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*Cover Image supplied by Tim Burvill (A Hereford Beefstouw)

Executive summary

The Food Safety / Market Access Science Program arises from the Meat Industry Strategic Plan (MISP), which identifies the need to ensure market access and to enhance and ensure systems to for product integrity. This Achievement report responds to the MISP 2020. The program supports the activities of SAFEMEAT, the primary role of which is to oversee and promote management systems that will deliver safe and hygienic product to the marketplace.

The Program has maintained the same approach for a number of years, while responding to changes in the expression of food safety / market access objectives by the industry. Needs are assessed, scientific research and development activities are undertaken and these are communicated widely to industry, government and scientific stakeholders both nationally and internationally. Change in practice may occur within the industry as a result of research, resulting in lower risk of non-conforming or unsafe product, or achieving safety more efficiently. Australia has an accepted excellent reputation internationally, thus, the majority of efforts are I efficiency of achieving safety. The safety of product then needs to be measured, and communicated to stakeholders as a preliminary activity to addressing existing technical barriers to trade or preventing the formation of new barriers. The latter activity requires data to be available well ahead of time so that industry/government can rapidly respond to proposals by other countries for new regulations.

Domestic public health authorities have commenced an initiative to reduce the incidence of foodborne disease in Australia. It is pleasing that red meat products are not mentioned at all in the plans. This acknowledges the relatively high safety of our product.

Major outputs resulting from the food safety program over the past twelve months have been made available to the industry:

- Shelf life prediction model has been validated, and the value in supply management has been demonstrated. Further work will enhance the value to supply chains.
- Some progress is being made with overcoming shelf life barriers, particularly in Middle East markets. Shelf life studies in the coming year will allow the barriers in more markets to be addressed.
- Guidelines for the safe production of dry age meat will provide industry and regulators with guidance to produce safe and suitable product.
- The first round of changes to post mortem inspection practices were approved and will be implemented in the coming year in domestic meat inspection.
- The industry has a basis for choosing more cost effective options for pathogenic *E. coli* (STEC) testing and new methods are being investigated.

A stakeholder survey of the program was conducted to gauge stakeholder satisfaction. Overall the respondents are happy with the work conducted, direction and outputs of the food safety program. 89% of the stakeholders are satisfied with their awareness of the program and that the program is focusing on topics which are important to them.

1. Reason for being

The Food Safety / Market Access Science Program arises from the **Meat Industry Strategic Plan (MISP)**¹. The MISP does not address food safety specifically, which is seen to reflect the absence of market access failures relating to food safety and the maturity of the industry in incorporating food safety issues as a component of everyday business. The text of the MISP that aligns with this program:

MARKET GROWTH AND DIVERSIFICATION FOR AUSTRALIAN RED MEAT AND LIVESTOCK

Gaining competitive access to global markets with customer and consumer preference for our products based on quality and integrity systems.

Key issues

- We are an export industry and must be focussed on reducing barriers to trade.

Addressing the issues

- Efficiency and value in trade and market access
 - Reducing technical barriers to trade

MISP Objective progress in reducing technical barriers to trade new market opportunities are made available or cost savings achieved worth \$100 million by 2020 and \$250 million by 2030 with stakeholders satisfied with service providers' contribution to these results

SUPPLY CHAIN EFFICIENCY AND INTEGRITY ACROSS OUR INDUSTRY

Enhancing and ensuring the integrity of our whole of supply chain quality/integrity systems and paying all sectors in the supply chain on objective performance.

Key issues

- We must ensure our integrity systems deliver the products that we promise.

Addressing the issues

- Livestock and **product assurance through integrated integrity systems**

MISP Objective As technological advances become available and as customer requirements change, ongoing development of red meat and livestock integrity systems occurs to the satisfaction of stakeholders

¹ The Red Meat Advisory Council (RMAC) was formed in 1998 as a single industry touch-point for the Federal Government when dealing with cross-sectoral matters. RMAC comprises a membership of five Peak Industry Councils: Cattle Council of Australia, Sheep Producers Australia, Australian Lot Feeders' Association, Australian Livestock Exporters' Council and Australian Meat Industry Council. The Goat Industry Council of Australia also maintains a link, but not as a member.

2. Sub-program overview

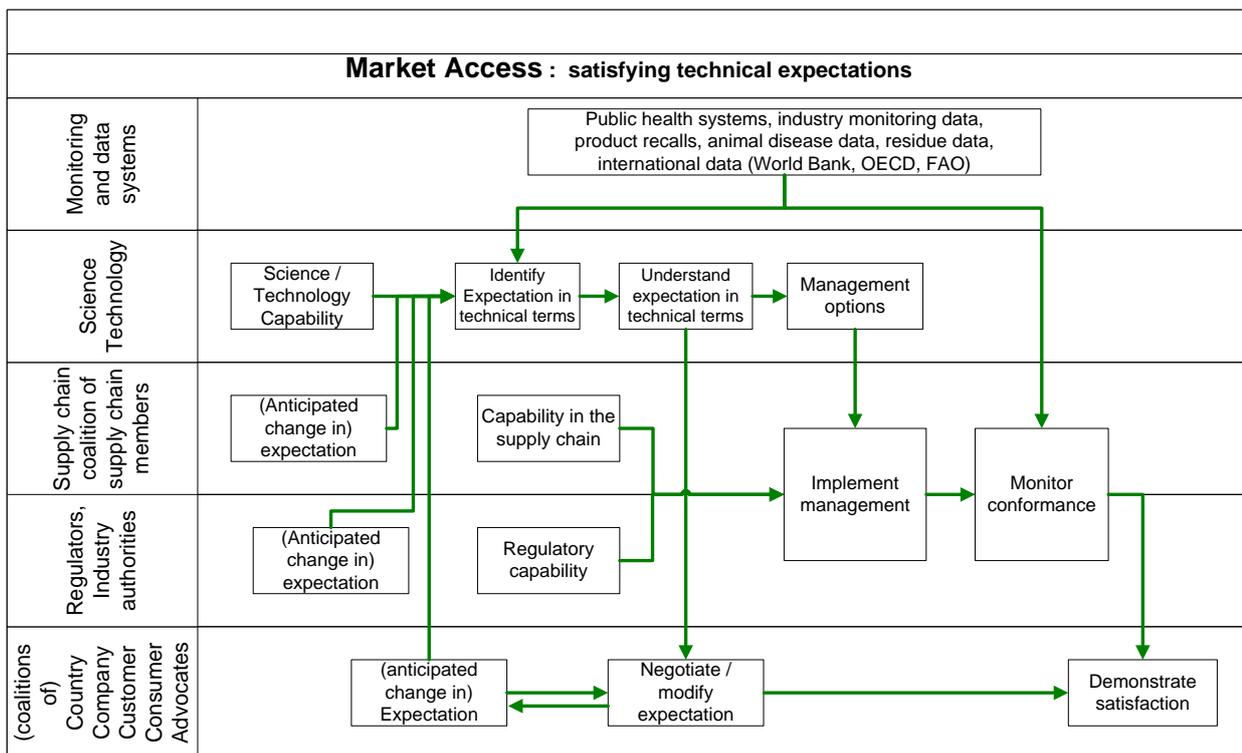
The joint program strategy addresses externally-facing technical market access, and internally-facing process effectiveness and efficiency, both leading to safe product and supply chain confidence at a competitive price.

The *R&D-oriented component* can be divided into two areas of work:

- address key access issues and demonstrate technical quality of product & systems
- research and development and science-based evidence for safety and integrity systems employed or introduced

Other issues are monitored and managed when required.

The R&D is conducted within the framework of satisfying the expectations of customers (whether they be countries, companies or consumers) and considering the expectations of advocacy organisations. The needs may be expressed by customers, in which case there is usually a short-term need to satisfy the expectation. On the other hand, it is also the role of the program to anticipate future expectations, and to provide the scientific basis for meeting future expectations. The diagram below shows how the components of the science program interact with customers and the major stakeholder groups.

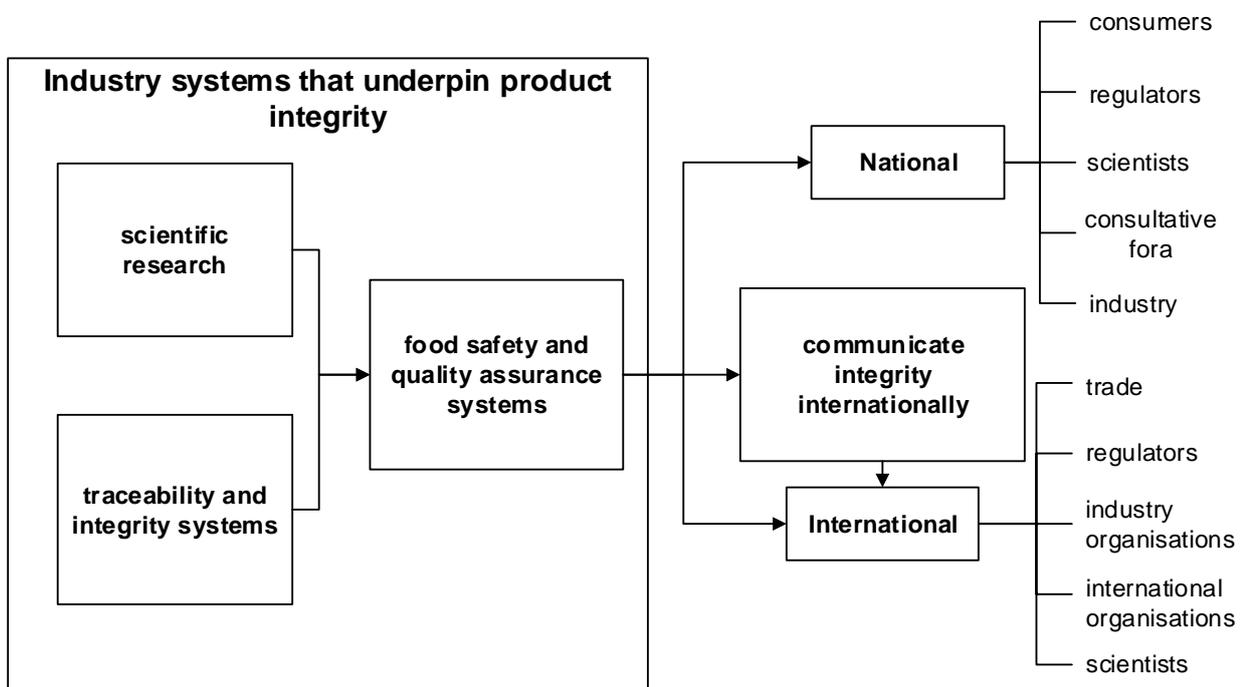


Model for the cooperation of science providers, regulators, public health systems and industry in meeting customer requirements through the work of the food safety / market access science program

The Food Safety / Market Access Science Program focuses on communicating knowledge about food safety risks and technical access expectations in the red meat supply chain, and their control, so that industry, regulators and the marketplace worldwide are aware and satisfied that risks are understood and are being controlled effectively. The communications components ensure that the high level of food safety of Australian meat is acknowledged. MLA international offices, websites with a focus on food safety, and materials for industry/regulator use (brochures, downloadable reports and tools etc.) are all key communication channels. The work of the program is often transmitted to the target audience through other activities in MLA. The diagram below illustrates the linkages between this program, other MLA activities in delivering integrity systems and reducing economic barriers, and recipients of information including decision-makers.



