ACT HEALTH PROTECTION SERVICE

MICROBIOLOGICAL QUALITY OF Pulled Meats

July 2016 - January 2017

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EXECUTIVE SUMMARY

Pulled meats, especially pork, have recently had an increase in popularity and can now be found on many restaurant, cafe and food van menus in the ACT. Commercially, pulled meats are made in large batches that are slow cooked, cooled, shredded and then re-heated at the time of serving. They are then used in products such as burritos, burgers and pizza. Due to the challenges of this type of food preparation, there are multiple steps where bacteria may be introduced and increase to unsafe limits.

The survey was designed to determine the bacteriological status of pulled meats and products containing pulled meats, available in the ACT market, and the compliance of these products to the Food Standards Australia New Zealand (FSANZ) Guidelines for the Microbiological Examination of Ready-to-Eat (RTE) Foods 2001 (FSANZ RTE Guidelines). The survey was conducted between July 2016 and January 2017. During this period ninety six initial samples and thirty one follow-up samples were collected by Health Protection Service (HPS) Public Health Officers (PHOs) across twenty ACT retailers. A questionnaire was also completed at the time of sampling. Samples included both the pulled meat itself as well as pulled meats in their final product, such as a whole burger including salad. Samples were processed by the HPS Microbiology laboratory. All of the samples were tested for the hygiene indicator *E. coli* and the food pathogens; coagulase positive *Staphylococci, C. perfringens, B. cereus, Salmonella* spp. and *L. monocytogenes.* A standard plate count (SPC) was also performed on some samples.

This snap-shot of twenty retailers suggests that the microbiological quality of pulled meats and food products containing them in the ACT is generally good. The questionnaire completed at the time of inspection provided an opportunity to correct unsafe practices occurring at a few establishments.

BACKGROUND

Pulled meats, especially pork, has recently had an increase in popularity and can now be found on many restaurant, cafe and food van menus in the ACT.

Commercially, pulled meats are made in large batches that are slow cooked, cooled, shredded and then re-heated at the time of serving. They are then used in products such as burritos, burgers and pizza.

Due to the challenges of this type of food preparation, there are multiple steps where bacteria may be introduced and rise to unsafe levels including;

- The meat cooling process. As meat is usually cooked in large batches an effort should be made to spread the meat out and cool it quickly in an ice bath or cool room. Small businesses may not have the equipment or space to do this.
- The shredding of meat increases the chance for contamination to occur post cooking.
- Reheating of meat. There is potential of batches being reheated multiple times during service or batches of the reheated meat being held at inappropriate temperatures and durations. Spore forming bacteria such as *B. cereus* and *C. perfringens* can grow to dangerous levels during heating and cooling cycles as the spores are resistant to high temperatures.

Pulled meats were the causative food in a recent foodborne outbreak, in the ACT associated with *Clostridium perfringens,* where 27 people reported ill to the ACT Health Protection Service (HPS). Incorrect temperature control was identified at the premises involved. Overseas, pulled meats have also been the cause of foodborne outbreaks involving *Salmonella, Bacillus cereus* and *Clostridium perfringens*.

This survey set out to determine the bacteriological status of pulled meats and products containing pulled meats available in the ACT market and the compliance of these products to the Food Standards Australia New Zealand (FSANZ) Guidelines for the Microbiological Examination of Ready-to-Eat (RTE) Foods 2001 (FSANZ RTE Guidelines). A questionnaire was also included in the survey to gain information on current food practices related to this food type and to pinpoint areas where more information on safe food practices could be provided.

1 ***Potentially hazardous food*** *means food that has to be kept at certain temperatures to minimise the growth of any pathogenic microorganisms that may be present in the food or to prevent the formation of toxins in the food.*

STANDARDS

The Food Standards Australia New Zealand Food (FSANZ) Ready to Eat (RTE) Guidelines identifies four categories of microbiological quality ranging from satisfactory to potentially hazardous. Table 1 is an extract from the FSANZ RTE Guidelines. Table 1 not only reflects both the high level of microbiological quality that is achievable for RTE foods in Australia and New Zealand but also indicates the level of contamination that is considered to be a significant risk to the public health.

Table 1 Categories of Microbiological Quality from the RTE Guidelines produced by FSANZ

Test	Microbiological Quality (cfu per gram)			
	Satisfactory	**Marginal**	**Unsatisfactory**	**Potentially Hazardous**
Standard Plate Count				
Level 1	$< 10^4$	$< 10^5$	Greater than or equal to 10^5	-
Level 2	$< 10^6$	$< 10^7$	Greater than or equal to 10^7	-
Level 3	NA	NA	NA	-
Indicators				
Escherichia coli (E. coli)	<3	3-100	>100	*
Pathogens				
Coagulase positive *staphylococci (Staph)*	$<10^2$	10^2-10^3	10^3-10^4	$\geq 10^4$ SET +ve
Bacillus cereus (B. cereus)	$<10^2$	10^2-10^3	10^3-10^4	$\geq 10^4$
Clostridium perfringens (C. perfringens)	$<10^2$	10^2-10^3	10^3-10^4	$\geq 10^4$
Salmonella spp.	not detected in 25g			detected
Listeria monocytogenes (L. monocytogenes)	not detected in 25g	detected but $<10^2$ #		$\geq 10^2$ ##

