements were fed to sows in late gestation from day 90 of gestation until farrowing (control, CON; 0.5% supplemented arginine, ARG; 0.15% supplemented β -hydroxy- β -methyl butyrate, HMB; 0.15% supplemented N-carbamylglutamate, NCG; and 0.1% supplemented Ca(NO₃)₂, CAN). Dietary treatment effect was analysed by chi-square (X² = 46.62; P < 0.001).

FIGURE 1



FEATURE PROJECT: 5A–107

USING ALGAL EXTRACTS TO IMPROVE WEANER GROWTH PERFORMANCE AND DIGESTIBILITY

PROJECT LEADER: Robert Parkes (Ridley Agriproducts Pty Ltd)

PROJECT PARTICIPANTS: D.J. Henman (Rivalea), S. Haberecht (formerly Ridley; currently MTech Systems), Dr F. Liu (Rivalea), J. Walker (Rivalea)

PROJECT STATUS: Completed

AIMS AND OBJECTIVES

To investigate the impacts on pig performance, gut microbial populations and inflammatory markers, the efficacy of a number of algal extracts was evaluated in post-weaning diets. Pigs were fed either a standard weaner diet or a diet designed to be pro-inflammatory (based on higher amounts of soybean meal and a higher n-6-n-3 PUFA ratio), with or without a number of algal extracts. The algal extracts may provide a solution to improve post-weaning growth performance and reduce the severity of post-weaning diarrhoea.

EXPERIMENTAL DESIGN

A total of 96 male pigs, weaned at approximately 28 days of age, was randomly allocated into individual weaner pens and assigned to one of eight dietary treatments in a 4 x 2 factorial design. The experiment studied the effects of algal extracts (A, B, A+B vs control) on growth performance, post-weaning diarrhoea, and potentially markers of gut health (microbiome, inflammatory markers) of weaner pigs fed on a conventional diet or a high pro-inflammatory diet (higher soybean meal and n-6-n-3 PUFA ratio).

Algal Extract A was a combination of laminarin and fucoidan at 300 ppm, Algal Extract B was ulva at a concentration of 300 ppm, and Algal Extract A+B was the combination of laminarin and fucoidan extract and ulva at concentrations of 300 ppm each.

KEY FINDINGS

The experiment showed that the use of the algal extracts from brown seaweed or ulva species did not improve growth performance or have any effect on the postweaning scour score, and thus any major disturbances in the gut were insufficient under the conditions of this experiment to show positive effects (Table 1).

Analysis of the faecal score results indicated that the use of the pro-inflammatory diet significantly increased the softness of the faeces at both time points (day 10 and 20) following weaning, which might be due to an inflammatory response (Table 2).

APPLICATIONS TO INDUSTRY

There was no benefit to the utilisation of the algal extracts used in this experiment. The combination of the algal extracts did not show any differences in performance or scour score to the individual algal extracts or the control diets. The level of inclusion at 300 g/t of the algal products was relatively low and there is potential to look at the level of algal extract inclusion that is required to influence gut structure and function and potentially growth performance under a wider range of growing and environmental conditions that present more of a challenge after weaning.



THE ALGAL EXTRACTS MAY PROVIDE A SOLUTION TO IMPROVE POST-WEANING GROWTH PERFORMANCE AND REDUCE THE SEVERITY OF POST-WEANING DIARRHOEA

TABLE 1

Growth performance of pigs after weaning fed two different basal diets in combination with different algal extracts (ADFI: average daily feed intake; ADG: average daily gain; FCR: feed conversion ratio).

VARIABLES BASAL TYPE		L DIET E (B)	SEM		ALGAL EX	AL EXTRACTS* SEM P VALUES					
	Conven- tional	Pro- inflam- matory		Control	FU/LA	Ulva	Combo		Basal diet	Algal	Interac- tion
Body weight, d 0	8.0	8.0	0.09	8.0	8.0	8.0	8.0	0.13	1.00	1.00	1.00
Body weight, d 7	9.4	9.3	0.14	9.4	9.3	9.3	9.3	0.15	0.37	0.99	0.35
Body weight, d 21	15.7	16.0	0.30	16.2	15.9	15.8	15.7	0.43	0.44	0.84	0.33
0-7 d											
ADFI, g/d	231	219	11.6	235	224	223	215	16.4	0.47	0.87	0.56
ADG, g/d	198	179	14.9	193	189	187	185	21.1	0.37	0.99	0.35
FCR	1.35	1.49	0.136	1.30	1.24	1.63	1.51	0.190	0.46	0.46	0.29
0-21 d											
ADFI, g/d	425	431	15.0	445	422	422	423	21.2	0.76	0.84	0.31
ADG, g/d	368	383	14.3	390	375	371	366	20.2	0.44	0.84	0.33
FCR	1.17	1.15	0.019	1.17	1.13	1.16	1.17	0.027	0.40	0.81	0.56

Entry body weight was used as a covariate when analysing all variables except for body weight (0 d)

* FU/LA - Fucoidan/Laminarin extract 300 ppm, Ulva extract 300 ppm, Combo - 300 ppm of each algal extract

TABLE 2

Faecal score of pigs after weaning fed two different basal diets in combination with different algal extracts (data analysed within each day point). Faecal score was assessed on a scale of 0 to 3. A higher score indicates looser faeces.