Section 4 of this report will describe the outputs of the scientific research program.



How the science projects in the Food Safety Program lead to the development of systems to deliver safety, quality and integrity and are used to influence key stakeholders nationally and internationally.

The activities of the Food Safety / Market Access Science Program will utilise methods that are:

- **Science-based** – producing credible scientific data and information to support its strategies.
- **Risk-based** – concerned with addressing real food safety issues and the protection of public health.
- **Efficient and effective** – are economic for industry to implement

3. Sub-program implementation

3.1 Joint Program

Over the past few years, the Australian Meat Processor Corporation (AMPC) has operated a food safety program. Since late 2015, MLA and AMPC have agreed to operate the food safety program jointly.

A joint approach to portfolio development and project contracting, management and extension will ensure that the strategic priorities of each sector can be addressed in an efficient manner while avoiding duplication of effort and resources. Similarly, adoption of outcomes from these portfolio areas typically impacts across the value chain and a collaborative approach between AMPC and MLA will serve to reinforce and underpin the importance of a whole-of-industry approach.

Meat & Livestock Australia and the Australian Meat Processor Corporation are required to incorporate MISP strategic themes into their own strategic planning. The plan is also endorsed by SAFEMEAT. The program therefore supports the activities of SAFEMEAT, the primary role of which is to oversee and promote management systems that will deliver safe and hygienic product to the marketplace.²

Both AMPC and MLA express the MISP aspirations and objectives in their own plans.

3.2 Sub-program position in the MLA strategic plan

In MLA's Strategic Plan 2016-2020³, two priorities relating to this program area are identified:

MISP Objective	Priorities
Through progress in reducing technical barriers to trade new market opportunities are made available or cost savings achieved worth \$100 million by 2020 and \$250 million by 2030 with stakeholders satisfied with service providers' contribution to these results	<p>EFFICIENCY AND VALUE IN TRADE AND MARKET ACCESS Australian red meat faces tariffs, quotas and technical barriers to trade across the globe, imposing billions of dollars in additional costs across the value chain. These barriers also prevent or restrict trade which limits the diversity of markets and, consequently, reduces the number of potential customers for Australian red meat. MLA will collaborate with the Australian Government, the Australian Meat Processor Corporation and industry stakeholders to drive growth in exports. MLA will do this by prioritising and taking action to reduce economic and technical barriers to trade in global markets.</p>
As technological advances become available and as customer requirements change, ongoing development of red meat and livestock integrity systems occurs to the satisfaction of stakeholders	<p>GUARANTEEING PRODUCT QUALITY AND SYSTEMS INTEGRITY For years Australian red meat has been marketed as clean, safe and natural, underpinned by its disease free status and advanced food safety and integrity systems. As our competitors build their own capabilities to deliver a similar product claim, it is essential for Australia to enhance our systems and technologies to keep ahead of our competitors and maintain our point of difference. Raising the bar of our integrity systems also helps Australia capture price premiums from discerning consumers and customers willing to pay more for higher levels of product assurance.</p>

² SAFEMEAT is a partnership between the Australian meat and livestock industry and State and Federal governments. SAFEMEAT's primary role is to oversee and promote sound management systems. SAFEMEAT also initiates R&D projects, particularly in relation to microbiology and food-borne pathogens and examines emerging issues, such as gene technology, that could have an impact on the red meat industry at some point in the future.

³ <http://www.mla.com.au/About-the-red-meat-industry/About-MLA/Company-overview/Corporate-documents>

3.3 Sub-program position in MLA annual investment plan

MLA's Annual Investment Plan (AIP) for 2017-18⁴. guides the practical delivery of MLA's long-term investment priorities and outcomes, which are set out in MLA's Strategic Plan 2016-2020. The work described here is positioned in the AIP as follows:

Program: Integrity Systems

MLA's integrity systems program assists MLA to foster the prosperity of the Australian red meat and livestock industry by protecting its disease-free status and underpinning the marketing of Australian product as clean, safe and natural. It also helps Australia capture price premiums from customers and consumers willing to pay more for higher levels of product assurance.

Sub-program: Market access science

MLA's market access science sub-program delivers assurance of product safety to customers and reduce non-tariff (technical) barriers to trade by applying science and technology to the supply chain.

3.4 AMPC implementation

AMPC invested funds jointly into the Food Safety program with MLA. The funds are invested on behalf of the membership and aim to reach food safety outcomes to benefit the Red Meat Processing Industry, with the aim of reducing Non-Tariff Technical Barriers to export trade.

Programs that AMPC fund directly that are related to the areas Food Safety and Integrity Systems, in which the outcomes will benefit processors in the form of higher food safety outcomes and greater export market access.

3.5 Program budget

The budget for the work of the joint program, as described in detail in the following section has funds from three sources:

- MLA Annual Plan (25% producer, 25% processor, 50% Commonwealth)
- AMPC funds (50% processor, 50% Commonwealth)
- MLA Donor Company (MDC) Funds (50% Donor, 50% Commonwealth)

In the case of projects utilising levy funds, the Food safety Joint Portfolio Management Team determines which of the RDCs is in the best position to manage the research contract.

Forecast project expenditure (\$ '000) in 2017-18*

	Source of funds			
	Producers	Processors	Donors	Commonwealth
MLA managed**	595	595		1,191
AMPC managed***	12	640		640
MLA managed through MDC			110	110

* estimated values at the time of reporting – not final reporting by RDCs

** includes program support as well as project expenditure

*** includes processor levy only projects and jointly funded projects

⁴ <https://www.mla.com.au/about-mla/Planning-reporting/annual-reporting/>

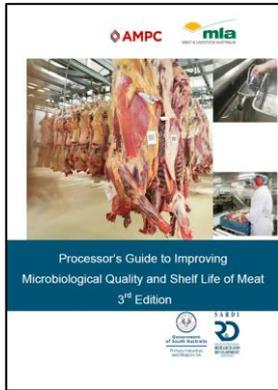
4. KPIs, outputs and activities

4.1 Achievement of Key Performance Indicators

The MLA Annual Investment Plan specifies Key Performance Indicators:

Program / subprogram / product group	Key Performance Indicator	Status	Further information
Integrity systems / Market access science / Market access technical research	Maintaining a high level of satisfaction (above 85%) by industry and government stakeholders with MLA's contribution to reducing impact of non-tariff (technical) barriers	In progress	A stakeholder survey will be conducted shortly, and reported in a 2 nd edition of this report.
	Food safety risks associated with Australian product usage in all markets is assessed so that risk management options can be considered	Achieved	A food safety risk profile for the red meat industry did not identify high food safety risks with any Australian meat products. We will continue to monitor the situation.(see 9.2)
	Agree with industry on how to approach the use of new genetic technologies by public health authorities	Partly Achieved	A strategy for using new genetic technologies inn food safety studies has been discussed with industry and government stakeholders. Proposals for utilising these approaches will be discussed with industry shortly.(see 9.2)
	Respond to the new South Korean positive list for residues	Achieved	24 chemicals have been identified that are of moderate to high risk. DAWR will respond to South Korea. (see 9.2)
	Correlation of Cadmium levels between sheep liver and kidney is reported	Achieved	The correlation of cadmium residues in Sheep liver and kidney is poor. Therefore both offals need to be tested. (see 9.2)
	Chilled vacuum packed shelf life model is validated so as to assist with a more accurate prediction of shelf life	Achieved	The model has been validated and is being used in cold chain and supply chain management investigations, and decision-making on suitability of product for sale. (see 6.2 and 9.2)

4.2 Publications for industry



Processor's guide to improving microbiological quality and shelf life of meat 3rd edition

This updated booklet contains reports of processing establishments that participated in investigation training for microbiological testing of meat and a guide on shelf life of red meat. The aim is to inform staff at establishments about possible how to investigate ways to improve their process hygiene and control.

The third edition contains case studies from beef and sheep meat processing system, and studies on shelf life trials, on measuring storage temperature accurately and a guide to determination of shelf life.

<http://publications.mla.com.au/go/E5SKUmsmcjsxsZ00>

October, 2017



Seminar report: Shiga toxin-producing Escherichia coli in manufacturing beef:

This seminar was held to review the current position with testing in June 2017. The prevalence of STEC are reviewed, the nature of the organisms and detection methods are explained and comparisons of test methods is presented.

The seminar also looked at the testing system that has been implemented in New Zealand, and the direction that STEC testing may take internationally, as the significance of these microbes are reviewed, and further new molecular methods are implemented.

<https://www.mla.com.au/research-and-development/search-rd-reports/final-report-details/Product-Integrity/Molecular-characterisation-of-STEFor-continued-market-access/3473>

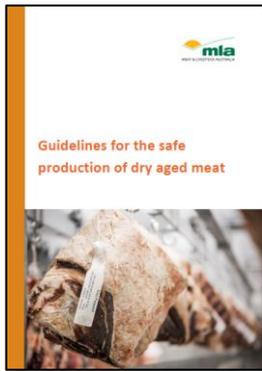
Costs of testing for Shiga toxin-producing E. coli (STEC)

Based on a comparative evaluation of screening tests for STEC relevant to the US market (reported in the above document), a spreadsheet calculator has been developed to provide an estimate of the costs associated with the use of different screening and confirmation methods. It allows processors to choose a method that is economically advantageous. It has also provides a basis for further development and validation of methods by diagnostic test manufacturers through MDC funding.

<https://www.mla.com.au/research-and-development/search-rd-reports/final-report-details/Product-Integrity/Enteric-pathogens-beef/3521>

Model can be requested by emailing Lhuynh@mla.com.au

Screening test method	Specific method (assessments)			Abundance specific (Screening)	
	Current situation BAX or IDEC	AB 5000 IDEC only	AB 5000 PAC (containing only)	Current situation BAX or IDEC	New situation Full methods
% of production or potential production	9%	9%	9%	9%	9%
# of processing tests per annum	20911120	20911120	20911120	100	100
Screening testing cost - \$/test	100	100	100	100	100
Confirmation test method	ColiChek based	ColiChek based	ColiChek based	Network	Network
# of confirmation tests per annum	1312118	201491000	201491000	1	8.1
Confirmation testing cost - \$/test	1000	1000	1000	1000	1000
Total testing cost	\$1,291,140	\$2,091,211	\$2,091,211	\$4,100	\$2,078
Transport time for samples to laboratory - days	0.5	0.5	0.5	0.5	0
Cost when lost or rejected or sample by laboratory - \$/kg	0.843	0.843	0.843	0.843	0.843
Storage cost - \$/kg/day	0.843	0.843	0.843	0.843	0.843
Carriage cost	406,310	406,310	406,310	406	406
Total storage cost	100,967	100,967	100,967	100	100
Transportation	42,114	42,114	42,114	42	42
# of damaged lots	77,000	77,000	77,000	1.00	1.00
Weight of carbon - kg	27.4	27.4	27.4	27.4	27.4
Weight of H ₂ O - kg	1110.000	1110.000	1110.000	1110.00	1110.00
Price of non-damaged product - \$/kg	0.21	0.21	0.21	0.21	0.21
Price of damaged lot - \$/kg	2.00	2.00	2.00	2.00	2.00
% increase in confirmed positives	0%	0%	0%	0%	10%
Value of damaged lot cost	\$1,275,000	\$1,275,000	\$1,275,000	\$1,260	\$2,117
Transportation	\$1,471,070	\$1,471,070	\$1,471,070	\$1,461	\$2,117
Change in costs		\$11,542	-\$112,718		\$1,941

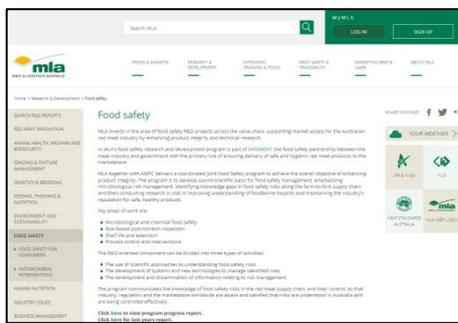


Guidelines for the Safe production of dry aged meat

The popularity of dry aged meat has increased in recent years, and concerns have been raised about the methods that need to be employed to ensure that it is safe and suitable for human consumption. A group of scientists, regulators, and dry ageing processors combined to produce this guide, which will be submitted to the Australian Meat Regulators Group, for endorsement. MDC and levy funded.