NOTE:
*Pathogenic strains of *E. coli* should be absent.
Foods with a long shelf life stored under refrigeration should have no *L. monocytogenes* detected in 25g.
The detection of *L. monocytogenes* in ready-to-eat-foods prepared specifically for "at risk" population groups (the elderly, immuno-compromised and infants) should also be considered as potentially hazardous.
SET +ve: Staphylococcus enterotoxin positive.
Level 1 – applies to ready-to-eat foods in which all components of the food have been cooked in the manufacturing process/preparation of the final food product and, as such, microbial counts should be low i.e. fried chicken.
Level 2 – applies to ready-to-eat foods which contain some components which have been cooked and then further handled (stored, sliced or mixed) prior to preparation of the final food or where no cooking process has been used i.e. custard slice.
Level 3 – SPC not applicable. This applies to foods such as fresh fruits and vegetables (including salad vegetables), fermented foods and foods incorporating these (such as sandwiches and filled rolls). It would be expected that these foods would have an inherent high SPC because of the normal microbial flora present. An examination of the microbiological quality of a food should not be based on SPC alone. The significance of high (unsatisfactory) SPC cannot truly be made without identifying the predominant microorganisms or other microbiological testing.

SURVEY

This survey was conducted between July 2016 and January 2017. During this period ninety six initial samples and thirty one follow-up samples were collected by Health Protection Service (HPS) Public

Health Officers (PHOs). Twenty ACT retail outlets were chosen randomly for sampling, the samples were processed by the HPS Microbiology laboratory. Samples included both the pulled meat itself as well as pulled meats in their final product, such as a whole burger including salad. All of the samples were tested for the hygiene indicator *E. coli* and the food pathogens; coagulase positive *Staphylococci, C. perfringens, B. cereus, Salmonella* spp. and *L. monocytogenes.* A standard plate count (SPC) was also performed on some samples. SPC testing was not performed on any samples containing salad ingredients as they are Level 3 Foods according to the "Categories of Microbiological Quality from the RTE Guidelines" produced by FSANZ and therefore SPC is not applicable.

The survey collected multiple samples from single outlets and apart from investigative re-samples, outlets were only tested once. A questionnaire was completed by the PHOs at the time of inspection with the staff at the premises. The questionnaire was designed to form part of the inspection and education process and to also correlate its findings with microbiological testing results. Temperatures were taken of the pulled meats, both refrigerated and heated when available.

When the HPS identifies a non-compliance issue in a food business, corrective actions are addressed through a graduated and proportionate response. Unsatisfactory results are re-sampled. Marginal results can also be re-sampled; this is dependent on resources as these foods are still considered compliant. Re-samples can be taken as statutory samples, as these can be later used as evidence for the purpose of prosecution if required.

MICROBIOLOGICAL METHOD OF ANALYSIS

Samples were tested for the presence of:

- *Salmonella* spp. method modified from AS 5013.10 – 2009
- *B. cereus* method modified from AS 5013.2 - 2007
- Coagulase positive *Staphylococci* method modified from AS 5013.12 – 2004
- *E. coli* method modified from AS 5013.19.1– 2012
- *L. monocytogenes* method modified from AS 5013.24.1– 2009
- *C. perfringens* method modified from AS 5013.16 – 2006
- Specific plate count (SPC) method modified from AS 5013.5 – 2004.

The sample preparation for *E. coli, B. cereus, C. perfringens* and coagulase positive *Staphylococci* and SPC consisted of:

- 25g of sample being homogenised with 225mL of 0.1% peptone saline diluent
- Subsequent serial dilutions were prepared for use in enumeration.

***E. coli* enumeration:** Pour plates of Tryptone bile x-glucuronide medium (TBX) agar using 1ml of 10^{-1} dilution were prepared in triplicate and incubated at 37°C for 4 hours followed by 44°C for 20 hours. *E. coli* colonies appear blue/green after incubation.

***B. cereus* enumeration:** Spread plates (using a 100µl of 10^{-1} in duplicate and 10^{-3} dilution) on a solid selective medium containing egg yolk and mannitol (MYP) were incubated at 30°C for 24-48 hours. Typical large, pink colonies, with or without lecithinase action were counted and a proportion of the colonies confirmed by a haemolysis test on Sheep Blood Agar. Statutory samples were further confirmed using spore staining.

***C. perfringens* enumeration:** Overlaid pour plates of Egg Yolk free -Tryptose Sulphite Cycloserine (TSCNE) agar using 1ml of 10^{-2} dilution (in duplicate) and 10^{-4} were prepared and incubated anaerobically at 37°C for 24 hours. Typical presumptive *C. perfringens* colonies are black with or without precipitation surrounding the colony. Typical colonies are then confirmed using the API 20A biochemical testing kit.

