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Food Safety Survey Report

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Leafy Greens Horticulture Survey

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This investigation survey is to determine the microbiological quality of fresh pre-packaged washed bagged leafy greens sold in South Australian retail outlets.

Aims & Scope of the Investigation

This survey was intended to inform whether there are potential risks associated with washed, bagged leafy greens sold in SA retail outlets.

Ready-to-eat, washed and bagged leafy greens displayed for sale in supermarkets, fruit and vegetables stores, market stalls and other food businesses were targeted.

Products included but were not limited to washed and bagged Lettuce, Cabbage, Spinach, Rocket, and Kale.

Information was provided to any manufacturer and/or retailer of any unsatisfactory results if the sampled product returned a detection of a target organism.

All samples were analysed for;

- *Salmonella spp.*
- *Campylobacter spp.*
- *Listeria spp.*
- *E.Coli.*

Background to the survey

This survey supports the Australia's Foodborne Illness Reduction Strategy 2018-2021 by targeting the core area of high risk horticulture with monitoring and surveillance focussed on *Campylobacter* and *Salmonella*.

Washed, bagged leafy greens continue to emerge as a convenient food supply source for consumers. Washed, bagged leafy greens have been implicated in recent food recalls overseas and in Australia.

At the 2008 meeting of Food and Agriculture Organization (FAO) and World Health Organization (WHO), it was concluded that leafy vegetables (including herbs) were the highest risk category of fresh produce (Level 1 Priority).

In 2013, the European Food Safety Authority reported salad greens as the second most common source of foodborne illness in the European Union.

A study published in 2015 (Outbreaks attributed to fresh leafy vegetables, United States, 1973–2012) noted that '*During the study period, 606 leafy vegetable-*

associated outbreaks, with 20 003 associated illnesses, 1030 hospitalizations, and 19 deaths were reported. On average, leafy vegetable-associated outbreaks were larger than those attributed to other food types.' It identified the most common pathogens as norovirus, Shiga toxin-producing *Escherichia coli* (STEC) and *Salmonella*.

Recent outbreaks associated with packaged leafy greens

- 2016, USA: bagged salad was linked to an outbreak of *Listeria monocytogenes* that made 19 people ill and caused the death of one person.
- 2016, UK: mixed salad was linked to an outbreak of *Escherichia coli* that sickened 161 people and caused the death of 2 people.
- 2016, Australia: bagged leafy greens (various) were implicated in a multijurisdictional outbreak of *Salmonella anatum* that was found to originate from one processor and affected over 50 people.

National work is progressing via the Food Regulation Standing Committee (FRSC) to understand food safety in the horticulture sector, in addition to the National Foodborne Illness Reduction Strategy 2018-2021 which is targeted at relevant parts of the food supply chain, including fresh produce.

<http://health.gov.au/internet/fr/publishing.nsf/Content/australia-foodborne-illness-reduction-strategy-2018%E2%80%932021>

The collection of this data will assist in identifying if food safety controls are in place and effective. Where unsatisfactory results were reported, trace-back investigation and corrective actions were to be implemented.

Standards

The *Food Act 2001* requires food businesses to only sell food that is safe and suitable for human consumption.

In Australia, there are no legislative requirements for growers of many high risk horticulture products (such as leafy greens, melons and berries) to be regulated. The only regulated high risk horticultural product is seeded sprouts.

For compliance with the Australian New Zealand Food Standards Code, testing for microbiological limits in food should be assessed in accordance with Standard 1.6.1-4 and Schedule 27 - 4 which sets out the number of units to be sampled for assessment of microbiological levels. For Ready-to-eat food in which growth of *Listeria monocytogenes* will not occur, 5 units' are to be purchased.

Due to the nature of fresh produce, Standard 1.6.1 does allow a limit of 100cfu/g for fresh cut and packaged horticulture.

Other guidance for microbiological limits can be found in FSANZ's 'Compendium of Microbiological Criteria for Food'

Method

Local Councils were invited to voluntarily participate in this survey and accordingly Environmental Health Officer's (EHO's) assisted in collection of washed bagged leafy greens from retail outlets in metropolitan and rural South Australia thus increasing the geographical collection network.

Samples were collected in their original packaging to minimise the risk of cross contamination. All applicable details of the sample were collected, for example sample description, sample size (grams), date marking, lot or batch details, place of purchase, producer and or packer details were recorded. Samples were also photographed to show the front and back of the label in the event further action may be required. All information collected by the EHOs was forwarded to SA Health for data collection and analysis.

5 samples of the identical washed bagged leafy greens with matching date marking were obtained and submitted for analysis. If 5 unit/samples with the same date mark were not available it was advised to purchase 5 units of identical washed bagged leafy greens with date marking as close together as achievable.

All samples collected were delivered to SA Pathology.

Results

Local Council involvement was foremost to this survey obtaining a significant sample size and geographical distribution.

14 Local Council's assisted. Below is a summary of the Local Council's involved and the number of samples collected by each Local Council.