<http://publications.mla.com.au/go/pnS3UKSgcns6sRPj>
June, 2018

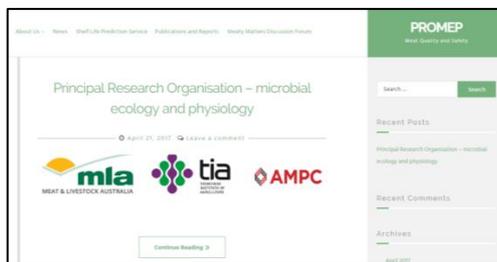
4.3 Websites for industry



Food Safety website

The Food Safety website has gone through significant changes. The new webpage is part of the MLA website and provide a point of reference on all things related to food safety. Contents on the website is significantly streamlined, to provide an overview of all our activities and the range of information and resources available, with links to more detailed reports on the MLA comprehensive reports database.

<https://www.mla.com.au/research-and-development/food-safety/>



Microbial Ecology and Physiology The UTas PRO website

The University of Tasmania is working on the website which will be the main source of provide an overview of all the latest activities, information related to the Principal Research Organisation: microbial ecology and physiology II project.

<http://blogs.utas.edu.au/promep/>

4.4 External Communications

Communication to scientists and technologists, both nationally and internationally holds a critical place in the strategy of the food safety program. There is a demand within government for risk-based and science-based transparent regulation with demonstrated cost-benefit. Communication through the scientific literature in peer-reviewed publications makes this information available to governments over a long period of time. It also influences scientific/technological thinking about meat safety and risk management.

A detailed list of scientific publications can be found in section 9.3

The program has a number of target groups (identified in the diagram in section 2), that may be influenced by different kinds of activities either directly by the MLA staff working on the Food Safety R&D Program, or by the scientists who work most closely with the program. A detailed list of activities can be found in section 9.4

4.5 Joint Levy funded (SAFEMEAT) activities

The Market Access Science sub-program frequently develops projects to address anticipated needs for information. Current projects include surveys of antimicrobial resistant bacteria in sheep and cattle because of the increasing demand to demonstrate that our industry is cooperating with global strategies to reduce infections with antimicrobial resistant bacteria. We are also conducting surveys of the microbiological quality of offals in response to greater demands to demonstrate the hygienic quality of these products.

In the area of enhancing product integrity we have continued to examine approaches to antimicrobial interventions for carcasses and carcase parts. We are also examining alternate sites for testing carcasses for the presence of microbial contamination to better assess the effect of processing.

Building on the success of the shelf life model, and trials in a domestic supply chain, we are conducting further work in domestic supply chains, and also in international supply chains. The international work will include the use of data loggers that can transmit their location and the temperature of product in real time, which will allow shelf life to be managed, not just predicted. It is also possible that the use of the model and knowledge of temperatures in supply chains will be a way that importing countries can be assured of the remaining shelf life of Australian product when it enters their country.

4.6 Processor Levy funded activities

AMPC is funding a number of projects as part of its Food Safety program. Current projects include a study into the impact of extending the shelf life of chilled beef in overseas markets, the use of plasma technologies in disinfection of carcasses and primals for food safety and shelf life extension purposes, and the use of laser shock wave technology on cryovac meats.

In the area of Integrity Systems, AMPC are funding projects and research in areas such as a review of process monitoring for the Australian meat industry, a study on the microbiological food safety and storage life of Australian red meat and AMPC also contributes to the TSE Freedom Assurance Program. AMPC has also worked with MINTRAC to educate the regulators and OPVs on the operations of red meat processing facilities.

AMPC are leading Joint Industry projects in the real time spectroscopy of for the detection of surface contamination of meat, as well as a couple of projects investigating non invasive methods of determining meat quality characteristics.

4.7 Other levy funded activities

The Sub-program has also part-funded (via support costs, i.e. largely, staff time) work, primarily funded through other programs, that is relevant to the objectives of the Sub-program. One key output, is the proof that certain kinds of microwaves are capable of greatly reducing levels of contaminating bacteria on meat surfaces without significantly changing the appearance of the meat. MLA is seeking interest from others to develop the process so that it can be applied to primals or carcasses, using MDC funding.

4.8 MLA Donor Company funded activities

An increasing number of activities relevant to this sub-program are conducted through MDC funding mechanisms. MLA Donor Company (MDC)-funded projects do not use industry levies, since they are funded by the companies suggesting projects and the Commonwealth. Some projects are with processing companies and others are with technology suppliers, or organisations that have interests in common with the Australian red meat industry.

Shelf life and old chain studies are being funded through the MDC. The information from these projects has helped to validate the shelf life model, understand how it can be used to manage supply chains, and determine where the value of this technology can be applied. It also provides specific information to the supply chain on how to manage their product. These projects will continue to be funded, using new technologies and ideas, which are then shared with the industry.

Following the industry-funded work to evaluate STEC testing, some technology suppliers are engaging in MDC-funded projects to evaluate new/improved test methods for manufacturing beef, under Australian conditions. The learnings from these projects will introduce new technologies to the Australian market, gain regulatory approval for new tests, and deliver benefits that can be calculated through the spreadsheet cost:benefit tool that has been developed.

Some of the applications currently being considered by the Australian Meat Regulators Group to make changes to post mortem inspection practice were funded through the MDC, with processing companies as funding partners.

The sale of vacuum packed chilled beef and lamb faces restrictions in the UK due to concerns by the regulator about the potential for botulinum toxin production. These restrictions extend to Australian product, and may affect regulators and retail customers in other countries also. The Donor Company project, funded with the British industry, is conducting a risk assessment to determine how long products can be in retail supply chains with safety.

In conjunction with the WA DPI and the Dry age expert panel, we've published the Guidelines for the safe production of dry age meat, the guide will ensure Australian dry age producers has increase awareness of risk associate and resolve common questions such as effectiveness of salt blocks. This guide will also demonstrate to the export market Australia has the expertise and experience in the Dry age market and potentially open and ultimately export DA meat.

5. Evaluation: outcome and impact

5.1 Periodic program evaluation

The next comprehensive program evaluation is not due until 2020, at the end of the current MISIP.

5.2 Towards outcomes and impact

The definition of outcomes and then determining the impact on the industry is a complex and time consuming task, which is why it is only performed periodically. This section indicates the potential outcomes of current work and identifies the potential resultant impact. Outcomes and impact are the result of cumulated efforts of many organisations over a long period of time; the program only plays one part of delivering on behalf of industry.

Project	Potential outcome / impact
Ensure risks associated with Australian meat are known and controlled.	1. This project has confirmed the low food safety risks associated with Australian meat and will ensure that this low risk is acknowledged in national and export markets.
Promote the exceptional shelf life of Australian meat.	<ol style="list-style-type: none"> 1. 2017 UAE changes to shelf life is estimated to return \$60m to the Australian industry 2. Plans have been developed to gain changes to shelf life by other GCC countries which would have a sizeable impact 3. Plans have been developed to obtain improved access to the Egyptian, Lebanese and Iranian markets through shelf life increases, which would have a significant impact 4. Trials in a domestic supply chain suggest that losses could be reduced worth \$3.6m pa 5. Application of shelf life models with real time temperature monitoring will be trialled in international markets where it is expected that it will allow shelf life to be managed in supply chains
Demonstrate the very low risk of enteric pathogens (E. coli, salmonella) in Australian beef.	<ol style="list-style-type: none"> 1. Australia is well-prepared to respond to US actions on Salmonella / process control in beef processing/ lymph nodes. The impact can only be determined once Australia has negotiated compliance with US requirements. 2. Results and publications of this work will support claims of achievement of high standards of process hygiene and provide a basis for making claims to change monitoring systems.
Demonstrate appropriate post-mortem procedures for a risk-based approach.	1. Agreement to change post mortem inspection could have a large impact on cost of inspection, and/or condemnation of carcasses and carcass parts. An early estimate is that \$35m could be gained from complete implementation of the current proposals, most arising from not incising masseter muscles.
Responding to international standards changes to keep the risk of residue violation in international markets low.	<ol style="list-style-type: none"> 1. Reduced risk of violating an importing country's residue limits. A number of potential issues have been identified with MRLs proposed by Korea. These have been reported to NRS, for action by the DAWR. 2. Responding to new regulations to keep residue within an acceptable limit. In 2018 abamectin MRLs for sheep meat in Japan were negotiated, which protected this market valued at \$118m pa

Controlling the risks of <i>Toxoplasma gondii</i>	1. Defining the risks of <i>Toxoplasma</i> continues. It is possible that the risk will need to be controlled within the capability of the industry to do so. Benefits from this work, for animal and human health will take some years to develop.
Controlling the potential risks associated with enteric pathogens in sheep	1. Results obtained from this work to date indicate that there are no risks associated with sheep that are not also associated with cattle to the same degree.
Demonstrate that antimicrobial resistance risks in Australian livestock are low.	1. Outcomes (avoidance of adverse publicity, avoiding implementation of ongoing surveillance programs) may accrue from having good antimicrobial resistance data which is well-known by stakeholders 2. Favourable interactions with government and international groups accrue from having a history of achievement. 3. These data underpin the development of appropriate antimicrobial stewardship programs by industry
Assessing new technologies for application by the program	1. New technologies are being investigated, both for research and application in the industry. Whole Genome Sequencing has the potential to provide data that could be very useful to industry. 2. Microwave decontamination has promise of being able to result in product that is even safer than usual and may have particular applications that could command a significant premium. 3. The program is investigating near real-time temperature logging that will allow the remaining shelf life of product to be predicted while the product is in the supply chain and decisions can be made to avoid product loss or unnecessary wastage.
Ensuring the system meets market expectations	1. There is little evidence of product failing to meet market expectations. Unnecessary technical barriers are therefore a major issue.
Maintaining and improving control of food safety and associated hazards	1. Novel chemical interventions on sub primal prior to vacuum packing, will be investigate to improve food safety. 2. A survey on the hygienic status of beef, sheep and goat offals will provide a baseline on the effectiveness of process control in offal process

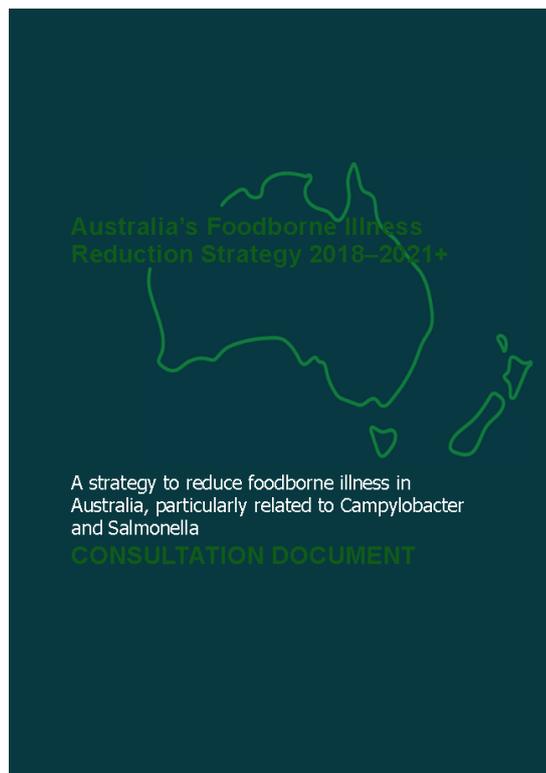
6. Highlights

6.1 Acknowledgement of meeting public health and food safety expectations

Plans for improvements in the rate of foodborne illness in Australia and newly collated data on rejections from overseas markets provide acknowledgement of the safety of Australian product.

