

final report

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V.RMH.0099 - Proof of Concept - Cold Smoked red meat (Smoke T – Lamb Bacon Co)

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Abstract

Smoking is a method of preservation, yet FSANZ ***Food Standards Act Australia and New Zealand*** does not recognise this as a method of reducing and limiting the growth of bacteria, unless the meat is cooked to an internal temperature of 65C degrees. Extending shelf life of red meat remains a key goal for the meat industry. Cold smoking red meat, under 5C allowed the project to test that smoke is a preservation that reduces bacteria growth to extend the shelf life. Testing was conducted using Lamb & Beef primal and selected cuts. Testing also included customer sensory feedback. The project results have proven that cold smoked meat does have a lower total plate count than industry average thereby extending the shelf life, customer feedback provided unexpected positive insights into achieving BBQ flavour from a frying pan.

Executive summary

For hundreds of years people all over the world have used smoking techniques as a way of preserving or adding flavour to food. According to the 2017 IBIS World Statistics, in Australia there are around 210 Smallgoods Manufacturers servicing a \$9billion industry, supporting a strong consumer demand for smoked and or cured meats. Preserving food is extending the meats shelf life by reducing or eliminating the growth of certain bacteria.

In Australia, meat is processed, packaged and labelled to obtain the maximum shelf life without creating a food safety risk to consumers. Meat products can be generally classified into the categories of unprocessed and processed. Unprocessed fresh meat can be sold as either chilled or frozen. Meat that has been processed by heating, curing or drying can be sold as shelf stable, chilled or frozen, depending on customer requirements. Shelf life of any of these products depends on the processes applied and temperature control along the supply chain. Australia's exports tonnes of red meat annually, the standards on raw meat shelf life extending the Focusing on the preservation of meat through smoking techniques with no other preservation method, for example curing or salting, could smoke alone generate enough preservative to inhibit the growth of bacteria and mould. How could the application of the smoking process which is naturally created by fire which heats the chamber such as an oven, ensure that the food product doesn't reach temperatures over 5C. According to the Australian Food Standards Code bacteria such as grow in temperatures over 5C

Meat that is considered cold smoked, is still required to reach an internal temperature of 65C for 10 minutes, this according to the Australian Food Standards Code destroys the growth of certain bacteria, if present. So, the meat is smoked, but it is also cooked.

The Kos' processes are more than cold smoked, it is chilled smoked. Engineered to meet the needs of the chilled smoked egg, Julie and Paul have patented the process to smoke food products in a chilled chamber. The smoke that has been naturally created with fire starts at a temperature of XX then travels through refrigeration chambers where its temperature has reduced to 5C, it then enters the main smoking chamber which is refrigerated to below 5C. Vigorous testing as shown that the product does not reach temperatures over 5C. Therefore, food safety is maintained, and the product remains in its natural state.

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1 Background

Smoke generates chemicals which inhibit the growth of bacteria and moulds, yet it is not recognised as a preservation method in the Food Standard Act FSANZ. Extending shelf life of red meat remains a key goal for the meat industry. With the increasing opportunities to export Australian red meat throughout the world, a competitive advantage of an extended shelf life, would set Australia apart of the world stage. Proving that cold smoking red meat in a chamber that does not exceed 5 degrees Celsius maintain the products integrity, while reducing the bacteria and inhibiting further growth.

2 Project objectives

2.1 Cold Smoked Meat Project Objectives

2.1.1 Overview of the chilled smoking process

The chilled smoking process Fig1, was undertaken using the patented process of the Egg Artisan Group. The red meat products were prepared and prior to vacuum sealing were placed in the smoking chamber for set periods of time. The smoked was generated by a natural wood smoker and infused into the chilled chamber. After the allocated time for the product, the product was removed from the smoker, placed in vacuum sealed bags and vacuum sealed. They were then labelled and packed as per any normal meat preparation standards. The smoking of the meat adds approx. 1.5 hours to a standard meat preparation process in order to fulfil customer requirements.

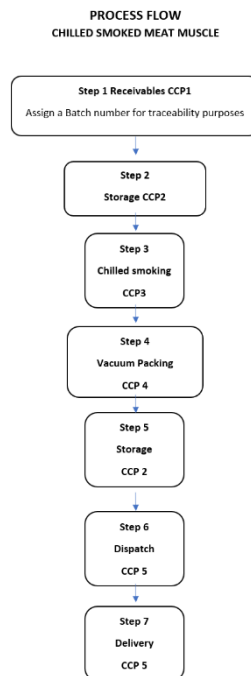


Fig 1 The chilled smoking process

2.1.2 HACCP Charts & Product Specifications for cold smoked meat

Appendix 1 HACCP Analysis and HACCP Audit Tables for Chilled Smoke Red Meat Muscle have been developed

Submission of the product description has been submitted to Primesafe Victoria in August 2019, approval to conduct product testing was provided by third party auditor SGS who is reviewing and validating the results to provide recommendation of approval to Primesafe.

2.1.3 Develop Proof of concepts & Shelf Life Validation

The proof of concept included three red meat options from lamb, beef and a mince product, the design of the product could not be referred to as cold smoked, as in the current vernacular cold smoking refers to a process of around 50C Celsius and is followed by a hot smoking up to 65C degrees internal temperature. To assist us with gaining the quick understanding of the testing groups, chilled smoked was created with the 4C degrees logo. Fig2



Fig 2 Design of proof of concept

Shelf life validation matrix Table 1 included variations of primals, cuts and mince, including burgers. Mince meat and by products such as burgers present the biggest challenge for meat processors and on sellers due to the traditionally short shelf like of the product.

Table 1: Shelf Life Validation Product Matrix					
Vacuum Packaged Minced Products	Industry Standard Shelf Life*	Vacuum Packaged Red Meat Primals	Industry Standard*	Vacuum Packaged Red Meat Cuts	Industry Standard*
Beef Brisket Burger	7 Days	Beef Whole	7 weeks	Beef topside	2 weeks
Beef Burger Plain	7 Days	Scotch Fillet	7 weeks	hand diced	
Mutton Mince -PET	7 Days	Beef whole	7 weeks	Lamb Chump	7 weeks
FOOD TEST		topside		Steaks	
Beef Mince	7 Days	Whole Lamb	7 weeks	Beef Scotch	7 weeks
		Leg bone in		Fillet Steaks	

*Table 1 industry standard as defined by Industry Standards Appendix 9.2

2.1.4 Test concept products with key stakeholders, test consumer/market and operational assumptions

Meat processors, further meat processors, cafes/restaurants, retailers & end consumers were questioned in the lead up and throughout the duration of the project.