VARIABLES BASAL DIET TYPE (B)		SEM		ALGAL EXTRACTS*			SEM	P VALUES			
	Conven- tional	Pro- inflam- matory		Control	FU/LA	Ulva	Combo		Basal diet	Algal	Interac- tion
Day 10	0.31	0.67	0.102	0.50	0.50	0.33	0.63	0.144	0.02	0.56	0.86
Day 20	0.08	0.56	0.079	0.29	0.21	0.42	0.38	0.111	<0.001	0.56	0.56

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.



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 MARKEDLY 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 markedly 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	NO.	PROJECT NAME	LEAD PARTY
PORK CRC PROJECTS	2A-116	Pre-farrowing health and welfare assessment of sows	Animal Genetics and Breeding Unit, University of New England
	2A-119	Development of a quantitative PCR test for swine dysentery	Murdoch University
	3A-119	On line lean meat yield measurement of pig carcases – 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
	4 A -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	SunPork Farms
	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	SunPork Farms
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: A1–102

PROOF OF CONCEPT: ORAL FLUIDS AND QUANTITATIVE ASSESSMENT FOR PORCINE CHRONIC RESPIRATORY DISEASE (PCRD) IN AUSTRALIAN FIELD CONDITIONS

PROJECT LEADER: Dr Greg Tuckett (Rivalea [Australia] Pty Ltd)

PROJECT

PARTICIPANTS: Dr Jessica Craig (Rivalea), Aileen Vanderfeen (ACE Laboratories), Theresa Limm (formerly ACE Laboratories), Dr Anke Woeckel (formerly Rivalea; currently Merck Animal Health)

PROJECT STATUS: Completed

AIMS AND OBJECTIVES

The current project aimed to demonstrate a close correlation between the number of DNA copies of primary and secondary respiratory pathogens involved in PCRD (*Actinobacillus pleuropneumoniae, Mycoplasma hyopneumoniae*, Porcine Circovirus type 2 (PCV2), *Mycoplasma hyorhinis,* and *Haemophilus parasuis*) in oral fluids (OF) with clinical symptoms, alternative diagnostic methods including histopathology, serology, and final evaluation of lung pathology at slaughter.

EXPERIMENTAL DESIGN

This project consisted of a single experiment, conducted in Corowa, NSW. In the weaner phase (n = 5 pens and n = 30 focal pigs), OF samples were collected on a pen basis and blood samples from a cohort of pigs. In the individual grower-finisher facility, individual blood and saliva samples were taken at 12, 15, 18, and 21 weeks of age (n = 80 pigs), and cough scores and eye temperatures were recorded. Oral fluids samples were collected using a rope hung in the pen for 30 minutes.

Pigs from the grower-finisher facility were transferred to an on-site abattoir at approximately 21 weeks of age, where lungs were scored for pleurisy and pneumonia, and hot standard carcass weight (HSCW), backfat P2, and loin depth were measured. Serum samples were analysed for antibodies against PCRD pathogens, and OF were analysed for antigenic DNA using qPCR. Correlation analyses were then carried out to examine relationships between antigen levels in OF, antibody levels in serum, and other clinical signs of PCRD.

KEY FINDINGS

- Most likely due to the nature of the design of the experiment, where pigs were housed individually in optimum conditions, there was an absence of major health challenges and no pigs presented conclusively with PCRD in the grower-finisher phase.
- *M. hyopneumoniae* or its antibodies were not detected in OF or serum for any pig at any timepoint.
- Antibodies against APP were detected in serum at most timepoints; however, APP was only detected in OF from a small number (n = 13) of pigs.
- PCV2 antibodies were detected in serum, and DNA from PCV2 was detected in OF. There was a significant positive correlation between PCV2 antibody in serum and PCV2 DNA in OF at 18 weeks of age (r = 0.37; P = 0.046) and 21 weeks of age (r = 0.41; P = 0.028) (Table 3).
- The number of PCV2 DNA copies in OF at 15 weeks of age showed a positive linear correlation with PCV2 serology antibody levels (titre) at 18 weeks of age (*r* = 0.326); the correlation tended towards significance (*P* = 0.085).
- From a dilution series it was concluded that OF testing at a pen level may be successful in detecting PCV2 when as little as only one out of 100 pigs in a pen is infected. However, this was at an age where the PCV2 load in pigs was quite high, and at ages where viral load is lower (e.g. at 21 weeks of age), testing OF may be less sensitive.

APPLICATIONS TO INDUSTRY

In conclusion, these results show that measurement of PCV2 by qPCR in OF in pigs may be used as an indicator for likelihood of infection and this knowledge will aid in the development of rapid on-farm diagnostic tests using OF. Further investigation is required in a more commercial setting, or using challenge models, with grower-finisher pigs housed in large groups, and in winter periods where PCRD may be more prevalent.