The Australia New Zealand Ministerial Forum on Food Regulation, through the Food Regulation Secretariat released a consultation document on a strategy in early 2018, on a plan to reduce foodborne illness in

Australia over the period 2018-2021⁵. The tacit acknowledgement of our industry's performance is that no red meat products were mentioned at all in this document. Reductions in foodborne illness will come from attention to other products. This is a turnaround from years past where 'meat' would have been considered a concern without further distinction, or red meat would have been considered a major concern.



The Australian Beef Sustainability Framework was developed to define sustainable beef production and provide transparent measures and information on areas of stakeholder interest.⁶ People and the community is one of the four themes of sustainability Food safety is a priority area because providing safe, nutritious and consistent beef is critical for consumers and for the longevity of our industry. The measure used for food

safety is the proportion of raw beef rejected on inspection into the USA. This is due to the availability of the data and regular production. Data was also sourced from the EU (Rapid Alert System for Food and Feed) and Japan (Ministry of Health Labor and Welfare), but they did not indicate any recent problems with Australian beef. The latest report indicates that 0.00084% (by weight) of product was rejected recently.



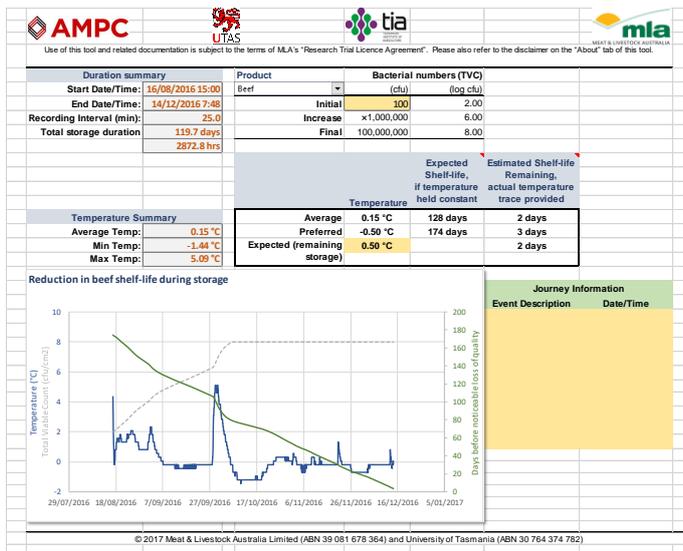
⁵ <http://health.gov.au/internet/fr/publishing.nsf/Content/australia-foodborne-illness-reduction-strategy-2018%E2%80%932021>

⁶ <https://www.sustainableaustralianbeef.com.au/>

6.2 Advances in shelf life management

The shelf-life model developed by researchers at the University of Tasmania has been validated with data collected on shelf life measured by industry people and scientists in Australia, the Middle East, Denmark and Japan, on beef and lamb of various cuts from various processing establishments. It is planned to publish this model.

The model is being supplied to industry in a controlled way. Licences are being issued to meat processors who wish to use the model, and their experiences are being reported, so that MLA can understand how the model can be used, and the benefits that accrue to those uses.



A shelf life study conducted in China has confirmed that product can meet the 120 day shelf life expectation (maximum expiry date) for chilled, vacuum-packed beef in Chinese supply chains.

One shelf life project aimed to simplify the supply chain for an Australian domestic supermarket. Although a detailed discussion is required by the supply chain, the project identify there is potential to extend shelf life of current product based on the supply chain temperatures. A cost-benefit analysis suggests there is a potential to return \$16.3 m/annum due to reduction in waste.

In international supply chains, the model has been used to determine the status of product

that has been subject to temperature abuse, with a potential value of \$5m/annum due to confidence that the model provides to allow product to be sold.

Trials will shortly commence to collect temperature data from international shipments in near to real-time so that the remaining shelf life can be estimated, and decisions made on how to manage the product in supply chains (for example, whether to sell it quickly, or not to sell it at a discount if there is time to sell it at a premium price).

We are in the final stages of negotiating a research licence (no cost to MLA) to allow Japanese researchers (working with Australian product) to calibrate a visual shelf life sensor that could be used on cartons to provide a quick indication of the suitability of product.

6.3 Reducing shelf life technical barriers



About a year ago, the UAE announced its decision to extend the shelf life of Australian beef and lamb. It is estimated that the benefit to industry may amount to \$60 m.

Since then we have not seen other markets follow suit, though some progress is being made with Iran. A plan is being developed between MLA and DAWR to have a significant impact on shelf life restrictions in other MENA markets. The research previously conducted by MLA, and the new insights that can be obtained using the shelf life model are key ingredients to negotiating with these markets to relax their shelf life restrictions.

Cold chain seminars were held in China in May 2018 to support importing companies and traders to have greater confidence in chilled Australian meat and learn important aspects of cold chain management to ensure that product is maintained in good condition through to the consumer. Seminars in developing markets such as this will reduce the likelihood of problems, and restrictions on the trade. They also provide opportunities to influence the direction of standards setting and regulator attitude toward products, thus keeping markets free of technical barriers. 98% of attendees found the seminar to be very good or excellent. 35% of respondents rated the technical presentation most highly.



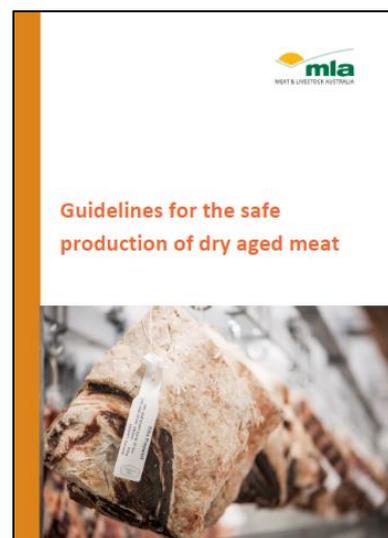
6.4 Consensus on safe dry aging of meat

The popularity of dry aged (DA) meat has increased in recent years, and concerns have been raised about the methods that need to be employed to ensure that it is safe and suitable for human consumption.

While extended ageing of fresh meat has not been a common practice in the Australian meat industry, dry ageing has been used since ancient times. In Australia, DA is expected to bring new value of \$3.5m to the sheep meat industry with a 20-30% premium over wet-aged lamb. In the beef sector DA beef is typically double the price of its wet-aged equivalent cut.

To address concerns that have been raised, and to ensure that dry ageing is conducted in a way that ensures a suitable product, a group of scientists, regulators, and dry ageing processors combined to produce a guide, with MDC and levy funding.

The dry age expert panel has signed off on the guidelines, and the AMIC National Retail Council has also endorsed the guidelines. The majority of state meat authorities are supportive of the guidelines and they will now be submitted by AMIC to the Australian Meat Regulator Group (AMRG) for endorsement to ensure national consistency.



6.5 Risk-based post mortem practices

The 2005 Codex Alimentarius Code of Practice for Hygienic Meat, allows that post mortem inspection should be risk based, yet, most countries (including Australia) rely on traditional inspection methods, which may not be contributing to public health, and may even spread contamination from one part to another. Research on risk-based approaches to post mortem practice have been conducted over the past few years and some projects are still in the research phase.

In the past year some proposals have been submitted to the Australian Meat Regulators Group (AMRG, composed of the competent meat authority for each Australian jurisdiction) requesting changes to the Standards for post mortem inspection and disposition. We are working with Australian Pork Limited who have conducted some projects relevant to pigs with a similar intention.

- 8 proposals have been submitted to AMRG
- 3 proposals have been approved
- 5 proposals are being resubmitted since AMRG have defined a new format for applications(not yet assessed)
- 1 additional proposal will be submitted when completed (early 2019)

A steering committee with relevant stakeholders has been meeting periodically to provide some direction for the work. There are two stages of implementation:

- domestic inspection changes can occur once AMRG informs industry
- export inspection changes can only occur once DAWR has developed instructions for their staff and importing countries that have expectations about the conduct of post mortem inspection have been consulted (and possibly, approved of the changes)

An early estimate of benefit may result in excess of \$30m benefit for the industry.

6.6 Reducing the burden of STEC compliance

Testing for Shiga toxin-producing *Escherichia coli* in manufacturing beef is required for some markets, such as the USA and Canada, as a condition of entry, or as a commercial requirement. It is estimated that testing, and heat treatment of lots of manufacturing beef found to contain certain types of STEC, costs in the industry \$2.3m per year. Action is being taken to address both the testing methods and what is considered to be an STEC of public health concern.

Testing - Some screening tests, result in higher testing costs than others, because of the proportion of samples that need to undergo a subsequent, confirmation test.

A testing cost model has been developed, and provided as a spreadsheet, that allows processors to select the test method (based on CSIRO research, funded through industry levies) that is most suitable for their use. It is too early to assess changes to industry practices as a result of the spreadsheet.

One result of having the cost-benefit model is that the MLA Donor Company has commenced projects with some diagnostics companies to prove the value of their tests using the criteria in the spreadsheet. Some have done so without MDC funding, but made their data available for inclusion in the spreadsheet. It is expected that in the next 12-18 months new information will become available to the industry that will further allow them to make optimal choices of test methods.

Public health definitions - We have been anticipating for a few years that a consensus of public health science would better define the STEC strains that are of most concern to human health. Work we have conducted with CSIRO in the past has been directed towards some of the significant aspects of the risks associated with E. coli O157 strains. More recently, we have funded an investigation and dialogue on the use of new genetic identification technologies (WGS, whole genome sequencing). A report has been released by FAO/WHO in which public health scientists suggest a new approach to defining STEC of public health concern. These changes to definitions of which STEC are likely to be of concern, combined with past (and future) characterisation of STEC strains will present new opportunities for Australian meat processors/exporters.