SPC

Duplicate pour plates using 'Plate Count Agar and 1ml of 10^{-2}, 10^{-4} and 10^{-6} dilutions of sample were prepared and incubated at 30°C for 72 hours. Visible colonies are counted to determine the total number of aerobic microorganisms.

Coagulase positive *Staphylococci* enumeration: Pour plates of Baird Parker medium with rabbit plasma fibrinogen using 1ml of 10^{-2} dilution (in duplicate) and 10^{-4} were prepared and incubated at 37°C for 48 hours. Typical black colonies, with a halo of precipitation surrounding the colony were indicative of coagulase activity found in coagulase positive S*taphylococci*.

***Salmonella* spp. detection:** 25g of sample was weighed out aseptically and homogenised with 225mL buffered peptone water (non-selective enrichment) and incubated at 37°C for 24 hours. Aliquots were then transferred into Brain Heart Infusion broth (BHI) and incubated for 3hours. DNA was extracted from 200uL of enriched BHI. This was screened for the presence of *Salmonella* spp. using a DuPont BAX Polymerase Chain Reaction (PCR) kit. No confirmation steps were performed as no samples were screened as positive.

***L. monocytogenes* detection:** 25g of sample was weighed out aseptically and homogenised with 225mL Half Fraser broth (selective enrichment) and incubated at 30°C for 24 hours. Aliquots were then transferred into Fraser broths incubated for 37°C for 48 hours and MOPS BLEB broths incubated for 37°C for 24 hours. DNA was extracted from 200uL of enriched MOPS BLEB broth. This was screened for the presence of *Listeria monocytogenes* using a DuPont BAX PCR kit. No confirmation steps were performed as no samples were screened as positive.

RESULTS / DISCUSSION

Raw results of analysis are attached at Appendix A, Resamples results of analysis in Appendix B and C and Raw Questionnaire results Appendix D.

Questionnaire

Out of the twenty sampled premises, ten reported preparing their pulled meat onsite rather than sourcing from an external supplier.

Of those premises only six reportedly checked the temperature while cooking, although this may have been because the nature of pulled meat means it is slow cooked and it was assumed to have reached an internal safe temperature after cooking for many hours. Only one premises didn't report putting the cooked meat into the cool room in trays straight away. They reportedly left it out on the bench to cool at room temp before moving to the cool room, this could increase the risk of the meat being outside of appropriate temperature control parameters allowing pathogenic bacteria to increase to dangerous levels. Also, no premises reported knowing how long it takes for the meat to cool down. The ANZFSC 3.2.2 food safety practices and general requirements states that "A food business must, when cooling cooked potentially hazardous food, cool the food (a) within two hours - from 60°C to 21°C; and (b) within a further four hours - from 21°C to 5°C.(c) Another temperature- if the food business demonstrates that maintenance of the food at this temperature for the period of time for which it will be so maintained, will not adversely affect the microbiological safety of the food".

Ten premises reported heating up the pulled meat in individual serves, eight heated it up in larger batches and transferred to a Bain Marie. Of those storing the meat in a Bain Marie five reported discarding meat after four hours, two reported keeping the meat at the re-heated temp "until it ran out" and one reported "keeping it for a full day's trade". Again, these practices could lead to harmful levels of bacteria building up in the meat if it is not held above 60°C. According to FSANZ "Although potentially hazardous food should be kept at 5°C or colder or 60°C or hotter wherever possible, this food can be safely stored between 5°C and 60°C provided it is between these temperatures for less than four hours. This is because it takes more than four hours for food-poisoning bacteria to grow to dangerous levels"

Most premises shredded the meat on the same day as cooking the meat, decreasing the time that a product would be made before consumption. A shelf life was recorded on ten of the products. Seven premises did not have a shelf life or used-by-date recorded, the absence of this practise could lead to incorrect stock rotation and meat being sold for consumption with unacceptable level of microorganisms present.

