FOOD SAFETY GUIDELINES FOR THE PREPARATION AND DISPLAY OF SUSHI

NSW GOVERNMENT Food Authority

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Introduction

Ready-to-eat sushi is regarded as a potentially hazardous food. As such, the *Australia New Zealand Food Standards Code* (the Code) Division 3, Standard 3.2.2 requires food businesses to maintain the temperature of sushi either at or below 5˚C or above 60˚C during transport, storage and display.

However, the Code allows for an alternative compliance method provided the businesses can demonstrate the product's safety (Clause 25 of Standard 3.2.2). The "2 hour/4 hour rule" is used by Food Standards Australia New Zealand (FSANZ) as an example of an alternative method for compliance.

The 2 hour/4 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; or
- 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.

To assess the applicability of utilising the "2 hour/4 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 permits retail sushi businesses to display sushi at temperatures up to 25°C for **no more** than 4 hours, provided:

- The Code's 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 is displayed at 5°C to 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 areas that can affect the safety of sushi when consumed, such as:

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

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. Business operators must read the 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.
Cross-contamination	The transfer of harmful bacteria from other foods (especially raw food), food handlers or the environment (cutting boards, utensils etc) to ready-to-eat food. For sushi businesses it means avoid allowing raw meat/poultry to come into contact with ready-to-eat sushi and use a separate cutting board and knife for raw meat/poultry and ready-to-eat food.
Pathogenic bacteria	Bacteria capable of causing food poisoning. Some examples: *Listeria monocytogenes, Salmonella, Bacillus cereus, Staphylococcus aureus* and some types of *Vibrio* species.
Potentially hazardous food	Food that has to be kept at certain temperatures to minimise the growth of any pathogenic microorganisms that may be present in the food or to prevent the formation of toxins in the food. *Food Standards Code 3.2.2, Division 1, Clause 1*
Ready-to-eat food	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, salmon, other fish and some vegetables.
Sanitising	The process of removing microorganisms from a surface, equipment and utensils. There are two methods available: (a) Heat – to sanitise effectively with heat only, temperature of at least 77°C and a contact time of greater than 30 seconds is required. Lower temperatures will require longer contact times. If using a dishwasher, check the manufacturer's instructions to ensure adequate temperature/time is achieved. (b) Chemical sanitiser – generally chlorine or ammonium based compounds. It is important to choose the right product for the food premises and to follow the manufacturer's instruction especially for dilution rate, contact time and safety instructions.

Sashimi	Thin slices of raw fish that are ready-to-eat. Sashimi must be kept at or below 5°C at all times.
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, • gunkan – an oval, ship-like sushi roll, comprising a nori seaweed sheet wrapped around a ball of rice with space left at the very top for other ingredients, • 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.
Tamago	Japanese omelette made with sugar, soy sauce and mirin. It is commonly used in nigiri sushi.
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 suppliers and are stored correctly. Below is some information to assist in complying with the requirements of the Code relating to the receipt and storage of foods.

Supplier and food information

- Source all ingredients from reputable suppliers.
- Maintain a list of food suppliers in case they need to be contacted. An example of a worksheet for listing suppliers is provided in Appendix 4.
- 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.
- Inspect the delivery – any items that do not meet receipt requirements should be returned to supplier.
- Check the stock regularly for date markings, rotate and prioritise stock for sale or disposal ensuring older food is used first and food is not sold beyond its *use by* date.

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 at 5°C or less.
- Check the label or paper work for time and date when sushi was made.
- 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.

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).
- Reject the rice if the pH is higher than 4.6 or it was made more than 8 hours ago.
- Record the pH result and the date and time the rice was made on a worksheet. An example of a 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.
- Cover acidified rice when not in use to protect against contamination.

Potentially hazardous raw ingredients

Potentially hazardous foods and raw ingredients must be stored refrigerated. This includes meat, chicken, seafood, non-acidified cooked rice and dairy products.

