NSW Food Authority

safer food, clearer choices

Food Safety Guidelines for the Preparation and Display of Sushi

June 2007

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Introduction

Ready-to-eat sushi is regarded as a potentially hazardous food. As such, it is a requirement for food businesses to maintain the temperature of sushi either at or below 5˚C during transport, storage and display. This is a requirement of the *Australia New Zealand Food Standards Code* (*Food Standards Code*) Division 3, Standard 3.2.2. The *Food Standards Code* allows for alternative compliance provided the businesses can demonstrate the product's safety (Clause 25, Standard 3.2.2, *Food Standards Code*). The "4 hour/2 hour rule" is used by Food Standards Australia New Zealand (FSANZ) as an example of an alternative method for compliance.

4 hour/2 hour rule

Any ready-to-eat potentially hazardous food, if it has been at temperatures between 5˚C and 60˚C:

- For a total of less than 2 hours, must be refrigerated or used immediately;
- For a total of longer than 2 hours but less than 4 hours, must be used immediately; or
- For a total of 4 hours or longer, must be thrown out (FSANZ, 2001).

To assess the applicability of utilising the "4 hour/2 hour" rule during the **display** of sushi, the NSW Food Authority conducted modelling of bacteria that cause food poisoning to assess the potential impact unrefrigerated display of sushi has on the safety of the product. This study concluded that the product would need to be displayed for longer than 4 hours at 25°C or higher for pathogenic bacteria to reach dangerous levels.

Based on this, the NSW Food Authority will permit retail sushi businesses to display sushi at temperatures greater than 5°C for no more than 4 hours, provided:

- The *Food Standards Code* requirements are followed during the receipt, preparation and storage of sushi and raw materials;
- Proper acidification of the rice (to a pH less than or equal to 4.6) takes place to inhibit the growth of food poisoning bacteria. The pH must be recorded; and
- Sushi businesses implement a system for monitoring the length of time sushi can be displayed at greater than 5^{o}C.
- Sushi is never displayed at temperatures above 25°C.

Purpose and Scope

This document aims to provide retail and food service businesses with information on the safe preparation and display of sushi. The document covers all areas such as:

- receipt of raw materials/sushi;
- preparation of sushi;
- display of sushi.

All of these areas can potentially affect the safety of the sushi when it is eaten. It also includes an example of a monitoring system for use when displaying sushi unrefrigerated.

This document does not cover all requirements of the *Food Standards Code*, in particular requirements relating to premises and equipment. Businesses are urged to read the *Food Standards Code* and ensure they comply with all aspects of the Code as it relates to their business.

Acknowledgements

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Definitions

Acidified rice	Cooked rice with vinegar added to achieve a pH of 4.6 or less
Cleaning	The process of removing food and other types of soils from surfaces, equipment and utensils. Detergents are used to assist removal.
Pathogenic bacteria	Bacteria capable of causing food poisoning. Includes Salmonella, Bacillus cereus, Staphylococcus aureus and some types of Vibrio species.
Potentially hazardous foods	Food that has to be kept at a certain temperature to minimise the growth of any pathogenic bacteria that may be present in the food or to prevent the formation of toxins in the food. *Food Standards Code 3.2.2, Division 1, Clause 1*
Ready-to-eat foods	Food that is ordinarily consumed in the same state as that in which it is sold and does not include nuts in the shell and whole, raw fruits and vegetables that are intended for hulling, peeling or washing by the consumer. *Food Standards Code 3.2.2, Division 1, Clause 1* For sushi businesses this would include cooked foods such as teriyaki chicken or cooked prawns or foods/products consumed raw such as tuna, other fish and some vegetables.
Sanitising	The process of removing microorganisms from a surface, equipment and utensils using either chemical agents or heat.
Shelf-stable foods	Foods which can be stored unrefrigerated without affecting their safety or quality. For sushi businesses this would include uncooked rice and nori sheets.
Sushi	Ready-to-eat cooked rice that has been acidified with a vinegar solution and formed with a variety of ingredients including raw or cooked seafood, fresh chopped vegetables, cooked egg etc. Product forms can include: • nigiri – small balls of rice with ingredients on top, • maki rolls – layers of rice and nori sheets rolled with a bamboo mat to form cylinders that contain various fillings, and • hand rolls – cone shaped rolls formed by a sheet of nori filled with various ingredients.
Sushi rice	Cooked short grain rice mixed with vinegar and other ingredients such as sugar and/or salt.

