

# FINAL REPORT

## Educational Pathways: Creating a Highly Skilled Meat Industry – Year 1

---

<b>PROJECT CODE:</b>	2016-1027
<b>PREPARED BY:</b>	Christopher Pillidge (RMIT University)
<b>DATE SUBMITTED:</b>	26 February 2018
<b>DATE PUBLISHED:</b>	13 July 2018
<b>PUBLISHED BY:</b>	AMPC

---

The Australian Meat Processor Corporation acknowledges the matching funds provided by the Australian Government to support the research and development detailed in this publication.

**Disclaimer:**

The information contained within this publication has been prepared by a third party commissioned by Australian Meat Processor Corporation Ltd (AMPC). It does not necessarily reflect the opinion or position of AMPC. Care is taken to ensure the accuracy of the information contained in this publication. However, AMPC cannot accept responsibility for the accuracy or completeness of the information or opinions contained in this publication, nor does it endorse or adopt the information contained in this report.

No part of this work may be reproduced, copied, published, communicated or adapted in any form or by any means (electronic or otherwise) without the express written permission of Australian Meat Processor Corporation Ltd. All rights are expressly reserved. Requests for further authorisation should be directed to the Executive Chairman, AMPC, Suite 1, Level 5, 110 Walker Street North Sydney NSW.

## TABLE OF CONTENTS

TABLE OF CONTENTS.....	2
1.0 EXECUTIVE SUMMARY .....	3
2.0 INTRODUCTION .....	4
3.0 PROJECT OBJECTIVES .....	5
4.0 METHODOLOGY .....	6
5.0 PROJECT OUTCOMES .....	6
6.0 DISCUSSION.....	8
7.0 CONCLUSIONS/RECOMMENDATIONS .....	9
9.0 APPENDICES .....	10
9.1 Appendix 1 - Educational Pathways (EP) project application .....	10
9.2 Appendix 2 - EP Project – Year 1 contract (signed) .....	10
9.3 Appendix 3 - Inaugural Steering Committee meeting (Milestone 2).....	10
9.4 Appendix 4 - Milestone 1 Report (1 <sup>st</sup> PhD position) .....	10
9.5 Appendix 5 - Milestone 3 Report (2 <sup>nd</sup> PhD position) .....	10
9.6 Appendix 6 - Milestone 10 Report (3 <sup>rd</sup> PhD position).....	10
9.7 Appendix 7 - Milestone 11 Report (4 <sup>th</sup> PhD position).....	10
9.8 Appendix 8 - PhD topics (including Year 2).....	10
9.9 Appendix 9 - Milestone 4 Report (Postdoc position).....	11
9.10 Appendix 10 - Milestones 5 and 6 Report (Hons positions) .....	11
9.11 Appendix 11 - Milestone 7-9 Report (Undergraduate Awards).....	11
9.12 Appendix 12 - Agenda MI&QA Meeting 01/03/2018 .....	11
9.13 Appendix 13 – RMIT Hons and Masters by Coursework Programmes.....	11

## 1.0 EXECUTIVE SUMMARY

The *Educational Scholarship Pathways Program: Creating a Highly Skilled Meat Industry* (EP Project) aims to create a holistic educational program at RMIT University to develop people that will have the skills and knowledge to contribute to the Australian meat industry over the coming decades. The project has been set up as three individual contracts (Year 1 / Year 2 / Year 3) with overlapping goals.

In year one, the project aims were to: (1) recruit a postdoctoral fellow to provide support to contribute research, student supervision and industry liaison and demonstrate the sophisticated nature of the research projects undertaken; (2) recruit four PhD students; (3) recruit two Honours level research students (ideally with one year research projects), and set project topics that benefit the red meat industry in Australia and that are in accordance with AMPC's stated research goals; (5) develop the skills of students with coursework at the bachelor degree level through recognition of top students (by making three student award presentations).

Recruitment began prior to the initial Steering Committee meeting held at RMIT on 09/03/2017 and resulted in five appointments (four PhDs and a postdoctoral fellow, the latter appointed on 02/10/2017). No Honours student appointments were made in 2017 and no student prizes were awarded.

A review of progress on the EP project was held between AMPC (Margaret Tayar, via teleconference) and the RMIT Project Steering Committee and other senior RMIT staff at RMIT on 24/11/2017. Preliminary information and a summary of achievements was sent to AMPC on 1/12/17, followed by full AMPC Milestone Reports for Milestones 1-11 on 08/12/2017.