• Berri Barmera Council	15 samples
• City of Charles Sturt	10 samples
• City of Holdfast Bay	15 samples
• District Council of Loxton Waikerie	20 samples
• City of Marion	20 samples
• Mount Barker District Council	25 samples
• City of Playford	20 samples
• City of Port Lincoln	10 samples
• Renmark Paringa Council	20 samples
• SA Health	15 samples
• City of Salisbury	10 samples
• City of Tea Tree Gully	20 samples
• City of Unley	20 samples
• City of Victor Harbor	20 samples
• City of West Torrens	20 Samples

Total 260 samples

A total of 260 individual samples were collected from metropolitan and regional areas of South Australia, each sample was tested for *Salmonella* species, *Campylobacter* species, *Listeria* species and *E.Coli*, and subsequently 1,040 individual analyses were conducted to establish a significant data set to assist in establishing the microbiological quality of pre-packaged leafy green vegetables.

Salmonella spp. and *Campylobacter spp.* were not detected in any of the samples submitted to SA Pathology over the testing period. 1 sample of Baby Gem Lettuce returned a certificate of analysis of 20 organisms per gram for E.coli but as the limit of detection is 10 organisms per gram, this cannot be considered an elevated result.

Table 1. Summary of analysis 2017-18.

Pathogen of concern	Samples	Presence (+’s)	Absent (-’s)
E.Coli	260	0	260
Campylobacter spp.	260	0	260
Salmonella spp.	260	0	260
Listeria spp.	260	11	249
Totals	1040	11	1029

Table 2. Summary of the 11 positive detections 2017-18.

Council or SA Health	Sample Number	Date	Sample Description	E.coli	Salmonella	Listeria	Thermophilic Campylobacter
SA Health	36721	21/11/2017	Baby French Kale	less tha 10 organisms per gm	not detected	Listera seeligeri	not detected
SA Health	36722	21/11/2017	Baby French Kale	less tha 10 organisms per gm	not detected	Listera seeligeri	not detected
SA Health	36723	21/11/2017	Baby French Kale	less tha 10 organisms per gm	not detected	Listera seeligeri	not detected
SA Health	36724	21/11/2017	Baby French Kale	less tha 10 organisms per gm	not detected	Listera seeligeri	not detected
SA Health	36621	29/11/2017	Baby French Kale	less tha 10 organisms per gm	not detected	Listera seeligeri	not detected
SA Health	36622	29/11/2017	Baby French Kale	less tha 10 organisms per gm	not detected	Listera seeligeri	not detected
Playford	37551 (e)	15/01/2018	Leafy Mix	less tha 10 organisms per gm	not detected	Listera seeligeri	not detected
Port Lincoln	37601 (a)	05/02/2018	Baby Spinach	less tha 10 organisms per gm	not detected	Listera seeligeri	not detected
Berri	37502 (c)	12/02/2018	Mesculin mix	less tha 10 organisms per gm	not detected	Listeria welshimeri	not detected
Holdfast	36856 (e)	03/04/2018	Cos Lettuce Hearts	less tha 10 organisms per gm	not detected	Listeria monocytogenes	not detected
Loxton Waikerie	37009 (c)	12/04/2018	Mesculin mix	less tha 10 organisms per gm	not detected	Listeria seeligeri	not detected

Discussion of results

This survey aimed at capturing as many different brands of washed and bagged leafy greens currently available in the South Australian marketplace and determining the microbiological quality of these products from different producers not just SA. The period of collection was from November 2017 to April 2018.

18 different varieties of washed bagged leafy greens were obtained for sampling; these were obtained from large supermarket chains through to smaller local fruit and vegetable stores. This variety in types/brands of samples obtained helps build an overall picture of the quality of the product across the South Australian market.

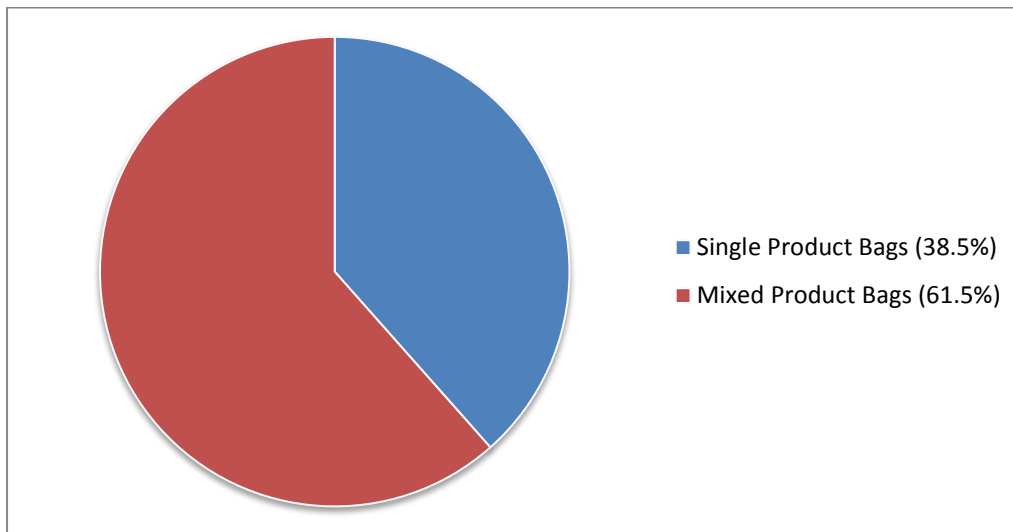
9 varieties consisted of a single product and 9 varieties consisted of a mixed bag of leafy greens (mixed varieties of leafy greens combined into 1 bag) demonstrating the diverse range of products sampled for this survey project. A summary of the 18 different varieties is below in table 3.

