Final Report

AMPC
AUSTRALIAN MEAT PROCESSOR CORPORATION

Pilot of risk-based MHA 3: Process Monitoring and Analysis

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1.0 Abstract

The original intent of the Meat Hygiene Assessment (MHA) system was to assist the Australian meat industry to establish systems that monitor the food production process with regard to its ability to produce safe product. In 2019, a revised MHA 3: Product Monitoring system was trialled and implemented industry-wide in 2023. The purpose of this project was to trial a revised MHA 3: Process Monitoring and Analysis system which, similar to MHA 3: Product Monitoring, focuses on food safety and operations are categorised according to their establishment-specific risk (high/low). Subsequently, establishments set monitoring frequencies for each operation that is commensurate with risk.

Eight export establishments (four beef, three sheep and one pork) completed the trial which consisted of a "Before" phase (Sep-Nov 2024) and an "After" phase (3 months within June-Dec 2025). Data were analysed from the National Carcase Microbiological Monitoring Program, MHA 3: Product Monitoring and MHA 3: Process Monitoring and Analysis and summarised in detailed and tailored establishment reports.

As part of the trial, data were collected on 1,730,843 operations on the slaughter floor, 463,130 operations in the boning room (cold only), 529,910 operations in the offal room and 493,455 operations at load-out. The overall conclusion was that although under the MHA 3: Process Monitoring and Analysis system, the monitoring frequency was reduced – primarily for low-risk operations – the relative frequency of detecting deviations increased. The trial did not identify any reasons for why MHA 3: Process Monitoring and Analysis should not be implemented across the Australian meat industry.

Feedback from establishment staff on the trial's performance and ease-of-use has been positive and supportive of industry-wide implementation. Further discussions with the Department of Agriculture, Fisheries and Forestry and the Export Meat Industry Advisory Council will continue to decide rollout and adoption.

2.0 Executive summary

The original intent of the Meat Hygiene Assessment (MHA) system was to assist the Australian meat industry to establish systems that monitor the food production process with regard to its ability to produce safe product. After its inception in 1996, MHA was revised in 2002 to give a second version for both process and product monitoring and over time, the system has expanded and was considered to be cumbersome and onerous in terms of resources and costs. The previous project (AMPC 2024-1004) developed a revised MHA 3: Process Monitoring and Analysis system, which:

- Reverts to the original intention of monitoring the slaughter-dressing-packing-refrigeration-load-out continuum; aspects of overseas programs, livestock handling and animal welfare are omitted for monitoring elsewhere.
- Is risk-based – offering the opportunity for an establishment to identify those stations along the process chain that require more, or less, monitoring.
- Has a single monitoring frequency, set by the establishment in line with risk.
- Records deviations and removes the terms Marginal/Acceptable/Unacceptable.
- Has no scoring system and hence no rating or Conformity Index.
- Reviews deviations to work instructions at individual workstations, Product Monitoring data, ZT findings and microbiological monitoring results weekly.
- Focuses on using monitoring data to improve unit operations, leading to a change in title to MHA 3: Process Monitoring and Analysis.

The objective of this project was to deliver an industry trial to collect data on MHA 3: Process Monitoring and Analysis to assess its performance. The trial was conducted in two phases: “Before” and “After” phases which were from Sep-Nov 2024 and over June-Dec 2025, respectively. Eight export establishments (four beef, three sheep and one pork) contributed data from the National Carcase Microbiological Monitoring Program, MHA 3: Product Monitoring and MHA 3: Process Monitoring and Analysis which were summarised in tailored establishment reports.

Data were collected on 1,730,843 operations on the slaughter floor, 463,130 operations in the boning room (cold only), 529,910 operations in the offal room and 493,455 operations at load-out. The overall conclusion was that the MHA 3: Process Monitoring and Analysis system still identified process deviations, even at the reduced frequency of checking operations and in most cases, the classification into high- and low-risk operations was appropriate and supported by the trial data. In addition, no substantive adverse effects on visual and microbiological monitoring were observed. Thereby, the trial was successful. In addition, feedback from establishment staff on the trial’s performance and ease-of-use has been positive and supportive of industry-wide implementation.

The MHA 3: Process Monitoring and Analysis system offers more focused monitoring while also achieving significant reductions in hours spent monitoring, compared with the MHA 2 system. Over the MHA 3 phase, the eight establishments “saved” a total of approximately 6000 hours (ca. 171 working weeks of 35 hours) in monitoring on the slaughter floor and in the boning and offal rooms for a nominal cost saving of $297,000 (note, we were unable to estimate savings in time spent monitoring loadout).

The estimates are based on various assumptions and, for an individual establishment would depend on their throughput/chain speed, salary costs and risk ratings for the various operations (more low risk operations enable greater savings). There are also savings, not insignificant, for time spent setting up and recording the results of each monitoring foray, though these may be offset to an extent by the requirement for the Analysis component of MHA 3: Process Monitoring and Analysis.

The recommendations are:

1. The MHA 3: Process Monitoring and Analysis system in its current form be implemented industry-wide.
2. The Department of Agriculture, Fisheries and Forestry provide instructions and criteria for establishments to transition to MHA 3: Process Monitoring and Analysis, that is, update the Meat Hygiene Assessment: Process Monitoring (2nd edition) document to Meat Hygiene Assessment 3: Process Monitoring and Analysis.
3. If needed, SARDI could deliver webinars for industry and technical assistance to DAFF in the transition to Meat Hygiene Assessment 3: Process Monitoring and Analysis.

3.0 Introduction

The Australian meat industry has been on a mission to modernise how it monitors its processes, products and microbiological profile. As part of the process, the Australian Meat Processor Corporation (AMPC) commissioned the South Australian Research and Development Institute (SARDI) to conduct a series of reviews and projects to implement new monitoring systems.

- Process Control Monitoring – Is There A Better Way? (AMPC 2017-1068)
- Process Monitoring for the Australian Meat Industry – A Comparative Trial (AMPC 2018-1070)
- Visual Monitoring of Carcase and Carton Meats – A System for the 21st Century (AMPC 2019-1066)
- Meat Hygiene Assessment 3 – An Industry Trial (AMPC 2021-1091)

- Guideline and Manuscript for Meat Hygiene Assessment 3 (Product Monitoring) (V.MFS.0004)
- Review of Meat Hygiene Assessment (Process Monitoring) (AMPC 2024-1004)

AMPC 2024-1004 “Review of Meat Hygiene Assessment (Process Monitoring)” proposed a revised, improved Meat Hygiene Assessment (MHA) system for process monitoring which is risk-based, reverts to the original intention of monitoring the slaughter-dressing-packing-refrigeration-load-out continuum and focuses on using monitoring data to improve unit operations; this has led to a change in title to MHA 3: Process Monitoring and Analysis (MHA 3). The recommendation at the conclusion of AMPC 2024-1004 was for feasibility trials prior to potential industry-wide implementation.

This project delivers an industry trial in which beef, sheep and pork establishments tested the utility of the MHA 3: Process Monitoring and Analysis system by comparing performance indicators with the existing MHA system. The trial generated data to assess the on-plant performance of the MHA 3: Process Monitoring and Analysis system. Outcomes for the industry included a risk-based monitoring system for process, allowing an establishment to focus on food safety together with areas of risk to their business.

4.0 Project objectives

The project objective is to deliver an industry trial which will collect industry data on MHA 3: Process Monitoring and Analysis to assess its performance.

5.0 Methodology

5.1 Participating Establishments

Eight establishments (four beef, three sheep and one pork) participated fully in this industry trial. Four additional establishments (two beef and two pork) were initially included in the trial and contributed “Before” data, but due to circumstances such as imminent closure, lack of Quality Assurance staff and company delays which impacted the start of the trial and data delivery, these establishments did not participate in the After phase. Only establishments which participated during both phases are included in this report.

5.2 Establishment Visits and Discussions

In preparation for the After phase of the trial, five establishments were visited in-person by Andreas Kiermeier and John Sumner in the week of 7 April 2025. The remaining establishments had individual meetings and teleconferences with the SARDI team to go through their Before phase data and documentation. The discussion during these meetings covered an assessment with company Quality Assurance staff of the establishment’s performance at each of the four locations (slaughter, boning, offal and loadout) over the 3-month period and the results of the monitoring of processes, products and microbiological quality of the products. All establishments were impressed not only by the copious amounts of process monitoring they had completed (almost up to 500,000 observations in some cases), but also by the way it was laid out in the Excel spreadsheet and establishment reports, showing exactly where they were most likely to identify problems. This approach assisted them in making decisions on how to allocate High-risk and Low-risk processes, plus the frequency of monitoring at each location. After the evaluation of MHA 2: Process Monitoring, the manufacture of carcases, carton meat and offal was assessed through MHA 3: Product Monitoring, before the evaluation of the microbiological profile of carcases and carton meat. The changes between MHA 2 and MHA 3: Process Monitoring and Analysis, what the staff needed to

complete stage-by-stage and the emphasis on weekly data analysis and discussions with the On-Plant Veterinarian (OPV) were also covered.

5.3 How-To Guide

A 'How-To' Guide for Meat Hygiene Assessment 3: Process Monitoring and Analysis was developed and distributed to all trial establishments (Appendix 1, Section 7.1) during the establishment meetings (see above). The 'How-To' Guide highlighted the key changes to monitoring under MHA 3, outlined what establishments needed to do to amend their Approved Arrangement and provided a suggested reporting format for the weekly meeting with the OPV.

5.4 Collection and Reporting of Establishment Data

The trial was conducted in two phases, a "Before" phase using MHA 2: Process Monitoring, which ran from September-November 2024 and an "After" phase in which establishments monitored operations using MHA 3: Process Monitoring and Analysis for a minimum of 3 months from June to December 2025; some establishments sent up to 5 months of data.

Each establishment developed a stand-alone Approved Arrangement (AA) for the After phase of the trial, which included the risk assessment of the process operations; the AAs were approved by Jason Ollington, DAFF, before the commencement of the trial.