The following questions were asked to assess the appetite of the concept;

On smoked meat

- Do you like the flavour of smoked meat?
- As a consumer or chef have you attempted to smoke meat yourself
- How was that experience? Would you/have you repeated, why, why not

On shelf life

- When purchasing meat is the remaining shelf life a major influencing factor
- How its packaged, wrapped, vacuum sealed, bulk, single,
- Preference to frozen chilled

Anecdotally there was enough feedback from industry and consumers that a pre-smoked, shelf life extended, single portion serve re meat product would be of interest and would fill a gap in the Australian market.

Further consumer market testing was undertaken at Fine Foods Sydney Conference 2019. This provided the platform to give coked samples to attendees and have them assess the appearance of the packaging and smoked meat. The conversations allowed us to engage with the attendees to understand the importance of shelf life and influence over the purchase decision.

2.1.5 Scale-up and preliminary cost/benefit analysis

Table 2: Cost benefit analysis		
Description	\$ per unit	Smoker Chamber Volume units per smoke
Raw meat	\$ 8.00	\$ 1,400.00
staff costs, HACCP management, meat management, logistics, packaging, processing.	\$ 0.25	
labelling and packaging	\$ 0.80	
Smoking	\$ 0.25	
Logistics	\$ 0.10	
marketing and in house tasters	\$ 0.50	
compliance	\$ 0.25	
total cost per unit	\$ 10.15	\$ 14,210.00
Profit	\$ 1.85	\$ 2,590.00
Price per unit	\$ 12.00	
Total Revenue		\$ 16,800.00
Total Cost of Value add	\$ 2.15	

3 Methodology

3.1 Shelf Life Validation

The shelf life of these products was determined by conducting storage trials under the conditions that the product would be sold as chilled. Adopting the industry standards Appendix 9.2, the testing process of chilled smoked meat would be deemed successful to have increased the shelf life at least by 50% and laboratory results were within the microbiological limits.

Testing was conducted at Symbio Laboratories, Brooklyn Victoria. Samples of vacuum sealed whole primals, portion primals, minced of beef and lamb were used. Samples of the portions, cut or minced were provided in 3 samples per sample date with 6 sample dates.

Whole primals were tested smoked and not smoked. As well as Day 1 and Day 63. The purpose was to understand the immediate impact of the smoke on the outer layer of the primal muscle and top ascertain the growth of bacteria on the outer layer.

Bacteria was measured using **M2_5-Standard Plate Count (CFU/g)**, **M8_8-Escherichia coli (CFU/g)**, **M13_2MONO-Listeria monocytogenes (/125g)**, **M16_1-Salmonella spp. (/125g)**

For the purpose of this research project we have adopted microbiological limits set for RTE meat products to determine the suitability for human consumption. While the product is cooked prior to consumption the lack of agreed standards and expense budget to determine the standard limits the data set does provide enough insight to make a fair assessment.

3.2 Chilled Smoked Red Meat Microbiological limits

n = minimum number of samples

c = the maximum allowable number of defective units

m = the acceptable microbiological level of a sample unit

M = the level at which when exceeded in one of more samples would cause the lot to be rejected.

Miro-organism	n	c	m	M
<i>Escherichia coli (CFU/g)</i>	5	0	00**	0
<i>Listeria monocytogenes (/125g)</i>	5	0	0**	0
<i>Salmonella spp. (/125g)</i>	5	0	0**	0
<i>Standard Plate Count (CFU/g)</i>	3	0	10 ⁶	10 ⁷

3.3 Chilled smoking process

Table 4: Chilled Smoked Meat – Smoking Process Time and Temperature Record

batch	Description	Preparation	Packed	kg	smoked	C - in	smoking	Total chamber	C - out
1	Lamb Steaks	Deboned Chump hand cut	3/07/2010	6kg	5/07/2019	4.9	4*5min (20)	65 min	4.2
1	lamb Rib	Deboned Chump hand cut	3/07/2010	6kg	5/07/2019	4.7	4*5min (20)	65 min	4
1	Scotch Fillet Steaks	Whole muscle hand cut to steaks	3/07/2010	6kg	5/07/2019	5	4*5min (20)	65 min	4.1
2	beef scotch fillet whole muscle	cut in half length wise	28-Aug	2.8kg	28/08/2019	4.2	4*5min (20)	65 min	5.4
2	Beef Hamburgers	Machine Minced, hand prepared	26-Aug	40g	28/08/2019	4	4*5min (20)	65 min	3.6
2	Brisket Burgers	Machine Minced, hand prepared	26-Aug	40g	28/08/2019	4	4*5min (20)	65 min	3.6
2	Beef Mince	Machine Minced	26-Aug	50g	28/08/2019	4.2	4*5min (20)	65 min	3.8
2	Beef Mince Control	Machine Minced	26-Aug	50g	28/08/2019				
2	Mutton Mince	minced via machine, frozen, thawed then smoked	12-Aug	50g	28/08/2019	3.2	4*5min (20)	65 min	4
2	Mutton Mince Control	minced via machine, frozen, thawed then smoked	12-Aug	50g	28/08/2019				
2	Lamb Leg Whole	nil	21-Aug	1.5kg	28/08/2019	4.6	4*5min (20)	65 min	4.4
2	Topside Whole	nil	28-Aug	1.3kg	28/08/2019	4.6	4*5min (20)	65 min	4
2	Topside Diced	Whole muscle hand cut to diced	28-Aug	1kg	28/08/2019	4.6	4*5min (20)	65 min	4
2	Scotch Fillet Steaks	Whole muscle hand cut to steaks	28-Aug	6kg	28/08/2019	4	4*5min (20)	65 min	4

3.4 Market Tests

Data obtained from chefs and consumers at Sydney Fine Food event, instead of the Global Table event in Melbourne, provided insights for the following

10kg of samples of smoked lamb steaks, smoked scotch fillet and smoked mince meat balls were cooked and provided to attendees. Over the course of the 3 day event approx 200 samples were provided. Results were captured through conversations and direct consumer insight answering the questions as set out in **Appendix 3**

Samples on display included single serve vacuum sealed packs of the scotch fillet steak and lamb steaks, and single serve packs of the meat balls, (approx. 6)



Fig 3. Single Serve Chilled Smoked meat samples for Sydney Fine Foods

4 Results

4.1 Shelf Life Validation

Full table of report and individual product analysis and Symbio Laboratory Reports Appendix 4.

