final report

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‘Meat Industry Services IV’ and ‘Meat Industry Knowledge Development’

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Important Disclaimer

Contents

1. INTRODUCTION

The two projects that are the subject of this report have run for three years up to 30 June 2010. These were the latest of a series of projects jointly funded by AMPC, MLA and CSIRO that have provided a range of services to the Australian meat processing industry. The purpose of the projects was to provide industry, industry organisations (particularly MLA and AMPC) and government authorities (particularly AQIS) with new knowledge and information to assist in the maintenance, defence and enhancement of market access, thus providing public benefit to all Australians.

2. PROJECT OBJECTIVES

The objectives of project A.MIS.0007 (Meat Industry Services IV) were:

1 Provide the Australian red meat industry with information, advisory services, and technology transfer programs that assist processors to compete effectively on the world markets.

2 Respond to company-specific enquiries; and

3 Respond to enquiries related to research and route-to-market issues, and technology transfer programs.

The objectives of project A.MIS.0008 (Meat Industry Knowledge Development) were:

1 Carry out activities to create new knowledge for the Australian red meat industry that will assist processors to compete effectively on the world markets.

2 Provide the Australian red meat industry with information services, market intelligence and knowledge management to inform new R&D investment and engagement.

3 Assist in maintaining Australia's terms of trade for red meat and thus provide public benefit to all Australians by providing information, advisory services, technology transfer programs and R&D activities that assist governments, Australian Quarantine and Inspection Service (AQIS), MLA and industry associations to maintain, defend and enhance market access.

3. PROJECT OVERSIGHT

The project was managed by a steering committee that met quarterly to review progress and consider future activities. The following people participated in some or all of the meetings during the term of the project:

AMPC

Dr Joanne Sillince
Kevin Collison
John McGuren

MLA

Ian Jenson

CSIRO

Gary Dykes
Kari Gobius
Ian Eustace
Alison Small
Bill Spooncer

During the final year of the project MLA commissioned a consultant to review the activities of the current project with a view to recommending the approach to conducting future meat industry services projects. The recommendations were:

"*… awareness of MIS amongst industry members is limited. This requires further promotion of the MIS to industry, to raise awareness of the services that the MIS program provides. Furthermore, the provision of the updates and newsletters in email format needs to be better advertised to current and potential users of the service. The research raised the question of whether the promotion of the program has not been prioritised because the service has been running for so long that it is subconsciously considered to be a part of the collective awareness of industry. Staff/personnel changes within the processors was also suggested as a reasons for a lack of awareness (i.e. new staff may not know of the MIS program whereas their predecessor did). The above conclusions may be addressed by:*

- *Advertising the ability to provide email updates and newsletters to current and potential users of the service;*
- *Encouraging the distribution of email newsletters to colleagues;*
- *Attending industry events and representing the service;*
- *• Periodically contacting key personnel/positions at processing plants that would benefit from the service.*
- *○ By regularly (e.g. annually, biennially) contacting people in key positions, the appropriate people are made aware and/or reminded of the service. This strategy addresses staff turnover. Informal feedback may also be a positive outcome of this strategy;*
- *Providing a periodic 'index of services' of the MIS to all current and potential users of the service to remind people of the services they have access to through the program.*"

4. STAFFING

The following staff and sub-contractors worked regularly but not exclusively on the projects:

Ian Eustace
Alison Small
Neil McPhail
Lynn Cox (part time)
Bill Spooncer (Kurrajong Meat Technology)
Chris Sentance (Food Safety Services)

Other CSIRO staff were consulted or utilised on the project when specialist skills were required.