Establishments submitted MHA 3 data to SARDI in various formats – Excel spreadsheets, PDF files and iLeader forms; SARDI collated the following data in individual establishment spreadsheets:

- National Carcase Microbiological Monitoring Program results
- Meat Hygiene Assessment 3: Product Monitoring
- Meat Hygiene Assessment 3: Process Monitoring and Analysis

The results of the Before and After phases were summarised in establishment reports – an example is given in Appendix 2, Section 7.2.

5.5 Data Analysis

All data manipulations and analyses were performed using the open-source software program R (version 4.5).

5.6 Export Meat Industry Advisory Council reporting

A paper was submitted to the Export Meat Industry Advisory Council – Food Safety and Animal Health Subcommittee by AMPC for consideration at the next meeting.

6.0 Results and Discussion

Using the Before data, each establishment was provided with a summary report of their microbiological and visual product monitoring results, as well as a summary of the number of deviations by operation. Together with other considerations related to process knowledge, customer expectations and complaints, etc. this

allowed establishments to determine which operations were to be considered high-risk (HR) – usually related to many deviations from work instructions being recorded – and which were to be considered low-risk (LR). In addition, establishments took the opportunity to review all their operations being monitored and this resulted in some operations being combined while other were divided into multiple operations. Subsequently, operations were classified as LR or HR for the Before phase and aligned with analogous operations during the After phase.

Since each establishment has a unique AA based on its decisions as to which operations are LR and HR, plus their frequency and intensity of monitoring, the results shown below should be interpreted only on an establishment basis, rather than on a comparative, across-industry basis.

That said, a generalised finding is that establishments elected to monitor HR operations at a similar frequency and intensity in both phases (i.e. similar to existing MHA 2 monitoring frequencies) and were able to reduce significantly the number of observations for LR processes.

It should be noted that within-establishment interpretations may be confounded to an extent because of:

- Possible seasonal effects - MHA 2 monitoring was undertaken in Spring 2024, whereas MHA 3 monitoring was mainly in Winter 2025;
- Possible livestock effects e.g. the ratio of sheep:lamb slaughter volumes for each phase, stock origins, etc.;
- Changes in workforce, including number of shifts worked per day;
- Processes undertaken unsatisfactorily in MHA 3 are all judged equally as “Deviations” while unsatisfactory MHA 2 processes, judged as unequal “Marginal” or “Unacceptable” criteria, are for the purposes of this report conflated as Deviations.

Furthermore, differences in observed numbers between Before (MHA 2) and After (MHA 3) results are due to a range of reasons, including:

- Length of trial period, as some establishments contributed (many) more days during the After phase than during the Before phase;
- Operational requirements e.g. one versus two shifts operating;
- Changes in operations e.g. one operation being split into two operations or multiple operations being combined into a single operation;
- Changes in monitoring frequency especially for LR operations.

In the following sections, the results for the slaughter floor, boning room, offal room and load out processes are presented. For each, a summary of the process under MHA 2 and MHA 3 is presented by establishment. This is followed by a summary of visual (using MHA 3 Product Monitoring) and microbiological results; visual results include only high-risk products which tend to incur the largest number of defects. Note that hot-boning related results and processes are excluded for the purpose of this report to maintain establishment anonymity – the full set of results has been provided to Jason Ollington (DAFF) for evaluation.

6.1 Slaughter floor

A summary of the slaughter floor process monitoring results by establishment is shown in Table 1, followed by visual monitoring results in Table 2 and microbiological carcase monitoring results in Table 3. Across all establishments, 1,730,843 operations were monitored during the trial – 1,377,910 Before and 352,933 After. Despite the almost 75% reduction in monitoring frequency (noting the above-mentioned reasons for changes in monitoring frequency), the relative frequency of detecting deviations was more than three times

higher After than Before – 0.15% (2134 deviations) versus 0.49% (1731deviations). In fact, deviations were detected relatively more frequently in all but two establishments: Beef 2 LR operations and Sheep 2 HR operations. However, any differences between MHA 2 and MHA 3 observations should not be considered causative due to the potential confounding factors listed above. These results are supplemented by the visual monitoring results in Table 2, which indicate that detection of ZTs and average defect scores differed little between the two phases. Microbiological monitoring results (Table 3) showed some variability between the Before and After phase, especially in relation to *E. coli* prevalence, though few results exceeded the species-specific microbiological limits (m and M); on average, Total Viable Counts remained consistent between the two phases.

Table 1: Summary of slaughter floor process monitoring observations and deviations

			Before = MHA2			After = MHA3		
Species	**Establishment**	**Operations Risk**	**Observed**	**Deviations**	**Percentage**	**Observed**	**Deviations**	**Percentage**
Beef	1	High	24780	49	0.20	18430	74	0.40
		Low	21240	6	0.03	1843	22	1.19
	2	High	50500	129	0.26	30500	243	0.80
		Low	113120	53	0.05	11760	18	0.15
	3	High	30240	59	0.20	10800	59	0.55
		Low	59360	67	0.11	5200	3	0.06
	4	High	122880	422	0.34	90200	373	0.41
		Low	120320	88	0.07	33000	25	0.08
Sheep	1	High	147960	89	0.06	30510	85	0.28
		Low	290440	85	0.03	14280	15	0.11
	2	High	30360	104	0.34	14490	40	0.28
		Low	81420	57	0.07	16640	15	0.09
	3	High	35360	353	1.00	28800	546	1.90
		Low	220320	474	0.22	21280	148	0.70
Pork	1	High	17640	39	0.22	22400	60	0.50
		Low	11970	60	0.50	2800	5	0.18

Table 2: Summary of slaughter floor carcase product monitoring results (MHA 3)

		Before					After				
Species*	**Establishment**	**n**	**ZTs**	**Defects**	**Ave. Score**	**Max. Score**	**n**	**ZTs**	**Defects**	**Ave. Score**	**Max. Score**
Beef	1	3124	1	91	0.03	0.06	5252	0	179	0.03	0.10
	2	3350	0	240	0.07	0.18	5300	0	331	0.06	0.12
	3	1822	3	279	0.15	0.22	1920	5	268	0.14	0.25
	4	1680	0	39	0.01	0.02	8360	0	58	0.01	0.04
Sheep	1	43440	2	3807	0.09	0.17	33984	4	3017	0.09	0.21
L	2	2070	2	21	0.01	0.07	1990	1	13	0.01	0.05
M		8170	15	201	0.03	0.20	6540	14	152	0.03	0.20
	3	19610	4	2649	0.14	0.20	18300	5	2281	0.12	0.17
Pork	1	8580	5	317	0.04	0.20	11300	0	624	0.06	0.16

* L = lambs, M = mutton

Table 3: Summary of cold-swabbed carcase microbiological monitoring results

		Before					After				
			E. coli	**TVC**				***E. coli***	**TVC**		
Species*	**Establishment**	**n**	**(%)**	**>m**	**>M**	**Average (log_{10} cfu/cm^2)**	**n**	**(%)**	**>m**	**>M**	**Average (log_{10} cfu/cm^2)**
Beef	1	96	0.0	2	0	1.01	159	1.89	11	0	1.28
C/B	2	189	0.0	8	5	0.98	168	2.98	4	1	1.04
S/H		336	0.30	17	1	0.75	320	1.25	13	1	0.82
C/B	3	15	0.0	0	0	1.23	12	0.0	0	0	1.02
S/H		67	1.49	1	0	1.12	48	0.0	0	0	1.02
	4	298	0.0	0	0	1.18	314	0.0	1	1	1.18
Sheep L	1	829	11.94	0	0	0.80	602	5.32	0	0	0.62
M		94	17.02	0	0	0.82	25	20.00	0	0	0.81
L	2	86	18.60	5	0	1.60	72	41.67	8	0	1.91
M		328	69.82	3	0	1.64	218	68.70	23	0	1.93
L	3	154	26.62	0	0	1.51	197	24.37	0	0	1.45
M		72	41.67	0	0	1.85	24	58.33	0	0	1.69
Pork	1	196	6.63	0	0	0.87	246	10.98	0	0	0.74

* C/B = Cow/Bull; S/H = Steer/Heifer; L = lamb; M = mutton

6.2 Boning Room (Cold only)

A summary of boning room process (cold-boning only) monitoring results by establishment is shown in Table 4, followed by visual monitoring results in Table 5 (pre-trim carcases; not provided by all establishments) and Table 6 (carton product) and microbiological carton monitoring results in Table 7. Across all establishments, 463,130 operations were monitored during the trial – 316,640 Before and 146,490 After. Similar to the slaughter floor findings, the monitoring frequency (noting the above-mentioned reasons for changes in monitoring frequency) was reduced by about 50%, yet the relative frequency of detecting deviations was about 50% higher during the After phase compared with Before: 0.48% (1534 deviations) *versus* 0.73% (1070 deviations). Deviations were detected relatively more frequently in 10 out of the 16 establishment-by-operational risk combinations. Again, any differences between MHA 2 and MHA 3 should not be considered causative due to the potential confounding factors listed previously.

These results are supplemented by the visual monitoring results in Table 5 (pre-trim carcases) and Table 6 (carton product), which indicate that detection of ZTs remained low (except Sheep Establishment 2 for mutton) and that the average defect scores differed little between the two phases. Similarly, carton product monitoring results were broadly comparable between the two trial phases, though Beef Establishment 2 had more occurrences of unacceptable carton products during the later phase. Microbiological monitoring results (Table 7) again showed some variability between the Before and After phase in relation to *E. coli* prevalence in carton meat (where tested), though much less than for carcases; on average, Total Viable Counts were consistent between the two phases.

