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Microbiological quality of sushi – 2009

Snapshot survey on the microbiological quality of sushi sold in NSW

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Introduction

A national sushi survey was conducted in 2006/2007

In 2006/2007 a national survey, involving NSW, SA, NT, and the ACT, was conducted on the microbiological quality of sushi sold in sushi bars and trains. This involved sushi premises being visited once during the summer months (between December 2006 and February 2007) and once during the winter months (between June 2006 to August 2006). A total of 1000 samples of cooked acidified rice, nigiri rolls, maki rolls and raw fish were analysed. A focus on sushi containing raw seafood was used to assess whether the use of this ingredient resulted in a higher prevalence of bacteria in the final product.

The main findings of this survey were:

- Samples were generally very good, with 98.6% of sushi rice samples and 94.6% of sushi samples microbiologically acceptable (combine summer and winter results).
- Sushi was found to have significantly higher levels of faecal coliforms and *E. coli* in the summer months.
- Six sushi samples were categorised as potentially hazardous due to elevated levels of *Bacillus cereus*.
- Cooling of cooked rice was often uncontrolled and verification of the pH of acidified sushi rice was rarely undertaken, sometimes resulting in rice with a higher pH than the 4.6 limit identified by the NSW Food Authority.
- Sushi premises generally did not have a documented system for identifying how long sushi had been displayed out of temperature control.
- All samples of raw seafood were within the Food Standards Code limit for histamine.

A full report of this survey can be found on the NSW Food Authority's website at: http://www.foodauthority.NSW.gov.au/aboutus/science%2Dand%2Dresearch/market%2Danalysis/sushi/

Food Safety Guidelines for Sushi Retailers was made available in 2007

In conjunction with the 2006/2007 national sushi survey, the Authority also published *Food Safety Guidelines for the Preparation and Display of Sushi* (available in English, Korean and Japanese), and these were made available to sushi retailers via local councils and the Authority's website at: http://www.foodauthority.nsw.gov.au/_Documents/industry_pdf/Sushi-Guidelines-Eng.pdf

In 2009, a snapshot sushi survey was conducted in NSW

In 2009, the Authority conducted a follow up survey to determine if there had been a shift in the microbiologically quality of sushi since the national 2006/2007 survey and the introduction of the *Food Safety Guidelines for the Preparation and Display of Sushi*.

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Method

In the absence of readily accessible data on the sushi industry in NSW to enable the design of a statistically representative survey of sushi sold in NSW, a snapshot survey was undertaken. Between February and March 2009, sushi and acidified rice from fifteen sushi retailers across greater Sydney and Wollongong were sampled and analysed for a range of pathogens and indicator organisms. Raw seafood was also analysed for histamine, and the pH of the acidified rice was measured.

The fifteen premises surveyed were randomly selected from the sushi outlets that were sampled in NSW during both the summer and winter sampling periods of the 2006/2007 survey (representing 36% of outlets surveyed in NSW during the summer period of the 2006–2007 survey).

In total, fifteen acidified rice samples, fourteen raw seafood and 58 sushi samples were collected and tested using Australian standard methods. Analysis for each sample is outlined in Table 1. The guideline or standard that results were compared against is also listed in Table 1.

Table 1: Type of analysis for each sample

Sample	Tests	Standard/Guideline which results were assessed against
Acidified rice	• Standard plate count • thermotolerant coliforms • *Bacillus cereus* • Coagulase positive staphylococci • *Escherichia coli*	• FSANZ's guidelines for the microbiological examination of ready to eat foods. (ANZFA, 2001) • PHLS's guideline for the microbiological quality of some ready to eat foods sampled at the point of sale. (PHLS, 2000)
	• pH	• The Authority's Food safety guidelines for the preparation and display of sushi
All sushi	• Thermotolerant coliforms • *Bacillus cereus* • Coagulase positive staphylococci • *Escherichia coli* • *Salmonella* spp. • *Listeria monocytogenes* • *Vibrio parahaemolyticus (sushi containing raw seafood only)*	• FSANZ's guidelines for the microbiological examination of ready to eat foods. (ANZFA, 2001) • PHLS's guideline for the microbiological quality of some ready to eat foods sampled at the point of sale. (PHLS, 2000)
Raw seafood	• Histamine	• *Standard 2.2.3 – Fish and Fish Products* of the *Food Standards code*