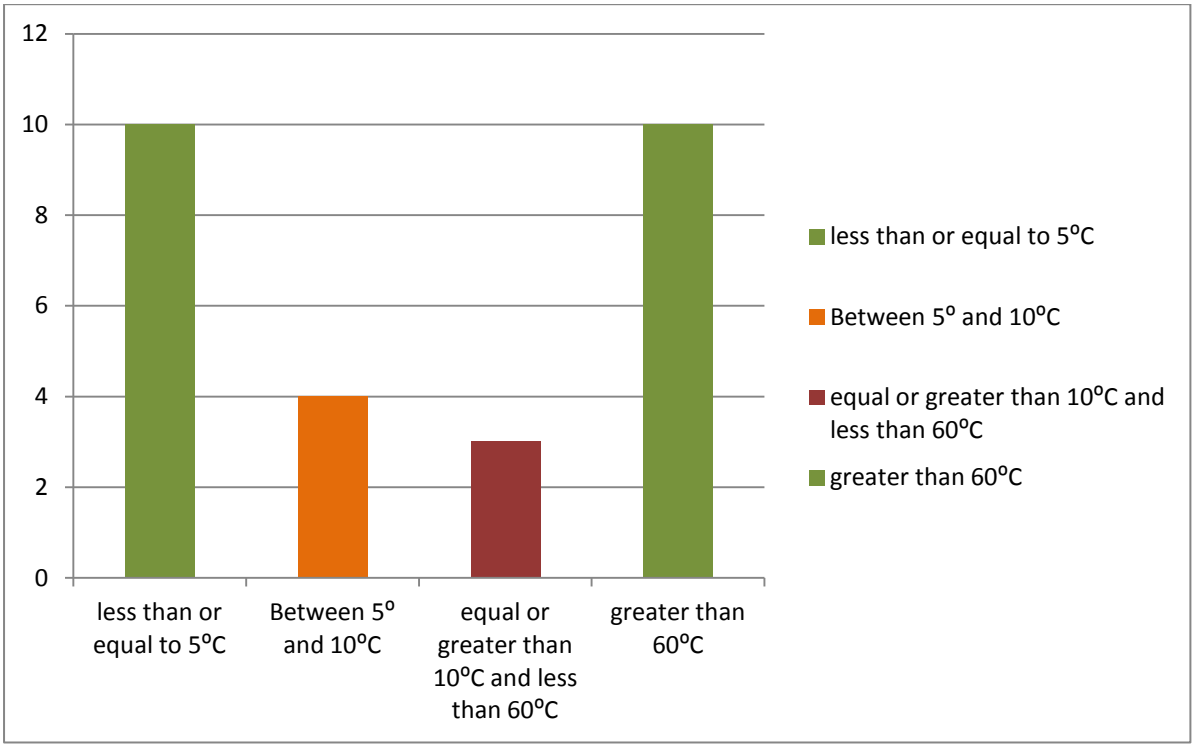
Throughout the completion of the questionnaire PHO's completing the inspection were able to advise the food handlers of safer practises when necessary.

Raw results of the questionnaire are shown in Appendix C.

Temperature

Twenty seven samples of pulled meat had their temperature measured at the time of inspection. The Australia New Zealand Food Standards Code- Standard 3.2.2 – Food Safety Practices and General Requirements (Australia Only) require foods that are potentially hazardous be stored below 5°C or above 60°C to minimise the growth of infectious or toxigenic microorganisms. Most (74%) samples were compliant with these requirements.

Figure 1. Temperature of pulled meats at time of inspection



E. coli

All ninety six survey samples were tested for *E. coli*. The presence of *E. coli* in RTE foods is undesirable. Its presence in food indicates that poor sanitation and unhygienic conditions has led to the contamination of food or that the food has been inadequately heat treated. Six samples (6.3%) across 3 premises had *E.coli* present in them (>3 cfu/g). One premises had three samples report unsatisfactory results. These were Pulled Pork Burrito (8,800 cfu/g), Pulled Pork Taco (11,000 cfu/g) and Pulled Pork Burrito (11,000 cfu/g). This premises was re-inspected and statutory samples of individual ingredients were collected. All of the resamples were found to have satisfactory levels of *E.coli.*

A second premises that returned two samples with marginal counts of *E.coli* (3 cfu/g and 60 cfu/g) was re-inspected and five statutory samples were taken. During this inspection education was given to food handling staff on the importance of hand washing and good hygiene practises. From these five resamples, one returned an unsatisfactory result for *E.coli* (110 cfu/g) and another returned a marginal result (3 cfu/g). The premises was re-inspected a further three times and statutory samples as well as swabs were taken as *E.coli* continued to be found. During these follow-up inspections the PHO worked with the food handling staff to correct the issue. This was performed by providing; further education on the correct dilution for sanitisers, voluntary disposal of the contaminated product, education provided about *E.coli* and procedures for effective washing of hands and fresh produce. Alongside this the premises was issued with an Improvement Notice by the PHO which included the direction for a complete clean and sanitisation of the premises.

The third premises had one sample, pulled chicken, which had a marginal count of 3 cfu/g. The premises was re-inspected and education provided as well as a resample taken. The resample result was satisfactory.

Coagulase positive *Staphylococci*

Ninety six samples were analysed for coagulase positive *Staphylococci.* All of the samples tested were found to have satisfactory levels i.e. <100 cfu/g.

C. perfringens

Ninety six samples were analysed for *C. perfringens.* All of the samples tested were found to have satisfactory levels i.e. <100 cfu/g.

B. cereus

B. cereus is found in soil and as such raw plant foods such as rice, potatoes, peas, beans and spices are common sources of *B. cereus* (FSANZ, 2013). *B. cereus* in cooked foods generally occurs as a result of inadequate temperature control as the resistance of spores to thermal processes allows *B. cereus* to multiply quickly during heating and cooling cycles. The detection of high levels (>10^3 cfu/g) of *B. cereus* should result in an investigation of the food handling controls used by the food business. Levels of greater than or equal to 10^4 cfu per gram are considered potentially hazardous as consumption of foods with this level of contamination may result in foodborne illness.