Table 4: Summary of boning room (cold) process monitoring data

			Before = MHA2			After = MHA3		
Species	**Establishment**	**Operations Risk**	**Observed**	**Deviations**	**Percentage**	**Observed**	**Deviations**	**Percentage**
Beef	1	High	6960	72	1.03	5820	36	0.62
		Low	35960	5	0.01	2910	17	0.58
	2	High	16050	49	0.31	20250	172	0.85
		Low	33170	235	0.71	8400	42	0.50
	3	High	6480	49	0.76	4320	36	0.83
		Low	17820	83	0.47	3300	26	0.79
	4	High	24320	223	0.92	17680	183	1.04
		Low	34560	63	0.18	9360	34	0.36
Sheep	1	High	9240	61	0.66	10260	35	0.34
		Low	29040	112	0.39	4200	18	0.43
	2	High	13800	46	0.33	6500	91	1.40
		Low	30360	31	0.10	5130	23	0.45
	3	High	15360	219	1.43	27120	234	0.86
		Low	20480	114	0.56	8840	58	0.66
Pork	1	High	10240	115	1.12	9280	54	0.58
		Low	12800	57	0.45	3120	11	0.35

Table 5: Summary of (cold) boning room pre-trim carcase monitoring results (MHA 3) where reported.

		Before					After				
Species	**Establishment**	**n**	**ZTs**	**Defects**	**Ave. Score**	**Max. Score**	**n**	**ZTs**	**Defects**	**Ave. Score**	**Max. Score**
Beef	1										
	2	6290	0	183	0.03	0.10	6720	0	144	0.02	0.07
	3										
	4	3850	0	23	0.01	0.05	4000	0	26	0.01	0.05
Sheep	1	5490	0	328	0.06	0.10	4440	1	220	0.05	0.10
	2	2740	1	1	0.0	0.03	2040	12	1	0.0	0.03
	3										
Pork	1	1890	1	62	0.03	0.07	2200	0	98	0.04	0.10

Table 6: Summary of high-risk combined (cold) carton meat product monitoring results (MHA 3)

		Before				After			
Species	**Establishment**	**n**	**ZTs**	**Defects**	**Unacceptable***	**n**	**ZTs**	**Defects**	**Unacceptable***
Beef	1	514	0	1	0	868	0	4	0
	2	2299	5	48	10	2685	6	88	17
	3	493	0	0	0	496	1	0	0
	4	2962	0	0	0	3300	0	0	0
Sheep	1	3124	2	147	9	2371	0	123	1
	2	9361	18	18	2	9793	4	0	0
	3	1433	0	1	0	1836	0	0	0
Pork	1	641	0	5	1	778	0	1	0

* Unacceptable numbers include only shifts when the defect score exceeds the limit and does not include ZT detections, which are automatically unacceptable.

Table 7: Summary of cold carton microbiological monitoring data

		Before			After		
Species	**Establishment**	**n**	***E. coli* (%)***	**TVC (log_{10} cfu/cm^2)**	**n**	***E. coli* (%)**	**TVC (log_{10} cfu/cm^2)**
Beef	1	99		2.74	162		3.02
	2	548	1.64	2.59	548	0.0	2.61
C/B	3	13	0.0	2.81	10	0.0	3.06
S/H		67	5.97	2.90	47	0.0	3.00
	4	302	1.32	2.35	315	1.90	2.17
Sheep	1	719		2.14	557		2.19
	2	415		2.28	292		1.92
	3	62		2.29	99		1.93
Pork	1	84	1.19	2.11	103	2.91	2.49

*not all establishments test for *E. coli*

6.3 Offal Room

A summary of the offal process monitoring results by establishment is shown in Table 8, followed by visual monitoring results in Table 9; there are no microbiological monitoring results for offal. Across all establishments, 529,910 operations were monitored during the trial – 395,790 Before and 134,120 After. As for other processes, a 66% reduction in monitoring frequency (noting the above-mentioned reasons for changes in monitoring frequency) was observed, though the relative frequency of detecting deviations was more than double during the After phase compared with Before: 0.24% (933 deviations) *versus* 0.56% (757 deviations). In fact, deviations were detected relatively more frequently at all but three establishments – Beef 2 LR, Beef 3 HR and Pork 1 HR operations. However, any differences between MHA 2 and MHA 3 should not be considered causative due to the potential confounding factors listed above. These results are supplemented by the visual monitoring results in Table 9, which indicate that detection of ZTs were very rare for offal and the average defect scores differed little between the two phases.

Table 8: Summary of offal process monitoring data

			Before = MHA2			After = MHA3		
Species	Establishment	Operations Risk	Observed	Deviations	Percentage	Observed	Deviations	Percentage
Beef	1	High	3540	0	0.00	5820	3	0.05
		Low	44840	9	0.02	3492	23	0.66
	2	High	13260	61	0.46	14400	94	0.65
		Low	35700	99	0.65	9600	46	0.48
	3	High	5940	33	0.56	4290	22	0.51
		Low	21060	20	0.09	3900	21	0.54
	4	High	19200	123	0.64	1378	118	0.86
		Low	24320	136	0.56	6360	38	0.60
Sheep	1	High	17680	10	0.06	15820	20	0.13
		Low	28560	35	0.12	3920	5	0.13
	2	High	4140	5	0.12	3780	9	0.24
		Low	26220	7	0.03	11400	6	0.05
	3	High	30360	67	0.22	18880	207	1.10
		Low	102120	203	0.20	11200	48	0.43
Pork	1	High	14950	110	0.74	18720	88	0.47
		Low	3900	15	0.38	1160	9	0.78

Table 9: Summary of high-risk (combined) offal product monitoring data (MHA 3)

		Before				After			
Species	Establishment	n	ZTs	Defects	Ave. Score	n	ZTs	Defects	Ave. Score
Beef	1	4615	0	20	0.005	6844	2	24	0.004
	2	8480	0	0	0	8988	0	0	0
	3	3300	0	86	0.026	3660	0	75	0.020
	4	32172	0	20	0.001	39732	0	32	0.001
Sheep	1	11640	1	10	0.001	9972	0	17	0.002
	2	3168	0	0	0	2514	0	0	0
	3	19128	0	708	0.036	19116	0	671	0.032
Pork	1*	4228	0	12	0.003	206	0	0	0

* This establishment has no high-risk offal and hence results are for low-risk offal.

6.4 Load out

A summary of the loadout process monitoring results by establishment is shown in Table 10; no visual or microbiological monitoring data exist for the loadout process. Across all establishments, 493,455 operations were monitored during the trial – 359,230 Before and 134,225 After. Similar to other processes, the monitoring frequency (noting the above-mentioned reasons for changes in monitoring frequency) was reduced by about 60%, yet the relative frequency of detecting deviations almost doubled between the Before and After phases: 0.26% (944 deviations) *versus* 0.46% (611 deviations). Deviations were detected relatively more frequently in 12 out of the 16 establishment-by-operational risk combinations. Again, any differences between MHA 2 and MHA 3 should not be considered causative due to the potential confounding factors listed above.

Table 10: Summary of loadout process monitoring data

			Before = MHA 2			After = MHA 3		
Species	**Establishment**	**Operations Risk**	**Observed**	**Deviations**	**Percentage**	**Observed**	**Deviations**	**Percentage**
Beef	1	High	4560	51	1.12	2140	60	2.80
		Low	63840	69	0.11	2625	25	0.95
	2	High	13080	15	0.11	15600	18	0.12
		Low	49050	10	0.02	11600	0	0.00
	3	High	6600	6	0.09	4730	17	0.36
		Low	25800	38	0.15	4300	16	0.37
	4	High	53760	140	0.26	35560	140	0.39
		Low						
Sheep	1	High	10670	7	0.07	7440	10	0.13
		Low	12610	11	0.09	1520	1	0.07
	2	High	20700	132	0.64	9750	109	1.12
		Low	34500	200	0.58	7250	48	0.66
	3	High	15180	81	0.53	10890	40	0.37
		Low	38640	119	0.31	4760	52	1.09
Pork	1	High	7680	46	0.60	13140	38	0.29
		Low	2560	19	0.74	2920	37	1.27

6.5 Establishment Feedback

At the conclusion of the After phase, establishment staff provided the following feedback on the trial of the MHA 3: Process Monitoring and Analysis system.

- *"They all felt that MHA3 is better (and easier for them). It does reduce the time spent on low-risk areas which means they can then focus on high-risk areas where most of our issues are.*

  There is a bit more involved in the entering of data so that the OPV can have a snapshot of our findings but we are working on a more efficient way to document findings for management review so hopefully that time will reduce early in the new year."

- "*The MHA 3 process has been working well I believe. We are looking at reviewing some of the areas where defects are being identified to see if we can improve the process, add additional workers or amend the WI to match what action is actually being undertaken.*

  I don't think that we have noted any increase in micro or ZT compared to previous MHA process. The trial method is also taking less time for the operators to undertake the checks and gives more time to supervise."

- "*The MHA 3 trial is definitely easier; I'm still adjusting because its different then what I have done for the last 20 years. I feel you still get the same outcome but there is less monitoring on certain areas, so that makes it easier."*

- *"The timing of MHA 3 Process aligned with another project to develop forms for use on a Tablet. So thanks to both these projects, we were able to redesign our monitoring forms to be more user-friendly. You can imagine that over the years […], more processes/steps were added to the forms and some were double ups so the forms have been simplified.*
  Rating processes as High and Low has put a better focus on the high food safety issues. Removing the scoring potentially removes the thoughts around exceeding limits. The reporting makes more sense with a focus on the top 5 issues for improvement."

All feedback has been positive and supportive of MHA 3: Process Monitoring and Analysis.

6.6 Benefit to Industry

The MHA 3: Process Monitoring and Analysis system offers more focused monitoring while also achieving significant reductions in hours spent monitoring, compared with the MHA 2 system. An estimate is presented in Table 11 indicating that over the MHA 3 phase, the eight establishments "saved" a total of approximately 6000 hours (ca. 171 working weeks of 35 hours) in monitoring on the slaughter floor and in the boning and offal rooms for a nominal cost saving of $297,000 (note, we were unable to estimate savings in time spent monitoring loadout).

The estimates are based on the assumptions which sit below Table 11 and, for an individual establishment would depend on their throughput/chain speed, salary costs and risk ratings for the various operations (more low risk operations enable greater savings). Note that faster chain speeds will result in lower savings as the same number of operations can be monitored in less time, while slower chain speed will increase the savings.