Table 5: Shelf Life Validation Product Matrix								
Vacuum Packaged Minced Products	Smoked Chilled Meat results	Industry Standard Shelf Life*	Vacuum Packaged Red Meat Primals	Smoked Chilled Meat results	Industry Standard*	Vacuum Packaged Red Meat Cuts	Smoked Chilled Meat results	Industry Standard*
Beef Brisket Burger	35 days	7 Days	Beef Whole Scotch Fillet		7 weeks	Beef topside hand diced		2 weeks
Beef Burger Plain	35 days	7 Days	Beef whole topside	9 weeks	7 weeks		13 weeks	
Mutton Mince - PET FOOD TEST	21 Days	7 Days	Whole Lamb Leg bone in	failed	7 weeks	Lamb Chump Steak portions	13 weeks	7 weeks
Beef Mince	35 days	7 Days				Beef Scotch Fillet Steak portions	13 weeks	7 weeks

*Table 2 overview of shelf life results. Full analysis Appendix 4

4.2 Market Tests

Guidelines (please don't type in this section, guidelines must be removed before submission by highlighting this section and then deleting): This section should include the key data sets with appropriate statistical analysis. Use of graphs and tables to summarise data is encouraged. All project data should be included as an appendix or supplied electronically.

Table 6: Shelf Life Validation Product Matrix			
n = 250	Positive	Negative	Comments
Ambient Aroma during cooking	100%	0%	Smells like a BBQ, Smells Like a chargrill
Meat Sample Raw Appearance	60%	40%	Brown appearance in packaging, cannot see red meat product
Meat Sample Cooked Appearance	100%	0%	The meat did not display any abnormal discoloration evident in the raw state

Meat Sample Cooked Aroma	100%	0%	Slightly smoked aroma, like a chargrill restaurant.
Meat Sample Cooked Taste - beef	100%	0%	This flavour came from a frying pan? The meat was full of flavour and can achieve that authentic cooked flavour from a frying pan
Meat Sample Cooked Taste - lamb	100%	0%	Hard to believe it was not cooked over coals, or on a BBQ
Meat Sample Cooked Taste – meatballs	70%	30%	Salty flavour, some found it inedible

5 Discussion

5.1 Insights Chilled Smoked Meat

5.1.1 Data Insights & Inferences

The results from the data indicate that the smoking process reduces and inhibits the growth of bacteria thereby increases the shelf life of the raw red meat product.

Consumers enjoy the flavour of the smoked meat, and commentary indicates that achieving the BBQ flavour from a frying pan has significant benefits for apartment dwelling consumers without access to BBQs and chefs who are time or equipment poor, to enable them to achieve an authentic chargrill taste.

Retailers are more interested than chefs and consumers in the extension of shelf life. Retailers are also seeking single serve packaging to fit within an already full meat supermarket shelf and to meet the demands of consumers eating less meat but of high quality.

The product description, product process flow and HACCP audit tables along with the associated shelf life testing meets the requirements of regulators and we would see no issues with the product being accepted for consumer production for either domestic or export markets

5.1.2 Practical Implications for the industry

Smoking alone could be considered a method or preservation, which would have implications to the smallgoods industry of Australia. Could this mean less reliance on nitrate/nitrite preservatives.

The red meat industry can benefit from a low cost value adding process to existing cuts of red meat including beef and lamb, there is consumer appetite for a pre-smoked raw meat product.

Red meat processors can increase the shelf life of mince and mince by products, which we would could eliminate waste and maintain the value of the product for longer periods of time.

Cafes/Restaurants can achieve a smokey BBQ flavour without the hassle of in-house smoking, preparation or clean up. This adds a lot of value to the burger industry and for those supplying the industry.

Exporters of red meat can consider the implications of extended shelf life and a pre-smoked product on the export market.

5.1.3 Recommendations for additional research

Additional research is recommended in relation to sensory testing on the meat products that achieved a longer shelf life, the reviews undertaken would not be considered a large enough sample size or cross section of end users to be valid. Initial findings show that the meat has a discoloration from the smoking process which does not change over the products chilled vacuum sealed life. We do not understand if this has a negative impact for consumer purchase and use.

While shelf life testing was conducted via the guidance of Symbio Laboratories, further testing should be conducted to demonstrate that smoking alone is a method preservation and should be included in the Food Standards Act (**FSANZ**)

It is also recommended that a smokeless flavour smoke process be considered. This can assist with products that require extended shelf life but without having a flavour or colour impact on the raw meat. If this was achieved then, we believe that further sales opportunity exists for exporters and retailers. There is not enough evidence to suggest that the smoked flavour is a sustainable market trend and further research or product development is required to review a smokeless meat

5.1.4 What could have been improved in the project delivery

The complexity of the laboratory testing and costs was underestimated and as such allocated budget was overspent.

Further testing could have been conducted with a burger chain and meat processor to ascertain the uptake and consumer feedback on flavour, as well as understanding the implications to changes on shelf life

Undertake a retailer specific test where single serve product were available to for sale and to understand the purchase and repeat purchase of the product range. LaManna supermarket in Melbourne did agree to participate in a market test, however had some concerns over the appearance of the product.

5.2 Project objective outcomes

5.2.1 Overview of the chilled smoking process

An overview of the chilled smoking process has been achieved and the ability to maintain the product at below 5C degrees throughout the process is paramount to the product safety.

5.2.2 HACCP Charts & Product Specifications for chilled smoked meat

HACCP Audit Tables and Product Specifications have been defined and reviewed by an third party auditor.

5.2.3 Develop Proof of concepts & Shelf Life Validation

A range of products were developed with supporting marketing collateral to provide a sample for customers. While there was some confusion between cold smoked meat and chilled smoked meat, the branding of 4 Degrees Celsius and using the word “chilled” removed the confusion and customers were able to understand the difference between the two.

A good sample test was undertaken and while we were undertaking the project to ascertain the extension of shelf life, the project uncovered the desire for consumers to achieve the authentic bbq flavour from a frying pan, we were surprised to see the result of 100% of consumers responded favourably to the smoked flavour.

Additional comments provided such as “we thought there was a big BBQ being cooked here, instead it’s a small frying pan” “tastes just like a BBQ steak” “tastes like its from a steak house char grilled restaurant” “so a BBQ flavour from a frying pan?” “this is perfect for me as I don’t have a balcony for a BBQ, but I love BBQs in summer”

6 Conclusions & Key Messages

6.1 Smoking is a form preserving

It is recommended that MLA invest resources to have smoking alone recognised as a form of preserving product, and is incorporated into Food Standards Act FASNZ. By achieving this all meat manufacturers have an opportunity to value add, reduce waste and access markets that may be difficult to reach.

6.2 Competitive Advantage

The Australian Red Meat industry can benefit from providing the worlds first safer meat. Further research into the desire of the global industry to access rea meat products that are more shelf stable than a non smoked meat. This has the opportunity of increasing the value of beef and lamb carcasses and ultimately benefit Australian farmers and the red meat industry.