5. SERVICES PROVIDED

These projects provided the Australian red meat processing industry with a range of services including:

- Information and advisory service;
- Rapid response to enquiries;
- Advice to industry and government organisations and input into industry meetings;
- Publications;
- Maintenance of contact with processor personnel
- Supply chain analysis response to emerging issues;
- Environmental and food safety and quality impacts of new processing parameters;
- Risk assessment and mitigation;

5.1 Information and advisory service

Up to date information of relevance to the Australian meat processing industry was obtained by regular perusal of scientific journals and by subscribing to food and meat industry electronic bulletins. Project staff regularly kept in touch with MLA project managers to keep up with MLA-funded research and attended industry conferences, committees and seminars. Conferences and workshops that were attended included:

- AMIC Conference
- MINTRAC Conferences
- International Congress of Meat Science and Technology
- Australian Renderers' Association Symposium
- MINTRAC QA Network Meetings
- MINTRAC Environmental Network Meetings
- Meat Plant Engineers Network Meetings
- *E. coli* O157 Panel
- Export Meat Industry Advisory Committee
- Australian Institute of Food Science and Technology Conferences

The information gained via these means was assessed by the project team and utilised to prepare publications of relevance to industry. Analysis at the end of each quarter of all enquiries received and web site activity allowed the team to develop a feel for the issues that were currently affecting industry. This knowledge was fed back to AMPC, MLA and CSIRO through quarterly reports and direct contact to support strategic decision-making processes.

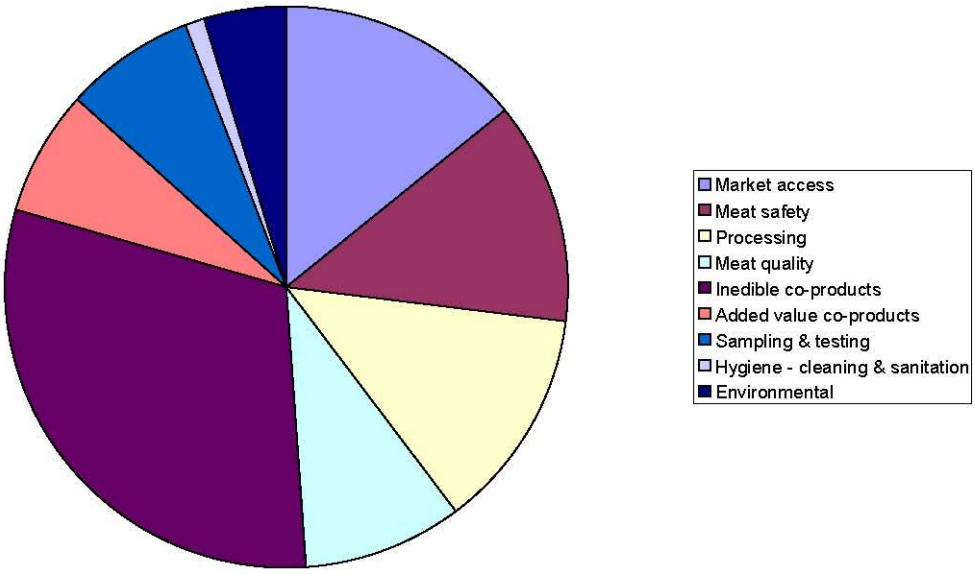
The Meat Industry Services team hosted a science workshop for the Meat Industry at the CFNS laboratory in Werribee, VIC on 21st May. Approximately 40 delegates from industry, state and federal governments attended the day, to hear presentations on the MLA R&D program; *E. coli* O157 in carton meat; Bioactive extractions and adding value to the animal processing and production industries; Impact of pre-slaughter stress on livestock welfare and meat quality and Shelf-life evaluation of vacuum-packed beef. They were also taken on a guided tour of the pilot plant facilities at Werribee, during which some of the research work was highlighted, particularly the extractions and separations work. Informal feedback though the day was very favourable.

5.2 Rapid response to enquiries

The meat Industry Services team received 2,570 technical enquiries mainly via telephone, email and personal contact, during the term of the project. Approximately 85% of enquiries were from people directly associated with the meat industry and the remaining 15% from researchers, consultants or suppliers who were providers of services and equipment to the Australian meat industry.

A record of all enquiries received was kept and a breakdown of the topics of the enquiries is presented in Figure 1.