There are also savings, not insignificant, for time spent setting up and recording the results of each monitoring foray, though these may be offset to an extent by the requirement for the Analysis component of MHA 3: Process Monitoring and Analysis.

Table 11: Estimated savings for implementation of MHA3: Process Monitoring and Analysis for trial plants

	Hours involved*			
	MHA2	MHA3	"Saved"	Reduced cost ($)**
SF	5710	1916	3794	189,700
BR	1680	716	964	48,200
Offal	1734	548	1186	59,300
Total	9124	3180	5944	297,200

* Assume average chain speed of 2 head/minute cattle, 12 head/minute sheep, 7 head/minute pigs and that these chain speeds are the same across slaughter floor, boning room and offal room.571
** Assume hourly QC Officer cost $50, based on information from two establishments

6 Conclusions / Recommendations

Based on the results discussed above and the feedback from the trial establishments, the overall conclusion was that the MHA 3: Process Monitoring and Analysis system still identified process monitoring deviations, even at the reduced frequency of checking operations and in most cases, the classification into high- and low-risk operations was appropriate and supported by the trial data. In addition, no substantive adverse effects on visual and microbiological monitoring were observed (noting again the presence of confounders). Thereby, the trial was successful.

In addition, assuming an average chain speed of 3 head/minute for cattle, 12 head/minute for sheep and 7 head/minute for pigs, the trial establishments spent a total of 4203 hours monitoring slaughter floor (only) operations during the Before phase, which reduced to 1356 hours during the After phase. This reduction was primarily associated with the reduction in monitoring of low-risk operations (2596 versus 367 hours) while high risk operations (1608 versus 989 hours) also reduced. It should be noted that some reductions were achieved simply from staff reviewing operations in light of operational changes over time and the need to monitor them.

The recommendations are:

1 The MHA 3: Process Monitoring and Analysis system in its current form be implemented industry-wide.
2 The Department of Agriculture, Fisheries and Forestry provide instructions and criteria for establishments to transition to MHA 3: Process Monitoring and Analysis, that is, update the Meat Hygiene Assessment: Process Monitoring (2nd edition) document to Meat Hygiene Assessment 3: Process Monitoring and Analysis.
3 If needed, SARDI could deliver webinars for industry and technical assistance to DAFF in the transition to Meat Hygiene Assessment 3: Process Monitoring and Analysis.

7 Appendices

7.1 Appendix 1 – How-To Guide for Meat Hygiene Assessment – Process Monitoring and Analysis

Meat Hygiene Assessment - Process Monitoring and Analysis (3rd Edition) (MHA 3)

How to amend your Approved Arrangement (AA)

May 2025

AMPC

Government of South Australia
Department of Primary Industries and Regions

SARDI
SOUTH AUSTRALIAN RESEARCH AND DEVELOPMENT INSTITUTE

Contents

Modernisation of the Australian Meat Industry

Over recent years, the South Australian Research and Development Institute (SARDI) has been funded by the Australian Meat Processor Corporation (AMPC) to improve the ways in which the Australian meat industry monitors the microbiological and visual condition of its products.

You recently changed to MHA 3: Product Monitoring, a simplified system for monitoring individual products based on how you assess their risk (High or Low).

A new system for process monitoring entitled “MHA 3: Process Monitoring and Analysis” is being trialled and you need to modify your Approved Arrangement to accommodate a trial scheduled for May, June and July 2025.

Main features of MHA 3 Process Monitoring and Analysis

There are several key changes to the way you will monitor under MHA 3, including the change from recording “defects” to “deviations”, in recognition that the way an operation was performed deviated from the Work Instructions (WI).

Change 1: Only food safety defects are recorded as part of MHA 3

As part of MHA 2, you monitored every operation for which a WI exists, including those that relate to non-food safety aspects, such as legislative, country and animal welfare requirements. The focus of the revised system is on food safety only, though you are free to continue to monitor other aspects that are important to you – except these are no longer part of MHA 3.

Change 2: Classification of each process operation according to risk

Monitoring frequency is now carried out according to the risk rating (see below for details on how to do this) you give to each food safety related process step on the slaughter floor, in the offal and boning rooms and at load out.

Change 3: Reduced/intensified sampling frequency is eliminated

The concept was considered counter-productive and was therefore removed. For each operation, you now must determine the frequency with which you monitor Low and High risk operations.

Change 4: The Marginal category is eliminated

From now on, an operation is rated as either Acceptable, if it is performed as documented in the WI, or as a Deviation, if it is not performed as documented in the WI. You should still record information about the form of the deviation, e.g. “X did not wash hands” or “Y did not sterilise the knife”, as this will allow you to gain a better understanding of the deviations and possible training needs as part of the “Analysis” part of MHA 3.

Change 5: Defect rating calculations

The Conformity Index has been removed – you just record Deviations (including their detail), their location and Corrective Action.

If you wish, you can still trend the number of deviations over time to help identify trends as part of the Analysis.

Change 6: Corrective action

There are requirements for immediate corrective action for a process when a Deviation is recorded.

As part of the Analysis, you may also identify trends that lead to implement additional preventative corrective action, e.g. change staff training.

What you need to do

1. Assess risk of each processing operation

You have sent 3 months of data to SARDI for the “Before trial” period and we have prepared summaries for you to help you with the risk assessment.

Use this information to allocate high- or low-risk status to each operation in each of the four processes (slaughter floor, offal and boning rooms, load out).

In addition to the Before trial data, you should also consider commercial risk and take into account the following factors and how they are influenced by your unit operations in processing:

- Market and customer requirements
- Customer complaints/advice
- Port of entry detections

Once you have identified all your High-risk operations, the remainder automatically go into the Low-risk category. You must be able to justify your decisions on risk and provide supporting data and information. This classification process will be verified by the Department as part of the sign off for your Approved Arrangement, and both Low and High-risk processes may be monitored as part of their verification process.

List the low and high-risk operations to be monitored for each process, i.e. slaughter floor, boning room (both hot and cold), offal room and loadout.

2. Decide on monitoring frequency

Under MHA 2 you observe each operation on 10 occasions at least once a day/shift (depending on slaughter numbers) and you may think it is sensible to continue this frequency for High-risk processes.

You may be able to justify monitoring low-risk processes once a week e.g. if you looked at a process ten times on each day of the Before trial and never recorded a Marginal or Unacceptable.

The decision is yours to make and justify to the Department.

3. Recording

You need to record any deviations in a spreadsheet, or something similar, (e.g. iLeader). Also record other details such as the species; date and time of monitoring; sample size (i.e. how many times the operation was checked); name, position and signature of the person undertaking the check; any corrective action taken and whether a recheck was performed and its outcome. The exact format of how you do this is left to you and you can likely modify your existing MHA forms to accommodate the changes needed.

We suggest you make a simple Excel spreadsheet for use in the After trial. If the trial is successful, and DAFF proceeds to the new MHA format you can then modify your reporting system.

4. MHA 3: Process Monitoring and Analysis reporting format

MHA 3: Process Monitoring and Analysis needs to integrate your data for microbiology, product and process monitoring, ideally on a weekly basis and discussed with your OPV.

You should do a weekly summary for each process that is similar to the following example for the slaughter floor, but the details are ultimately up to you. For the boning room you will need to look at both low and high-risk products and you may want to include the loadout process as well (which only has process information). Similarly, for the offal room you will need to consider low and high-risk offal, microbiology and process information.

Note that an important aspect of the "Analysis" part of MHA 3 is that you learn from what you find and make improvements to your systems as appropriate, i.e. preventative corrective actions. For example, if you find that the same person is repeatedly being found to not wash hands appropriately then this needs to be addressed in some way. Similarly, if you find that different people are "struggling" to wash hands or sterilise knives then you may either need to adjust the chain speed so they have time to follow the WI or look at the WI and see whether they can be changed so people can follow them effectively.

5. Slaughterfloor process monitoring

	Monday	Tuesday	Wednesday	Thursday	Friday
	30/9/24	1/10/24	2/10/24	3/10/24	4/10/24
High risk operation: n = 27					
Deviations	0	0	1	0	1
Low risk operation: n = 6					
Deviations	0	0	0	0	0

Deviation Details

Date/Time	Operation	Staff	Deviation Details	Corrective action
2/10/24 08:32	Y-cut	X	Did not sterilise knife between carcases	Retrained and importance of sterilising emphasised; recheck OK
4/10/24 10:47	Bunging	Y	Did not wash hands properly between carcases	Retrained and importance of personal hygiene noted; recheck OK

6. Carcase MHA monitoring

	Monday	Tuesday	Wednesday	Thursday	Friday
	30/9/24	1/10/24	2/10/24	3/10/24	4/10/24
Defect rating	0.05	0.07	0.01	0.0	0.02
ZT detected	0	0	0	1	0
Conformity?	Yes	Yes	Yes	No	Yes

7. Carcase microbiological monitoring

Total Viable Count and *E. coli* specifications are exactly as you currently operate.

	Monday	Tuesday	Wednesday	Thursday	Friday
Date	30/9/24	1/10/24	2/10/24	3/10/24	4/10/24
TVC	1,000	890; 11,000	2,600	540	3,100
TVC OK?	Yes	Yes	Yes	Yes	Yes
E. coli	Nd	Nd	3	nd	nd
E. coli OK?	Yes	Yes	Yes	Yes	Yes

7.2 Appendix 2 – Example of Establishment Report

Beef - After

A. Kiermeier, J. Jolley, J. Sumner

01 January 2026

1 Background

In preparation for the trial of *Meat Hygiene Assessment 3: Process Monitoring and Analysis*, three months of data were obtained from the plant and summaries of the data are shown below.

2 Micro Summary

2.1 Carcases

A summary of the carcase microbiological results is shown in Table 2.1 below and a time plots of TVC and *E. coli* results are shown in Figures 2.1 and 2.2. All *E. coli* and TVC results met DAFF microbiological limits and no windows were breached for any of the species processed.