7 Appendix

7.1 Appendix 1

7.1.1 HACCP Charts & Product Specifications for chilled smoked red meat muscle

**HAZARD ANALYSIS
CHILLED SMOKED MEAT MUSCLE**

PROCESS STEP	INPUTS	POTENTIAL HAZARDS	SEVERITY	RISK	SIGNIFICANCE	PREVENTIVE, CONTROL OR MONITORING MEASURE
Step 1 Receipt of carcasses boned broken meats. Carton Meats CCP-1	Carcases	M-Growth of pathogens	H	H	H	Carcases surface temp <7°C <5°C at the site of microbiological concern. Hard Frozen no evidence of thawing.
	Boxed Bagged meats	C-residues	H	L	L	Source approved supplier
	Frozen/chilled	P-Flies, dirt, dust	H	L	L	Transfer to chiller. Unload without delay
	Load-in area	P-Dirty, Leaking	H	L	L	Inspect load
Receipt of ingredients chemicals, packing CP	Receiving Area Storage	P-Rodents Q-Packaging	L	L	L	Every delivery and storage
Step 2 Storage CCP-2	Chiller Freezer	M-Growth of pathogens	H	H	H	Maintain at less than 5°C Frozen <-15°C
		C-Contamination	H	L	L	Maintain cleaning procedures

PROCESS STEP	INPUTS	POTENTIAL HAZARDS	SEVERITY	RISK	SIGNIFICANCE	PREVENTIVE, CONTROL OR MONITORING MEASURE
Step 3 Chilled smoking CCP-3	Temperature	M-Growth of pathogens	H	H	H	Core temperature at the thickest section of the muscle 5°C @ MAXIMUM. Actual process FOLLOW SMOKING INSTRUCTIONS.
		C/M-Contamination	H	L	L	Maintain cleaning procedures
Step 4 Packing CCP-4	Temperature Packing room	M-Growth of pathogens	H	H	H	Maintain product at less than 5°C Maintain room temperature less than 10°C/GMP. Annual testing 5 Samples shall be tested for: 1. Listeria monocytogenes 2. E.coli 3. Salmonella 4. Coagulase-positive staphylococci Annual Validation of Shelf Life
Step 5 Storage CCP-2	Chiller	M-Growth of pathogens	H	H	H	Maintain at less than 5°C
Step 6 Dispatch CCP-5	Delivery Van	M-Growth of pathogens	H	H	H	Maintain at less than 5°C
		C-Contamination	H	L	L	Maintain cleaning procedures

7.1.2 HACCP Audit Table Chilled Smoked Red Meat Muscle

PROCESS STEP	POTENTIAL HAZARD	CCP	CONTROL MEASURE	MONITORING FREQUENCY	RESPONSIBILITY	RECORD	SPECIFICATION CRITICAL LIMITS	CORRECTIVE ACTION
Step 1 Meat Carton Bags	Growth of pathogens	Receiving Inspection CCP-1	Inspect Temperature Check	Who What How Where When	QAM/QAO Product Temp Guage Receival Each delivery	Daily HACCP Form 2	Broken meats <5°C Frozen <-15°C Traceability	Trim or reject >7°C Actively chill product >5°C Letter of complaint to supplier, re temperature non conformance Freeze product <-15°C
Receipt of chemicals	1 Damaged containers 2 Incorrect product supplied	CP	Inspect on delivery Check against order Store separately	Monitor each delivery	QAM/QAO	Delivery docket.	Check against order	Reject damaged product
Receipt of dry ingredients	1 Damaged packages 2 Wrong order (order) 3 Contamination	CP	Inspect and examine on delivery. Check against order. Store all incoming goods off the floor	Monitor each delivery	QAM/QAO	Delivery docket.	Certificate of Analysis from supplier suitable as a food additive	Reject damaged or Out of date product Reject incorrect product
Step 2 Storage	Growth of pathogens	Chiller/Freezer CCP-2	Refrigeration	Who What How Where When	QAM/QAO Product/Room Temp Guage Chiller 2 X Daily	Form 1	Maintain temperature <5°C Frozen <-15°C	Maintain and service Refrigeration Refrigeration break down contact service provider. Seek alternative refrigeration actively chill

Step 3 Chilled smoking Batch no ID production date	Growth of pathogens Inadequate temperature control	Temperature of Smoke Chamber CCP-3	Monitor temperature Controls	Who What How Where When	QAM/QAO Product Temp Guage Chiller Each Batch	Smoking Temperature Record Form 2	Core temperature at the thickest section of the muscle <5 degrees Area of microbiological concern temp <5°C throughout the smoking process	Actively chill products >5°C Discard as waste >7°C
Step 4 Packing	Growth of pathogens Inadequate temperature control	Temperature of packing room CCP-4	Monitor product and room temperature Refrigeration Micro testing Annually 1. Coagulase-positive staphylococci 2. Listeria monocytogenes 3. Salmonella Standard 1.6.1 Microbiological limits for food. No visual contamination.	Who What How Where When Who What How Where When	QAM/QAO Product/Room Temp Guage Packing room 2 X Daily QAM/QAO Product Micro testing Nata Lab Every 12 months	Form 1 Lab report	Maintain temperature <5°C Room <10°C ANNUALLY - STANDARD 1.6.1 - MICROBIOLOGICAL LIMITS FOR FOOD 5 Samples shall be tested for: 1. Coagulase-positive staphylococci 2. Listeria monocytogenes 3. Salmonella 4. Ecoli 5. 12 MONTHLY Shelf Life Validation	Maintain & service Refrigeration Refrigeration break down contact service provider. Stop packing until repairs completed. Actively chill products >5°C Discard as waste >7°C Discard as waste product that has not met critical limits for food.

Step 5 Storage	Growth of pathogens	Chiller/Freezer CCP-2	Refrigeration	Who What How Where When	QAM/QAO Product/Room Temp Gauge Chiller 2 X Daily	Form 1	Maintain temperature <5°C Frozen <-15°C	Maintain and service Refrigeration Refrigeration break down contact service provider. Seek alternative refrigeration actively chill
Step 5 Dispatch	Growth of pathogens	Delivery Van CCP-5	Refrigeration Contamination	Who What How Where When	QAM/QAO Product/Chiller Temp Gauge Chiller/Product Every dispatch	Dispatch Form 3	Maintain temperature <5°C Frozen <-15°C	Maintain and service Refrigeration Refrigeration break down contact service provider. Seek alternative refrigeration actively chill
			Contamination	Who What How Where When	QAM/QAO Delivery Van Cleaning procedure Load out Every dispatch	Form 1	Cleaning procedures	Maintain and service

7.2 Appendix 2 Industry Standards on Shelf Life Red Meat

7.2.1 Primesafe Industry Standards

<https://www.primesafe.vic.gov.au/standards-and-guidelines/primenotes/shelf-life-and-labelling-requirements-for-meat-products/>

The shelf life of products is generally determined by conducting storage trials under the conditions that the product would be sold (e.g. ambient, chilled or frozen). Usually the shelf life is determined in the product development stage by skilled technologists or processors that know the product well. In most cases variables such as pH, water activity, preservative content and storage temperatures are considered when decisions are made on the life of the product.