Temperature control	Means maintaining food at a temperature of: a. 5°C or below if this is necessary to minimise the growth of infectious or toxigenic microorganisms in the food so that the microbiological safety of the food will not be adversely affected for the time the food is at that temperature; or b. 60°C or above; or 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. *Food Standards Code 3.2.2, Division 1, Clause 1*

Receiving and storing foods

The safety of food begins by ensuring only safe and suitable ingredients are purchased from a supplier and are stored correctly. Below is some information to assist in complying with the requirements of the *Food Standards Code* relating to the receipt and storage of foods.

Supplier and food information

- It is advisable to maintain a list of food suppliers in case they need to be contacted. An example worksheet for listing suppliers is provided in Appendix 3.
- For all foods, the label or receipt must contain details of suppliers' names and addresses. Phone contact details should also be kept.
- Only receive foods that are within their *use by* date or *best before* date.
- For all foods, you should use the oldest stock first.
- Items that do not meet receipt requirements should be returned to supplier.

Ready made sushi

- Only receive sushi that has been transported in refrigerated vehicles.
- Always check the temperature of sushi for each batch received. The temperature must be 5°C or less.
- Once received, sushi must be:
    - Kept refrigerated at 5°C or less; or
    - Placed on retail display immediately.
- Sushi must be covered during receipt and storage to protect against contamination.

Potentially hazardous raw ingredients

Potentially hazardous foods and raw materials will need to be stored refrigerated. This would include meat, chicken, seafood, non-acidified cooked rice and dairy products.

- Only receive potentially hazardous foods that have been transported under temperature control.
- Once received all potentially hazardous foods must be placed under refrigerated storage at 5°C or less immediately.

- Only sashimi-grade tuna or fish should be used in raw fish sushi.
- Refrigerated raw ingredients must be stored separately from:
    - Finished sushi; and
    - Ready-to-eat foods and ingredients such as tuna or salmon
- Raw foods such as uncooked chicken and meat must not be placed above ready-to-eat foods in the refrigerator, to prevent the raw juices from dripping onto them.
- Refrigerated ingredients must be covered during receipt and storage to protect against contamination.

Receiving acidified rice

- Only receive acidified rice that is labelled with the date and time it was made.
- Check the pH of the rice to ensure it has been properly acidified. It must be less than 4.6 (see Appendix 1 and 2).
- If the pH is higher than 4.6 or it was made greater than 8 hours ago, reject the rice.
- Record the pH result, the date and time the rice was made, and the pH on a worksheet. An example worksheet is shown in Appendix 4.
- Only acidified rice can be stored at room temperature; however it must be used on the day it was made – after this it must be discarded.
- All acidified rice must be kept covered when not in use to protect against contamination.

Shelf stable foods

- Shelf-stable foods include uncooked rice, seaweed (nori) sheets, wasabi powder and pickles.
- When receiving shelf stable foods make sure that the packaging is intact.
- Shelf-stable foods must be covered during storage to protect against contamination

Frozen foods

- All frozen foods must be received in a frozen state.

- If foods are to be kept frozen, they must be placed in a freezer immediately.

- When receiving and storing frozen foods, ensure they are adequately covered and the package is intact.

Preparing Sushi

Preparing sushi involves a great deal of handling of both raw and cooked foods. Because sushi is eaten without any further cooking it is important that it is prepared correctly and safely.

Raw foods can contain bacteria and, if not handled correctly, the numbers of bacteria can grow. Poor handling of cooked foods can result in them becoming cross-contaminated from raw foods, and if not stored correctly, the number of bacteria can also grow.