During this survey *B. cereus* was tested for in ninety six samples. Eighty seven (91%) samples were satisfactory; seven samples (7%) were marginal, a single sample was unsatisfactory (1%) and another single sample was found to be within potentially hazardous (1%) limits. These results were obtained across six different premises.

The unsatisfactory level of 2500 cfu/g and potentially hazardous level of 14000 cfu/g were found in a Beef Burrito and Chicken Burrito sample respectively. Both these samples were collected from the same premises. The proprietor was advised of the result and the premises re-inspected and

education provided. Statutory resamples were collected of individual components common to both samples. These were found to have satisfactory levels of *B. cereus.*

***Salmonella* spp.**

Salmonella spp. was not detected in any of the ninety six samples tested. RTE foods should be free of *Salmonella* spp. as consumption of food containing this pathogen may result in foodborne illness.

L. monocytogenes

One sample was not tested for *L. monocytogenes* due to an insufficient quantity of sample. *L. monocytogenes* was not detected in any of the ninety five samples tested. Foods in which all components have been cooked in the final food preparation should be free of *L. monocytogenes*. The detection of *L. monocytogenes* in such foods indicates the food was inadequately cooked or the food was contaminated post preparation.

Specific Plate Count (SPC)

Only forty eight samples were tested for SPC, as this test is not applicable to any samples containing salads according to the "Guidelines for the microbiological examination of ready-to-eat foods" produced by FSANZ. Pulled meats by nature have been further handled by the shredding of meat once it is cooked so they were assessed against the Level 2 Criteria. Four samples reported marginal counts for SPC ranging from 1,000,000 to 4,200,000 cfu/g. The remaining forty four samples (92 %) were within the satisfactory range.

Table 2 Summary of Results

Test	Coagulase positive staphylococci (n=96)	*Listeria monocytogenes* (n=96)	*Salmonella* spp. (n=96)	*E. coli* (n=96)	SPC (n=48 Level 2)	*B. cereus* (n=96)	*C. perfringens* (n=96)
Number of marginal samples	Nil	Nil	NA	6	4	7	Nil
Number of unsatisfactory samples	Nil	NA	NA	3	Nil	1	Nil
Number of Potentially Hazardous samples	Nil	Nil	Nil	NA	NA	1	Nil

Detailed results are tabled in Appendix A.

CONCLUSION

This snap-shot of twenty retailers suggests that the microbiological quality of pulled meats and foods containing pulled meats in the ACT is generally good. The questionnaire completed at the time of inspection provided an opportunity to correct unsafe practises occurring at a few establishments. As some premises reported unsafe practises, and this food type continues to gain popularity, it is advisable that this survey be run again in the future to ensure safe food preparation practises are followed.

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APPENDIX A: Raw Sampling Results

Sample Description	*Salmonella* spp. P/A in 25 g	Coagulase Pos Staph cfu/g	*C. perfringens* cfu/g	*E. coli* cfu/ g	*B. cereus* cfu/g	*L. monocytogenes* P/A in 25g	SPC cfu/g	Assessment
Pulled Meat - Chicken	Absent	<50	<50	3	<50	Absent	1,000,000	M
Pulled Chicken Wrap	Absent	<50	<50	<3	<50	Absent	NP	S
Pulled Chicken Wrap	Absent	<50	<50	<3	<50	Absent	NP	S
Pulled Chicken Wrap	Absent	<50	<50	<3	<50	Absent	NP	S
Pulled Chicken Burger	Absent	<50	<50	<3	<50	Absent	NP	S
Pulled Meat - Beef	Absent	<50	<50	<3	<50	Absent	<50	S
Pulled Meat - Pork	Absent	<50	<50	<3	<50	Absent	<5,000	S
Pork Burrito	Absent	<50	<50	<3	<50	Absent	NP	S
Beef Burrito	Absent	<50	<50	<3	<50	Absent	NP	S
Beef Tacos	Absent	<50	<50	<3	<50	Absent	NP	S
Pulled Meat - Mild Pork	Absent	<50	<50	<3	<50	Absent	<50	S
Pulled Meat - Spicy Pork	Absent	<50	<50	<3	<50	Absent	<50	S
Mild Pork Burrito	Absent	<50	<50	<3	<50	Absent	NP	S
Spicy Pork Burrito	Absent	<50	<50	<3	<50	Absent	NP	S
Spicy Pork Tacos	Absent	<50	<50	<3	<50	Absent	NP	S
Pulled Meat - Pork	Absent	<50	<50	<3	<50	Absent	500*	S
Pulled Meat Tacos	Absent	<50	<50	<3	<50	Absent	NP	S
Pulled Meat Burrito	Absent	<50	<50	<3	<50	Absent	NP	S
Pulled Meat Burrito	Absent	<50	<50	<3	<50	Absent	NP	S
Pulled Meat Burrito	Absent	<50	<50	<3	<50	Absent	NP	S
Pulled Meat - Pork	Absent	<50	<50	<3	<50	Absent	2,400,000	M
Pulled Meat - Chicken	Absent	<50	<50	<3	<50	Absent	200	S
Pulled Pork Burger	Absent	<50	<50	3	<50	Absent	NP	S
Pulled pork Quesadilla	Absent	<50	<50	<3	<50	Absent	NP	S
Chicken Burrito	Absent	<50	<50	60	100	Absent	NP	M
Pulled Meat - Pork	Absent	<50	<50	<3	<50	Absent	100*	S