Milestones 1 – 4, 10 and 11 which included PhD positions 1-4, the inaugural Steering Committee meeting, and the postdoctoral fellow appointment, were accepted by AMPC on 18/12/2017.

The first PhD project aims to use Raman spectroscopy to distinguish identical muscle types from different species, and (conversely) different muscle types within the same species. This has been demonstrated. Work is now progressing to use Raman to detect metabolite content (glycogen) in meat, important in determining meat quality at slaughter, in various muscle tissues.

The second PhD project aims to undertake defined texture modification of meat for elderly people, particularly those with dysphagia, and to determine the safe-swallowing attributes of meat by bolus characterization. Further studies will address the influence of added ingredients such as hydrocolloids and new processing methods (e.g. ultrasound) on meat texture. RMIT ethics approval had been sought and was granted the work involving volunteer taste panel assessments.

The third and fourth PhD students are presently reviewing the scientific and patent literature in their respective areas (packaging and nutrition). It is too early at this stage to include any technical details, however, this will be done in subsequent reports. Further advice on their proposed topics has been sought from AMPC (by Email 7/02/18) and at the Steering Committee meeting held on 19/02/2018.

Milestones 5-9 (for appointment of two Honours students and three undergraduate student awards) were not achieved in 2017 and were deleted from the EP Program (Year 1) by mutual agreement between RMIT and AMPC on 18/12/2017. A formal contract variation is now required, as agreed at

the Steering Committee meeting held on 19/02/2018.

In terms of industry engagement, presentations by the first two PhD students and Steering Committee member are planned for an AMPC Meat Inspection and Quality Assurance Network meeting (MI&QA meeting), to be held in Melbourne on 01/03/2017. Feedback on industry involvement for each project and on industry attendance for student prizes (2018) will be sought by RMIT Steering Committee members A/Prof Peter Torley and Dr Chris Pillidge.

## **2.0 INTRODUCTION**

The “Educational Pathways: Creating a Highly Skilled Meat Industry” (EP) Program is a three-year program funded by the AMPC, with in-kind co-contributions from RMIT and the Australian Government. The project commenced following signing of the Year 1 Contract on 25 January 2017, following an application made by RMIT University (Request for Proposal #15-C03-04 Implementation of an Integrated Scholarship Program for the Red Meat Processing Industry) in 2015.

The 3-year project is divided into three separate 1-year contracts (the AMPC funding component for year 1 totals \$286,387). The program is designed to attract top Australian graduates from a variety of educational backgrounds to gain skills and knowledge (both academic and via industry engagement), enabling and encouraging them to work for the Australian red meat industry of the future.

RMIT University is ideally placed to meet those needs, with a number of existing degree programmes that can supply the needs of the meat industry. Additionally, RMIT offers further options for vocational training.

The Year 1 EP project has focused on recruitment in three capacities: PhD students (3-year degree), Honours students (1-year research project within a degree), and a post-doctoral fellow. In addition to recruitment, the project seeks to reward high performance in RMIT undergraduate teaching courses involving food technology, by sponsoring student awards.

The scope of the research in the original proposal includes the following areas: (1) Understanding the synergistic impacts of meat microbiomes and metabolomes on food safety and quality; (2) full profile characterization of meat quality; (3) meat quality prediction from live animals to carcass; (4) intelligent active functional packaging for meat; (5) modified atmosphere packaging for beef; (6) automated visual inspection and measurement of whole carcass; (7) meat for an aging population; (7) effect of lairage time and stocking rate. These are subject to change in response to AMPC’s current research priorities.

This report describes progress in recruitment, the areas of meat research targeted, and the project outlook ahead.

### **3.0 PROJECT OBJECTIVES**

The objectives of the "Educational Pathways" program are:

1. To produce graduates that are skilled and experienced in research related to various aspects of meat science and technology. The programme will involve:
  - Research training for RMIT students drawn from various fields of science and technology. The research projects undertaken by these students will address topics of relevance to the meat processing industry.
  - The meat related research training will be at different levels, from honours to PhD.
  - Provide a research training pathway in meat related research for students, from honours to PhD.
  - Select and award undergraduate students a meat technology prizes.
  - Incorporate meat science and technology content into courses taken by Bachelor and Master degree students studying food technology programmes at RMIT.
2. Provide incentives and support for students to join and continue the program at all stages of the educational pathway through:
  - The provision of a post-doctoral fellow dedicated to support students, contribute to research, student supervision and industry liaison.
  - The provision of undergraduate student prizes to promote opportunities in meat industry
  - Organising and supporting industry placements for students.
  - Working with AMPC and meat organisations to identify research topics and provide support for students and industry placements.
  - Providing support to encourage students to continue their research along the educational pathway from honours to PhD and undertake meat industry placements.
  - Ensuring research supervisors provide strong support and are familiar with meat research priorities and opportunities.
  - The provision of a stipend and consumables for students in the postgraduate scholarship program.
  - Developing and delivering meat science and technology content into bachelor and masters food technology programs.
3. To recruit four PhD students, two honours students and provide three undergraduate scholarships.

## 4.0 METHODOLOGY

The EP Project began following a successful application to AMPC on 01 May 2015 (Appendix 1). This was in response to AMPC's stating a problem facing the meat industry of the future:

“Minimal uptake of scholarships at the PhD and post-doctoral level; Ineffective targeting of scholarships and research providers to address key industry capability gaps and achieving critical mass at individual institutions; Difficulties in transitioning tertiary scholarship holders into the industry; and Poor completion rates of industry-based scholarship recipients.”

An agreement was executed on 25 January 2017 between AMPC and RMIT (Appendix 2).

The project is being led (at RMIT) by Associate Professor Peter Torley, working with Collaborative Investigators: Professors Benu Adhikari, Alireza Bab-Hadiashar, Ewan Blanch, Harsharn Gill, Reza Hoseinnezhad, Mark Osborn and Distinguished Professor Kourosh Kalantar-zadeh. The inaugural EP Project Steering Committee at RMIT comprised A/Prof Peter Torley, Prof. Harsharn Gill, Prof. Mark Osborn, and Ms. Jennifer Dick (RMIT Senior Contracts Officer), and the first meeting was held at RMIT on 09/03/2017 (Appendix 3). Dr Chris Pillidge (postdoctoral fellow) joined the Steering Committee later on after being appointed on 2<sup>nd</sup> October 2017.

PhD and Hons positions were advertised to final-year food technology, biotechnology and engineering students on repeated occasions during 2016/17, both in the RMIT School of Science (SSCI) and the School of Environmental Health and Engineering (SEH). Recruitment of students by due process proceeded throughout 2016/17 with appointments made as indicated in the Project Outcomes section.

## 5.0 PROJECT OUTCOMES

Milestones achievements for all project milestones are shown below. Appointments were made on the dates indicated, following interviews by a panel of RMIT food science/food technology experts and other senior staff. PhD topics are also shown.

**Milestone 1.** The first PhD student (Ms. Patience Shoko) was appointed on 20/03/2017 and is undertaking a project to evaluate the use of Raman Spectroscopy for meat quality assessment.

**Milestone 2.** The inaugural Steering Committee meeting was held on 09/03/2017 at RMIT.

**Milestone 3.** The second PhD student (Mrs Nelum Pematilleke) was appointed on 4/09/2017 and is undertaking a project on texture modification of meat (primarily beef) products suitable for elderly people with dysphagia (difficulty in swallowing).

**Milestone 4.** The Postdoctoral fellow (Dr Christopher Pillidge) was appointed on 02/10/2017, following a formal interview by a panel of senior RMIT staff held on 24/08/2017.