In some instances, shelf life is estimated based on the history of the product and its composition. Figure 1 explains the process used to make a decision on shelf life. Table 1 summarises shelf life guidelines for meat products stored frozen or up to 5°C. The reference temperature of 5°C included in the table is the minimum standard required by the Australian Standard of Hygienic Production and Transportation of Meat and Meat Products for Human Consumption (AS4696:2007). As shown, lower temperatures may achieve a greater shelf life for processed products, however this requires scientific validation or other evidence from a credible source.

Validation data from product specific trials and testing must be provided for any situation outside these guidelines. If process is adopted from scientific research, then verification records must be provided for the shelf life values used as shown in shown in Figure 1.

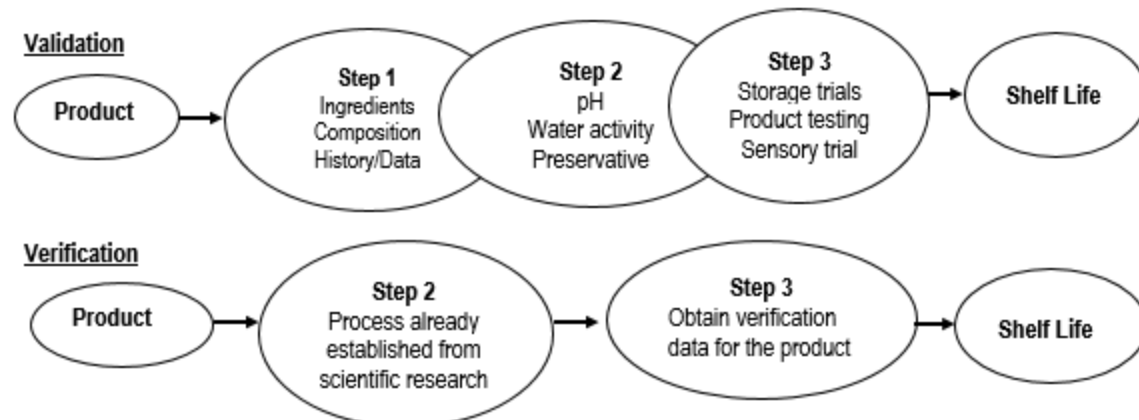




Figure 1: Assessment process for shelf life

7.2.2 Summary of shelf life guidelines for packaged meat and meat Products

<https://www.primesafe.vic.gov.au/standards-and-guidelines/primenotes/shelf-life-and-labelling-requirements-for-meat-products/>

	Type	Temperature	Beef 	Lamb 
Processed	VP Primal cuts (beef & lamb)	0°C	10-12 weeks	6-10 weeks
	VP Primal cuts	<5°C	7 weeks	7 weeks
	VP Portions	<5°C	3 weeks	3 weeks
	VP Machine diced and sliced	<5°C	3 weeks	3 weeks
	VP Hand diced and sliced	<5°C	2 weeks	2 weeks
	VP Raw Mince	<5°C	7 days	7 days

7.3 Appendix 3 Results – Shelf Life Validation

7.3.1 Summary of Symbio laboratory results

Report Number	Discription	Start Date	End Date	Days	Tests	M2_5-Standard Plate Count (CFU/g)	M8_8-Escherichia coli (CFU/g)	M13_2MON O-Listeria monocytogenes (/125g)	M16_1-Salmonella spp. (/125g)
M822485-A	Beef Brisket Burger	03.09.19	08.10.19	35	6	630000	<10		
M822485-B	Beef Burger Plain	03.09.19	08.10.19	35	6	660000	<10		
	Mutton Mince -PET FOOD TEST								
M822480-A	Control not smoked	03.09.19	24.09.10	21	4	3000000	<10		
M822480-A	Smoked	03.09.19	24.09.10	21	4	2800000	<10		
	Beef Whole Primal								
M822569-B/1	#1 - Beef Whole Scotch	3.10.19		1	1	780,000	<10		
M822569-B/2	#2 - Beef Whole Scotch	3.12.19		63	2	18,000	<10		
	Beef DICED								
M822569-A/1	#1 - Topside Beef Diced	03.09.19		1	1	4,900	<10		
M822569-A/2	#2 - Topside Beef Diced	03.10.19		30	2	~40000	<10		
M822569-A/3	#3 - Topside Beef Diced	03.11.19		61	3	22,000	<10		
M822569-A/4	#4 - Topside Beef Diced	03.12.19		91	4	~16,000,000	<10		
M822569-A/5	#5 - Topside Beef Diced	03.01.19		122	5	2,100,000	<10		
M822569-A/6	#6 - Topside Beef Diced	03.02.19			6	CEASED	CEASED		
	Smoked Lamb Steaks								
M802679/1	3 x Smoked lamb meat 1	05.07.19		1	1			ND	
M802679/2	3 x Smoked lamb meat 2	05.08.19		31	2			ND	
M802679/3	3 x Smoked lamb meat 3	26.08.19		54	3	11000	<10	ND	
M802679/4	3 x Smoked lmb meat 4	05.10.19		92	4	10000000	<10	ND	
M802679/5	3 x Smoked lmb meat 5	05.11.19		123	5	2600000			ND
M802679/6	3 x Smoked lamb meat 6	05.12.19		153	6	48000000	<10		ND
	#NOT SMOKED Beef Topside								
M822475	Muscle Packed 28.08.19	03.09.19	03.09.19		1	9,400	<10		
	SMOKED #2 - Beef Topside								
M822475	Muscle Packed 28.08.19	03.09.19	03.09.19		2	1100	<10		
	Beef Mince								
M822470	3 x Smoked beef mince 1	03.09.19		1	1	440000	<10		
M822470	3 x Smoked beef mince 2	10.09.19		7	2	160000	<10		
M822470	3 x Smoked beef mince 3	17.09.19		14	3	30000	<10		
M822470	3 x Smoked beef mince 4	24.09.19		21	4	450000	<10		
M822470	3 x Smoked beef mince 5	1.10.19		28	5	820000	<10		
M822470	3 x Smoked beef mince 6	8.10.19		35	6	1400000	<10		