Sample Description	*Salmonella* spp. P/A in 25 g	Coagulase Pos Staph cfu/g	*C. perfringens* cfu/g	*E. coli* cfu/ g	*B. cereus* cfu/g	*L. monocytogenes* P/A in 25g	SPC cfu/g	Assessment
Pulled Meat - Lamb	Absent	<50	<50	<3	<50	Absent	4,200,000*	M
Pulled Pork Pizza	Absent	<50	<50	<3	<50	Absent	NP	S
Pulled lamb Pizza	Absent	<50	<50	<3	<50	Absent	NP	S
Pulled Pork Burger	Absent	<50	<50	<3	150	Absent	NP	M
Pulled Meat - Pork Shoulder	Absent	<50	<50	<3	550	Absent	8200	M
Pulled Meat - Lamb Shoulder	Absent	<50	<50	<3	<50	Absent	1,800,000	M
Pulled Meat - Pork	Absent	<50	<50	<3	<50	Absent	200*	S
Pulled Meat - Pork Shoulder	Absent	<50	<50	<3	100	Absent	4900	M
Pulled Meat - Lamb Shoulder	Absent	<50	<50	<3	<50	Absent	400,000	S
Pulled Meat- Pork	Absent	<50	<50	<3	<50	Absent	<50	S
Pulled Pork Salad with rice	Absent	<50	<50	<3	<50	Absent	NP	S
Pork Taco	Absent	<50	<50	<3	<50	Absent	NP	S
Pork Burrito	Absent	<50	<50	<3	<50	Absent	NP	S
Pork Burrito	Absent	<50	<50	<3	<50	Absent	NP	S
Pulled Meat - Pork	Absent	<50	<50	<3	<50	Absent	100*	S
Pulled Meat - Pork	Absent	<50	<50	<3	<50	Absent	400*	S
Pulled Meat - Pork	Absent	<50	<50	<3	<50	Absent	250*	S
Pulled Meat - Pork	Absent	<50	<50	<3	<50	Absent	1,200*	S
Pulled Meat - Pork	Absent	<50	<50	<3	<50	Absent	1,100*	S
Pulled pork burger	Absent	<50	<50	<3	<50	Absent	NP	S
Pulled Meat - Pork	Absent	<50	<50	<3	<50	Absent	150*	S
Pulled Meat - Pork	Absent	<50	<50	<3	<50	Absent	7200	S
Pulled Meat - Pork	Absent	<50	<50	<3	<50	Absent	750*	S
Pulled Meat - Pork	Absent	<50	<50	<3	<50	Absent	150*	S
Pulled Meat - Lamb	Absent	<50	<50	<3	<50	Absent	3,800	S
Pulled Meat - Lamb	Absent	<50	<50	<3	<50	Absent	900*	S
Pulled Meat - Lamb	Absent	<50	<50	<3	<50	Absent	700*	S
Pulled Meat - Lamb	Absent	<50	<50	<3	<50	Absent	900*	S

Sample Description	*Salmonella* spp. P/A in 25 g	Coagulase Pos Staph cfu/g	*C. perfringens* cfu/g	*E. coli* cfu/ g	*B. cereus* cfu/g	*L. monocytogenes* P/A in 25g	SPC cfu/g	Assessment
Lamb Sliders	Absent	<50	<50	<3	<50	Absent	NP	S
Beef Burrito	Absent	<50	<50	<3	<50	Absent	NP	S
Pork Burrito	Absent	<50	<50	<3	<50	Absent	NP	S
Pulled Chicken Burrito	Absent	<50	<50	<3	<50	Absent	NP	S
Pulled Lamb Burrito	Absent	<50	<50	<3	<50	Absent	NP	S
Pulled Chicken Wrap	Absent	<50	<50	<3	<50	Absent	NP	S
Pulled Chicken Tandoori Wrap	Absent	<50	<50	<3	<50	Absent	NP	S
Pulled Chicken Roll	Absent	<50	<50	<3	<50	Absent	NP	S
Pulled Chicken Tandoori Roll	Absent	<50	<50	<3	<50	Absent	NP	S
Pulled pork Baked Potato	Absent	50	<50	<3	<50	Absent	NP	S
Pulled Pork Baked Potato	Absent	<50	<50	<3	<50	Absent	NP	S
Pulled Lamb Baked Potato	Absent	<50	<50	<3	<50	Absent	NP	S
Pulled Lamb Baked Potato	Absent	<50	<50	<3	<50	Absent	NP	S
Pulled Meat - Pork	Absent	<50	<50	<3	<50	Absent	<50	S
Pulled Meat - Pork	Absent	<50	<50	<3	<50	Absent	<50	S
Pulled Meat - Lamb	Absent	<50	<50	<3	<50	Absent	<50	S
Pulled Meat Beef	Absent	<50	<50	<3	50	Absent	150*	M
Pulled Meat Beef	Absent	<50	<50	<3	<50	Absent	400*	S
Pulled Meat Beef	Absent	<50	<50	<3	<50	Absent	100*	S
Pulled Meat Pork	Absent	<50	<50	<3	<50	Absent	<50	S
Pulled Meat Pork	Absent	<50	<50	<3	<50	Absent	<50	S
Pulled Meat Pork	Absent	<50	<50	<3	<50	Absent	150*	S
Pulled Meat Chicken	Absent	<50	<50	<3	<50	Absent	<50	S
Pulled Meat Beef	Absent	<50	<50	<3	<50	Absent	200	S
Pulled Meat Pork	Absent	<50	<50	<3	<50	Absent	100	S
Pulled Meat Lamb	Absent	<50	<50	<3	<50	Absent	<50	S
Chicken Burrito	Absent	<50	<50	<3	<50	Absent	NP	S
Lamb burrito	Absent	<50	<50	<3	<50	Absent	NP	S