- Only receive potentially hazardous food that have been transported under temperature control.
- Once received, refrigerate all potentially hazardous foods immediately (at 5°C or less).
- Do not overfill the refrigerator.
- Allow chilled air to circulate around all food items.
- Only use the freshest, suitable to be eaten raw fish in raw fish sushi.
- Store refrigerated raw ingredients separately from sushi and other ready-to-eat foods and ingredients such as tuna or salmon to be eaten raw.
- Do not store raw foods such as uncooked chicken and meat above ready-to-eat foods in the refrigerator. This is to prevent the raw juices from dripping onto the ready-to-eat foods.
- Cover refrigerated ingredients during receipt and storage to protect against contamination.

Frozen foods

- Only receive frozen food that is in a frozen state.
- If foods are to be kept frozen, place them in a freezer immediately.
- Ensure that frozen food is adequately covered and the package is intact.
- Label foods stored in freezers with the 'date of freezing' using food grade labels that will not come off in the freezer.

Shelf stable foods

- Shelf-stable foods include uncooked rice, seaweed (nori) sheets, wasabi powder and pickles.
- Ensure that the packaging of shelf stable food is intact.
- Cover shelf-stable foods during storage to protect against contamination.

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.

Generally, the food processing area must be kept clean, well maintained and free of pests to avoid contamination. 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, do not use wooden utensils. All utensils must be able to be easily cleaned and sanitised.
- Clean and sanitise all benches, utensils and equipment before preparing sushi.
- Sushi rolling machines must be cleaned and sanitised regularly during the day to remove the build-up of rice and destroy pathogenic bacteria. Other utensils and equipment also need to be cleaned regularly to remove build-up of rice and other ingredients.
- Clean and sanitise chopping boards and utensils in between preparing different foods, especially when preparing foods that will not be cooked further (e.g. raw fish and cooked teriyaki chicken).
- Clean and sanitise bamboo and plastic mats daily. If bamboo mats are used then it is recommended that they are covered with clean cling wrap and the cling wrap is changed regularly.

Personal hygiene

Staff must have the appropriate skills and knowledge for any food handling activities they do. All food handlers preparing and handling sushi must also ensure they follow good personal hygiene practices.

- Food handlers must not prepare food when they are sick.
- 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.
- 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.

- Use a tested, standard recipe for sushi rice to ensure that the target pH is achieved every time.
- Acidify rice as soon as possible after cooking is finished. Mixing the vinegar solution whilst the rice is still warm also helps the rice to absorb the vinegar/salt solution.
- Mix sushi rice thoroughly and uniformly with the vinegar solution.
- Check the pH of the rice to ensure proper acidification has occurred. An example of a worksheet for rice acidification is provided in Appendix 4.
- Label the rice container with the time of acidification.
- Once acidified, store and cover the rice when not being used.
- Acidified rice can be stored up to 8 hours at room temperature. 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

- Keep all potentially hazardous raw materials under refrigeration until used – this is especially the case for raw fish.
- Acidified rice should be at room temperature prior to being used in making the sushi products.
- Thaw frozen foods under refrigeration or use a microwave oven.
- Wash vegetables before use.
- Cook meat and chicken thoroughly. Use a probe thermometer to confirm that the meat is completely cooked (the core temperature must be 75°C or above).
- Store prepared potentially hazardous ingredients (e.g. cooked chicken, tamago) under refrigeration after cooking and when not being used.
- Once prepared, store sushi under refrigeration (at 5°C or less) unless it is being displayed for sale immediately.
- If cooked ingredients are not at the refrigerated temperature and acidified rice is not 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.

- 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. This is important especially for businesses with limited storage and display space.

Defrosting frozen fish

- Only defrost fish in small amounts, as needed.
- Defrost frozen fish overnight in a refrigerator or cool room at 5°C or below.
- Label fish with the 'date of defrosting'.
- Have good stock rotation i.e. defrost 'oldest' stored fish first.
- Defrosted fish must be used on the day of defrosting. Discard unused defrosted fish.
- Do not defrost fish under running water or in a water bath or at room temperature.
- Do not refreeze defrosted fish.
- Do not freeze fish at the end of its shelf life.

Retail display of sushi

- Providing the previous requirements have been met, sushi can be displayed at temperatures up to 25°C for no longer than 4 hours.
- Records must be kept demonstrating adherence to the time temperature requirements.
- Sushi must be kept out of direct sunlight during display.
- Sushi must be discarded at the end of the trading day.