TAE	BLE	3

Correlations between serum antibody (titre) and oral fluid PCR DNA (copies/ μ L) for porcine circovirus type 2 (PCV2) tested at 15, 18, and 21 weeks of age.

	AGE	TITRE (SEROLOGY)					
		METHOD	RANGE	MEAN (SD)			
	15 Weeks	r = +0.167 P = 0.39	r = +0.326 P = 0.085	r = +0.274 P = 0.15			
PCR DNA copies/µL (oral fluid)	18 Weeks	r = -0.046 P = 0.81	r = +0.374 P = 0.046	r = +0.261 P = 0.17			
	21 Weeks	r = +0.111 P = 0.57	r = +0.324 P = 0.087	r = +0.408 P = 0.028			

PROJECT COMMITMENTS APRIL ROUND 1 PROGRAM 2 APRIL ROUND 1 PROGRAM 3A

APRIL ROUND 1 PROGRAM 2 PROJECT COMMITMENTS PROGRAM 2 - COST

NO.	PROJ	PROJECT NAME								LEAD PARTY		
A2–101	Protected vitamin and mineral premixes maintain performance SunPork Farr of commercial pigs at reduced inclusion rates								-arms			
	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	
A1–101	E	\$7,391					<mark>\$16,259</mark>					
								■ Paid	= Fi	uture comm	itment	

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	SunPork Farms
A3A-105	Base-Funded Experiment: Feeding a single diet versus phase feeding to pigs in the growing-finishing stage	Rivalea (Australia) Pty Ltd





FEATURE PROJECT: A3A–102

REVIEW OF RELATIONSHIPS BETWEEN ENERGY INTAKE AND PERFORMANCE AND BODY COMPOSITION CHANGES IN 60–108 KG PIGS WITH MODERN GENETICS USING A DXA SCANNER

PROJECT LEADER: Dr Fan Liu (Rivalea [Australia] Pty Ltd)

PROJECT PARTICIPANTS: Chris Brewster (Rivalea), David Henman (Rivalea), Dr Robert Smits (formerly Rivalea, currently Australian Pork Limited), Professor Frank Dunshea (The

PROJECT STATUS: Completed

University of Melbourne)

AIMS AND OBJECTIVES

Quantifying energy requirements for expressing lean tissue deposition potential in finisher pigs will help nutritionists set daily energy allowances to maximise lean tissue growth without excessive fat deposition. This experiment aimed to quantify the relationship between energy intake (range from 26 MJ/d to 44.5 MJ digestible energy/day) and lean tissue deposition rate in 60–110 kg pigs with modern genetics using a DXA scanner.

EXPERIMENTAL DESIGN

Intact male and female pigs with modern genetics (Primegro[™] Genetics, Corowa, NSW, Australia) were fed seven different amounts of digestible energy (DE) of a wheat-based diet containing 14.3 MJ DE/kg [25.8, 29.0, 32.6, 35.3, 38.5, 41.5 and 44.2 MJ DE/d (ad libitum) for males, and 25.8, 28.9, 32.0, 35.6, 38.3, 40.9 and 44.5 MJ DE/d (ad libitum) for females] between 60 kg and 108 kg live weight. The amount of feed intake in the ad libitum group was measured as actual voluntary feed intake. Body composition of anaesthetised pigs was measured using the Dual Energy X-ray Absorptiometry (DXA) method when individual pigs reached 108 kg, and lean, water, protein, fat and ash gain rates were calculated. Pigs were slaughtered on the second day post-DXA scan, and commercial carcass traits were measured. The linear, quadratic and piece-wise regression (where applicable) models were compared and used to describe the relationship between energy intake and outcome variables.

THE MOST SIGNIFICANT FINDING WAS IN THE AMOUNT OF WHOLE-BODY FAT AND P2 BACKFAT THICKNESS, WITH THERE BEING 16% AND 15% LESS BODY FAT IN ENTIRE MALES AND FEMALES, RESPECTIVELY, AND A 22% AND 15% LOWER P2 BACKFAT THICKNESS IN INTACT MALES AND FEMALES, RESPECTIVELY, RELATIVE TO THE SAME BREED 15–20 YEARS AGO

KEY FINDINGS

Results showed that the lean tissue deposition rate followed a linear response to the increased dietary energy intake in both male and female pigs (Figure 2), which agreed with a previous study by King et al. (2004). The most significant finding was in the amount of wholebody fat and P2 backfat thickness, with there being 16% and 15% less body fat in entire males and females, respectively, and a 22% and 15% lower P2 backfat thickness in intact males and females, respectively, relative to the same breed 15–20 years ago.

These changes presumably reflect the emphasis on selection for backfat depth reduction for the Australian market.

Carcass backfat thickness (at 108 kg live weight) increased linearly in male, but not in female, pigs, in response to the increased dietary energy intake (Figure 3).

