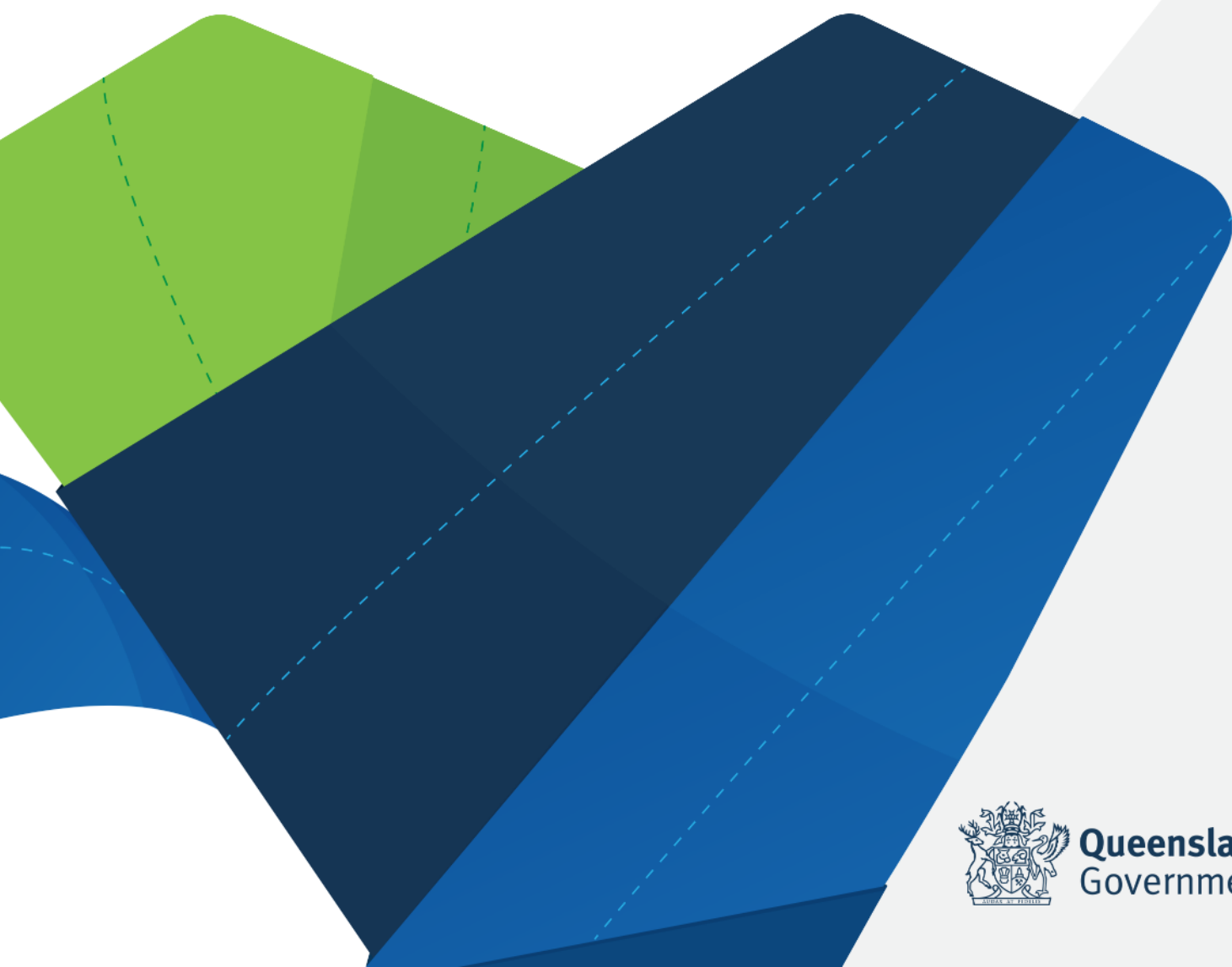


Safe preparation of raw eggs

A guide for food businesses



Safe preparation of raw eggs - A guide for food businesses

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An electronic version of this document is available at www.qld.gov.au/foodpantry.