Sample Description	*Salmonella* spp. P/A in 25 g	Coagulase Pos Staph cfu/g	*C. perfringens* cfu/g	*E. coli* cfu/ g	*B. cereus* cfu/g	*L. monocytogenes* P/A in 25g	SPC cfu/g	Assessment
Pulled Pork Burger	Absent	<50	<50	<3	750	Absent	NP	M
Pulled Meat- Pork	Absent	<50	<50	<3	550	NP	2,200	M
Pork Chimichanga	Absent	<50	<50	<3	<50	Absent	NP	S
Beef Chimichanga	Absent	<50	<50	<3	<50	Absent	NP	S
Pulled Meat - Chicken	Absent	<50	<50	<3	<50	Absent	12,000	S
Beef Burrito	Absent	<50	<50	<3	2,500	Absent	NP	U
Pulled Meat - Beef	Absent	<50	<50	<3	<50	Absent	<50	S
Chicken Burrito	Absent	<50	<50	<3	14,000	Absent	NP	PH
Pulled Meat - Chicken	Absent	<50	<50	<3	<50	Absent	<50	S
Pulled Meat - Lamb	Absent	<50	<50	<3	<50	Absent	<50	S
Pork Burrito	Absent	<50	<50	8,800	<50	Absent	NP	U
Pork Tacos	Absent	<50	<50	11,000	<50	Absent	NP	U
Pork Burrito	Absent	<50	<50	11,000	<50	Absent	NP	U
Pulled Meat - Pork	Absent	<50	<50	<3	200	Absent	1,200	M

* = estimate count only, NP = Not Performed.

Assessments: S = Satisfactory U = Unsatisfactory, M = Marginal, PH = Potentially Hazardous, according to the Categories of Microbiological Quality in the Ready to Eat Guidelines by FSANZ 2001.

APPENDIX B: Raw Resample Results

Sample Description	*E. coli* cfu/g	SPC cfu/g	*B. cereus* cfu/g	Assessment	Collected as Statutory samples Yes/No
Pulled chicken meat	<3	34000*	NP	S	Yes
Pulled Pork	3	3400000*	<50	M	Yes
Bean Salsa	<3	NP	<50	S	Yes
Corn Salsa	<3	NP	<50	S	Yes
Rice	<3	NP	<50	S	Yes
Tomato Salsa	110	NP	<50	U	Yes
Pulled Pork	53	34000000	<50	U	Yes
Whole Parsley	<3	NP	<50	S	Yes
Tomato Salsa	50	NP	<50	M	Yes
Whole Tomato	<3	NP	<50	S	Yes
Tomato Salsa	220	NP	NP	U	Yes
Pulled Pork	<3	5000000*	NP	M	Yes
Pulled Pork A1	NP	550*	<50	S	No
Pulled Pork A2	NP	600*	<50	S	No
Pulled Lamb B1	NP	45000*	750	M	No
Pulled Lamb B2	NP	7400	<50	S	No
Pulled Lamb	NP	2500	<50	S	No
Pulled Pork	NP	1100*	<50	S	No
Thyme (used on pork)	NP	760000	350	M	No
Pulled pork	NP	3500000*	NP	M	Yes
Tomato Salsa	<3	NP	NP	S	Yes
Pulled Pork - Hans Continental Small Goods	NP	NP	<50	S	Yes
Bagged lettuce	NP	NP	<50	S	Yes
Lettuce on display	NP	NP	<50	S	Yes
Salsa with beans	NP	NP	<50	S	Yes

Sample Description	*E. coli* cfu/g	SPC cfu/g	*B. cereus* cfu/g	Assessment	Collected as Statutory samples Yes/No
Tomato salsa	NP	NP	<50	S	Yes
Coriander and Onion salsa	NP	NP	<50	S	Yes
Cooked Rice	<3	NP	<50	S	Yes
Pickled Cabbage	<3	NP	<50	S	Yes
Tomato Pico	<3	NP	<50	S	Yes
Pulled Pork	<3	NP	<50	S	Yes

* = estimate count only, NP = Not Performed.