Table 2.1: Carcase micro summary; TVC is presented in CFU/cm^2.

Trial	Species	n	E. coli (%)	Coliform (%)	Ave. log TVC	TVC > m	TVC > M	Max. log TVC
Before	Cow/Bull	15	0.00	0.00	1.23	0	0	2.92
	Steer/Heifer	67	1.49	4.48	1.12	1	0	3.08
After	Cow/Bull	12	0.00	0.00	1.02	0	0	2.91
	Steer/Heifer	48	0.00	4.17	1.02	0	0	2.89

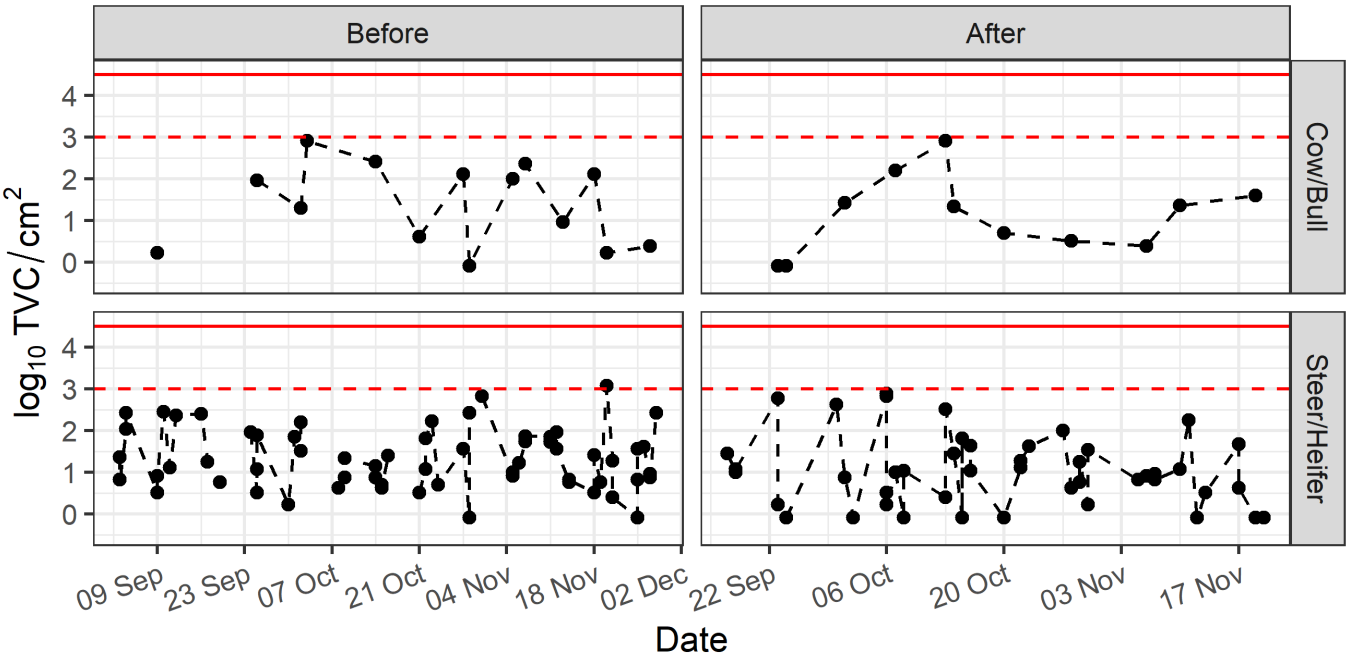

Figure 2.1: Time plot of carcase TVC; red lines indicate limits m (dashed) and M (solid).

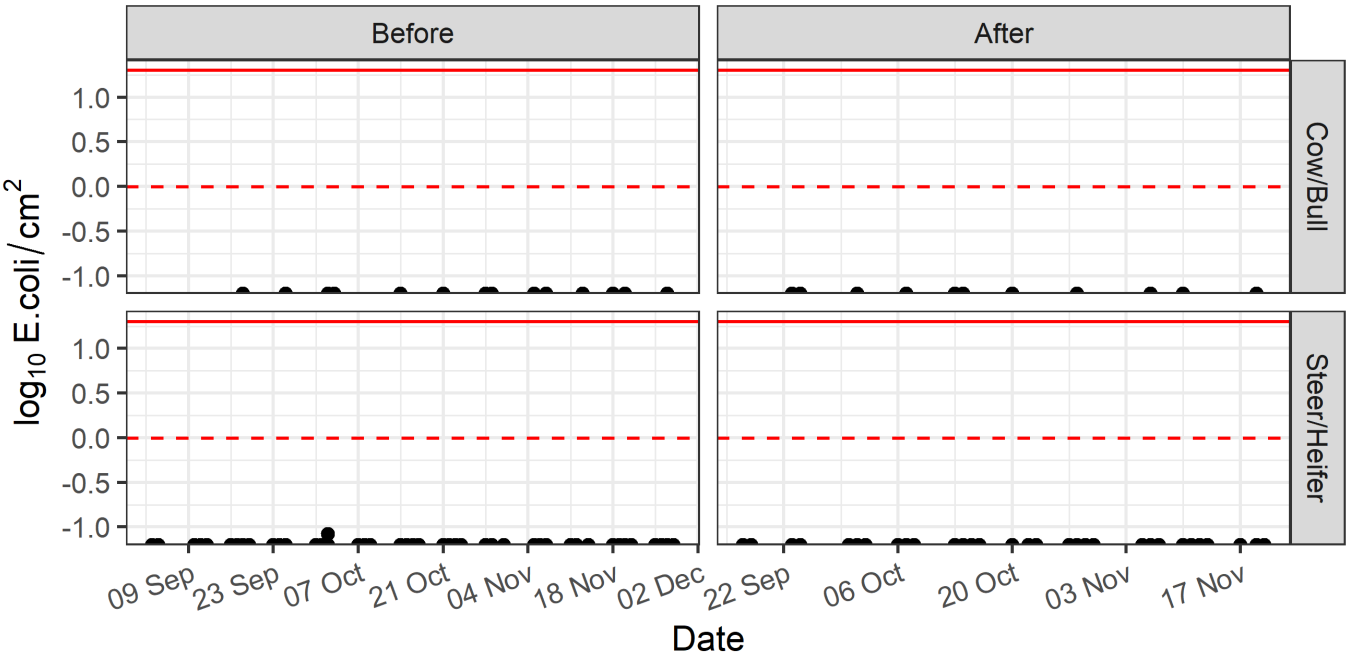

Figure 2.2: Time plot of carcase E. coli; red lines indicate limits m (dashed) and M (solid).

2.2 Cartons

A summary of the carton microbiological results is shown in Table 2.2 below and a time plots of TVC and *E. coli* results are shown in Figures 2.3 and 2.4. There are no specific DAFF microbiological limits for *E. coli* and TVC.

Table 2.2: Carton micro summary; TVC is presented in CFU/g.

Trial	Species	n	E. coli (%)	Coliform (%)	Ave. log TVC	Max. log TVC
Before	Cow/Bull	13	0.00	7.69	2.81	4.18
	Steer/Heifer	67	5.97	10.45	2.90	4.56
After	Cow/Bull	10	0.00	30.00	3.06	3.91
	Steer/Heifer	47	0.00	19.15	3.00	4.30

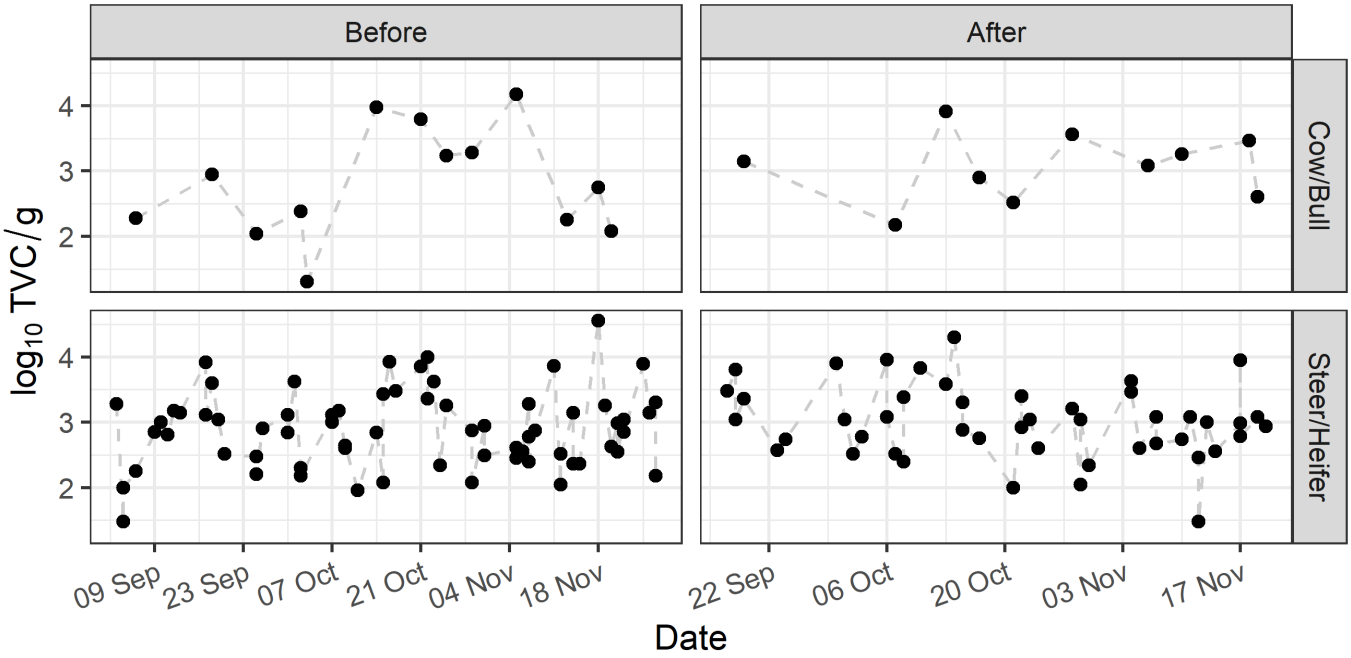

Figure 2.3: Time plot of carton TVC.