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1 Introduction

Salmonella is the most common type of bacteria associated with foodborne illness outbreaks in Australia. The pathogen *Salmonella* is known to be present on the surface of eggs and improper handling can lead to raw egg products becoming contaminated.

Many large outbreaks of *Salmonella* food poisoning have occurred in Queensland and nationally as a result of raw egg foods, particularly where business hygiene and temperature control issues were apparent. There are a number of factors that contribute to the strong association between foodborne illness outbreaks caused by *Salmonella* and the sale of food containing raw egg. These include:

- contamination of egg contents by *Salmonella* from the shell
- failure to process (through acidification or heat) raw egg foods sufficiently to effectively reduce *Salmonella* risk
- failure to clean and sanitise equipment and other food contact surfaces
- temperature abuse (i.e. storage above 5°C)
- keeping beyond recommended storage life (maximum 24 hours with temperature control, or if raw egg products are to be held warm, within the temperature danger zone, such as egg sauces, only held for that service period, generally up to 2 hours)
- the practice of pooling egg pulp to produce a raw egg food significantly increases the likelihood of *Salmonella* contamination into a product.

The easiest solution to reducing the risk of retail food businesses being implicated in a foodborne illness outbreak caused by *Salmonella* is to avoid selling food containing raw egg.

2 Purpose and scope

This document is intended to provide food businesses with information about food safety issues in relation to eggs. Guidance is provided on specific safety steps that retail food businesses can undertake to ensure the safe preparation of raw egg products, as well as record sheets and a compliance checklist.

This document applies to foods that contain raw or lightly cooked eggs, which are commonly implicated in *Salmonella* food poisoning. Examples include:

- sauces and dressings made with raw egg e.g. mayonnaise, aioli, egg butter
- desserts made without an effective cook step e.g. tiramisu, mousse, deep fried ice cream
- drinks containing raw egg e.g. eggnog, raw egg shakes and smoothies.

This document does not cover all requirements of the *Australia New Zealand Food Standards Code* (the Food Standards Code). To ensure food businesses meet the requirements relating to premises and equipment, staff are urged to read standard 3.2.2 and standard 3.2.3 of the Food Standards Code at www.foodstandards.gov.au/code. Further information on safe food handling practices and running a food business and can be found on the Food Pantry at www.qld.gov.au/foodpantry.

3 Food laws

The *Food Act 2006* (the Food Act) is the primary piece of food safety legislation in Queensland which seeks to ensure that food for sale is safe and suitable for human consumption. Queensland Health and local governments share responsibility for enforcing the Food Act.

The Food Act includes requirements for compliance with the Food Standards Code, which includes food safety practices and food premises and equipment requirements. Additionally, the Food Standards Code prohibits cracked eggs, dirty eggs, or egg products which contain a pathogenic micro-organism, to be sold retail or to sold to a caterer.

The Food Act works alongside the *Food Production (Safety) Act 2000*, which is administered by the Department of Agriculture and Fisheries. Safe Food Production Queensland is a statutory body established under the *Food Production (Safety) Act 2000* that regulates primary production and processing of food, especially under food safety schemes, to ensure it is safe for human and animal consumption.

Safe Food Production Queensland is responsible for the accreditation of Queensland egg producers and processors under the Egg Food Safety Scheme. Under the Egg Food Safety Scheme, egg producers and processors are required to identify each individual egg with a unique identification (such as a stamp) to ensure traceability and prevent cracked and dirty eggs from entering the food supply chain.

4 Food business responsibilities

All food businesses must meet the requirements of the Food Standards Code to ensure they follow safe handling practices. In relation to food processing, standard 3.2.2, division 3, clause 7 states:

7 Food processing

- (1) A food business must –
 - (a) take all practicable measures to process only safe and suitable food; and
 - (b) when processing food –
 - (i) take all necessary steps to prevent the likelihood of food being contaminated; and
 - (ii) where a process step is needed to reduce to safe levels any pathogens that may be present in the food – use a process step that is reasonably known to achieve the microbiological safety of the food.
- (2) A food business, when processing potentially hazardous food that is not undergoing a pathogen control step, must ensure that the time the food remains at temperatures that permit the growth of infectious or toxin-producing bacteria is minimised.