7. Government Research Priorities

The program is responsive to government policies and frameworks on research, development and innovation. The table below shows how the MISP priorities fit with Australian government priorities

Meat industry strategic plan priorities	Australian government priorities	
	Science and research priorities	Rural research, development and extension priorities
Efficiency and value in trade and market access	Food	Advanced technology Adoption of research and development
Guaranteeing product quality and systems integrity	Food Transport	Advanced technology Adoption of research and development

Further analysis can be found in section 9.5

8. Where to from here

8.1 Major activities towards achievement of 2020 MISP Objectives

Over the two years remaining in the current MISP the program will engage in projects that will deliver immediate value to the industry, as well as projects that will provide a firm defence against future requirements and expectations:

- demonstration of shelf life achievable in supply chains and management of the shelf life may bring market access benefits, as well as benefits to individual supply chains due to improvements in efficiency
- implementation of changes to post mortem inspection practices will yield benefits to the industry in terms of value of product, and freeing labour for more productive tasks
- demonstration of risks associated with product, which we hope will be low, and advantageous to Australian product
- Commencement of plans to mitigate the risk in supply chains, where necessary, before significant demands are placed on product by trading partners

8.2 MLA Donor Company initiatives

MLA Donor Company activities are likely to cluster around two themes that may converge over time:

- demonstration of cold chain integrity, improvement in cold chain management and management of shelf life through to customer to make supply chains more efficient, reduce wastage, better manage stock and reduce product sold at a discount near the end of anticipated shelf life
- demonstration and protection of the integrity of product through to consumers, and data flowing to/from consumers, through traceability, supply chain management, product verification through analysis, and IT platform technologies and infrastructure.

Initiatives in both of these areas will contribute to the MISP 2020 objectives.

9. In detail

9.1 Communications in print media

THE LAND

Shelf-life tool to reduce red meat waste

17 May 2018, 8 p.m.

Beef



PhD candidate Tai Gardner and Associate Professor Tom Ross at work in a Tasmanian Institute of Agriculture lab.



COMMERCIAL trials of a new model designed to more accurately predict the shelf-life of red meat and ultimately reduce waste have shown promising results in a domestic supply chain.

<https://www.theland.com.au/story/5408103/shelf-life-tool-to-reduce-red-meat-waste/?cs=224>

Commercial Trials of New Shelf-life Prediction Tool Prototype Are Promising

May 23, 2018.



Commercial trials of a new shelf-life prediction tool have shown promising results in a domestic supply chain. This tool, which has been developed by the Tasmanian Institute of Agriculture, is designed to accurately predict the shelf-life of red meat and ultimately to reduce retail and food service industry waste.

According to data from the Australian Government, food waste costs the Australian economy an estimated 20 billion dollars every year, with Australian consumers throwing away 3.1 million tonnes of edible food. This trial, which is backed by Meat & Livestock Australia (MLA), has suggested that a 10% reduction in red meat waste is possible if we can improve cold chain control and the accuracy of shelf-life prediction.

<http://www.teysaust.com.au/beef-shelf-life-tool/>

New shelf-life prediction tool set to reduce red meat waste



by Beef Central, 18 May 2018



COMMERCIAL trials of a new model designed to more accurately predict the shelf-life of red meat and ultimately reduce retail and food service industry waste have shown promising results in a domestic supply chain.



The Tasmanian Institute of Agriculture has developed the new shelf-life prediction tool for beef and lamb, and a retail trial of the model is validating its accuracy.



Australian Government data shows food waste is estimated to cost the Australian economy around \$20 billion each year, with Australian consumers throwing away 3.1 million tonnes of edible food a year.

The trial, backed by Meat & Livestock Australia, has suggested that a 10pc reduction in red meat waste is possible as a result of improving cold chain control and accuracy of shelf-life prediction.

<https://www.beefcentral.com/trade/new-shelf-life-prediction-tool-set-to-reduce-red-meat-waste/>

Japanese sheep meat trade disruption over abamectin sheep drench averted



by Terry Sim, 04 June 2018



Japan sheep meat trade disruption averted.

AUSTRALIA has avoided potential disruption to its multi-million dollar sheep meat trade with Japan by negotiating a higher maximum residue limit for the common drench ingredient abamectin.

In April last year, Japan reviewed the existing maximum residue level (MRL) for abamectin, an insecticide and sheep drench chemical that is used widely in

many agricultural industries in Australia, the Department of Agriculture and Water Resources said in its Agricultural Trade Matters June report.

<https://www.sheepcentral.com/japanese-sheep-meat-trade-disruption-over-abamectin-sheep-drench-averted/>

MLA developing national dry-ageing guidelines

Andrew Miller
29 Jan 2018, 4:40 p.m.

Meat & Livestock Australia (MLA) has flagged the development of national guidelines for the dry-ageing of meat, following the discovery no such standards currently existed.



DRY AGEING: Chef Andrew McConnell and butcher Troy Wheeler with dry-aged beef.

MLA Market Access Science and Technology manager Ian Jenson said the work came out of a larger project, currently being undertaken in Western Australia, on the dry ageing of sheepmeat.

"It was identified that there is currently no nationally agreed method or definition for dry aged products," Mr Jenson said.

"This broader project includes the drafting of nationally accepted guidelines to produce dry-aged product based on previous and current research in the domestic and international market."

<https://www.stockandland.com.au/story/5196619/mla-developing-national-dry-ageing-guidelines/>



Mutton 'the chocolate of meat' as farmers apply dry-ageing to sheep

Share on Facebook Share on Twitter Print Email More

ABC Rural | By National Rural Reporter Marty McCarthy
Posted 30 April 2018 at 8:36 am



Chefs at William Angliss Institute are experimenting with dry-aged mutton to cook mutton piccata. (ABC Rural: Marty McCarthy)

Farmers and researchers believe mutton could be the next big thing in food, thanks to a dry-ageing process that brings out complex flavours and makes the meat tender and juicy.

Melbourne chef Dale Lyman has been tasked with looking for ways to introduce dry-aged mutton to consumers.

"When we first saw the mutton we didn't quite know what to do with it, but after a lot of trials we have come up with some really good dishes, and have learnt a lot about the animal and the best way to cook it," Mr Lyman said.

While mutton is not his first sheep meat of choice when compared to a nice cut of lamb, its popularity could change through a technique known as dry-ageing.

<http://www.abc.net.au/news/rural/2018-04-30/mutton-next-big-thing-food-dry-ageing-research/9704370>

New red meat safety technology shows promise

05 April 2018

The safety and integrity of Australian red meat is being further bolstered following recent trials of new cutting-edge microwave technology, aimed at consumers who prefer their meat on the rare side of the cooking spectrum.

The independent trials, funded by Meat & Livestock Australia (MLA), speak directly to a growing trend of eating undercooked red meat, especially in the food service sector.

While Australian meat is accepted as being safe when cooked by usual methods, undercooking may expose consumers to some risk.

The trials have shown that using a form of microwave technology on raw meat can significantly reduce the amount of naturally occurring bacteria such as *Escherichia coli* (*E. coli*), which is similar to other bacteria that can cause food poisoning.

The microwave process – which takes less than a second – was developed in the United States by Dr Vlad Sklyar and Dr Mike Shevelev, at Gyrotron Technology, Inc in Bensalem, Pennsylvania, as an industrial heating process for non-organic materials, and has now been applied to food.

MLA Program Manager - Market Access Science and Technology, Dr Ian Jenson, said the undercooking of red meat has become an increasingly popular trend, especially in restaurants, and consumers rightly expect a safe product.

“Government regulations also require meat to be completely free of harmful microorganisms. We have been working towards these outcomes for a number of years and these latest trial results are positive in that we now have a technology that is capable of achieving both of these,” Dr Jenson said.

“The results are equivalent to the pasteurization process for milk, which makes it a better technology than everything except irradiation, which is not acceptable to most consumers.”

Following these initial positive results, Dr Jenson said there is considerable work to do before the technology can be applied in the meat processing sector.

“This is a significant milestone in our efforts to improve the efficiency of processing, and ensuring acceptability and premium pricing for our product in all markets,” Dr Jenson said.

“Further research and development work will now occur through MLA’s subsidiary company - MLA Donor Company (MDC) - and will utilise funds from technology developers rather than red meat industry levies.”

<https://www.mla.com.au/news-and-events/industry-news/new-red-meat-safety-technology-shows-promise/>

FEEDBACK

MLA – FOSTERING PROSPERITY

JULY/AUGUST 2017



BREAKING DOWN THE 'OTHER' BARRIERS

Research commissioned by the Australian red meat industry has estimated the value of non-tariff barriers (NTB) affecting the Australian red meat industry at \$3.4 billion.

MLA Trade and Market Access Manager Andrew McCallum said Australian Meat Industry Council (AMIC) and MLA initiated the research to re-energise industry and assist the Government's focus on NTBs.

"The cost of NTBs to our industry has risen significantly in recent years and an ongoing coordinated industry effort, in partnership with the Australian Government, is essential to alleviate the impacts of priority NTBs," Andrew said.

"MLA, in conjunction with AMIC, producer peak industry councils and other commercial partners, will help develop and implement NTB-alleviation action plans. It will take a coordination, science research and in-market service role, as well as ensuring communication of actions to stakeholders against the various priorities."

Andrew said industry's recent NTB alleviation efforts (led by AMIC, with MLA's support) had focused on:

- Middle East – shelf-life restrictions on chilled meat; burden of legalisation of documents to Gulf Cooperation Council countries
- China – restrictions on chilled meat; tripe, white offal restrictions; establishment listing restrictions
- Egypt – beef piece size restriction
- Indonesia – import regime; product bans
- Mexico – flat-stacking of sheepmeat carcasses.

Andrew said there was a breakthrough in the Middle East in May 2017.

Following concerted advocacy for increased shelf-life (via the provision of commercial and scientific justification), the United Arab Emirates announced new shelf-life standards. Vacuum-packed chilled beef was assigned a 120-day shelf-life period (previously 90 days) and sheepmeat a 90-day period (previously 70 days).

"Across the Middle East shelf-life restrictions have an impact value of more than \$85 million a year, so the UAE's move will help facilitate additional trade in high-value chilled product," Andrew said.

"The task now is to seek similar shelf-life amendments in more countries in the Middle East region.

"In relation to China, there has been welcome progress with the Australian and Chinese governments signing a joint statement on Enhancing Inspection and Quarantine Cooperation between Australia and the People's Republic of China in March."