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Results and discussion

Microbiological analysis

Sushi

Based on the FSANZ microbiological guidelines (ANZFA, 2001) and PHLS microbiological guidelines (PHLS, 2000), 94.8% of sushi samples were within acceptable microbiological limits (Table 2). No samples were classified potentially hazardous and *Salmonella* was not detected in any sample.

Table 2: Sushi results

Survey	Microbiologically acceptable		Microbiologically unacceptable		Potentially hazardous	
	No	%	No	%	No	%
2009, Summer, NSW	55	94.8%	3	5.2%	0	0%
2006/2007, Summer, NSW	215	94.7%	8	3.5%	4	1.8%
2006/2007, Summer, National	374	92.6%	26	6.4%	4	1.0%

The three unacceptable samples in 2009 were due to the presence of *Listeria monocytogenes*. *L. monocytogenes* is widespread in the environment and can be naturally present in raw food, such as raw seafood and vegetables. The degree of food safety risk presented by this pathogen is influenced by the level detected. For a product like sushi, levels of *L. monocytogenes* greater than 10^2 are classified unacceptable and levels under this are classified acceptable (ANZFA, 2001). In this survey *L. monocytogenes* was not enumerated. Any sample with a result of *L. monocytogenes* detected in 25g was given a conservative classification of unacceptable. It must be noted that certain groups in our community, for example pregnant women, are more vulnerable to *L. monocytogenes* infection. For this reason it is recommended that certain foods, such as sushi, are avoided during pregnancy.

Overall, results from 2009 were consistent with results from 2006–2007 (Table 2). In 2009, there was a decrease in the number of potentially hazardous samples. The potentially hazardous samples from 2006–2007 were sourced from the one premises and appropriate enforcement action was taken. This premises was re-sampled in 2009 and all samples were classified microbiologically acceptable.

Acidified rice

All acidified rice samples were classified microbiologically acceptable. No samples were classified microbiologically unacceptable or potentially hazardous. This shows an apparent improvement compared to the national 2006–2007 summer results where 2.6% of acidified rice samples were classified microbiologically unacceptable. However, the sample size in 2009 was much smaller.

Chemical analysis

Acidified rice

It is important for sushi rice to be acidified properly, as most pathogenic bacteria do not grow or produce toxins at a pH of 4.6 or less (Hocking, 2003). Sushi rice with a pH above 4.6 is classified unacceptable. Only one sample (7%) was classified unacceptable due to the pH being greater than 4.6 (Table 3). This shows an apparent improvement from the national 2006–2007 summer results which found 12.8% of acidified rice samples had a pH greater than 4.6. However, the sample size in 2009 was much smaller.

Table 3: pH results of acidified rice

Survey	Acceptable pH≤4.6		Unacceptable pH>4.6	
	No.	%	No.	%
2009, summer, NSW	14	93%	1	7%
2006–2007, summer, national	34	87.2%	5	12.8%

Raw fish

The presence of histamine in raw fish can be an indicator of poor handling and hygiene. Raw tuna and salmon were tested for the presence of histamine. No sample analysed contained a detectable level of histamine. This is comparable to the previous summer survey where all raw seafood samples analysed were classified acceptable.

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Conclusion

The vast majority of samples surveyed were within acceptable microbiological and chemical limits, and overall the results were consistent with the high level of acceptability demonstrated in the 2006–2007 survey.

This survey reinforces the need for industry to remain vigilant in ensuring adequate food handling practices and hygiene.

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