Below are some main points to assist in proper preparation of sushi and to assist in avoiding cross-contamination.

Equipment and utensils

- With the exception of bamboo mats, wooden utensils must not be used by the food business. All utensils must be able to be easily cleaned.
- Only clean and sanitised equipment must be used when preparing sushi.
- It is recommended that prior to preparation all benches and utensils which come in contact with the sushi and ingredients are sanitised.
- Sushi rolling machines must be periodically cleaned and sanitised during the day to remove the build-up of rice and destroy pathogenic bacteria. Other utensils and equipment will also need to be periodically cleaned to remove build-up of rice and other ingredients.
- Boards and utensils must be cleaned and sanitised in between preparing different foods, especially when preparing foods that will not be further cooked (eg. raw fish and cooked teriyaki chicken).
- Bamboo and plastic mats must be cleaned and sanitised daily. If bamboo mats are used then it is recommended that they be covered with clean cling wrap and the cling wrap changed regularly.

Personal hygiene

All persons preparing and handling sushi must ensure they follow good personal hygiene practices:

- People who are sick with vomiting, diarrhoea or fever must not be preparing food.
- Take all practicable measures to prevent unnecessary contact with ready-to-eat food.

- Wash hands prior to preparing sushi and after handling non-food articles, using the toilet, smoking, drinking, eating and touching hair, scalp or body.

- Wash hands between handling of raw ingredients and ready-to-eat foods.

Use of disposable gloves

It is not mandatory for food handlers to use disposable gloves, although if used correctly they can assist with minimising contamination. When using disposable gloves they must be:

- Only used for one continuous task and then discarded;

- Regularly changed to avoid cross-contamination – this is especially the case when changing from preparing raw ingredients to handling ready-to-eat foods;

- When taken off they must always be discarded and not kept for use later; and

- Removed and discarded before using the toilet, smoking, eating, drinking or touching the hair, scalp or body.

Preparation of acidified rice

Proper preparation of acidified rice is important to ensure the rice is safe to use. Rice acidified to a pH of less than 4.6 will inhibit the growth of pathogenic bacteria.

Appendix 1 lists some sushi rice recipes that if followed should result in proper acidification of the rice. Acidification of rice should occur as soon as possible after cooking is finished. The pH of the rice is to be checked to ensure proper acidification has occurred. An example worksheet is provided in Appendix 4.

Once acidified, the rice must be stored covered when not being used. Acidified rice can be stored up to 8 hours and at the end of the day, the remaining rice must be discarded.

Note: If cooked rice is not acidified, it must be stored under refrigeration at or below 5°C at all times.

Preparation of fillings and sushi

- All potentially hazardous raw materials should be kept under refrigeration until used – this is especially the case for raw fish.

- Acidified rice should be at room temperature prior to making the sushi products.

- Frozen foods are to be thawed under refrigeration or using a microwave oven.

- Vegetables must be washed before use.

- Meat and chicken must be thoroughly cooked.

- Prepared potentially hazardous ingredients (e.g. cooked chicken, tamago) must be placed under refrigeration after cooked and when not being used.

- Once prepared, sushi should be placed under refrigeration (at 5°C or less) unless it is being displayed for sale immediately.

- If cooked ingredients are not tempered (e.g. cooked meat and tamago at 5°C or less and acidified rice at room temperature) prior to making sushi, the sushi must be placed under refrigeration prior to display to effectively decrease temperature to 25°C or less.

Note: Display cabinets will not effectively reduce the temperature of prepared sushi.

- Businesses with limited storage and display space should only make an amount of sushi that can be properly placed within the storage or display section. Sushi must not be left unrefrigerated unless on display.

Retail display of sushi

- Providing the previous requirements have been met, sushi can be displayed at temperatures greater than 5°C for no longer than 4 hours.
- Records must be kept demonstrating adherence to the time temperature requirements (see below).
- During display, sushi must be kept out of direct sunlight.