**Milestone 5.** Appointment of the 1st Honours student was not achieved.

- Milestone 6.** Appointment of the 2nd Honours student was not achieved.
- Milestone 7.** Delivery of 1<sup>st</sup> Award for Undergraduate Scholarship was not achieved.
- Milestone 8.** Delivery of 2<sup>nd</sup> Award for Undergraduate Scholarship was not achieved.
- Milestone 9.** Delivery of 3<sup>rd</sup> Award for Undergraduate Scholarship was not achieved.
- Milestone 10.** The third PhD student (Mrs Nidhi Jindal) was appointed on 21/11/2017 and is undertaking a project in the meat packaging area. Precise details of the project are yet to be finalized (feedback was requested from AMPC on 7/02/2018 and also at the Steering Committee meeting held on 19/02/2018).
- Milestone 11.** The fourth PhD student (Ms Elena Zafiris) was appointed on 01/02/2018 and is planning to undertake a project on the effect of added prebiotics or dietary resistant starch to processed meats in normal-weight and obese individuals (feedback on this project was requested from AMPC on 7/02/2018 and at the Steering Committee meeting on 19/02/2018)
- Milestone 12.** Project reports for Honours students could not be submitted.
- Milestone 13.** Project reports for Honours students could not be submitted.
- Milestone 14.** *This report* is the 1<sup>st</sup> Year Milestone Report. The SnapShot Report was submitted by CP to AMPC on 16 February 2018. Industry engagement is proceeding beginning with an AMPC Meat Inspection and Quality Assurance Network meeting (MI&QA meeting) scheduled in Melbourne on 1<sup>st</sup> March 2018. RMIT EP project members including the first two PhD students will be attending and will be seeking valuable links to local industry QA and other representatives.
- Milestone 15.** A Steering Committee meeting was held at RMIT on 19/02/2018. RMIT staff in attendance were: Prof. Trevor Stevenson (Deputy Dean, Research & Innovation, School of Science) / Assoc. Prof. Peter Torley / Prof. Harsharn Gill / Dr Chris Pillidge / Ms. Jenny Dick (Senior Contracts Officer). AMPC staff attending via teleconference link were: Margaret Tayar, David Lean. MLA staff attending: Ian Jenson.
- Milestone 16.** Major milestone review is scheduled for 5 March 2018.

The first PhD project was slightly delayed by the signing of the contract (which occurred after the due date for Milestone 1). In this project, our Raman spectroscopy instrument was successfully used to distinguish identical muscle types from different species, and (conversely) different muscle types within the same species. Work is now progressing to use this Raman instrument to detect metabolite content (glycogen) in meat, important in determining meat quality at slaughter, in various muscle tissues. The Milestone Report submitted to AMPC on 8/12/2017 is included in Appendix 4.

The second PhD project aims to undertake defined texture modification of meat for elderly people, particularly those with dysphagia, and to determine the safe-swallowing attributes of meat by bolus characterization. Further studies will address the influence of added ingredients such as hydrocolloids

and new processing methods (e.g. ultrasound) on meat texture. In 2017, key meat parameters after cooking were assessed, both by laboratory instrumentation using a texture particle analyzer, and by use of a trained human panel of volunteers. RMIT ethics approval had been sought and was granted for this latter aspect of the work. The Milestone Report submitted to AMPC on 8/12/2017 is included in Appendix 5.

Both the first and second PhD students have recently conducted major literature reviews of their project areas (it is intended that some of this material will be published as scientific reviews, which will benefit the industry), and have completed RMIT Confirmation of Candidatures.

The third and fourth PhD students are reviewing the scientific and patent literature in their respective areas. It is too early at this stage to include any technical progress details, however, this will be done in subsequent reports. Milestone reports for both of these PhDs were sent to AMPC on 8/12/2017 (Appendices 6 and 7). The proposed PhD topics were communicated to AMPC (by Email 7/02/18) and further at the Steering Committee meeting held on 19/02/2018. A full list of current topics for all six PhD students (including student names) is contained in Appendix 8. Industry feedback will be sought at an upcoming industry meeting (see below).

The Position Description for the post-doctoral position together with a document describing the full selection process was sent to AMPC on 01/12/17 (Appendix 9). The PD outlines the role of the postdoctoral fellow in the EP Project and how this is expected to contribute to achieving the project goals in 2018-2019. An appointment (Dr C. Pillidge) was made on 02/10/2017.

Milestones 5-9 (for appointment of two Honours students with one-year projects and three undergraduate student awards) were not achieved in 2017 and were deleted from the EP Program (Year 1) by mutual agreement between RMIT and AMPC on 18/12/2017, following submission of Milestone Reports (Appendices 10 and 11) on 08/12/2017. Milestones 12 and 13 (for Honours project reports) therefore do not now apply.

One top local Honours student (an RMIT graduate) with an excellent food science background was interviewed and was offered an AMPC-funded Honours scholarship position, but subsequently got offered a senior level job in the local food industry and so declined. A few other candidates with promising academic records and a desire to undertake Honours scholarships were also identified, but they were all international students and so could not be offered a position. Funding for milestones 5-9 (\$23,000 in total) was withdrawn by AMPC.

In terms of industry engagement, presentations by two Steering Committee members (Peter Torley, Chris Pillidge) and the first two PhD students are planned for an upcoming MI&QA industry meeting to be held in Melbourne on 01/03/2017 (the Agenda for this meeting is shown in Appendix 12). Feedback from industry, particularly from QA personnel, and canvassing for industry representatives for each project, together with decisions on industry attendance for RMIT's Gala Awards ceremony 2018 (undergraduate student prizes), will be sought by Peter Torley and Chris Pillidge then.