Table 3. Summary of Types of Leafy Greens Sampled for 2017-18.

Single product (1 type of Leafy Greens)	Mixed bag product (Combination of Leafy Greens)
Baby French Kale	4 Leaf Salad
Baby Gem Lettuce	Mesculin Mix
Baby Leaf Rocket	Mixed Leaf Leafy Mix
Baby Leaf Spinach	Organic Gourmet Salad Mix
Baby Spinach	Rocket Salad Mix
Cos Lettuce Hearts	Spinach and Rocket and Sweet Peppery
Iceberg Lettuce	Super Leaf Mix
Red Oak Lettuce	Sweet Mix
Spinach Leaves	The Perfect Salad Mix

A 50/50 split between the varieties of single bagged product and mixed bagged product were obtained and submitted for sampling however with consideration of the total 260 samples obtained, 100 bags (38.5%) were the single product bags and 160 (61.5%) were the mixed or combination bags (see figure 1 below).

Figure 1. Summary data for the types of Leafy Greens sampled, Single product bags versus mixed product bags.



From the 260 samples obtained, table 1 shows that 11 positives or 4.2% of the samples detected *Listeria* spp. Despite Mixed Product bags taking 60 more samples, the positive detection rate was higher amongst the single product bags. Single product bags accounted for 3.1% (or 8 out of 11 samples that returned a positive result) and Mixed (co-mingled) product bags accounted for 1.1% or 3 out of 11 samples that returned a positive detection.

Salmonella spp. and *Campylobacter* spp. were not detected in any of the 260 samples submitted.

In relation to *E.Coli*, 259 of the samples returned a less than 10 organisms per gram, which is the level of detection for the laboratory. 1 sample submitted returned 20 organisms per gram, which is just above the limit of detection.

Three different species of *Listeria* were identified during the project

1. *Listeria seeligeri* (x9)
2. *Listeria welshimeri* (x1)
3. *Listeria monocytogenes* (x1)

Listeria spp. are present in the natural environment and can be attributed to the farm environment where there are a number of natural hosts or sources for the bacterium to enter into the food chain.

Listeria monocytogenes is the most significant public health pathogen of concern due to the virulent nature of the bacterium. It has a high mortality rate, long incubation period of 3 to 70 days (average 3 weeks), and has the ability to multiply in refrigerated foods if the foods have been contaminated. *Listeria monocytogenes* is more serious amongst the vulnerable population pregnant women, newborn babies, the elderly and immune suppressed people.

Listeria spp. detections indicate that there can be opportunities for *Listeria* to survive long enough that it is detectable in the end product. Essentially if any *Listeria spp.* can survive the hurdles and controls in place then *Listeria monocytogenes* can also survive.

Follow-up activities

Of the 11 positives detected for *Listeria spp.* follow up activities including email notification and trace-back activities to identify such information as farm location and packing facilities, were collected.

Each sample that tested positive was beyond its shelf life. FCDB worked cooperatively with our CDCB to identify whether there were any cases of illness. No cases of illness were linked during the survey period. In light of this, SA Health used this as an opportunity to see how effectively a business's recall system and trace back could operate.

3 separate supermarket chains had to be contacted in relation to a positive detection in a sample. All businesses were successful in relaying the information required and showed competence in a well-developed trace back and recall system

Conclusion

Fresh vegetables play a role in healthy diets and recently there has been an emergence of washed and ready-to-eat bags of leafy greens becoming a popular convenience food amongst consumers. There have also been a number of food-borne outbreaks directly associated with leafy green vegetables.

The scope of this project was to determine the microbiological quality of washed ready-to-eat prepacked leafy greens, including single product bags and co-mingled bags of leafy green vegetables purchased from retail outlets.

This survey did not capture activities occurring on the farm, however there are future opportunities to consider how the farm environment may impact food safety

Outbreaks associated with fresh produce can be very costly for industry. Industries can suffer initial consumer backlash, unwanted media attention, be subjected to product recalls and very often result in economic losses some of which are long-term.

The outcomes of the survey identify that non pathogenic *Listeria* species are present in the environment. This further supports additional work occurring towards identifying high risk horticultural products under the Australia Foodborne Reduction Strategy.

Acknowledgements

SA Health would like to acknowledge the contribution of Local Council Environmental Health Officers in assisting with the collection, processing and delivery of samples throughout the course of this project.

- Berri Barmera Council
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SA Health would like to acknowledge the support SA Pathology Main Laboratory, Frome Road, Adelaide provided in analysing the samples provided throughout this project.