Figure 1: Topics of technical enquiries



Many enquiries could be answered during the telephone conversation or by email response. When available, scientific or technical literature was cited to support the advice provided. In some other cases searches of literature were required. The resources of the CSIRO library network and electronic journals proved invaluable in these cases, as did the database maintained by Meat Industry Services.

In some instances, issues with processing required more detailed investigation, which at times included a visit to the processing plant and some analyses. In some cases, this led to a short-term investigative project funded by the processor. Some examples where significant benefit has arisen from Meat Industry Services advice are:

***Discolouration of vacuum-packed beef and lamb*:** Discolouration and colour stability continue to be an issue, particularly for high-value products such as Wagyu and lamb. In one instance product from a particular producer displayed poor colour and flavour. Investigations indicated that stress during transport from the feedlot in southern NSW to the abattoir in SE Queensland was the major cause of the poor colour. Browning of meat in MAP has also been an issue as has the discolouration of bone in high O_2 MAP.

***Storage life of vacuum packed beef and lamb*:** Processors have requested information to substantiate their storage life claims. High bacterial counts in some lamb packages have also been an issue.

***Market access for rendered products*:** Meat Industry Services continues to be a source of information on the requirements to access markets such as Indonesia, the EU and North America.

***Hygienic rendering*:** A large number of enquiries continue to be received regarding production of Salmonella-free meat meal. The Australian Standard for Hygienic Rendering has been amended to require that a review of hygiene procedures and corrective action be taken in response to any detection of Salmonella in meat meal. This has led to more requests for advice on actions to be taken.

***Dry ageing*:** Dry ageing has developed a niche market and there has been an increase in the number of enquiries regarding procedures for doing it successfully. In one case an operator was experiencing storage life problems which were likely due to a high relative humidity in the chiller.

***Off-odours in cooked steaks*:** An intermittent problem of foul off-odours was experienced when cooking aged steaks, especially when using slow cooking procedures. Some analyses were done and advice was provided on possible sources of these odours.

***Alternative chilling procedures*:** assistance has been provided to several plants wishing to obtain approval for alternative procedures for beef carcase chilling. There has also been increased interest in spray chilling of beef and lamb to improve yield.

5.3 Advice to industry and government organisations and input into industry meetings

Project team members provided advice to industry through attendance and presentations at industry advisory committees, contact groups and other appropriate industry meetings. They included:

- Export Meat Industry Advisory Committee (EMIAC)
- Australian Renderers' Association (ARA)
- *E. coli* O157 panel
- MINTRAC QA Managers' Network Meeting
- MINTRAC Environmental Network Meeting
- Meat Plant Engineers' Network Meeting
- FAO/WHO expert meeting on Animal Feed Impact on Food Safety
- TSE FAP National Advisory Committee
- Entry and exit meetings with auditors from the Philippines reviewing market access for meat and bone meal
- Lectures to university students
- Assistance in development of the Australian submission to the US on *E. coli* O157:H7 testing of beef for manufacturing
- NSW Food Authority and DPI working group on Salmonella in poultry feed
- Development of Diploma Course in Agribusiness with MINTRAC

5.4 Publications

During the course of the projects, 18 Meat Technology Updates were prepared and distributed to industry. They were:

4/07 Think lean: Improving productivity
5/07 Lactic acid bacteria
6/07 Producing quality sheep meat
1/08 Solid Waste management
2/08 Fat composition of beef & sheepmeat: opportunities for manipulation
3/08 Maximising offal yields
4/08 Rendering hygiene
5/08 Bioactives, nutraceuticals and functional foods
6/08 Renewable energy
1/09 Antimicrobial resistance and residues
2/09 Update on electrical stunning
3/09 40 years of Meat Industry Services
4/09 Hormonal growth promotants and meat quality

5/09 Bulk-packed frozen meat for further processing: alternatives to current practice
6/09 Shelf life of Australian chilled, vacuum-packed, boneless beef
1/10 Market access for animal by-products
2/10 Dry ageing of beef
3/10 Shelf life of Australian chilled, vacuum-packed lamb

In addition 18 issues of Meat Technology – What's New were prepared and distributed with the Meat Technology Update. These summarised papers published in scientific journals and elsewhere that were considered to be relevant to industry. A list of topics covered is presented in Appendix 1.