## **6.0 DISCUSSION**

Four excellent PhD students and the postdoctoral fellow have been appointed and all are now



successfully contributing to the EP programme. Further, RMIT has expanded the undergraduate teaching component for its animal-based food technologies courses, including meat technologies, for its 2018 Bachelor of Science (Food Technology and Nutrition) Degree.

In contrast, milestones for appointment of two Honours students and the awarding of three undergraduate student prizes were not achieved in 2017, and RMIT accepts that funding for these milestones was duly cancelled by AMPC. A formal contract variation for this is now required, as agreed at the Steering Committee meeting held at RMIT on 19/02/2018.

We suggest that fewer students these days are electing to do “straight” Honours science degrees with a food research focus. Strategies to deal with this include enlarging the scope of Honours and Master by Coursework level degrees offered by RMIT with a research project component that could meet AMPC requirements. A list Honours degree or coursework Master degree programs with a minor thesis component offered at RMIT was sent to AMPC on 7/01/2018 (Appendix 13). It was agreed at the recent Steering Committee meeting of 19/02/2018 that these degrees meet these requirements.

In terms of topics being worked on by PhD students, RMIT has ensured all projects are within the focus areas (scope) outlined in the original research proposal (Appendix 1). Results to date are promising in terms of delivering future technical outputs for the industry. However, there are some gaps in the program, for example in the areas of meat microbiology/metagenomics to improve meat quality and shelf-life extension, and on meat processing engineering improvements. Students with a background in either of these areas are now being sought to fulfill Milestones 2 and 3 in the Year 2 contract.

It is clear that AMPC wants greater local industry involvement on projects to ensure they address current problems and issues. RMIT wants this too, as well as ensuring that all students and staff on the EP project maintain up-to-date knowledge of local and overseas developments in meat technology. Attendance at local industry meetings and subsequent local meat processing site visits will assist in this. A major international conference on meat science and technology (ICoMST; <http://www.icomst2018.com/>) is being held in Melbourne from 12-17 August, and it is anticipated that students and staff on the EP project will attend.

## **7.0 CONCLUSIONS/RECOMMENDATIONS**

The Year 2 Contract for the project should continue as planned with appropriate AMPC funding.

## 9.0 APPENDICES

### 9.1 Appendix 1 - Educational Pathways (EP) project application



AMPC

Full-Research-Propos

### 9.2 Appendix 2 - EP Project – Year 1 contract (signed)



17100-Torley-AMPC  
2016-1027 Yr 1\_EXEC

### 9.3 Appendix 3 - Inaugural Steering Committee meeting (Milestone 2)



AMPC - Steering  
Committee Meeting M

### 9.4 Appendix 4 - Milestone 1 Report (1<sup>st</sup> PhD position)



AMPC - 2016-1027 -  
Milestone 1 - 081217.

### 9.5 Appendix 5 - Milestone 3 Report (2<sup>nd</sup> PhD position)



AMPC - 2016-1027 -  
Milestone 3 - Nelum P

### 9.6 Appendix 6 - Milestone 10 Report (3<sup>rd</sup> PhD position)



AMPC - 2016-1027 -  
Milestone 10 - 081217

### 9.7 Appendix 7 - Milestone 11 Report (4<sup>th</sup> PhD position)



AMPC - 2016-1027 -  
Milestone 11 - 081217

### 9.8 Appendix 8 - PhD topics (including Year 2)



PhD project topics  
for AMPC 210218.doc

### **9.9 Appendix 9 - Milestone 4 Report (Postdoc position)**



AMPC - 2016-1027 -  
Milestone 4 - 081217.

### **9.10 Appendix 10 - Milestones 5 and 6 Report (Hons positions)**



AMPC - 2016-1027 -  
Milestones 5-6 - 0812

### **9.11 Appendix 11 - Milestone 7-9 Report (Undergraduate Awards)**



AMPC - 2016-1027 -  
Milestones 7-9 - 0812

### **9.12 Appendix 12 - Agenda MI&QA Meeting 01/03/2018**



MIQA Network  
Agenda Victoria - Sec

### **9.13 Appendix 13 – RMIT Hons and Masters by Coursework Programmes**



RMIT Hons  
Programmes 070218