The joint statement will unlock a number of trade restrictions including:

- expanding the chilled meat trade
- expediting the listing of 15 additional establishments eligible to export meat to China
- advancing Australia's access for tripe exports to China (and initiating trade in donkey meat and edible skins to China)
- promoting a protocol for the export of Australian slaughter sheep and goats. ■

✉ Andrew McCallum
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9.2 Current status of Projects

The current status of the specific projects agreed with SAFEMEAT are presented below:

Product	Progress
<p>Information and program management</p>	<p>The Program Advisory Group consisting of Peak industry members and Stakeholders to the Food safety program which meets twice a year for a progress update and consultation for the programs direction. The group met on 5 March, 2018 and particularly discussed the proposed new work for the coming financial year. University of Tasmania has recommenced provision of the news digest of food safety research via their website: http://blogs.utas.edu.au/promep/. They are also planning to condense this material into an occasional newsletter.</p> <p>The MLA website has a page dedicated to food safety information with links to reports, publications, fact sheets etc. www.mla.com.au/foodsafety</p> <p>The scientific risk management panel will meet in mid-February to provide advice on risks associated with Australian meat and potential future projects.</p>
<p>Product Integrity risks</p>	<p>The risk assessment project is complete, following a meeting with the scientific risk management panel. A particular focus has been identifying risks with product supply chains and red meat uses that have not been previously recognised or managed. Information is being collected particularly on 'unusual' uses of red meat that may pose higher food safety risks in our major markets. No significant new risks were uncovered, confirming the safety position of Australian red meat. Scientific publications are being prepared.</p> <p>Other than ensuring that data continues to be collected to be sure that we remain in a good position, there are no significant recommendations about investigating issues other than those of which we are already aware.</p> <p>Further information and copies of past reports in this area can be found here</p>
<p>Shelf life</p>	<p>We announced that the Shelf life predictive tool is available to processors/exporters under a licence for research purposes at the MINTRAC MIQA Conference and Meetings. A number of establishments have access to the model already. Feedback is being gathered and continuous improvements will be made. Sufficient data has now been collected to validate the use of the shelf life model for beef and lamb</p> <p>The shelf life project team at University of Tasmania is collaborating with an MSA research projects to combine microbiological analysis with eating quality analysis to determine whether microbiological factors can <i>help to explain consumer response to product packed for retail display</i>.</p> <p>A paper was presented at the Dubai International Food Safety Conference to exemplify the long shelf life of lamb in the Gulf region – supporting actions to achieve change in other GCC countries. A document summarising long shelf life of Australian meat has been prepared for submission to the Iranian Vet Office to hopefully provide enough evidence to drive some changes in shelf life.</p> <p>A risk assessment will be conducted on the significance of the potential presence of <i>Clostridium botulinum</i> in vacuum packed, chilled meat. The retail display period for these products is being restricted in some markets because of botulism concerns and data are required to understand the risk, and negotiate requirements that are more reasonable with regulators.</p> <p>Some European importers are testing for <i>Clostridium</i>, in particular <i>Clostridium estertheticum</i>, which may cause blown packs. MLA has prepared a document to provide advice and assist exporters on this issue</p> <p>A project to gather data and prove the frozen shelf life of Australian beef and lamb primals and trim to justify the 24 month shelf life in international markets. Results will not be available until July 2020.</p> <p>Further information about this area and copies of past reports can be found here.</p>

	<p>Processors wishing to obtain advice have been invited to share their shelf life data, or questions about shelf life in supply chains, with the University of Tasmania. Establishments are sending enquiries which will help build an understanding of both supply chains and the impact of temperature on shelf life. A number of supply chain studies have commenced and others are under discussion.</p> <p>Domestic and international supply chains are being evaluated to determine actual shelf life, and opportunities to derive value from product shelf life.</p>
<p>Enteric pathogens (beef)</p>	<p>A guide on STEC testing (screening and confirmation) has been produced based on meetings held in Melbourne and Brisbane in early June 2017. Discussions with diagnostics companies are seeking to build on this through MLA Donor Company projects specific to particular tests.</p> <p>A Cost Benefit Analysis on STEC detection systems has been performed. The model is freely available to allow evaluation of new approaches to testing.</p> <p>The FSIS carcass baseline survey report was published in September 2017. US beef carcasses have similar total bacterial counts to Australian beef carcasses, despite employing a number of interventions. Enteric bacteria (Coliforms, E. coli and Salmonella) are much lower on Australian beef carcasses. A scientific publication is being drafted for further industry consideration. It should be noted FSIS has not indicated their next steps but have commented the results will be used for future policy developments</p> <p>We are commencing a survey on the prevalence antibiotic resistant bacteria in cattle at the time of slaughter, which will allow a direct comparison to the 2013 survey, and inform industry of the changes (if any) has occurred during the 5 year period. Further information and copies of past reports in this area can be found here.</p>
<p>Post mortem procedures</p>	<p>Projects to provide a risk-based justification for the revision of the post-mortem inspection methods and dispositions in the Australian Standard continues. The umbrella project is being conducted with a steering group chaired by DAWR. Both domestic (AMRG) and export regulators are engaged with decision-making about the scientific studies already completed. DAWR is now engaged in assessing applications for use in export registered establishments, including gaining approval where necessary from importing countries. MINTRAC are engaged in assessing the consequential changes in training systems. Changes to inspection procedures for TB, C. bovis, pneumonia, are likely to be accepted by the AMRG in 2018, with potential changes to domestic plants aimed for late 2018, However, negotiations will still need to occur with importing countries before changes can occur in export meat establishments.</p> <p>A project initiated through the Plant Initiated Projects program to investigate the post mortem classification and disposition of carcasses affected by arthritis has suggested that there are opportunities to improve post mortem disposition criteria for arthritis.</p> <p>This work is coordinated with the Rural R&D for Profit project, Health 4 Wealth, which seeks to create value from collecting post-mortem inspection data.</p> <p>Work on cadmium in adult sheep offal (liver and kidney) is progressing at a slow pace. On analysis, the samples from high rainfall areas have low correlation between cadmium in kidney and liver and are more likely to exceed international MRLs, whereas med to low rain fall areas are less likely to exceed the MRLs. Unfortunately, statistical analysis indicates that further sampling will not increase the correlation. Thus, the focus will now shift to collecting whole liver samples to determine variation within liver, the result will complete the data set to assist NRS's liver cadmium project which samples only a part of the liver.</p> <p>Further information and copies of past reports in this area can be found here.</p>

<p>Chemical residues</p>	<p>MLA continues to respond to Technical Barriers to Trade (TBT) notifications on MRLs for the red meat industry. MLA has developed, and agreed with SAFEMEAT, a protocol for raising these issues to an industry level when a response is required. The National Residue Survey has informed MLA that Korea may potentially have a nil limit approach for all MRLs unless they are registered for use in Korea. Korea Ministry of Food and Drug Safety indicated this would come into effect in 2020. MLA has submitted to NRS a list of 465 chemicals, which may be affected and have finished reviewing the chemicals with high and moderate potential to impact on production. This will allow the Australian industry or drug manufacturers to respond to Korea and seek registration of high-impact chemicals if required. Further information and copies of past reports in this area can be found here.</p>
	<p>No action has been necessary at the Codex level. MLA is not continuing to fund work on the toxicology of indospicine, but keeps a watch on this area.</p>
<p>Toxoplasma gondii (sheep)</p>	<p>There has been increased attention to the significance of <i>T. gondii</i> as a public health hazard in sheepmeat. Work commenced in November 2016 to produce risk assessment data on the prevalence and concentration of <i>T. gondii</i> cysts in sheep meat for human consumption. Viable cysts can be found in ovines at the time of slaughter. The prevalence, concentration and genotype of these cysts will be determined. While this work is being conducted over the next year, discussions will be held to determine future directions for research to ensure that this risk to the industry is able to be addressed. Further information and copies of past reports in this area can be found here.</p>
	<p>Work in this area will be determined by the outcome of the project 'Controlling the risks of <i>Toxoplasma gondii</i>'.</p>
<p>Enteric pathogens (sheep)</p>	<p>MLA has commissioned CSIRO to undertake a baseline survey on the prevalence of pathogenic bacteria and their antibiotic resistance in sheep. Nationally 12 establishments are supplying samples to the study. The first round of sampling to collect 400 faecal samples between Sept – Nov 2017 is completed. The prevalence of Salmonella was 7.25%, and prevalence of STEC was at 2.5%. Surprisingly of the 10 samples, 9 were O157 and one was O26. MLA expects the results to demonstrate a low prevalence of antimicrobial resistance in sheep. STECs will be isolated and characterised, as they may become a more significant trade issue in the future. The work will fulfil the expectations of Australia's antimicrobial resistance strategy. Further information and copies of past reports in this area can be found here.</p>
<p>Antimicrobial resistance</p>	<p>MLA continues to represent the sector in discussions on the National Antimicrobial Resistant Strategy. Recently, comments were submitted on the Australian position on Codex Alimentarius on international approaches monitoring and controlling the spread of antimicrobial resistance. Discussions have been held with other animal industries and with the CVO and CMO on antimicrobial stewardship and use of antibiotics for growth promotion. Discussions have been held with ALFA on antimicrobial resistance issues. MLA is working with other animal industries to produce a document explaining to external stakeholders the antimicrobial stewardship practices being followed by the industry. An antimicrobial stewardship conference will be held in November 2018. Further information and copies of past reports on work in this area can be found here.</p>

<p>Novel product integrity technologies</p>	<p>CSIRO has prepared a report on new genetic identification technologies (such as whole genome sequencing, WGS) and how these technologies are being used in public health and the impact they may have on the industry. This report will allow industry to make informed decisions about the application of the technology both in market access and the program’s future research agenda.</p> <p>MLA is seeking opportunities through the MLA Donor Company to co-invest in technologies that may provide the industry with significant advantages in the detection and destruction of foodborne hazards, and ensuring product integrity. Recent trials have confirmed the ability of microwave treatment to cause significant inactivation of pathogens on the surface of meat without changing the appearance. Further information and copies of past reports on work in this area can be found here.</p>
<p>Product integrity systems</p>	<p>MLA is maintaining oversight of technical requirements for red meat products and how the industry can best respond to these requirements.</p> <p>Work has commenced on microbiological testing for process control. A review of systems and requirements for assessing microbial levels on meat carcass surfaces has been completed. Reports on the most appropriate sampling sites for beef and sheep carcass testing will be available by mid 2018. The sheep report has recently been received, and we will wait for the beef report before releasing advice to industry. Trials over several days in a commercial chiller on whole carcasses evaluated the use of oxidising agents (such as acidified sodium chlorite or chlorine dioxide and peroxyacetic acid) during the (spray) chilling process on <i>E. coli</i>. This work confirms an intervention during chilling is effective under commercial conditions. In the laboratory, the same impact is noted for <i>Salmonella</i>. Further commercial trials using carcasses inoculated with <i>E. coli</i>, has shown greater than 3 logs reduction. A cost benefit analysis using this intervention is being developed, and is available via the link below.</p> <p>Further work on the chemical interventions is being trialled on sub primal prior to vacuum packing, this will investigate the effects it has compared to when it’s applied on carcasses.</p> <p>A survey of the hygienic status of beef and sheep offal has commence. We are currently seeking establishments willing to participate and provide samples. The data collected will be used to maintain, defend or open new markets for exporting offal. Further information and copies of past reports on work in this area can be found here.</p> <p>MLA will assist an AMPC-managed project to review the monitoring systems for food safety in processing and an AMIC-led review of the export management system (AEMIS).</p>

9.3 Scientific publications

The following table provides a list of scientific publications from the sub-program over the past year. The status of a publication is classified as: in preparation, submitted, under revision, accepted, published (either on line or in print). Publications appear in this list until they are recorded as being published.