These publications were printed and posted out to plant managers, quality assurance managers, engineers and others on a mailing list maintained by Meat Industry Services and senior managers on a list maintained by AMPC. Currently over 800 copies are posted out but many more people have access to the publications at the plants.

They were also posted on the website (www.meatupdate.csiro.au). In addition an email list is maintained of those who wish to download an electronic copy of these publications. This list is increasing rapidly and when the MTUs are posted on the web site, currently in excess of 70 people are advised by email that a new one is available for downloading.

5.5 Maintenance of contact with processor personnel

During the course of the project team members visited meat processing plants in all Australian mainland states. During the visits which were at times part of other activities, the services provided by under the Meat Industry Services projects were explained to key personnel at the plant.

5.6 Supply chain analysis response to emerging issues

The Meat Industry Services team has responded to several issues during the term of the project. Some of these have required limited short-term investigations. Examples include:

- The effect of lead shot in beef on muscle lead levels. Lead pellets were detected in Japan in an Australian beef primal cut and the customer was concerned that it could result in high lead levels in the meat. A primal cut that was detected by X-Ray was obtained from an export abattoir and it was stored for several weeks to simulate the time to market. Analyses of muscle samples at distances up to 75 mm from the pellet and immediately surrounding the pellet showed that all samples contained lead levels below the maximum permissible level of 0.1 mg/kg.

- Gas bubbles in vacuum packs. The cause of the gas bubbles was resolved by CSIRO investigations in 2000 but the sight of them is still causing customers to consider rejecting product. Some investigative work was done to reassure customers that the bubbles are not of microbiological origin and contain predominately nitrogen (about 70%) which slowly leaches out of the fat. The problem appears to be more common with cuts from long-fed Wagyu cattle.

- Coring as a microbiological sampling method. The USDA has published a revised directive that specifies a surface sample size for N60 sampling for *E. coli* O157:H7 in raw beef product. An investigation was undertaken to determine what weight of sample would be required to obtain the equivalent surface area if frozen cartons were cored rather than surface sampled. The number of surfaces penetrated over a range of CL specifications was obtained by requesting plants to count meat pieces during coring for CL analyses. The investigation showed that coring would require a sample weight about six times that obtained by surface sampling.

5.7 Environmental and food safety and quality impacts of new processing parameters

The MIS team review many journals and newsfeeds in order to maintain currency in published relevant research. New processes and technologies have been introduced to the Industry through presentations at industry forums and newsletters as described previously. More specifically, in the period covered by this report, advances in separations technology and bioactives extraction; lean manufacturing; renewable energy and alternative methods of handling bulk-packed frozen trim have been discussed in the Meat Technology Update, while a number of potential new technologies (e.g. High Hydrostatic Pressure Processing; Pulsed-light Technology) have been highlighted in the Meat technology – Whats New? newsletter.

5.8 Risk assessment and mitigation

The team maintain currency in issues affecting international trade and food safety, by accessing international journals and newsfeeds, and communication with AQIS, EFSA and US contacts as well as with MLA program managers and other Australian and international scientists. This knowledge is then used to advise industry. Furthermore, the team has assisted in the preparation of briefing papers for the Primary Industries Standing Committee (PISC) on issues such as meat labelling and humane slaughter, and produced a Meat Technology Update advising on market access requirements for rendered products.

6. SUMMARY

The Meat Industry Services team has, over the period July 2007 to June 2010, responded to a wide variety of issues and queries, relating to numerous scientific and commercial disciplines. Examples of areas of expertise utilised include: Meat Quality; Meat Safety; Co-products processing; Market Access; Processing Technology; Environment and Sustainability; Sampling and Testing.

