
# final report

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## Process Risk Models –

## Continued Development 11/12 and 12/13

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# Contents

# Background

Previously a process risk model was developed to utilise existing data from MLA projects and the wider literature and place it into a risk context. This model can be used as a research tool to better understand risks and identify areas within the program (particularly the pathogen and microbial contamination area) requiring further investigation. The model allows for analysis of data in a descriptive and mathematical manner and is useful within the pathogen program plan as a predictive tool to ensure MLA and the industry stays "ahead of the play" rather than just "reacting/responding" to food safety concerns. Modelling was also used to understand contamination of cartons of beef.

The maintenance and further development of the existing risk model is important to MLA for a number of reasons. Firstly, using data collected for a pathogen known to currently pose a food safety problem, the model can be used to predict prevalence and concentration of those pathogens which are foreseen to cause problems, but for which little data exists. In addition, the model can be used to identify particular steps throughout the processing chain that present significant risk, thus providing direction as to what areas require further investigation and data collection. Carton beef models can be used to support Australia's testing and control of pathogens such as *E. coli* O157.

# Project Objectives

1. Documenting and explaining the model to maintain transparency and accessibility to MLA and MLA's scientific risk management panel
2. Identifying parts of the existing model which may need improvement / updating
3. Identifying areas within existing data, where there may be incomplete data, and a need for additional collection
4. Specifying the data requirements and allow for data obtained from a wide range of different projects within the program to be fed into the model for evaluation
5. Contributing to the development of experimental and survey design for projects related to the model
6. Identifying areas within the processing chain which may be more important from a risk viewpoint, and therefore require a greater degree of investigation / knowledge
7. Assisting in the development of recommendations for complete risk assessments, and performing risk assessment, when required
8. Assisting in the development of risk management options, based on outcomes from the use of the process risk model
9. Interacting with MLA's scientific risk management panel, as required.

# Results and Discussion

The following is a summary of the work undertaken as part of this project.

**Risk assessment of *E. coli* O157 in burgers made from Australian beef trim**

The risk assessment for *E. coli* O157 in burgers made from Australian beef trim, which was initiated in project A.MFS.0222, has been further developed and documented. This risk assessment uses data on the contamination of cartons of Australian beef trim[1] and subsequently models the *E. coli* O157 concentration in beef patties through retail storage, transport to the home, home storage, cooking and consumption.

A manuscript reporting the risk assessment and results is currently being prepared for scientific publication in *Risk Analysis*. In addition, an abstract for a conference presentation has been accepted for the Annual Conference of the International Association for Food Protection (IAFP), to be held in Charlotte, North Carolina from 28-31 July 2013.

**Quick service restaurant's Japan visit**

MLA hosted a delegation for a Quick Service Restaurant (QSR) in Japan in October 2011. Dr Kiermeier contributed to the following two presentations during a scientific symposium on 13 October 2011:

- *Analysis of ESAM data*, a joint presentation with Dr Sumner
- *Investigation of lots positive for* E. coli *O157*, a joint presentation with Dr Barlow

In addition, the draft risk assessment model for *E.* coli O157 (see above) was discussed in detail with the QSR's delegation on 14 October 2011.

**Risk assessment of *E. coli* O157 in burgers made from Australian lamb**

The risk assessment model for *E. coli* O157 in burgers made from Australian beef trim was modified for lamb meat in response to an Australian QSR interested in serving lamb burgers. The results provided confidence that the current cooking practices of the QSR were effective for managing the risk of illness from *E. coli* O157, even under very conservative assumptions.

[1] Kiermeier, A., Mellor, G., Barlow, R. & Jenson, I. (2011). Assumptions of Acceptance Sampling and the Implications for Lot Contamination: *Escherichia coli* O157 in Lots of Australian Manufacturing Beef. *Journal of Food Protection* 74(4): 539-544.

**Process Control**

Dr Kiermeier met with Dr Darrell Donahue, a consultant to the International Commission for the Microbiological Specifications of Foods, who visited MLA in July 2012. The meeting was organised to explore opportunities for the application of statistical process control methodology in the meat processing industry. Subsequently, a proposal was accepted by the IAFP for the delivery of a process control workshop as part of the 2013 Annual Conference.

**Investigation of data sources to assess the risk of STEC contamination**

On 4 June 2013 new testing requirements took effect for market access to the US for manufacturing beef.

In response to STEC detections at various establishments, ESAM and Product Hygiene Index data was requested from all beef processing plants for data analysis with the aim to identify patterns that may help predict STEC contamination – a total of 20211 records from 27 plants were received and analysed. In addition, eight establishments were visited with Ian Jenson or John Sumner to undertake detailed investigations of the information available and to identify additional factors that may have led to the STEC contamination. From the various analyses undertaken it was concluded that ESAM and PHI data are not able to predict STEC contamination (and detection) in manufacturing beef.

The findings from these investigations were presented at the Mintrac Meat Inspection and Quality Assurance Conference in Brisbane in September 2012.

**Investigation workshops**

During a series of workshops in August 2012 to inform industry on developments in testing for STECs, it became apparent that there was a need to assist the industry to investigate/validate process controls. A pilot workshop was developed by John Sumner and Andreas Kiermeier and delivered to ten QA staff from six beef plants in December 2012. Subsequently, the workshop was modified and delivered over two days in Brisbane, Tamworth, Wagga Wagga, Melbourne and Adelaide (Day 1: 29 Apr to 3 May; Day 2: 13-17 May). A total of 52 personnel attended from beef, sheep, pig and kangaroo abattoirs, testing laboratories, consultants and a supplier of antimicrobial chemicals. Abattoir participants comprised QA, production, inspection and microbiology staff. The workshops were very well received and resulted in 24 investigations being undertaken. A report on the workshops and the investigations was prepared and submitted to MLA.

**Discussion document on aspects related to sampling beef trim for *E. coli* O157**

Exporters of manufacturing beef undertake *E. coli* O157 testing of each lot using the 'Robust N-60' sampling plan. An argument which is frequently made in the USA is that testing smaller lots results in higher probabilities of detecting contamination. Subsequently, there has been pressure on establishments to reduce the lot size from a maximum of 700 cartons to 350 or even 175 cartons. A document to address some of the issues related to *E. coli* O157 testing has been produced and will be discussed by the *E. coli* panel in early July 2013.

**Publications**

The following manuscripts were published as part of this project.

Holdus Small, A., Jenson, I., Kiermeier, A. & Sumner, J. (2012). Vacuum-Packed Beef Primals with Extremely Long Shelf Life Have Unusual Microbiological Counts. *Journal of Food Protection* 75(8): 1524-1527.

Kiermeier, A., Tamplin, M., May, D., Holds, G., Williams, M. & Dann, A. (submitted). Microbial Growth, Communities and Sensory Characteristics of Vacuum and Modified Atmosphere Packaged Lamb Shoulders. *Food Microbiology*.

Sumner, J., Kiermeier, A. & Jenson, I. (2011). Verification of Hygiene in Australian Manufacturing Beef Processing — Focus on *Escherichia coli* O157. *Food Protection Trends* 31(8): 514-520.

# Conclusions and Recommendations

This project has provided MLA with a flexible mechanism to address a variety of statistical and modelling issues. Consequently it is recommended that funding be continued to allow ongoing provision of such services. This will also allow completion of the risk assessment.