Assessments: S = Satisfactory U = Unsatisfactory, M = Marginal, PH = Potentially Hazardous, according to the Categories of Microbiological Quality in the Ready to Eat Guidelines by FSANZ 2001.

APPENDIX C: Raw Resampling Swab Results

Sample Description	*E. coli* from a swab (Detected / Not Detected)
Swab of prep Bench #2	Not Detected
Swab of microwave Handle	Not Detected
Swab of cutting Board	Not Detected
Swab of hand wash Basin/Bench	Not Detected
Swab of Prep Bench	Not Detected
Swab of inside cabinet fridge	Detected
Swab of food handlers 1 Hands	Not Detected
Swab of food handlers 2 Hands	Not Detected
Swab of doorhandle to fridge	Not Detected
Swab of BBQ sauce handle	Not Detected
Swab of bench top	Not Detected
Swab of hand wash sink tap	Not Detected
Swab of microwave handle	Not Detected

Sample Description	*E. coli* from a swab (Detected / Not Detected)
Swab of chopping block	Not Detected
Swab of chopping block #2	Not Detected
Swab of knife handle	Not Detected

APPENDIX D: Raw Questionnaire Results

Premises	Prepared onsite	Is temp checked while cooking?	How is meat cooled?	Is it known how long it takes to cool down?	How is it reheated	How long held at re-heated temp? (Hours)	What happens to re-heated product at the end of the day?	Shelf life of product recorded?	Days between cooking and pulling?	Current temp of refrigerated product? (˚C)	Current temp of heated product? (˚C)
Premises 1	Yes	Yes	whole chicken cut into quarters, put in cool room	No	Individual serves	N/A	N/A	Yes- 2 days	1	<5	Unknown
Premises 2	No	Yes	N/A	N/A	N/A	4	Discarded	Yes	0	Unknown	65.1, 74.7
Premises 3	Yes	Yes	in trays in cool room	No	Batches > Bain Marie	4	Discarded	Yes	0	<5	89
Premises 4	No	N/A	N/A	N/A	Microwave > 60˚C, tray	4 approx.	Discarded	?	N/A	Unknown	Unknown
Premises 5	Yes	No	spread onto trays	No	Individual serves	N/A	N/A	No	0	5	60-67
Premises 6	Yes	no	Spread onto trays	No	on top of pizza, in frypan for salads, hot plate for burgers	N/A	N/A	no- but bath date made	0	1	Unknown
Premises 7	Yes	No	Ice bath, spread out in larger tray	No	microwave in small batches	N/A	N/A	No	0	27.9, 16.6, 31.2,	7.4, 6.5
Premises 8	No	N/A	N/A	N/A	Microwave, > 60˚C, tray	4 approx.	Discarded	?	N/A	Unknown	Unknown
Premises 9	Yes	No	Large shallow tray,	No	microwave, small batches	N/A	N/A	Yes 4-5 days vacuum packed	0	3.8	Unknown
Premises 10	Yes	No	tray in cool room	No	in frying pan, small batches	N/A	N/A	no	0	5.8	Unknown

Premises	Prepared onsite	Is temp checked while cooking?	How is meat cooled?	Is it known how long it takes to cool down?	How is it reheated	How long held at re-heated temp? (Hours)	What happens to re-heated product at the end of the day?	Shelf life of product recorded?	Days between cooking and pulling?	Current temp of refrigerated product? (˚C)	Current temp of heated product? (˚C)
Premises 11	Yes	No	cooled at room temp, cool room 30 min	No	microwave, small batches	N/A	N/A	no, 7-10 days reported	0	4.5	92
Premises 12	No	N/A	N/A	N/A	Microwave	Unknown	Unknown	Yes	0	Unknown	74
Premises 13	Yes	Yes	into cold display area	No	N/A - not	N/A	N/A	Yes	Unknown	2	Unknown
Premises 14	No	Yes	small container in fridge	no	small batches	8-7pm full day trade	discarded	Yes	0	Unknown	78
Premises 15	No	N/A	N/A	N/A	Individual batches, microwave	N/A	N/A	Yes 2 days	0	3.1	Unknown
Premises 16	No	Yes	N/A	N/A	microwave >75˚C	4	Refrigerated at end of trade, Reheated only once	Yes	N/A	Unknown	65
Premises 17	No	N/A	N/A	N/A	Individual serves, microwave	N/A	Unknown	Yes	N/A	Unknown	Unknown
Premises 18	Yes	No	Unknown	Unknown	Individual serves	N/A	No	Unknown	Unknown	1	Unknown
Premises 19	No	N/A	N/A	N/A	Microwave batches > Bain Marie	Until it runs out	discarded	No	N/A	4	84
Premises 20	No	N/A	N/A	N/A	Reheated in bag in boiling water > Bain Marie	Until it runs out	Discarded	No	N/A	5.2	63