Sushi Bars

- Display cabinets must include doors to protect food from the likelihood of contamination and maintain the temperature control inside the cabinet.
- When not in use, doors on the display cabinet must be closed.
- Either each roll or batch must be able to be identified. This could include:
    - Colour-coded stickers on roll packaging,
    - Colour-coded containers,
    - Time stamp of each roll/container – this is only applicable to sushi bars preparing their own sushi.
- Display cabinets must be cleaned and sanitised at the end of the day.
- All equipment (eg. containers or utensils) used for handling sushi must be kept clean at all times and sanitised at the end of the day.

Sushi conveyor system

- All plates on conveyer must be covered to protect from contamination.
- All plates must be able to be traced to a batch and time of display. Suggested systems include:
    - Colour coded plates
    - Patterns on plates
    - Colour-coded stickers
- Garnishes cannot be used as time of display indicator.
- After they have been used, all plates and lids must be cleaned and sanitised.

- Individually packaged wasabi and pickled ginger should be provided to prevent cross contamination

Record system

- Records must be kept that indicate:
    - Time the sushi was placed on display,
    - If sushi is made and displayed immediately (eg conveyer system), the time it was made must be recorded,
    - Corresponding colour, patterns, etc.
- Example record sheet is shown in Appendix 4.

References and Further Reading

ACT Health Services (2005). ACT Health Services – Food Survey Reports 2002-2003: Microbiological quality of sushi. Canberra. http://www.health.act.gov.au/c/health?a=da&did=10060511&pid=1094601516.

Anon (1995). The Food Safety (Temperature Control) Regulation 1995. London. http://www.opsi.gov.uk/si/si1995/Uksi_19952200_en_1.htm.

Anon (1997). Industry Guide to Good Hygiene Practice: Catering Guide. London. http://archive.food.gov.uk/dept_health/pdf/catsec.pdf.

Anon (1997). Industry Guide to Good Hygiene Practice: Retail Guide. London. http://archive.food.gov.uk/dept_health/pdf/retsec.pdf.

Department of Human Services, Victoria (?). Foods kept under alternative temperature control. Victoria. http://www.health.vic.gov.au/foodsafety/downloads/alttemp_foods_research.pdf.

Department of Human Services, Victoria (2004). Food Safety program Templates for Food Service and Retail Businesses (edition 1.1) – Supplement B Sushi. Victoria. http://www.health.vic.gov.au/foodsafety/templates.htm.

Food and Environmental Hygiene Department (2000). Risk Assessment Studies Report No. 2: Microbiological Hazards Evaluation. Sushi and Sashimi in Hong Kong. Hong Kong. http://www.fehd.gov.hk/safefood/report/sashimi/ss_ras2_eng.pdf.

Food Standards Australia New Zealand (2001). Safe Food Australia: A Guide to the Food Safety Standards. Canberra. http://www.foodstandards.gov.au/_srcfiles/complete_safefood.pdf.

University of Florida IFAS Extension (2004). Guidance for Processing Sushi in Retail Operations. Florida. http://edis.ifas.ufl.edu/FS117.

US Department of Health and Human Services (2005). Food Code. Maryland. http://www.cfsan.fda.gov/~dms/fc05-toc.html.

Appendix 1: Rice Acidification

At pH values of 4.6 or less, most pathogenic bacteria do not grow, sporulate or produce toxins (Hocking, 2003). There are a few exceptions to this, *Salmonella* spp and enteropathogenic *Escherichia coli*, although when the pH of the growth medium or food is adjusted using acetic acid, the minimum pH for growth increased to above pH 4.6.

Therefore, acidification of the sushi rice using rice vinegar to a pH of 4.6 will assist in stopping the growth of pathogenic bacteria. Sushi rice acidified to a pH of 4.6 can be considered as a non-hazardous food, and storage at room temperature during preparation is allowed. The pH of the rice must be checked to make sure it has reached the 4.6 pH limit.

Acidification procedure

Following the recipes and instructions below will assist in making sushi rice that has been properly acidified.