7.3.2 Detailed Results Report M822485 Burgers (Brisket & Plain)

Symbio LABORATORIES



CERTIFICATE OF ANALYSIS			
Certificate Number	M822485-A [R01]	Page	1/1
Client	Egg Artisan Group	Registering Laboratory	Melbourne
Contact	Julie Kos	Contact	Customer Service Team
Address	114 Dears Lane Stonehaven VIC 3218	Address	Unit 36, 640 – 680 Geelong Rd, Brooklyn, VIC 3012
Telephone	0432 689 833	Telephone	1300 703 166
Order Number	---	Date Samples Received	03/09/2019 13:45
Job Description	Meat - Brisket Burger, Shelf Life	Date Analysis Commenced	03/09/2019
Client Job Reference	FOOD	Issue Date	10/10/2019
No. of Samples Registered	6	Receipt Temperature (°C)	7
Priority	Normal	Storage Temperature (°C)	4

ABN: 82 079 645 015



Accreditation No: 2455
Accredited for compliance
with ISO/IEC 17025 - Testing

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Definitions

<: Less Than	>: Greater Than	RP: Result Pending	~: Estimated	MPN: Most Probable Number	CFU: Colony Forming Units	---: Not Received/Not Requested
^ Subcontracted Analysis	NA: Not Applicable	[NT]: Not Tested	LOR: Level of Reporting	TBA: To Be Advised	ND: Not Detected	
* Test not covered by NATA scope of accreditation	# Result derived from a calculation and includes results equal to or greater than the LOR					

Authorised By

Name	Position	Accreditation Category
Kashif Ahmed	National Microbiology Manager	Environmental and Food Microbiology

Sample Information - Client Supplied

Sample ID	Sample Description	Sample Matrix
M822485-A/1	#1 - Brisket Burger; Tested:03/09/2019	---
M822485-A/2	#2 - Brisket Burger; Tested:10/09/2019	---
M822485-A/3	#3 - Brisket Burger; Tested:17/09/2019	---
M822485-A/4	#4 - Brisket Burger; Tested:24/09/2019	---
M822485-A/5	#5 - Brisket Burger; Tested:01/10/2019	---
M822485-A/6	#6 - Brisket Burger; Tested:08/10/2019	---

Analytical Results

Compound/Analyte	Method	LOR	Units	M822485-A/1	M822485-A/2	M822485-A/3	M822485-A/4	M822485-A/5
Standard Plate Count	M2.5 - AOAC 990.12	10	CFU/g	~60000	~20000	~160000	~240000	380000
Escherichia coli	M8.8 - AOAC 991.14	10	CFU/g	<10	<10	<10	<10	<10

Compound/Analyte	Method	LOR	Units	M822485-A/6
Standard Plate Count	M2.5 - AOAC 990.12	10	CFU/g	630000
Escherichia coli	M8.8 - AOAC 991.14	10	CFU/g	<10

Analysis Location

All in-house analysis was completed by Symbio Laboratories - Melbourne.

Symbio LABORATORIES



CERTIFICATE OF ANALYSIS

Certificate Number	M822485-B [R01]	Page	1/1	ABN: 82 079 645 015
Client	Egg Artisan Group	Registering Laboratory	Melbourne	
Contact	Julie Kos	Contact	Customer Service Team	
Address	114 Dears Lane Stonehaven VIC 3218	Address	Unit 36, 640 – 680 Geelong Rd, Brooklyn, VIC 3012	
Telephone	0432 689 833	Email	admin@symbiolabs.com.au	
Order Number	---	Telephone	1300 703 166	
Job Description	Meat - Plain Burger, Shelf Life	Date Samples Received	03/09/2019 13:45	
Client Job Reference	FOOD	Date Analysis Commenced	03/09/2019	
No. of Samples Registered	6	Issue Date	10/10/2019	
Priority	Normal	Receipt Temperature (°C)	7	
		Storage Temperature (°C)	4	



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Definitions

| <: Less Than | >: Greater Than | RP: Result Pending | ~: Estimated | MPN: Most Probable Number | CFU: Colony Forming Units | ---: Not Received/Not Requested | | ^ Subcontracted Analysis | NA: Not Applicable | [NT]: Not Tested | LOR: Level of Reporting | TBA: To Be Advised | ND: Not Detected | | * Test not covered by NATA scope of accreditation | # Result derived from a calculation and includes results equal to or greater than the LOR |

Authorised By

Name	Position	Accreditation Category
Kashif Ahmed	National Microbiology Manager	Environmental and Food Microbiology

Sample Information - Client Supplied

Sample ID	Sample Description	Sample Matrix
M822485-B/1	#1 - Plain Burger; Tested:03/09/2019	---
M822485-B/2	#2 - Plain Burger; Tested:10/09/2019	---
M822485-B/3	#3 - Plain Burger; Tested:17/09/2019	---
M822485-B/4	#4 - Plain Burger; Tested:24/09/2019	---
M822485-B/5	#5 - Plain Burger; Tested:01/10/2019	---
M822485-B/6	#6 - Plain Burger; Tested:08/10/2019	---

Analytical Results

Compound/Analyte	Method	LOR	Units	M822485-B/1	M822485-B/2	M822485-B/3	M822485-B/4	M822485-B/5
Standard Plate Count	M2.5 - AOAC 990.12	10	CFU/g	26000	~280000	420000	~70000	380000
Escherichia coli	M8.8 - AOAC 991.14	10	CFU/g	<10	<10	<10	<10	<10

Compound/Analyte	Method	LOR	Units	M822485-B/6
Standard Plate Count	M2.5 - AOAC 990.12	10	CFU/g	660000
Escherichia coli	M8.8 - AOAC 991.14	10	CFU/g	<10

Analysis Location

All in-house analysis was completed by Symbio Laboratories - Melbourne.