AIP area	KPI area	Citation	Status*
Demonstrate technical quality of product & systems	Risk assessments	Fegan, N. and I. Jenson (2018). "The role of meat in foodborne disease: Is there a coming revolution in risk assessment and management?" <i>Meat Science</i> .	published
		A risk profiling approach to investigate food safety risks within the red meat industry in Australia M. Hernandez-Jover, F Culley, J Heller, M Ward	submitted
		Semi-quantitative food safety risk profile of the Australian red meat industry Marta Hernandez-Jover, Fiona Culley, Jane Heller, Michael Ward, Ian Jenson Target journal: International Journal of Food Microbiology	in preparation
	Shelf life	Kaur M., Bowman J.P., Porteus B., Dann A.L. and Tamplin M. (2017) Effect of abattoir and cut on variations in microbial communities of vacuum packaged beef. <i>Meat Science</i> , 131:34-39 (DOI: 10.1016/j.meatsci.2017.04.021).	accepted
		Kaur M., Shang H., Tamplin M., Ross T. and Bowman J. (2017) Culture-dependent and culture-independent assessment of spoilage community growth on VP lamb meat from packaging to past end of shelf-life. <i>Food Microbiology</i> .	accepted
	Enteric pathogens	Bailey, G., L. Huynh, L. Govenlock, D. Jordan and I. Jenson. Low prevalence of Salmonella and Shiga toxin-producing Escherichia coli in lymph nodes of Australian beef cattle. <i>Journal of Food Protection</i> 80(12)2105-2111.	published
		Ahlstron, C., P. Muellner, G. Lammers, M. Jones and J. Heller. E. coli O157 shedding dynamics in Australian beef cattle – gearing up for high-resolution studies.	submitted
		Jenson, Sumner, Vanderlinde, Horchner et al. Beef Slaughter and Dressing Hygiene and the Application of Risk Management Metrics at Australian Export Establishments. <i>Journal of Food Protection</i>	In preparation
	Post-mortem procedures	Sergeant, ESG, J Happold and I Langstaff (2017) An evaluation of Australian surveillance for freedom from bovine tuberculosis. <i>Australian Veterinary Journal</i> 95(12):474-479.	published
		Pointon, A., A Kiermeier, D Hamilton. (2018) Review of the post-mortem inspection of beef, sheep, goats and pigs in Australia: approach and qualitative risk-based assessment results. <i>Food Control</i> 90:222-232.	published
		Kiermeier, A., D Hamilton and A. Pointon. Quantitative risk assessment for Human T. saginata infection from consumption of Australian beef.	under revision

Systems are underpinned by rigorous food safety research and development and science-based evidence	Improving control of food safety	Kocharunchitt, C., Gardner, T., Mellefont, L., Bowman, J.P. and Ross, T. Viable but non-culturable state of <i>Escherichia coli</i> as induced by combined cold and water activity stresses.	In preparation
		Porteus, B.F., Kocharunchitt, C., Bowman, J.P., Mellefont, L. and Ross, T. Oxidants targeting the reduction of <i>Escherichia coli</i> O157:H7 during carcass chilling.	In preparation
	Achieving optimum shelf life of Australian meat	Sumner, J., P. Vanderlinde, M. Kaur and I. Jenson. The changing shelf life of chilled, vacuum-packed red meat. In PJ Taormina and MD Hardin (eds) Food safety and quality based shelf life of perishable foods. Springer.	accepted
		Zhang P., Kaur M., Bowman P.J., Ratkowsky A.D. and Tamplin M (2017) Effect of environmental factors on intra-specific inhibitory activity of <i>Carnobacterium maltaromaticum</i> . <i>Microorganisms</i> , 5: 59, (DOI:10.3390/microorganisms5030059).	accepted
		Kaur <i>et al.</i> Core microbial communities of VP Australian red meat, their spatial and temporal dynamics during storage at different temperature.	In preparation
		Kaur <i>et al.</i> Potential and comparison of NIR and RAMAN spectroscopic techniques in meat industry for shelf-life prediction of beef and lamb.	In preparation
		Kaur <i>et al.</i> Monitoring metabolites in Australian VP beef and lamb stored at different temperatures.	In preparation

9.4 External education and promotion of food safety and integrity

Arena	Group	Activity	Nature of interaction
NATIONAL	Consumers	Website information	MLA's consumer website, www.beefandlamb.com.au , is used as a way of communicating specific meat safety messages to consumers. The FAQ section can be updated in response to consumer concerns.
	Regulators	Food Standards Australia New Zealand	MLA communicates with FSANZ about meat-related food safety matters. There are no current issues in this area.
		Standards Australia	Participating in the development and review of Australian Standards, as well as the development of International Standards through the International Standards Organisation.
	Scientists	Australian Association for Food Protection	A professional association, where the position of the Australian industry as technically competent is communicated.
		Australian Society for Microbiology	A professional association, where the position of the Australian industry as technically competent is communicated.
		Australian Institute of Food Science and Technology	A professional association, where the position of the Australian industry as technically competent is communicated.
	Consultative	SAFEMEAT	An opportunity to regularly update all red meat industry sector participants on the progress of the program.
		Export Meat Industry Advisory Committee	Provides an opportunity to gain agreement between export processors and Department of Agriculture on the application of MLA research to the industry. Sometimes responsive projects are developed.
		Export Meat Industry Advisory Committee Food Safety and Animal Health Subcommittee	The food safety subcommittee provides opportunities to discuss food safety and microbiological issues in detail. Some activities, such as revision of microbiological methods for the industry, will require professional input from MLA and consultants

	Industry	Meat Inspection Quality Assurance (MIQA) Network	About 12 presentations were given in the past year to industry QA Managers in all states on antimicrobial resistance, trends in ESAM data and process control. Also an opportunity to learn about industry needs.
		MINTRAC MIQA Conference	This popular conference for industry QA Managers and trainers was an opportunity to share R&D relating to shelf-life, antimicrobial interventions, and process control and the changes that are being made by processors as a result of following the approaches developed.
		MLA publications	Contribution to articles in MLA's magazine, feedback, on how research contributes to optimising processing, improving hygiene and new regulations
		Enquiry services	MLA provides an enquiry service for processors, exporters, customers, regulators etc. who require technical information on the safety of meat.
		E. coli panel	MLA runs an E. coli expert panel to interact with stakeholders on this important issue. MLA also provides advice to Department of Agriculture and Water Resources and AMIC in dealing with their own interests in this area
INTERNATIONAL	Trade	Working relationship with North American Meat Institute, National Cattlemen's Beef Association	MLA keeps in touch with like organisations in the USA, as well as individual processors to discuss issues of common interest.
		Enquiry services	Enquiries are often directed through MLA regional offices to provide information, or technical support, on trade enquiries.
	Regulators	Australia's position at Codex Alimentarius	Reviewing the development of Codex documents, which are a basis for international trade, to ensure that they reflect Australia's approach to meat safety. Particular attention is being paid to documents on Salmonella in beef, the development of a standard for chilled and frozen meat, pyrrolizidine alkaloids and to guides on control of parasites in the supply chain.
		Opportunity to input into Australia's position at OIE	Reviewing the development of documents to ensure that they do not impinge negatively on Australia's meat safety approach.

		National food control systems	Opportunities, through MLA regional offices, to make technical representations to assist in policy development relating to Australian meat products.
	Industry organizations International organizations	International Standards Organisation- ISO standards and working groups	Opportunity to comment on the development of International Standards, including participation on working groups, and obtaining advance notice of standards being developed.
		International Association for Food Protection (IAFP), member	A professional association, where the position of the Australian industry as technically competent is communicated.
	Industry organizations	International Commission on Microbiological Specifications for Foods	Scientists close to MLA are members of this group which is the leading international scientific food safety influencer.
	International organizations	Consultants to FAO/WHO	A number of scientists close to MLA work as consultants for the FAO/WHO food safety program.
		FAO/WHO Joint Expert Meetings on Risk Assessment (JEMRA)	Several scientists close to MLA are on the roster of experts for JEMRA.
	Scientists	Editorial Board, <i>Applied and Environmental Microbiology</i>	AEM is a leading food microbiology journal and MLA staff are frequently asked to peer review papers prior to publication.
		Reviewer for <i>International Journal of Food Microbiology and Meat Science</i>	The IJFM and Meat Science are leading food safety and meat science journals internationally. MLA staff are sometimes asked to peer review papers prior to publication.
		Editorial Board, <i>Food Protection Trends</i>	MLA staff have been invited to be members of this IAFP journal. It provides international recognition for the Australian industry.
		Invited speaker, international conferences	MLA staff and scientists working closely with MLA are frequently invited to be keynote and major speakers at international conferences
		Publications	See 9.3 Scientific / Technical publications

9.5 Government priorities

9.5.1 Science and Research priorities

In May 2015, the Government established a set of Science and Research Priorities, and corresponding Practical Research Challenges.⁷ These Priorities and Challenges will be reviewed every two years. Food is identified as one of the priorities. It is suggested that priority be given to research that will lead to:

1. knowledge of global and domestic demand, supply chains and the identification of country specific preferences for food Australia can produce.
2. knowledge of the social, economic and other barriers to achieving access to healthy Australian foods.
3. enhanced food production through:
 - novel technologies, such as sensors, robotics, real-time data systems and traceability, all integrated into the full production chain.
 - better management and use of waste and water; increased food quality, safety, stability and shelf life.
 - protection of food sources through enhanced biosecurity.
 - genetic composition of food sources appropriate for present and emerging Australian conditions.

With respect to food safety, the program is responding to the priorities for research:

Knowledge of global and domestic demand, supply chains and the identification of country specific preferences for food Australia can produce.

It is fundamental to the planning process for the program, and also continued development in areas such as shelf life, that the program develops an understanding of safety and quality expectations and that we develop reliable ways of meeting those expectations.

Knowledge of the social, economic and other barriers to achieving access to healthy Australian foods

Some work in the program is devoted to technical barriers to trade and overcoming those barriers through the provision of information to government and educating supply chains about the safety and suitability of our products.

Enhanced food production through novel technologies, such as sensors, robotics, real-time data systems and traceability, all integrated into the full production chain

The program has a clear vision to utilise supply chain data and research results to enhance the quality and safety of food delivered to consumers.

Enhanced food production through better management and use of waste and water; increased food quality, safety, stability and shelf life

Increased meat quality, safety, and shelf life is at the core of the market access science/ food safety program at MLA. Appropriate attention is given to improving management to achieve outcomes and to reducing water use where possible.

Enhanced food production through protection of food sources through enhanced biosecurity

Attention is given in the food safety program, where appropriate, to the impact of microorganisms originating from animals, and how they can be best controlled through the supply chain.

⁷ <http://www.science.gov.au/scienceGov/ScienceAndResearchPriorities/Pages/default.aspx>

9.5.2 Rural research and development priorities⁸

Productivity and Adding Value: improving the productivity and profitability of existing industries.

The Food Safety / Market Access Science program has a very clear focus on providing a sound scientific basis for continued development of quality systems within the Australian red meat industry. Providing a sound scientific basis for regulations allows the industry and regulators to control meat processing in a cost-effective way, by concentrating attention on the critical issues, and allowing the industry to innovate while maintaining food safety.

Supply Chain and Markets: understanding and responding to domestic and international market and consumer requirements through the whole supply chain, including to consumers.

MLA is leading or actively involved in a number of key initiatives designed to maintain and improve consumer confidence in the integrity of products produced by the beef and sheep meat industries based on sound science, risk analysis and the adoption and communication of research outcomes. The program also collects data that demonstrate the effectiveness of the Australian supply chain in producing quality products.