APPLICATIONS TO INDUSTRY

Unrestricted feeding in female pigs should be considered, because the lean tissue deposition rate of female pigs increased linearly in response to increased dietary energy allowance, and feed restriction did not affect carcass backfat thickness in female pigs when slaughtered at a fixed live weight. Feed restriction linearly reduced carcass backfat in male pigs slaughtered at a fixed body weight; however, the economics of feed restriction should be evaluated in each production system by considering mortality rate and penalties on carcass backfat.

In this regard, it is likely that other genotypes will respond differently to the energy levels used in this project. Furthermore, and irrespective of genotype, there are other factors that need to be considered when feeding finishing pigs to maximise carcase value. These include factors such as housing and environmental conditions (e.g., whether outdoor or indoor), immunocastration, time of the year, target carcase weight and P2 (if appropriate), stocking density and feeding regimens.

A feature article regarding this project can be found in the May/June 2021 edition of the Pork Journal. The article is titled "How much have our finisher pigs changed in composition over time".

The May/June 2021 edition of the Pork Journal can be found at https://indd.adobe.com/view/fb1089a3-9eaf-4555-921c-7598c60cce11

FEATURE PROJECT: A3A-102

FIGURE 2

Relationship between DE intake (MJ/day) and lean gain rate (g/day) in intact male and female pigs.



FIGURE 3

Relationship between DE intake (MJ/day) and carcass backfat (P2 site mm) in intact male and female pigs at 108 kg live weiaht.



PROJECT COMMITMENTS APRIL ROUND 1 PROGRAM 3B

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

NO.	PROJECT NAME	LEAD PARTY
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 transloactions to reduce early embryo mortality	SunPork Farms
A3B-104	Seasonal fertility: a novel approach to alleviating seasonal infertility in sows	SunPork Farms
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





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.

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

Aa at 30 June 2021, APRIL has supported scholarships for the following undergraduate and postgraduate students:

STUDENT	UNIVERSITY	QUALIFICATION	STATUS
Brittany Silva	Murdoch University	DVM	Completed
Ryan Kristen	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
Tanya Laird	Murdoch University	PhD	Ongoing
Elisabet Puig-Garcia	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 \$70,000 over the first two years to help cover salary and other costs associated with training the awardee for three years.

As at 30 June 2021, APRIL has supported the following IPP students:

STUDENT	EMPLOYER	STATUS
Sofie Pridgeon	SunPork Farms	Resigned prior to completion
Dr Jessica Craig	Rivalea (Australia) Pty Ltd	Completed
Lauren Staveley	SunPork Farms	Ongoing
Dr Maria Jorquera-Chavez	Rivalea (Australia) Pty Ltd	Ongoing

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



FOCUS ON INDUSTRY PLACEMENT PROGRAM STUDENT - LAUREN STAVELEY Lauren Staveley undertook the APRIL IPP award to assist with her production training at SunPork Farms South. Lauren has a Bachelor of Animal Science (Hons) and is currently in the final stages of her PhD, all of which has been undertaken through The University of Adelaide.

Lauren began her interactions with the pig industry in the second year of her undergraduate degree through the APL-funded student placement program at the McMahons McPiggery in Lameroo. This is where her passion for the pork industry began, as she returned in the summer holidays to help cover the Christmas period. Lauren worked for two years as a research technician for Dr Will van Wettere, at The University of Adelaide, primarily in the areas of piglet viability, sow welfare and reproduction. This research experience led her to undertake a PhD in pig reproduction, focussing on easily identifiable, preweaning indicators of reproductive resilience in gilts.

Lauren has spent the past three years working for the SunPork Group on a 4,000-sow breeder farm in South Australia, where she progressed to farrowing house supervisor and assistant manager. While based on a breeder farm she was able to gain an in depth understanding of the production flow, thanks to the IPP allowing her to spend time working on other breeder farms in addition to multiple grower/ finisher sites, both straw based and indoor systems. This time spent between sites, mainly in the same pig flow, allowed her to help increase the internal communication between sites. Lauren still has time allocated to spend at Big River Pork processing and feed mills, but unfortunately the presence of Covid-19 has prevented the transfer of personnel currently. In addition, Lauren has been involved in internal research, and the on-farm management of the APRIL project A3B–104: *Seasonal infertility: a novel approach to alleviating seasonal infertility in sows.*

As of September 2021, Lauren has taken on a new role as Research Officer within the SunPork Solutions team, where she will help in the experimental design, trial work, analysis and reporting on current projects, while also developing and planning her own research aims.