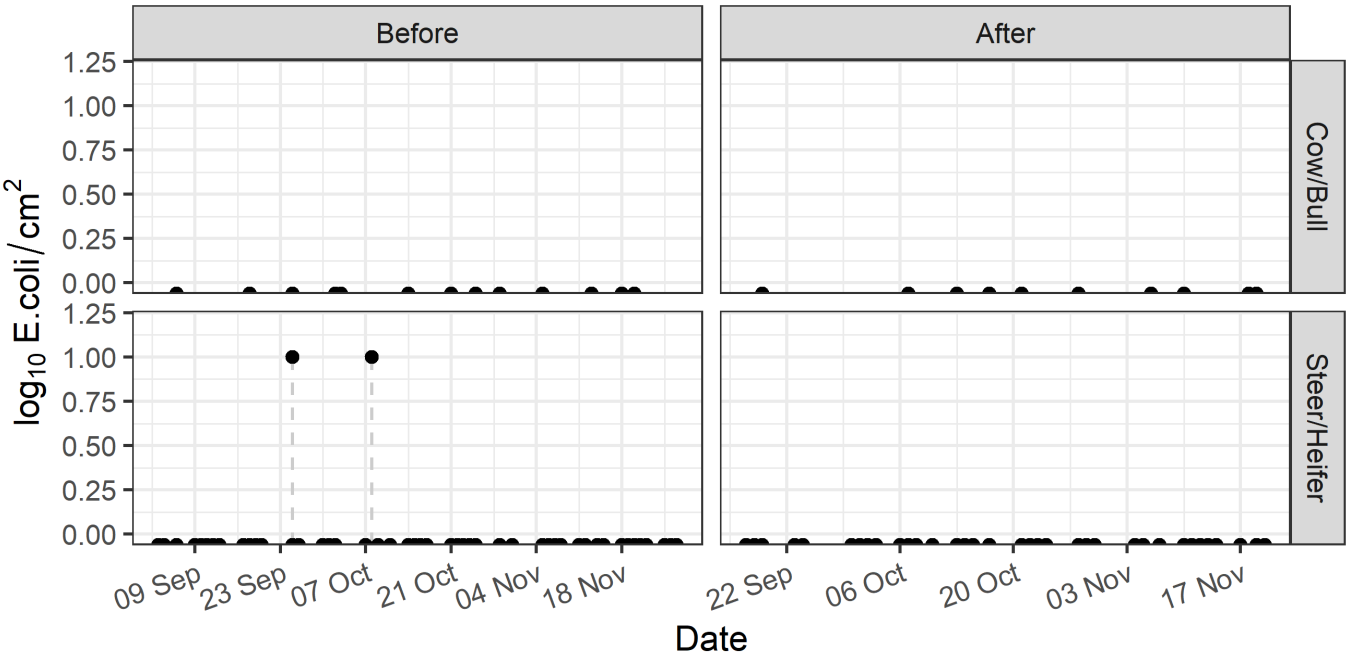

Figure 2.4: Time plot of carton E. coli; red lines indicate limits m (dashed) and M (solid).

3 Product Monitoring Summary

3.1 Carcases

A summary of the total number of defects and of ZTs from carcase MHA monitoring is shown in Table 3.1 below and a time plot of the MHA score is shown in Figure 3.1, where detection of ZTs are indicated by stars. Three ZTs were detected during both trial phases though daily defect scores were always below or equal to the acceptable limit of 0.25.

Table 3.1: Carcase MHA summary.

Trial	N	ZTs	Total Defects	Ave Daily Score	Max Daily Score
Before	1822	3	279	0.15	0.22
After	1920	5	268	0.14	0.25

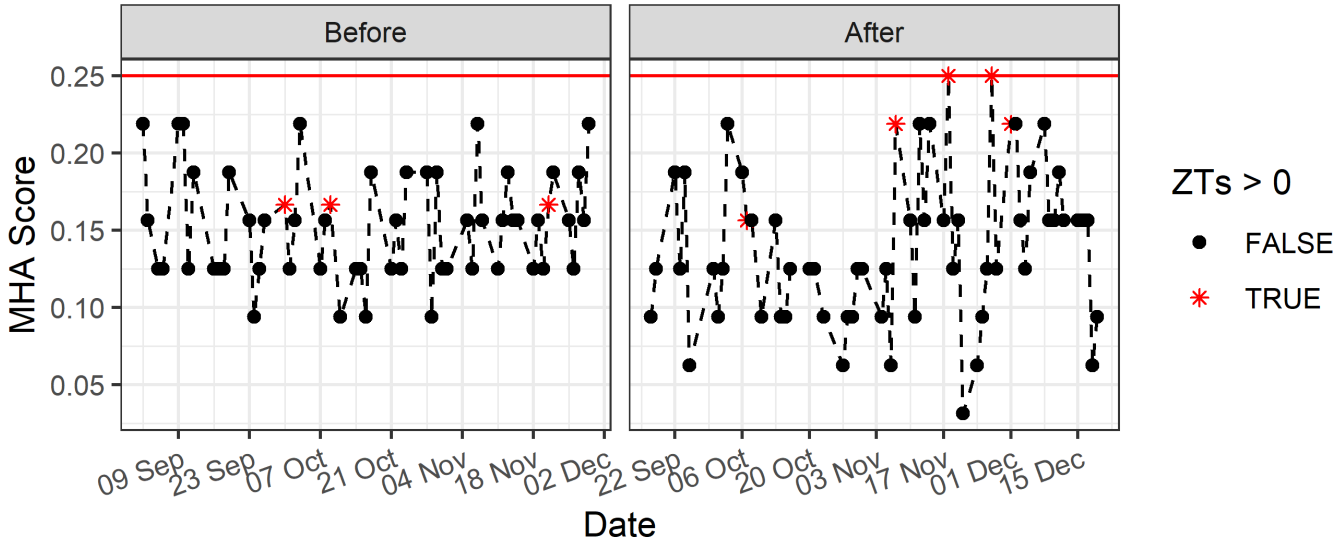

Figure 3.1: Time plot of carcase MHA score; stars indicate detection of ZTs and the red line indicates the unacceptable limit.

3.2 Boning room pre-trim

A summary of the total number of defects and of ZTs from carcase MHA monitoring at pre-trim is shown in Table 3.2 below and a time plot of the MHA score is shown in Figure 3.2, where detection of ZTs are indicated by stars. No ZTs were detected and defect scores never exceeded the acceptable limit.

Table 3.2: Carcase MHA summary.

Trial	N	ZTs	Total Defects	Ave Daily Score	Max Daily Score
Before	2160	0	181	0.08	0.1
After	2440	0	126	0.05	0.1

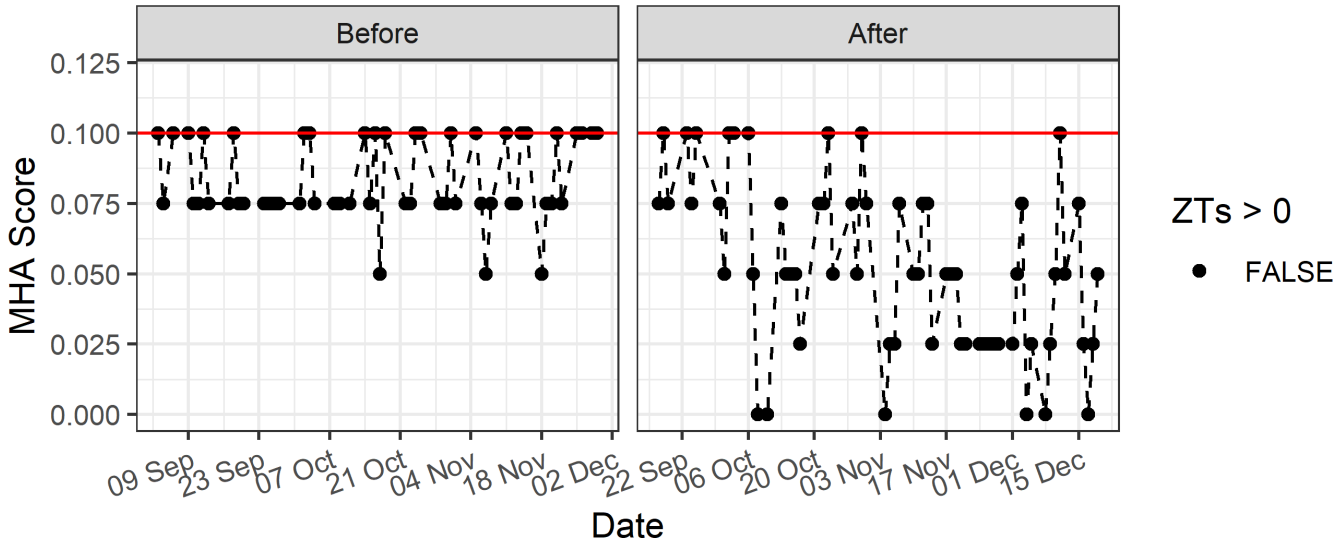

Figure 3.2: Time plot of carcase MHA score; stars indicate detection of ZTs and the red line indicates the unacceptable limit.

3.3 Carton Meat

A summary of the total number of defects and of ZTs from high and low risk product MHA monitoring is shown in Table 3.3 below and a time plot of the number of defects for each product risk category is shown in Figure 3.3, where detection of ZTs are indicated by stars. No ZTs nor any other defects were detected on any product.

Table 3.3: High and low risk product MHA summary.