Sushi Bars

- Display cabinets must include doors to protect food from contamination and maintain the temperature control inside the cabinet.
- Close the doors on the display cabinet when not in use.
- Have a system to ensure 'first-in-first-served' for prepared sushi (i.e. the earlier made sushi is sold first to reduce time at display).
- Either each roll or a batch must be able to be identified. This can be achieved by:
    - 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.
- Clean and sanitise display cabinets at the end of the day.
- Keep all equipment (e.g. containers or utensils) used for handling sushi clean at all times and sanitise them at the end of the day.

Sushi conveyor system

- Cover all plates on conveyer 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, or
    - Colour-coded stickers.
- Do not use garnishes as time of display indicator.
- Clean and sanitise all plates and lids after they have been used.
- Provide individually packaged wasabi and pickled ginger 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 (e.g. conveyor system), the time it was made must be recorded,
  - Corresponding colour, patterns, etc.
- Example of a record sheet is shown in Appendix 4.

References and further reading

ACT Health Protection Services (2011). Microbiological quality of sushi. https://www.health.act.gov.au/sites/default/files/2018-09/Microbiological%20Quality%20of%20Sushi%20September%20–%20December%202011.pdf

Anon (1995). The Food Safety (Temperature Control) Regulation 1995. http://www.legislation.gov.uk/uksi/1995/2200/contents/made

British Hospitality Association (2016). Industry Guide to Good Hygiene Practice: Catering Guide. https://www.bha.org.uk/book/#/reader/chapter/1

Department of Human Services, Victoria (2014). Food safety program template supplementary practices section for class 2 retail and food service businesses, no.1, version 3. https://www2.health.vic.gov.au/Api/downloadmedia/%7BF19EC9B0-B3EB-4E4C-9FCB-F754C75FDB7F%7D

Food and Environmental Hygiene Department (2000). Risk Assessment Studies Report No. 2: Microbiological Hazards Evaluation. Sushi and Sashimi in Hong Kong. https://www.cfs.gov.hk/english/programme/programme_haccp/programme_haccp_ss_ras2.html

Food Safety Authority of Ireland (2019). Safe Production of Sushi. https://www.fsai.ie/faq/safe_production_sushi.html

Food Standards Australia New Zealand (2016). Safe Food Australia: A Guide to the Food Safety Standards. https://www.foodstandards.gov.au/publications/Pages/safefoodaustralia3rd16.aspx

NSW Food Authority. (2008). Report on food handling practices and microbiological quality of sushi in Australia. https://www.foodauthority.nsw.gov.au/sites/default/files/_Documents/scienceandtechnical/report_quality_sushi_australia.pdf

NSW Food Authority. (2009). Microbiological quality of sushi – 2009. https://www.foodauthority.nsw.gov.au/sites/default/files/_Documents/scienceandtechnical/sushi_survey_2009_report.pdf

University of Florida IFAS Extension (2004). Guidance for Processing Sushi in Retail Operations. https://edis.ifas.ufl.edu/pdffiles/FS/FS11700.pdf

U.S. Food & Drug Administration (2017). Food Code 2017. https://www.fda.gov/food/fda-food-code/food-code-2017

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 can be stored at room temperature during preparation. The pH of the rice must be checked to make sure it has reached the pH of 4.6 (or below) 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 until dissolved.
- Place cooked rice in a shallow container and allow to cool slightly but still warm.
- 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**

- pH paper must have a working range from 3.5 to 5.0.
- 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.
- pH paper requires careful handling. Incorrect readings can occur from improper handling (contamination from hands).

2. **pH strips**

- Testing strips for pH must have a working range from 3.5 to 5.0.
- The strips should read pH in units of 0.5, although it is difficult to distinguish less than whole units.
- It is relatively cheap, easy to use and does not require as careful handling as the pH paper.

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 comes with instructions but may require some training of operators.
- A pH meter provides more accurate results than test strips. However it can be more costly than pH strips/papers. They must be cleaned regularly to avoid contamination, require calibration before use and training of operators.
- Follow manufacturer's instructions for calibration and maintenance of the instrument.

Measuring pH

- Once the rice/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

1. Supplier List
2. Rice Acidification Sheet
3. 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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