LAUREN HAS SPENT THE PAST THREE YEARS WORKING FOR THE SUNPORK GROUP ON A 4,000-SOW BREEDER FARM IN SOUTH AUSTRALIA, WHERE SHE PROGRESSED TO FARROWING HOUSE SUPERVISOR AND ASSISTANT MANAGER

STRATEGIC PLAN DELIVERABLES

A summary of progress against the strategic plan deliverables is provided below:

CORE STRATEGY 7:	TASK	KEY DELIVERABLES	ST	ATUS
HUMAN CAPACITY	7.1 Industry Capacity	APRIL support for PhD/MSc (MS), either through project support funds or 'top-ups'	~	Achieved
	Building	Two postgraduates being trained and (or) employed in industry by 2022	~	Achieved
FORCINDOSTRT		Four undergraduate students completed their Honours degrees by June 2021 and six by 2022	•	Delayed
		Postgraduate students embedded in APRIL research projects	~	Achieved
		Investigate co-funding opportunities for postgraduate students (e.g. APRIntern)	•	On target
		APRIL support of Honours students in APRIL and associated/related projects	~	Achieved
		Continued support of the Industry Placement Program (first placements by February 2019)	~	Achieved

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 2021, APRIL has 13 Ordinary (voting) Members, four (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)		MARGO ANDRAE	
SU MCCLUSKEY		DR GERARD DAVIS	
MEMBER NOMINATED DIRECTORS			
	PROFESSOR ROBERT VAN BARNEVELD	PROFESSOR FRANK DUNSHEA	NEIL FERGUSON
DAVID HENMAN		Details of each Dired can be found in the D	ctor's skills and experience irectors' report on page 65

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's purpose is to advise and assist the Board of APRIL on all matters relating to the establishment, conduct and monitoring of Projects undertaken by or on behalf of the company.

The members of the committee as at 30 June 2021 are:

- Dr Tony Peacock (Chair)
- Associate Professor Sam Abraham, Murdoch University
- Dr Kirsty Chidgey, New Zealand Pork Industry Board
- Dr David Cadogan, Feedworks P/L
- Dr Rob Smits, Australian Pork Limited
- Dr Taya Clarke, Westpork P/L
- Dr Darryl D'Souza, SunPork Solutions
- Dr Hugo Dunlop, Apiam Animal Health Ltd
- Dr Jeremy Cottrell, The University of Melbourne
- Dr John Pluske, APRIL
- Dr Jane Ryan, Anatara Lifesciences Ltd
- Professor Eugeni Roura, The University of Queensland
- Dr Rebecca Morrison, Rivalea (Australia) P/LProfessor Paul Verma, SARDI

The committee held two meetings during 2020/21 on 9 November 2020 and 4 February 2021.

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 2021 are:

- Professor Frank Dunshea,
- The University of Melbourne (Chair)
- Dr Tony Peacock, APRIL
- Professor Wayne Hein, The University of Adelaide
- Dr John Pluske, APRIL (CEO/Chief Scientist)
- Professor Eugeni Roura, The University of Queensland
- Dr Rebecca Athorn, Australian Pork Limited

The committee held two meetings during 2020/21 on 29 October 2020 and 11 February 2021.

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 2021 are:

- Su McCluskey (Chair)
- Neil Ferguson
- Sandra Di Blasio
- Dr John Pluske

The Company Secretary also attends all Audit Committee meetings.

The committee held five meetings during 2020/21 on 8 September 2020, 10 November 2020, 9 February 2021, 13 April 2021 and 1 June 2021.



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CEO/CHIEF SCIENTIST

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

MANAGEMENT

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, has focused on nutritiongut 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 17 years' experience in senior financial roles in Australia. Geoff 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

- Anatara Lifesciences Ltd
- Apiam Animal Health Ltd
- Australian Pork Limited
- Feedworks Pty Ltd
- Murdoch University
- New Zealand Pork Industry Board
- Ridley Agriproducts Pty Ltd
- Rivalea (Australia) Pty Ltd
- South Australian Research and Development Institute
- SunPork Farms
- The University of Melbourne
- The University of Queensland
- Westpork Pty Ltd

ASSOCIATE MEMBERS

- Flinders University
- Jefo Australia Pty Ltd
- DSM Nutritional Products Pty Ltd
- University of New England

SUPPORTING MEMBER

RSPCA Australia

FINANCIAL STATEMENTS

AUSTRALASIAN PORK RESEARCH INSTITUTE LIMITED ANNUAL REPORT FOR THE YEAR ENDED 30 JUNE 2021

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30 JUNE 2021

YOUR DIRECTORS PRESENT THEIR REPORT, TOGETHER WITH THE FINANCIAL STATEMENTS FOR AUSTRALASIAN PORK RESEARCH INSTITUTE LIMITED, FOR THE FINANCIAL YEAR ENDED 30 JUNE 2021 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

MS MARGO ANDRAE 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, 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 Australian Graduate School of Management, UNSW.

DR GERARD DAVIS BSc, Ph.D, MBA, GAICD

Dr Gerard Davis is an executive with extensive experience in agribusiness, biotech and agtech and a demonstrated ability to derive value from commercialising technology in companies ranging from start-ups to multi-national global leaders. Dr Davis has experience consulting to a range of organisations from agtech startups such as Mastaplex, research consortiums such as the CRC for Food Agility as well as major agribusinesses and organisations such as the Bill and Melinda Gates Foundation. These appointments have included developing strategic, organisational and technology commercialisation plans. The work has involved projects across Australia, New Zealand, Africa and South Asia.