Risk	Product Type	Trial	n	ZTs	Total Defects	Max Shift Defects	Unacceptable
High	TRMG	Before	493	0	0	0	0
		After	496	1	0	0	0
Low		Before	493	0	0	0	0
		After	493	0	0	0	0

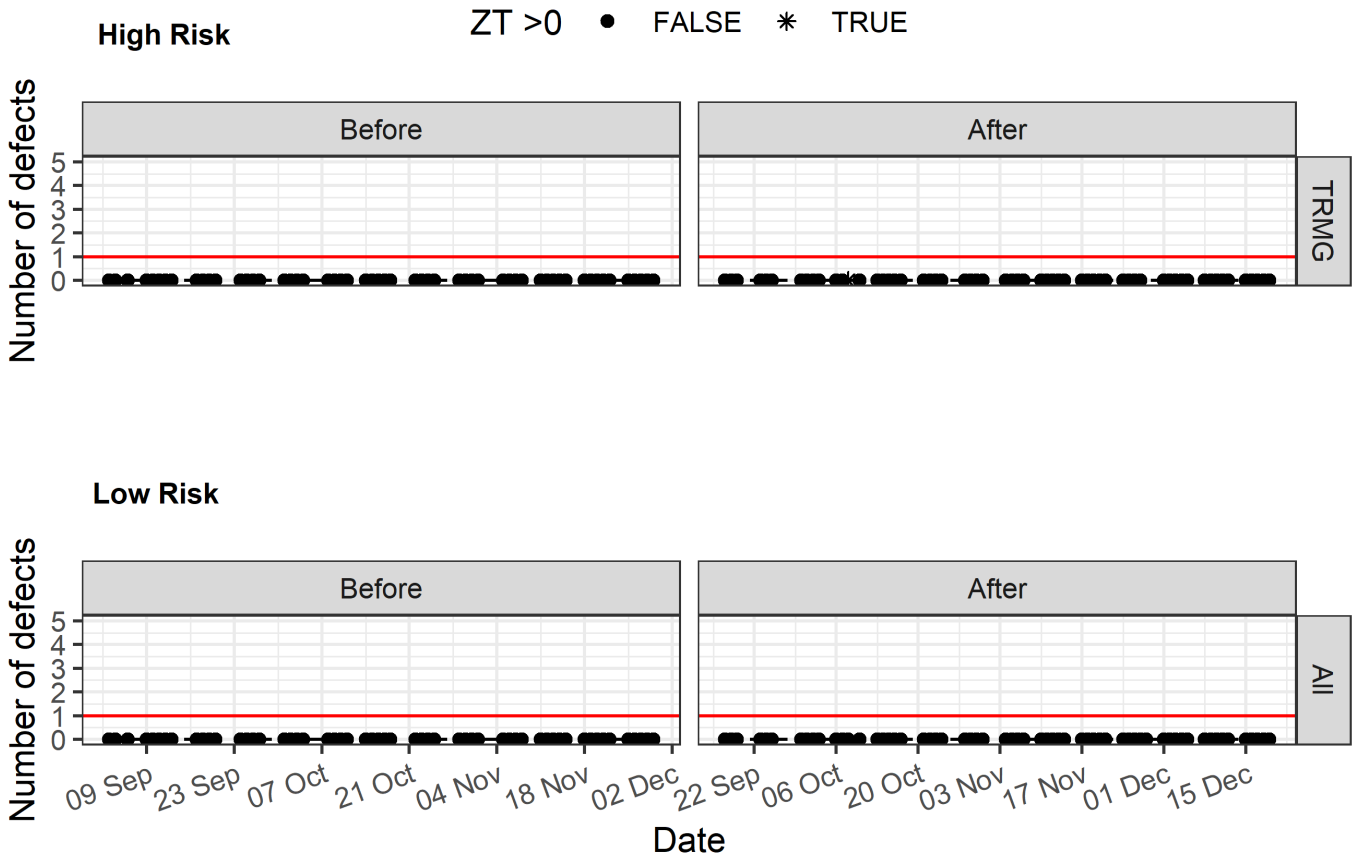

Figure 3.3: Time plot of daily defects for high and low risk carton products; stars indicate detection of ZTs and the red line indicates the unacceptable limit.

3.4 Offal

A summary of the total number of defects and ZTs from high and low risk offal MHA monitoring is shown in Table 3.4 below and a time plot of the offal defect rating for the low risk category is shown in Figure 3.4, where detection of ZTs are indicated by stars. No ZTs nor defects were detected in any of the offal products. While several defects were detected the acceptable limit was never exceeded.

Table 3.4: High and low risk offal MHA summary.

Risk	Product Type	Trial	n	ZTs	Total Defects	Ave Shift Score	Max Shift Score
High	Cheeks	Before	660	0	12	0.018	0.083
		After	732	0	16	0.022	0.083
	Head Meat	Before	660	0	14	0.021	0.083
		After	732	0	5	0.007	0.083
	Lips	Before	660	0	47	0.071	0.083
		After	732	0	36	0.049	0.083

Table 3.4: High and low risk offal MHA summary.

Risk	Product Type	Trial	n	ZTs	Total Defects	Ave Shift Score	Max Shift Score
	Tails	Before	660	0	3	0.005	0.083
		After	732	0	7	0.010	0.083
	Tongue Root	Before	660	0	10	0.015	0.083
		After	732	0	11	0.015	0.083
Low		Before	660	0	13	0.020	0.083
		After	732	0	2	0.003	0.083

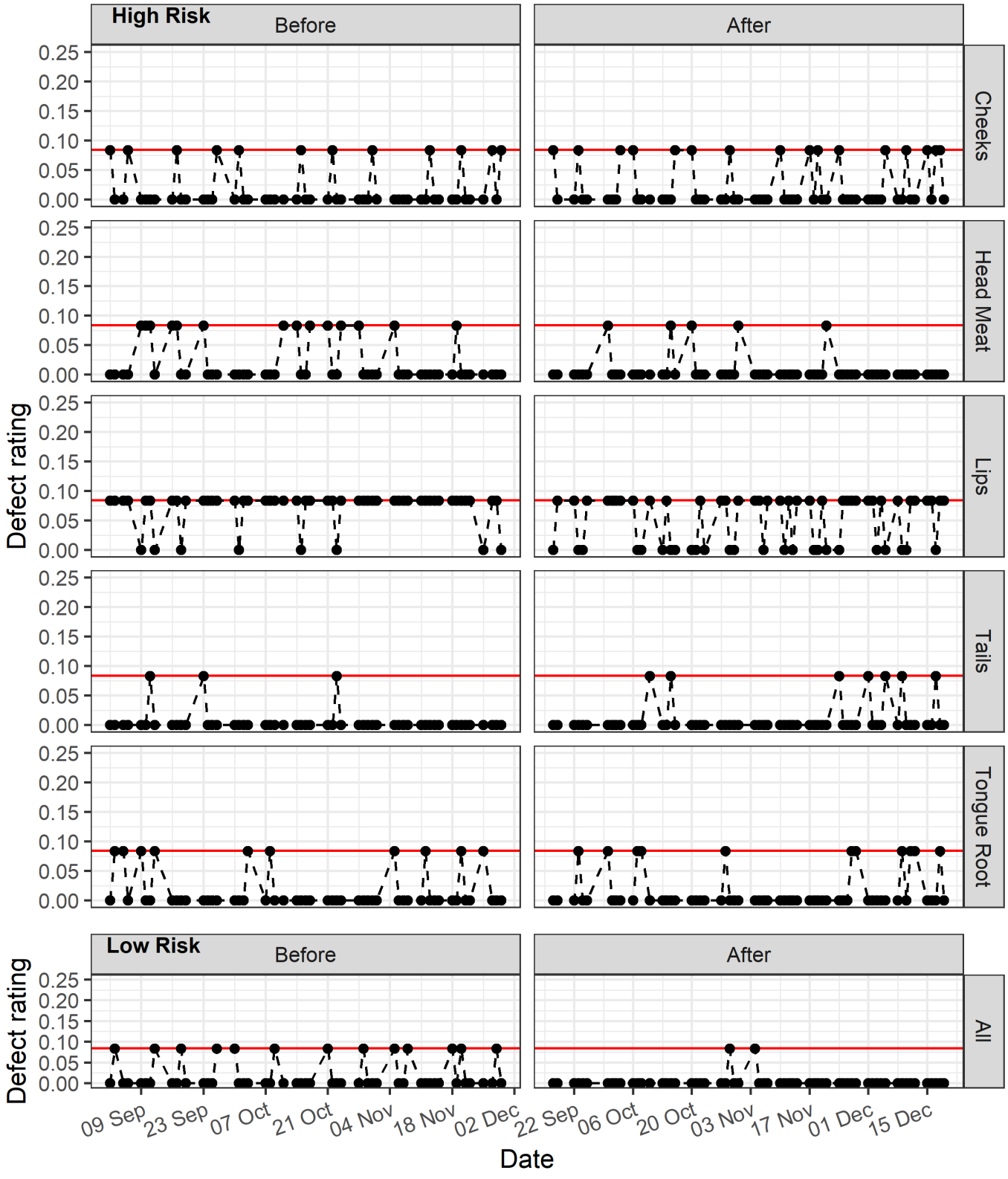

Figure 3.4: Time plot of daily defects for high and low risk offal; stars indicate detection of ZTs and the red line indicates the unacceptable limit.

4 Process Monitoring

Below are given summaries for the process monitoring of all but the livestock area. These summaries are presented to help assess the risk (of non-compliance with work instructions) of different operations. This risk assessment underpins the selection of operations to monitor as part of the trial.

4.1 Slaughterfloor

During the before phase of the trial, as part of MHA2, each operation was monitored twice per shift (10 repetitions per operation). These data were utilised, along with other relevant criteria, to identify 27 high-risk operations. For the “after” phase these operations were monitored once per shift (10 repetitions per operation), while low-risk operations were monitored once per week per shift (10 repetitions per operation).