7.3.3 Results Report M822480 – Mutton Mince – Pet Food

Symbio LABORATORIES



CERTIFICATE OF ANALYSIS			
Certificate Number	M822480-B [R01]	Page	1/1
Client	Egg Artisan Group	Registering Laboratory	Melbourne
Contact	Julie Kos	Contact	Customer Service Team
Address	114 Dears Lane Stonehaven VIC 3218	Address	Unit 36, 640 – 680 Geelong Rd, Brooklyn, VIC 3012
Telephone	0432 689 833	Email	admin@symbiolabs.com.au
Order Number	---	Telephone	1300 703 166
Job Description	Meat - Shelf Life	Date Samples Received	03/09/2019 13:45
Client Job Reference	FOOD	Date Analysis Commenced	03/09/2019
Number of Samples Received	6	Issue Date	26/09/2019
Number of Samples Analysed	Normal	Receipt Temperature (°C)	7
		Storage Temperature (°C)	4

ABN: 82 079 645 015



Accreditation No: 2455
Accredited for compliance
with ISO/IEC 17025 - Testing

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Definitions

<: Less Than	>: Greater Than	RP: Result Pending	~: Estimated	MPN: Most Probable Number	CFU: Colony Forming Units	---: Not Received/Not Requested
^: Subcontracted Analysis	NA: Not Applicable	[NT]: Not Tested	LOR: Level of Reporting	TBA: To Be Advised	ND: Not Detected	
* Test not covered by NATA scope of accreditation	# Result derived from a calculation and includes results equal to or greater than the LOR					

Authorised By

Name	Position	Accreditation Category
Kashif Ahmed	National Microbiology Manager	Environmental and Food Microbiology

Sample Information - Client Supplied

Sample ID	Sample Description	Sample Matrix
M822480-B/1	#1 Mutton mince; Tested:03/09/2019	Meat - Raw
M822480-B/2	#2 Mutton mince; Tested:10/09/2019	Meat - Raw
M822480-B/3	#3 Mutton mince; Tested:17/09/2019	Meat - Raw
M822480-B/4	#4 Mutton mince; Tested:24/09/2019	Meat - Raw
M822480-B/5	#5 Mutton mince - cancelled by the client; Tested:24/09/2019	Meat - Raw
M822480-B/6	#6 Mutton mince - cancelled by the client; Tested:24/09/2019	Meat - Raw

Analytical Results

Compound/Analyte	Method	LOR	Units	M822480-B/1	M822480-B/2	M822480-B/3	M822480-B/4	M822480-B/5
Standard Plate Count	M2.5 - AOAC 990.12	10	CFU/g	1500000	1000000	~6000000	2800000	---
Escherichia coli	M8.8 - AOAC 991.14	10	CFU/g	<10	<10	<10	<10	---
Compound/Analyte	Method	LOR	Units	M822480-B/6				
Standard Plate Count	M2.5 - AOAC 990.12	10	CFU/g	---				
Escherichia coli	M8.8 - AOAC 991.14	10	CFU/g	---				

Analysis Location

All in-house analysis was completed by Symbio Laboratories - Melbourne.

7.3.4 Results Report M822569 – Diced Beef

Symbio LABORATORIES



CERTIFICATE OF ANALYSIS - Preliminary Certificate

Certificate Number	M822569-A [R01]	Page	1/1	ABN: 82 079 645 015
Client	Egg Artisan Group	Registering Laboratory	Melbourne	
Contact	Julie Kos	Contact	Customer Service Team	
Address	114 Dears Lane Stonehaven VIC 3218	Address	Unit 36/640-680 Geelong Rd, Brooklyn, VIC 3012	
Telephone	0432 689 833	Email	admin@symbiolabs.com.au	
Order Number	---	Telephone	1300 703 166	
Job Description	Meat - Topside Beef Diced, Shelf Life	Date Samples Received	03/09/2019	
Client Job Reference	FOOD	Date Analysis Commenced	03/09/2019	
No. of Samples Registered	6	Issue Date	05/01/2020[interim]	
Priority	Normal	Receipt Temperature (°C)	7	
		Storage Temperature (°C)	4	



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Definitions

| <: Less Than | >: Greater Than | RP: Result Pending | ~: Estimated | MPN: Most Probable Number | CFU: Colony Forming Units | ---: Not Received/Not Requested | | ^ Subcontracted Analysis | NA: Not Applicable | [NT]: Not Tested | LOR: Level of Reporting | TBA: To Be Advised | ND: Not Detected | * Test not covered by NATA scope of accreditation | # Result derived from a calculation and includes results equal to or greater than the LOR | IH: Inconsistent results possibly caused by sample homogeneity

Authorised By

Name	Position	Accreditation Category
Kashif Ahmed	National Microbiology Manager	Environmental and Food Microbiology

Sample Information - Client/Sampler Supplied

Sample ID	Sample Description	Sample Matrix
M822569-A/1	#1 - Topside Beef Diced; Tested:03/09/2019	---
M822569-A/2	#2 - Topside Beef Diced; Tested:03/10/2019	---
M822569-A/3	#3 - Topside Beef Diced; Tested:03/11/2019	---
M822569-A/4	#4 - Topside Beef Diced; Tested:03/12/2019	---
M822569-A/5	#5 - Topside Beef Diced; Tested:03/01/2020	---
M822569-A/6	#6 - Topside Beef Diced; Tested:03/02/2020	---

Analytical Results

Compound/Analyte	Method	LOR	Units	M822569-A/1	M822569-A/2	M822569-A/3	M822569-A/4	M822569-A/5
Standard Plate Count	M2.5 - AOAC 990.12	10	CFU/g	4900	~40000	22000	~16000000	2100000
Escherichia coli	M8.8 - AOAC 991.14	10	CFU/g	<10	<10	<10	<10	<10

Compound/Analyte	Method	LOR	Units	M822569-A/6
Standard Plate Count	M2.5 - AOAC 990.12	10	CFU/g	
Escherichia coli	M8.8 - AOAC 991.14	10	CFU/g	

Analysis Location

All in-house analysis was completed by Symbio Laboratories - Melbourne.

Report Comments

Sampling was conducted by the customer and results pertain only to the samples submitted. Responsibility for representative sampling rests with customer.

7.3.5 Results Report M802679 – Lamb Steaks

Symbio LABORATORIES



CERTIFICATE OF ANALYSIS

Certificate Number	M802679 [R02]	Page	1/1	ABN: 82 079 645 015
Client	Egg Artisan Group	Registering Laboratory	Melbourne	
Contact	Julie Kos	Contact	Customer Service Team	
Address	114 Dears Lane Stonehaven VIC 3218	Address	Unit 36/640-680 Geelong Rd, Brooklyn, VIC 3012	
Telephone	0432 689 833	Email	admin@symbiolabs.com.au	
Order Number	---	Telephone	1300 703 166	
Job Description	Meat - Processed Shelf Life	Date Samples Received	05/07/2019	
Client Job Reference	FOOD	Date Analysis Commenced	05/07/2019	
No. of Samples Registered	6	Issue Date	08/12/2019	
Priority	Normal	Receipt Temperature (°C)	4	
		Storage Temperature (°C)	4	