Dr Davis has previously held senior roles with a series of major Australian and global companies, with more than 15 years' experience in commercialisation of technology. Most recently he was General Manager of Innovation and Strategic Development at Australian Agricultural Company. Prior to that he held senior roles with ThermoFisher Scientific and Pfizer's Animal Health Division, now Zoetis. In these roles he has been instrumental in enabling commercial success from the development and implementation of technology in the livestock and agri-food industries. Dr Davis spent 11 years as a researcher with Australia's leading research agency, CSIRO.

INDEPENDENT DIRECTORS

DR TONY PEACOCK BScAgr. (Hons) PhD FAICD FTSE Independent Chair

Dr Peacock is the Principal Consultant of Peacock Consulting Pty Ltd. He has 30 years' experience in research, research management and business development, 22 of those in CEO roles, and most recently (2010–2020) as CEO of the Cooperative Research Centres Association. Dr Peacock is an experienced company director and seed investor in a number of technology start-ups, including Wintermute Biomedical Inc, which is developing a unique antibiotic. He has extensive experience in regulatory and Government affairs.



SU MCCLUSKEY FCPA, B.Com, MAICD

Su is a Director of Australian Unity, the Foundation for Young Australians, NSW Rice Marketing Board and Energy Renaissance and a Commissioner for International Agricultural Research. 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 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. 30 JUNE 2021

ELECTED DIRECTORS

PROFESSOR ROBERT VAN BARNEVELD B.Agr.Sc. (Hons), PhD, RAnNutr, 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 the 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 has worked as a consultant scientist and nutritionist in Australia and overseas for the past 25 years.

PROFESSOR FRANK DUNSHEA B.Agric. Sci., PhD, FNSA, FAPSA, FASAP, RAnNutr

Professor Frank Dunshea has had a research career spanning 35 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. Frank has focused much of his recent research on biomedicine and functional foods. 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 22 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., RAnNutr. (appointed 19 November 2020)

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 25 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.

MR KENTON SHAW BAppSc. GradDip ManMgt (resigned 17 July 2020)

At the time of his resignation from the Board, Mr Shaw was Director and General Manager – Agricultural Operations for Rivalea (Australia) Pty Ltd., having held the role since 2007. A graduate of The University of Queensland, Mr Shaw has had over 30 years' experience in the pig industry working across all areas of production including feedmilling. While responsible for all pig production, feed milling, environmental management and agriculture at Rivalea, a major focus is on implementing sustainable production systems that enhance animal welfare and meet the needs of the public while ensuring long-term viability of the organisation and 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		R&D ADVISORY COMMITTEE	EDUCATION ADVISORY COMMITTEE
Ms Margo Andrae	Eligible	5	-	-	-
	Attended	5	-	-	-
Dr Gerard Davis	Eligible	5	-	-	-
	Attended	5	-	-	-
Dr Tony Peacock	Eligible	5	-	2	2
	Attended	5	-	2	2
Ms Su McCluskey	Eligible	5	5	-	-
	Attended	5	5	-	-
Professor Robert	Eligible	5	-	-	-
van Barneveld	Attended	5	-	-	-
Professor	Eligible	5	-	-	2
Frank Dunshea	Attended	5	-	-	2
Mr David Henman	Eligible	3	-	-	-
	Attended	3	-	-	-
Mr Neil Ferguson	Eligible	5	5	-	-
	Attended	4	4	-	-
Mr Kenton Shaw	Eligible	-	-	-	-
	Attended	-	-	-	-

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 http://apri.com.au/wp-content/ uploads/2020/05/Strategic-Plan-APRIL-May-2019.pdf), 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 2021, 13 organisations continue as Ordinary Members and four 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 \$180.

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 2021.

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

Hay hearah

Dr Tony Peacock Chair

23 September 2021 Canberra

INDEPENDENCE DECLARATION

30 JUNE 2021



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 2021, 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.

RSM

RSM AUSTRALIA PARTNERS

nous

Canberra, Australian Capital Territory Dated: 23 September 2021

GED STENHOUSE Partner

THE POWER OF BEING UNDERSTOOD AUDIT | TAX | CONSULTING

REM Australie Partners sement zer of the RSM hollwerk and trades as kEM. RSM sitholic administrations send to up the RSM hollwerk is an independent accounting and constructions the network of the RSM network is not teach a searca clevial entry in any jurise clean. REM Australia Partners AUN 16-065-185-036

Liability, imited by a scheme approved under Professional Standards Legislation

STATEMENT OF PROFIT OR LOSS AND OTHER COMPREHENSIVE INCOME

FOR THE YEAR ENDED 30 JUNE 2021

	NOTE	2021	2020
		\$	\$
Revenue	2	2,232,387	2,054,269
Expenses			
Research programme and other costs		(1,385,592)	(912,555)
Management expenses	3	(483,738)	(493,625)
Other expenses	4	(266,199)	(331,796)
Surplus from operating activities		96,858	316,293
Financial income		19,894	49,361
Net financial income	5	19,894	49,361
Surplus before income tax		116,752	365,654
Tax expense		-	-
Surplus for the period		116,752	365,654
Other comprehensive income		-	-
Total comprehensive income for the period		116,752	365,654