A summary of the number of checks performed, number of deviations detected and percentage of deviations (number of deviations divided by number of checks) is shown in Table 4.1. In this table, each high-risk operation is shown separately, while all low risk operations are combined as “All” at the bottom of the table. These include any operations that were not specifically classified as “High Risk”, i.e. where operations were renamed/changed as a results of the review. Note that for the “Before” results no differentiation is made between marginal and unacceptable results. While fewer checks are performed as part of the trial (“After”), relatively more deviations were recorded.

Table 4.1: Summary of the number of checks and number/percentage of deviations for each high-risk operation and all low-risk operations.

Risk	Operation	Trial	Checks	Deviations	Percent
High Risk	HALAL Cut Function/Stun Stick Interval	Before	1120	2	0.18
		After	400	1	0.25
	Neck Opening and Sticking	Before	1120	0	0.00
		After	400	0	0.00
	Rodding and Weasand Clipping	Before	1120	0	0.00
		After	400	5	1.25
	Bung Skinning	Before	1120	0	0.00
		After	400	0	0.00
	1st Leg Skinning	Before	1120	7	0.62
		After	400	3	0.75
	Change-over (1st & 2nd Leg)	Before	1120	3	0.27
		After	400	3	0.75
	2nd Leg Skinning	Before	1120	1	0.09
		After	400	0	0.00

Table 4.1: Summary of the number of checks and number/percentage of deviations for each high-risk operation and all low-risk operations.

Risk	Operation	Trial	Checks	Deviations	Percent
	Flanking/Brisket Saw	Before	1120	0	0.00
		After	400	1	0.25
	Hide Pulling	Before	1120	0	0.00
		After	400	0	0.00
	Head Removal	Before	1120	3	0.27
		After	400	5	1.25
	Head/Tongue/Nasal Washing	Before	1120	6	0.54
		After	400	4	1.00
	Tongue Dropping/SRM Removal	Before	1120	3	0.27
		After	400	2	0.50
	Bung Cleaning/Bagging/Tying	Before	1120	3	0.27
		After	400	0	0.00
	Fronting Out	Before	1120	2	0.18
		After	400	3	0.75
	Splitting Saw	Before	1120	1	0.09
		After	400	0	0.00
	Retain Rail Trimming/Condemn Disposal	Before	1120	0	0.00
		After	400	0	0.00
	Hygiene Trim	Before	1120	5	0.45
		After	400	8	2.00
	Spinal Cord Removal & SRM Gear and Equipment ID	Before	1120	2	0.18
		After	400	5	1.25
	SRM Identification & SRM Final Inspection	Before	1120	0	0.00
		After	400	0	0.00
	Personal Hygiene	Before	1120	1	0.09

Table 4.1: Summary of the number of checks and number/percentage of deviations for each high-risk operation and all low-risk operations.

Risk	Operation	Trial	Checks	Deviations	Percent
		After	400	2	0.50
	Operational Sanitation	Before	1120	20	1.79
		After	400	16	4.00
	Condensation	Before	1120	0	0.00
		After	400	0	0.00
	Specified Risk Material Disposal	Before	1120	0	0.00
		After	400	0	0.00
	BSE Exclusion	Before	1120	0	0.00
		After	400	0	0.00
	Hand Wash Water Temperature	Before	1120	0	0.00
		After	400	0	0.00
	Major Break Cleaning Procedures	Before	1120	0	0.00
		After	400	0	0.00
	Maintenance Handover Hygiene Check	Before	1120	0	0.00
		After	400	1	0.25
	Total	**Before**	**30240**	**59**	**0.20**
		After	**10800**	**59**	**0.55**
Low Risk	**All**	**Before**	**59360**	**67**	**0.11**
		After	**5200**	**3**	**0.06**

4.2 Boning room

During the before phase of the trial, as part of MHA2, each operation was monitored once per day (10 repetitions). These data were utilised, along with other relevant criteria, to identify 12 high-risk operations. For the trial these operations were monitored once per day (10 repetitions per operation), while low-risk operations were monitored once per week (10 repetitions per operation).

A summary of the number of checks performed, number of deviations detected and percentage of deviations (number of deviations divided by number of checks) is shown in Table 4.2. In this table, each high-risk operation is shown separately, while all low risk operations are combined as “All” at the bottom of the table. Note that for the “Before” results no differentiation is made between marginal and unacceptable results.

Table 4.2: Summary of the number of checks and number/percentage of deviations for each high-risk operation and all low-risk operations.

Risk	Operation	Trial	Checks	Deviations	Percent
High Risk	Boning Room Temperature	Before	540	0	0.00
		After	360	3	0.83
	BSE Exclusion/Non Ambulatory	Before	540	0	0.00
		After	360	0	0.00
	Internal Product Labelling	Before	540	0	0.00
		After	360	0	0.00
	Dropped Meat Procedure	Before	540	7	1.30
		After	360	12	3.33
	Product Build Up	Before	540	0	0.00
		After	360	0	0.00
	Carry Over Product/Part Cartons/Re-worked Product	Before	540	1	0.19
		After	360	1	0.28
	Loose Items Control	Before	540	9	1.67
		After	360	5	1.39
	Operational Sanitation	Before	540	30	5.56
		After	360	11	3.06
	X-Ray/Metal Detection Procedures	Before	540	0	0.00
		After	360	0	0.00
	Hand Wash Water Temperature	Before	540	0	0.00
		After	360	2	0.56
	Steriliser Temperature	Before	540	0	0.00
		After	360	2	0.56
	Maintenance Handover Hygiene Check	Before	540	2	0.37
		After	360	0	0.00
	Total	**Before**	**6480**	**49**	**0.76**

Table 4.2: Summary of the number of checks and number/percentage of deviations for each high-risk operation and all low-risk operations.

Risk	Operation	Trial	Checks	Deviations	Percent
		After	**4320**	**36**	**0.83**
Low Risk	**All**	**Before**	**17820**	**83**	**0.47**
		After	**3300**	**26**	**0.79**

4.3 Offal

During the before phase of the trial, as part of MHA2, each operation was monitored once per day (10 repetitions). These data were utilised, along with other relevant criteria, to identify 11 high-risk operations. For the trial these operations were monitored once per day (10 repetitions per operation), while low-risk operations were monitored once per week (10 repetitions per operation).

A summary of the number of checks performed, number of deviations detected and percentage of deviations (number of deviations divided by number of checks) is shown in Table 4.3. In this table, each high-risk operation is shown separately, while all low risk operations are combined as “All” at the bottom of the table. Note that for the “Before” results no differentiation is made between marginal and unacceptable results.

Table 4.3: Summary of the number of checks and number/percentage of deviations for each high-risk operation and all low-risk operations.

Risk	Operation	Trial	Checks	Deviations	Percent
High Risk	Offal Trimming/Washing	Before	540	0	0.00
		After	390	2	0.51
	Product Build-up/Flow	Before	540	1	0.19
		After	390	0	0.00
	Cartoned Product-Weighing/Labelling	Before	540	0	0.00
		After	390	0	0.00
	Transfer to Chilling/Freezing - Time/Temp	Before	540	0	0.00
		After	390	0	0.00
	Product Description /Label Check	Before	540	0	0.00
		After	390	0	0.00
	Personal Hygiene	Before	540	1	0.19
		After	390	2	0.51
	Loose Items Control	Before	540	1	0.19

Table 4.3: Summary of the number of checks and number/percentage of deviations for each high-risk operation and all low-risk operations.

Risk	Operation	Trial	Checks	Deviations	Percent
		After	390	11	2.82
	Operational Sanitation	Before	540	30	5.56
		After	390	7	1.79
	China	Before	540	0	0.00
		After	390	0	0.00
	Hand Wash Water Temperature	Before	540	0	0.00
		After	390	0	0.00
	Steriliser Temperature	Before	540	0	0.00
		After	390	0	0.00
	Total	**Before**	**5940**	**33**	**0.56**
		After	**4290**	**22**	**0.51**
Low Risk	**All**	**Before**	**21060**	**20**	**0.09**
		After	**3900**	**21**	**0.54**

4.4 Loadout

During the before phase of the trial, as part of MHA2, each operation was monitored once per day (10 repetitions). These data were utilised, along with other relevant criteria, to identify 11 high-risk operations. For the trial these operations were monitored once per day (10 repetitions per operation), while low-risk operations were monitored once per week (10 repetitions per operation).

A summary of the number of checks performed, number of deviations detected and percentage of deviations (number of deviations divided by number of checks) is shown in Table 4.4. In this table, each high-risk operation is shown separately, while all low risk operations are combined as “All” at the bottom of the table. Note that for the “Before” results no differentiation is made between marginal and unacceptable results.

Table 4.4: Summary of the number of checks and number/percentage of deviations for each high-risk operation and all low-risk operations.

Risk	Operation	Trial	Checks	Deviations	Percent
High Risk	Product Temperatures	Before	600	0	0.00
		After	430	0	0.00
	Carton Damage/Hygiene (Sorting)	Before	600	4	0.67

Table 4.4: Summary of the number of checks and number/percentage of deviations for each high-risk operation and all low-risk operations.

Risk	Operation	Trial	Checks	Deviations	Percent
		After	430	5	1.16
	Pallet Stacking/Racking	Before	600	0	0.00
		After	430	3	0.70
	Label/Trade Description	Before	600	0	0.00
		After	430	2	0.47
	Stamps/ID/Marks	Before	600	2	0.33
		After	430	5	1.16
	Loose Items	Before	600	0	0.00
		After	430	1	0.23
	Repack/Reinspection	Before	600	0	0.00
		After	430	1	0.23
	Container Lot Testing	Before	600	0	0.00
		After	430	0	0.00
	Hand Wash Water Temperature	Before	600	0	0.00
		After	430	0	0.00
	Steriliser Temperatures	Before	600	0	0.00
		After	430	0	0.00
	Security Program	Before	600	0	0.00
		After	430	0	0.00
	Total	**Before**	**6600**	**6**	**0.09**
		After	**4730**	**17**	**0.36**
Low Risk	**All**	**Before**	**25800**	**38**	**0.15**
		After	**4300**	**16**	**0.37**