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Definitions

| <: Less Than | >: Greater Than | RP: Result Pending | ~: Estimated | MPN: Most Probable Number | CFU: Colony Forming Units | ---: Not Received/Not Requested | | ^ Subcontracted Analysis | NA: Not Applicable | [NT]: Not Tested | LOR: Level of Reporting | TBA: To Be Advised | ND: Not Detected | * Test not covered by NATA scope of accreditation | # Result derived from a calculation and includes results equal to or greater than the LOR | IH: Inconsistent results possibly caused by sample homogeneity

Authorised By

Name	Position	Accreditation Category
Kashif Ahmed	National Microbiology Manager	Environmental and Food Microbiology

Sample Information - Client/Sampler Supplied

Sample ID	Sample Description	Sample Matrix
M802679/1	3 x Smoked meat 1; Tested:05/07/2019	Meat - Processed
M802679/2	3 x Smoked meat 2; Tested:05/08/2019	Meat - Processed
M802679/3	3 x Smoked meat 3; Tested:26/08/2019	Meat - Processed
M802679/4	3 x Smoked meat 4; Tested:05/10/2019	Meat - Processed
M802679/5	3 x Smoked meat 5; Tested:05/11/2019	Meat - Processed
M802679/6	3 x Smoked meat 6; Tested:05/12/2019	Meat - Processed

Analytical Results

Compound/Analyte	Method	LOR	Units	M802679/1	M802679/2	M802679/3	M802679/4	M802679/5
Standard Plate Count	M2.5 - AOAC 990.12	100	CFU/g	---	---	11000	~10000000	2600000
Escherichia coli	M8.8 - AOAC 991.14	10	CFU/g	---	---	<10	<10	---
Listeria monocytogenes	M13.2MONO - AS 5013.24.1	ND	/125g	ND	ND	ND	ND	---
Salmonella spp.	M16.1 - AS 5013.10	ND	/125g	---	---	---	---	ND

Compound/Analyte	Method	LOR	Units	M802679/6
Standard Plate Count	M2.5 - AOAC 990.12	100	CFU/g	48000000
Escherichia coli	M8.8 - AOAC 991.14	10	CFU/g	<10
Listeria monocytogenes	M13.2MONO - AS 5013.24.1	ND	/125g	---
Salmonella spp.	M16.1 - AS 5013.10	ND	/125g	ND

Analysis Location

All in-house analysis was completed by Symbio Laboratories - Melbourne.

Report Comments

Sampling was conducted by the customer and results pertain only to the samples submitted. Responsibility for representative sampling rests with customer.

7.3.6 Results Report M822475

7.3.7 Results Report M822470 – Beef Mince

Symbio LABORATORIES



CERTIFICATE OF ANALYSIS			
Certificate Number	M822470 [R00]	Page	1/1
Client	Egg Artisan Group	Registering Laboratory	Melbourne
Contact	Julie Kos	Contact	Customer Service Team
Address	114 Dears Lane Stonehaven VIC 3218	Address	Unit 36, 640 – 680 Geelong Rd, Brooklyn, VIC 3012
Telephone	0432 689 833	Email	admin@symbiolabs.com.au
Order Number	---	Telephone	1300 703 166
Job Description	Food - Beef Mince, Shelf Life	Date Samples Received	03/09/2019 13:45
Client Job Reference	FOOD	Date Analysis Commenced	03/09/2019
No. of Samples Registered	6	Issue Date	10/10/2019
Priority	Normal	Receipt Temperature (°C)	7
		Storage Temperature (°C)	4



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Definitions

<: Less Than	>: Greater Than	RP: Result Pending	~: Estimated	MPN: Most Probable Number	CFU: Colony Forming Units	---: Not Received/Not Requested
^ Subcontracted Analysis	NA: Not Applicable	[NT]: Not Tested	LOR: Level of Reporting	TBA: To Be Advised	ND: Not Detected	
* Test not covered by NATA scope of accreditation	# Result derived from a calculation and includes results equal to or greater than the LOR					

Authorised By

Name	Position	Accreditation Category
Kashif Ahmed	National Microbiology Manager	Environmental and Food Microbiology

Sample Information - Client Supplied

Sample ID	Sample Description	Sample Matrix
M822470/1	#1 - Beef Mince; Tested:03/09/2019	---
M822470/2	#2 - Beef Mince; Tested:10/09/2019	---
M822470/3	#3 - Beef Mince; Tested:17/09/2019	---
M822470/4	#4 - Beef Mince; Tested:24/09/2019	---
M822470/5	#5 - Beef Mince; Tested:01/10/2019	---
M822470/6	#6 - Beef Mince; Tested:08/10/2019	---

Analytical Results

Compound/Analyte	Method	LOR	Units	M822470/1	M822470/2	M822470/3	M822470/4	M822470/5
Standard Plate Count	M2.5 - AOAC 990.12	10	CFU/g	440000	~160000	~30000	450000	820000
Escherichia coli	M8.8 - AOAC 991.14	10	CFU/g	<10	<10	<10	<10	<10

Compound/Analyte	Method	LOR	Units	M822470/6
Standard Plate Count	M2.5 - AOAC 990.12	10	CFU/g	1400000
Escherichia coli	M8.8 - AOAC 991.14	10	CFU/g	<10

Analysis Location

All in-house analysis was completed by Symbio Laboratories - Melbourne.

7.3.8 Business Model Canvas

<p>Key Partners</p> <p>Abitors, Boning Rooms and further meat processing facilities. Food distributors MLA Symbio Laboratories Primesafe/SGS Auditors</p>	<p>Key Activities</p> <p>Selling product into food service and retail outlets Smoking Red meat for own brand or contract processing Packing, Labelling, storage, dispatching</p>	<p>Value Proposition</p> <p>Prolonged Shelf Life, with less bacteria growth Reducing food waste Reducing pressures and costs to cold chain speed to market Creating a bbq chargrilled experience from a frying pan</p>	<p>Customer Relationship</p> <p>Patented technology for chilled smoking. Only provider of smoking technique, Point of differentiation Continued confidence with safe meat</p>	<p>Customer Segment</p> <p>B2C – Under own brand Food Service – smoked meat that can be cooked on demand in house Food Service – shelf life fresh meat B2B – Contract processing/manufacturing Food Manufacturers looking for niche product “smoked burgers, sausages etc”</p>
<p>Cost Structure</p> <p>Licence Fees, Audits, QAM, Facility overheads, product testing</p>		<p>Revenue</p> <p>Contract Manufacturing Chilled chamber a shipping container, can take 1-2 tonne of product per smoke. Pricing model on a per kg basis approx. \$1 per kilo Selling own brand of smoked meats through existing export channels</p>		