The above statement of profit or loss and other comprehensive income should be read in conjunction with the accompanying notes

STATEMENT OF FINANCIAL POSITION

AS AT 30 JUNE 2021

	NOTE	2021	2020
		\$	\$
ASSETS			
Current assets			
Cash and cash equivalents	7	4,348,164	3,673,087
Trade and other receivables	8	280,102	567,779
Other assets	9	139,406	108,662
Total current assets		4,767,672	4,349,528
Total assets		4,767,672	4,349,528
LIABILITIES			
Current liabilities			
Trade and other payables	10	523,756	353,461
Unearned income	11	412,180	286,849
Provisions	12	24,257	24,892
Total current liabilities		960,193	665,202
Non-Current liabilities			
Provisions	12	21,042	14,641
Total non-current liabilities		21,042	14,641
Total liabilities		981,235	679,843
Net assets		3,786,437	3,669,685
Equity			
Retained surplus		3,786,437	3,669,685
Total equity		3,786,437	3,669,685

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

STATEMENT OF CHANGES IN EQUITY

FOR THE YEAR ENDED 30 JUNE 2021

	RETAINED SURPLUS	TOTAL EQUITY
	\$	\$
Balance at 1 July 2019	3,107,157	3,107,157
Adopting new Accounting standards	196,874	196,874
Surplus after income tax expense for the year	365,654	365,654
Balance at 30 June 2020	3,669,685	3,669,685
Balance at 1 July 2020	3,669,685	3,669,685
Surplus after income tax expense for the year	116,752	116,752
Balance at 30 June 2021	3,786,437	3,786,437

The above statement of changes in equity should be read in conjunction with the accompanying notes

STATEMENT OF CASH FLOWS

FOR THE YEAR ENDED 30 JUNE 2021

NOTE	2021	2020
	\$	\$
CASH FLOWS FROM OPERATING ACTIVITIES		
Cash receipts from members and customers	2,822,847	2,081,062
Payments to suppliers and employees	(2,167,664)	(1,997,679)
Net cash from operating activities	655,183	83,383
CASH FLOWS FROM INVESTING ACTIVITIES		
Interest received	19,894	49,359
Net cash investing activities	19,894	49,359
Net increase in cash and cash equivalents	675,077	132,742
Cash and cash equivalents at beginning of financial year	3,673,087	3,540,345
Cash and cash equivalents at end of financial year 7	4,348,164	3,673,087

The above statement of cash flows should be read in conjunction with the accompanying notes
FOR THE YEAR ENDED 30 JUNE 2021

NOTE 1. SIGNIFICANT ACCOUNTING POLICIES

Australasian Pork Research Institute Limited is a public company 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 23 September 2021.

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 – Reduced Disclosure Requirements 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 receivable 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.

FOR THE YEAR ENDED 30 JUNE 2021

NOTE 1. SIGNIFICANT ACCOUNTING POLICIES (continued)

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 Profit or Loss and Other Comprehensive Income 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.

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

CORONAVIRUS (COVID-19) PANDEMIC

Judgement has been exercised in considering the impacts that the Coronavirus (COVID-19) pandemic has had, or may have, on the company based on known information. This consideration extends to the nature of the products and services offered, customers, supply chain, staffing and geographic regions in which the company operates. Other than as addressed in specific notes, there does not currently appear to be either any significant impact upon the financial statements or any significant uncertainties with respect to events or conditions which may impact the company unfavourably as at the reporting date or subsequently as a result of the Coronavirus (COVID-19) pandemic.

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.

FOR THE YEAR ENDED 30 JUNE 2021

NOTE 2. REVENUE

	2021	2020
	\$	\$
Research and project co-funding	41,195	165,766
Membership fees	1,945,000	1,375,000
Other contributions & Government grant	-	26,331
Commercialisation income	246,192	487,172
	2,232,387	2,054,269

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

	2021	2020
	\$	\$
Management fees	483,738	493,626
	483,738	493,626

Australian Pork Ltd, Murdoch University (until 31 December 2020) and SciEcons Consulting (from 1 February 2021) 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

Legal fees	4,172	14,034
Directors fees	110,000	40,000
Travel	4,376	46,294
Communication costs	3,182	5,262
Commercialisation costs	104,627	192,797
Other	39,842	33,409
	266,199	331,796

Directors fees include an amount of \$35,000 (2020: \$Nil) in respect of back-pay.

NOTE 5. FINANCIAL INCOME

Interest income from cash and cash equivalents	19,894	49,361
	19,894	49,361

ACCOUNTING POLICY

Interest income is recognised in the Statement of Profit or Loss and Other Comprehensive Income as it accrues, using the effective interest method.

FOR THE YEAR ENDED 30 JUNE 2021

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

	2021	2020
	\$	\$
Cash at bank	454,606	700,875
Term deposits - original maturity date of 3 months or less	3,893,558	2,972,212
	4,348,164	3,673,087

The Company holds term deposit with interest rates of between 0.30% and 0.50%.