The service was reviewed in 2009, and although awareness of the service could be better, those stakeholders who did utilise the service felt that it was an important and credible program. When asked which part of the service was most important, respondents identified all components as important. Furthermore, they identified 'the need to keep abreast of industry innovations and developments' and 'relevant market information' as their most likely future information needs: each of which is considered a priority within the MIS program.

APPENDIX 1 Meat Technology – What's New? – Topics

eld (8) __ **Issue**	**Topics**
2007.4	Electrical stimulation and colour stability of lamb Improving the poor bulk behaviour of meat and bone meal The effects of enhancement and ageing on beef quality Effect of type of stunning on lamb meat quality Effects on lipid oxidation Survival of *Listeria monocytogenes* on jerky Effects on meat quality of finishing culled dairy cows
2007.5	Beef from old cows has lower oxidative stability Development of a hand hygiene unit Plastics from animal proteins Inactivation of *E. coli* by O-water *E. coli* reduction interventions for very small plants Effect of various pre-slaughter treatments on meat quality
2007.6	Assays for testing contamination of meat with ammonia The influence of genetics, animal age and nutrition on lamb production A modified dry curing process for beef Effect of a gelatine coating on the shelf life of fresh meat The antioxidant effect of rosemary extract and additives on retail packaged beef
2008.1	Reducing dark-cutting in pasture-fed steers The effect of grain feeding cast-for-age sheep Effectiveness of *E. coli* vaccine confirmed Effectiveness of penetrating captive-bolt stunning Humidification to reduce weight loss from unwrapped chilled meat on retail display Blown pack spoilage of vacuum-packed meats
2008.2	Lactic acid bacteria to inhibit pathogens on fresh meat Survival of Listeria on hot and cold beef carcase surfaces Variation in colour and pH of beef *semimembranosus* muscle The performance of industrial evaporator coils under frosting conditions Comparison of natural and industrially produced trans fats The effectiveness of time-temperature regulations on pathogen inactivation during composting New odour treatment technology
2008.3	Europe closer to accepting antimicrobial treatments Bacteria in beef primal cuts mechanically tenderised and injected with brine Spoilage and safety of ground beef packed in traditional and modified atmosphere packages Antimicrobial interventions for beef heads Influence of cooking rate and holding time on beef chuck and round flavour
Issue	**Topics**
	Strategies for reducing the refrigerant charge in refrigeration systems Effect of incubation temperature on aerobic plate counts of beef and sheep carcases
2008.4	Death of pathogenic bacteria during drying of meat False aneurysms in carotid arteries of cattle during schechita and halal slaughter Healthy fat in brisket Fatty acids and meat characteristics of different beef cattle types grazed on pasture Inactivation of *E. coli* in ground beef by high-pressure treatments Managing compost stormwater Effect of surface roughness of stainless steel on attachment of *Listeria monocytogenes*
2008.5	Cattle hide washing – efficacy of different chemicals Grass-fed beef acceptable – US study Recovering value from dark cutters Dry versus wet ageing of beef Extraction of proteins from slaughterhouse by-products Stress corrosion cracking in refrigeration systems Decontamination of knives used in the meat industry
2008.6	Self-sterilising surfaces Comparison of conventional and radio frequency tempering Influence of vacuum-packaged ageing on bloom development Performance and quality of lamb according to sex type Cholesterol and lipid oxidation of minced beef under oxygen-rich atmosphere Consumer preference for corn-or barley-fed beef
2009.1	Bacteriophages can remove *E. coli* O157:H7 from ground beef, glass and

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2009.1	Bacteriophages can remove *E. coli* O157:H7 from ground beef, glass and wall boards High pressure washing for removing biofilms from stainless steel Beef electrical stunning: effects of chest electrode Dietary tannins improve lamb meat colour stability Dust as a factor in *E. coli* on cattle hides Growth of Listeria in ready-to-eat frankfurters
2009.2	Effects of hormonal growth promotants on meat quality Cutting meat and bone with an ultrahigh pressure abrasive water jet Performance of oxygen scavengers with low O_2 MAP Packaging film may be an effective antimicrobial Physical distribution & characteristics of meat and bone meal

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