Ingredients

	Recipe 1	Recipe 2	Recipe 3
Short Grain Rice	900 g	900 g	900 g
Water	1100 ml	1320 ml	1250 ml
Rice vinegar	135 ml	99 ml	128 ml
Sugar	57 g	94 g	44 g
Salt	9 g	25 g	8 g

Preparation

- Rinse rice until water is clear.
- Add rice and water to cooker and cook.
- Mix vinegar, sugar and salt and dissolve.
- Place cooked rice in a shallow container and allow to cool to around room temperature.
- Pour vinegar mixture over the rice.
- Mix using a slicing action; do not stir.

Appendix 2: Measuring pH

pH measuring devices

pH can be measured using a pH meter, pH strips or pH paper (see picture below).

Pros and cons of each method

1. pH paper

- The paper should be able to read pH in 0.3 units, although it is difficult to distinguish less than 0.6 of a unit.
- Incorrect readings can occur from improper handling (contamination from hands).
- Box of three rolls cost $74.00 which gives approximately 100 - 150 measurements (approximately 49-74c per measurement).
- pH paper requires careful handling.

2. pH strips

- The strips should read pH in units of 0.5, although it is difficult to distinguish less than whole units.
- It is easy to use and does not require as careful handling as the pH paper.
- Cost $6.60 per packet of 50 strips (approximately 13c per measurement).

3. Hand held digital pH meter

- It reads pH in 0.1 units with certainty.
- Some hand held pH meters also measure the sample's temperature and compensate the measurement for sample temperature.
- It requires calibration before use with at least a single buffer (buffer 4.0 is suitable for acidified rice).
- It costs $50.00 for the meter, and 500mL of buffer costs about $12.00.
- It comes with instructions but may require some training of operators.

Measuring pH

- Once the vinegar mixture has been evenly mixed, place a small sample (¼ cup) in a clean container.
- Dip the pH strip or stick directly into the rice and compare to colour chart.
- For pH meters, follow the manufacturer's instructions.
- Record the pH on the checklist.
- If the pH is greater than 4.6, add more vinegar and mix. Take another pH reading.
- Continue adding vinegar until pH is less than 4.6
- If extra vinegar is needed, sushi rice recipes should be revised to account for the extra vinegar required.

References

Hocking, A.D (2003). Foodborne Microorganisms of Public Health Significance. AIFST; Waterloo.

Appendix 3: Temperature calibration and measurement

Calibration Procedures

Hand held thermometers should be calibrated monthly and results recorded on a checklist.

Ice Point (0°C):

- Fill a small container with crushed ice.
- Add a little water to the container to make an ice slurry.
- Place the thermometer in the centre of the container so that the point of the probe is in contact with the ice.
- Allow the temperature reading of the thermometer to reach a steady reading.
- Record the reading and calculate the difference from 0°C.
- Thermometers with a deviation of more than 2°C should be discarded.

Boiling Water Point (100°C):

- Fill a small container with boiling water.
- Immediately place the thermometer in the centre of the container so that the point of the probe is in the centre.
- Allow the temperature reading of the thermometer to reach a steady reading.
- Record the reading and calculate the difference from 100°C.
- Thermometers with a deviation of more than 2°C should be discarded.

Appendix 4: Example Worksheets

- Supplier list
- Rice Acidification Sheet
- Sushi Display Record sheet

1. Supplier List

Food	Supplier name	Supplier Address	Contact Person	Contact number

2. Rice Acidification Sheet

Date acidified	Time acidified	Supplier (if applicable)	Amount of rice	pH	Comments

3. Sushi Display Records

Colour stickers ☐ Time stamps ☐ Colour coded-plates ☐ Patterned-plates ☐ Other - details ☐

Date	Colour/Pattern	Display time	Time disposed (+ 4 hours)
4/12/2006	*Red*	*10:00am*	*2:00pm*

Date	Colour/Pattern	Display time	Time disposed (+ 4 hours)

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