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

	280,102	567,779
Other receivables	155,771	144,991
Trade receivables	124,331	422,788

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. OTHER CURRENT ASSETS

Prepayments	139,406	108,662
	139,406	108,662

NOTE 10. TRADE AND OTHER PAYABLES

	2021	2020
	\$	\$
Trade and other payables	523,756	325,114
GST payable	-	28,347
	523,756	353,461

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 day terms.

NOTE 11. UNEARNED INCOME

Current		
Contract liabilities	412,180	286,849
	412,180	286,849

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.

NOTE 12. PROVISIONS

Provisions		
Current	24,257	24,892
Non-current	21,042	14,641
	45,299	39,533

ACCOUNTING POLICY

The liability includes provisions for annual leave and long service leave. The leave liabilities are calculated on the basis of remuneration at the estimated rates that will be applied at the time the leave is taken. Consideration is given to expected future wage and salary levels, experience of employee departures and period of service. Provisions are processed by Australian Pork Ltd as agreed in the corporate services agreement.

FOR THE YEAR ENDED 30 JUNE 2021

NOTE 13. KEY MANAGEMENT PERSONNEL DISCLOSURES

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

DIRECTORS

- 1. Ms Margo Andrae PGCertMgt, MAICD
- 2. Dr Gerard Davis BSc, Ph.D, MBA, GAICD
- 3. Dr Tony Peacock BScAgr(Hons), PhD, FAICD, FTSE Independent Chair
- 4. Ms Su McCluskey FCPA, B.Com, MAICD
- 5. Professor Robert van Barneveld B. Agr.Sc. (Hons), PhD, RAnNutr, FAICD
- 6. Professor Frank Dunshea B. Agric. Sci, PhD, FNSA, FAPSA, FASAP, RAnNutr
- 7. Mr Neil Ferguson B.Bus (Agric)
- 8. Mr David Henman BScAgr., MSc.Vet.Sc., RAnNutr. (appointed 19 Nov 2020)
- 9. Mr Kenton Shaw BAppSci, GradDip ManMgt (resigned 17 July 2020)

EXECUTIVES

- 10. Dr John Pluske Chief Executive Officer, BSc (Agric) (Hons), PhD (UWA), RAnNutr, R. Anim.Sci
- 11. Dr Charles Rikard-Bell Manager, Commercialisation and Research Impact, BSc. Agr, MSc, PhD
- 12. Mr Geoff Crook Company Secretary, B.Sc. (Hons), FCA

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.

NOTE 14. 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 12) with each related party.

Net transactions with the Company by director related entities were as follows:

	2021	2020
	\$	\$
Project and program expenditure		
Australian Pork Limited (1,2)	68,072	552,072
SunPork Group (5)	301,155	31,961
The University of Queensland (5)	166,578	47,342
The University of Melbourne (6)	100,876	124,976
Australasian Pig Science Association (10,6)	-	7,663
Pork Innovation WA Management Committee (10)	-	5,322
Rivalea (Australia) Pty Ltd (8)	332,802	125,185
Ridley Agriproducts Pty Ltd (5)	29,597	-
SciEcons Consulting (10)	50,000	-
The University of New England (5)	4,326	-
Current receivables		
Trade receivables from related parties	11,118	275,000
Current payables		
Trade payables to related parties	161,913	15,130

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.

FOR THE YEAR ENDED 30 JUNE 2021

NOTE 15. 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 2021 these commitments (exclusive of GST) total \$1,700,067 (2020: \$1,654,406) and will be funded by cash balances and future receipts from member and research participant contributions.

NOTE 16. SUBSEQUENT EVENTS

The impact of the Coronavirus (COVID-19) pandemic is ongoing and while it has not financially impacted the company up to 30 June 2021, it is not practicable to estimate the potential impact, positive or negative, after the reporting date. The situation is rapidly developing and is dependent on measures imposed by the Australian Government and other countries, such as maintaining social distancing requirements, quarantine, travel restrictions and any economic stimulus that may be provided.

No matter or circumstance has arisen since 30 June 2021 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.

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 – Reduced Disclosure Requirements, 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 2021 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

Ethey Leanach.

Dr Tony Peacock Chair

23 September 2021 Canberra

Succus

Ms Su McCluskey Audit Committee Chair

23 September 2021 Canberra

INDEPENDENT AUDITOR'S REPORT



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 2021, 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 2021 and of its financial performance for the year then ended; and
- (ii) complying with Australian Accounting Standards Reduced Disclosure Requirements and the Corporations Regulations 2001.

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 2021, but does not include the financial report and the auditor's report thereon.

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Liability imited by a scheme approved under Professional Standards Legislation



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 – Reduced Disclosure Requirements 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: <u>http://www.auasb.gov.au/auditors_responsibilities/ar4.pdf</u>. This description forms part of our auditor's report.

RSM

RSM AUSTRALIA PARTNERS

Canberra, Australian Capital Territory Dated: 23 September 2021

GED STENHOUSE Partner



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