The sound scientific approach being taken to substantiate claims for market access is seen as a key factor for current and future market access. The Food Safety R&D Program develops information to support market access and also develops approaches to process validation and data collection and analysis to support future actions for technical market access.

Biosecurity: protecting Australia's community from biosecurity threats.

Threats in other countries are assessed and protocols for assessing their significance to Australia are part of the program's approach to pro-active management of food safety issues. Biosecurity is an approach that is relevant to ensuring that problems in overseas countries do not become established in Australia.

Supporting the Rural Research and Development Priorities: improving the skills to undertake research and apply its findings.

Undergraduate training: The program works with students and processors to work on projects that have real benefit to the industry, thus giving both parties the opportunity to innovate and see the potential for further innovation within the industry.

Post-graduate training: MLA and AMPC continue to support investment in post-graduate training with PhD and masters students currently supported through our post-graduate scholarship program and project-based support.

Researcher training: Funds are provided to support researchers to attend leading conferences to present their R&D results and to network with the world's leading scientists in this area.

Industry training: Workshops, network (professional development) meetings, and tools are provided to the industry to increase their knowledge and skills in doing their jobs but also to increase their ability to take up the results of research.

Supporting the Rural Research and Development Priorities: promoting the developing of new and existing technologies.

Researchers working on MLA projects are using cutting-edge proteomic and genomic technologies to provide an understanding of food safety issues and possibly find breakthroughs in food safety. We continue to keep the Australian industry ahead of the world in application of new ideas and approaches to food safety.

⁸ <http://www.agriculture.gov.au/ag-farm-food/innovation/priorities>

9.5.3 Agricultural Competitiveness white paper priorities⁹

The Government released a white paper in July 2015 with the aim of strengthening the sector and ensuring it remains as competitive as possible.

The Government acknowledges that the RD&E system will give our farmers access to the latest innovations, new technologies and best management knowledge available to seize opportunities.

The food safety / market access science program responds to priorities in the white paper. In particular the program responds by:

- developing and evaluating advanced technologies that lead to innovative processes and practices;
- evidence-based control of food safety risks for improving market access;
- emphasising the adoption of R&D through multiple channels

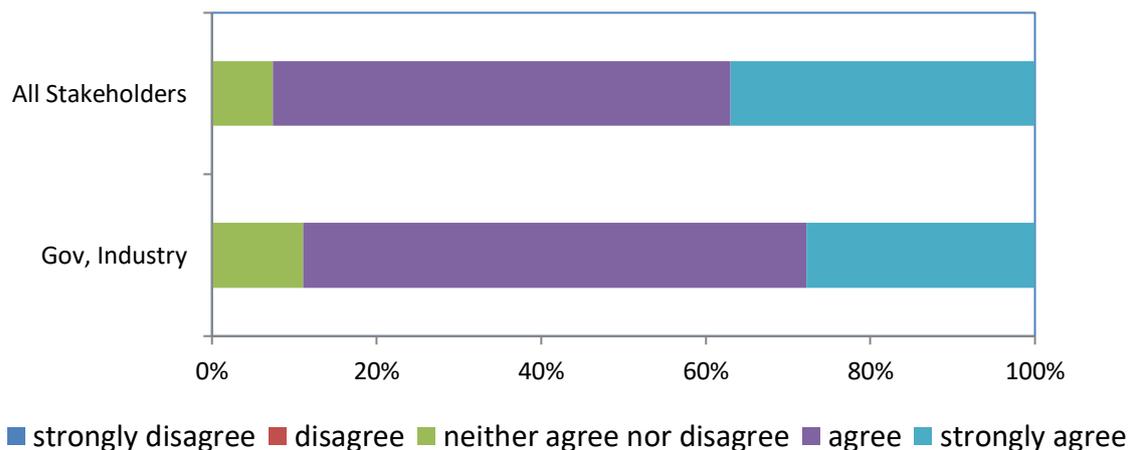
⁹ <http://agwhitepaper.agriculture.gov.au/>

9.6 Stakeholder survey

A stakeholder survey was conducted which focussed on whether the food safety program was conducted in a way which met with stakeholder satisfaction. Respondents were representatives of peak councils, government, processor companies and researchers, who had some involvement with the program during the year.

A total of thirty-one responses were received, from industry organisations and meat processing company representatives. Questions were largely asking for agreement with a statement, on a 5-point Likert scale, supplemented by open-ended responses.

Respondents generally were positive (agree or strongly agree) that they are satisfied with the program.

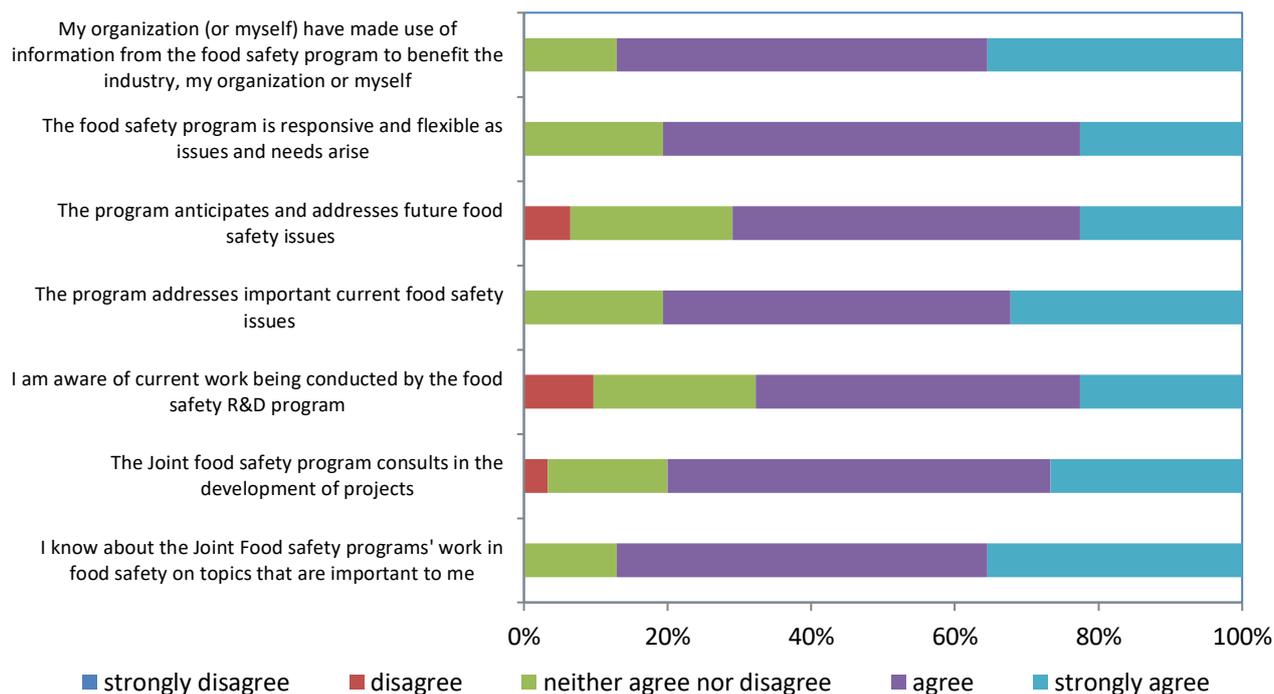


Overall the respondents are happy with the work conducted, direction and outputs of the food safety program. In particular 89% of the stakeholders are satisfied with being aware of the program and are focusing on topics which are important to them.

65% Respondents claimed to be aware of food safety publications and the MLA food safety website. There are continue plan for update of the web page to maintain the latest material of interest to stakeholders.

Positive comments received from government and industry stakeholders included:

- Very good work by a very small team. Is there any potential to look at linkages with NZ for future collaborations?
- The food safety R&D is reflective of the issues faced by industry and regulators



In response to the question on what areas of research / development / adoption / impact MLA should focus on, the following responses were received on the program, along with our initial response. It is our intention to discuss these comments with the Program Advisory Group

Comment	Response
Communication to producers - how about doing an ABC Landline story.	We look for stories about the program that can be published in MLA's Friday Feedback, Feedback magazine and in rural print media. We haven't thought about Landline; This could be another avenue of communicating our material.
Conducting an economic analysis on the impact on enterprises in the meat production chain from food safety incidents (international and domestic) as a way of fostering a stronger preventive culture in the industry.	We can consider this kind of analysis, which would require us to identify incidents, and have a trusted consultant gather information from those involved. Those involved may be reticent to provide information, and if legal liability questions arose, they would be unlikely to provide information. Perhaps we could provide what information is easily available and leave it to companies to take action.
Detection of Foodborne bacteria viruses	The program conducts work in this area where it seems appropriate. In meat testing, there are many commercial suppliers of test methods who are motivated to do the work needed to promote their methods. We are working with some companies through the MLA Donor Company (without the use of levy funds), to examine new methods.
New QA methodologies that reduce QC requirements	AMPC is currently managing some work in this area. Further discussion on opportunities would be worthwhile.
Making sure food is safe for consumers.	Our recent work on risks associated with red meat suggest that food IS safe for consumers.
Antimicrobial resistance	This is a current active area for research in the program. The feedlot research program is also taking steps to address this issue. MLA is very involved in discussions with the Government.

New forms of packaging	Commercial suppliers of packaging materials seems to be motivated to conduct their own research in this area. We are planning to conduct some investigations of the impact of some packaging on shelf life within that research project.
Shelf life and microbiology for other countries that impact meat processors.	Reducing technical market access requirements is a particular thrust of the program. We are slowly having success in this area and expect to see more positive change in the 2018-19 year. We have plans to continue supplying information that will help other countries understand our perspective on food safety and change their requirements.
Understand what our customers call food safety. Package outputs to address their concerns	
Shelf life of dry aged meat, Optimised processing for dry aged meat (hot vs cold boning, very fast chill, pH temperature etc), New product development using hogget meat	We are very interested to engage manufacturers of new products to work with us through the MLA Donor Company. There is a possibility that our product development program would be able to conduct generic work in this area.
Emerging risks - profiling, researching and field assessments of risk	We have just completed a project in this area and the risks appear to be very low. We continue to look out for new hazards and newly appreciated risks to make sure that we are addressing the expectations of our customers.
Revise typing of selected meat-borne pathogens of concern using genome sequencing to determine if this impacts on interpretation of selected prior studies and at the same time developing a database for Australian product. Could compare with local human database being developed.	We have been in discussion with AMIC about the application of new technologies for typing of pathogens such as STEC, and considering how the industry could gain increased confidence of the market.
NGS technologies for molecular risk based characterization of foodborne pathogens, source tracking/attribution etc.	
Investigation of underlying factors that drive spoilage in VPCB primals, for improved shelf life prediction.	The model that has been developed and is being rolled out with processors provides a good prediction of shelf life and we will be encouraging the use of this model in new ways. As we understand more about how to create value from this work, we will continue to develop the area.
Thorough mapping of sources of carcass contamination throughout processing for identifying optimal process control points	We have published three editions of a guide to processing hygiene, that provides a lot of examples of how processes can be improved and how individual processors can evaluate their processes. Overall, our hygienic quality is very good. Since there are differences between processors, we would propose that future work might be best conducted as a Plant Initiated Project, through the MLA Donor Company.