This is particularly important for food businesses such as restaurants, cafés, bakeries and caterers that prepare and sell food containing raw egg.

Cooking is a process known to achieve the microbiological safety of food and by choosing to serve raw or undercooked foods, food business operators must acknowledge that there will be public health and business risks.

Given there is a known risk in the preparation of raw egg products, this guideline has been developed to assist businesses to undertake practices that will ensure that they comply with requirements when making products known to cause salmonellosis.

The following guidance is provided:

1. Use safer alternatives to raw eggs in foods which are not cooked. Alternatives include commercially produced dressings and sauces, or pasteurised egg products.
2. If using a raw egg product is the only option, then all of the following controls must be in place:
 - a) Egg receipt – reputable suppliers, appropriate storage during delivery, no cracked, dirty or unstamped eggs accepted.
 - b) Storage – correct storage and display of ingredients and product, including proper temperature control.
 - c) Processing – correct handling such as good personal hygiene (including good hand washing practices and proper use of gloves if used), use of sanitised egg separator, proper temperature control.
 - d) Premises – clean premises, fixtures, fittings and equipment, compliant handwash facility, sanitised equipment (including egg separator) and food contact surfaces.

AND for foods containing raw egg, known to cause salmonellosis–

- e) The product is to be acidified to a pH of 4.2 (or less) or effectively heat treated:
 - foods containing raw eggs must be acidified to a pH of 4.2 (or less) through the addition of acidic ingredients such as lemon or vinegarOR
 - receive effective heat treatment to prevent contamination and growth of *Salmonella*.
- f) The treated raw egg product should be stored at 5°C or below for no longer than 24 hours and a fresh batch should be made daily. For egg products held warm, within the temperature danger zone (such as hollandaise or béarnaise sauce, or similar), it is recommended that the product is prepared just before service and must only be held for that service period (generally up to 2 hours) then discarded.

Acidification or the requirement for raw egg products to be stored at or below 5°C for no longer than 24 hours, as specified in this guideline, does not apply to certain products including:

1. Egg sauces e.g. hollandaise and béarnaise sauce
2. Traditional dishes that do not contain raw egg products, but a raw egg may be incorporated when serving such as tartare, congee, and soups
3. Breakfast style eggs such as scrambled or poached eggs and omelettes (cooked)
4. Cakes and soufflés (baked)
5. Meringues (baked)
6. Icing (high sugar content)
7. Marshmallows (boiled during preparation)

8. Frozen desserts such as ice cream or frozen mousse (frozen immediately after preparation).

Egg sauces have a higher risk of causing foodborne illness, because they are generally only lightly cooked and are commonly held within the temperature danger zone (5°C to 60°C) during a food service. These products should be discarded at the end of a food service (generally up to 2 hours).

The food business egg safety checklist (Appendix 1) can be used to check that correct food safety precautions are being undertaken in relation to the handling of raw eggs and egg products.

5 Receiving and storing eggs

Maintaining food safety begins by ensuring only safe and suitable ingredients are purchased from a supplier and that these items are stored correctly. The following information is provided to assist meeting the requirements of the Food Standards Code regarding the receipt and storage of eggs and egg products.

5.1 Supplier and food information

- A list of food suppliers should be maintained in case they need to be contacted.
- For all foods, the label or receipt needs to contain details of suppliers' names and addresses. Phone contact details should also be kept.
- Only accept eggs that are:
 - clean, not cracked or leaking
 - stamped with the producer's unique identification
 - supplied in clean packaging
 - correctly labelled (i.e. with name of the food, date mark and the supplier's name and address) and
 - not past their 'Use-By' or 'Best Before' date.
- Ensure proper stock rotation so that the oldest stock is used first (as long as they are within date).
- Items that do not meet these requirements should be returned to the supplier.

5.2 Storage of eggs

- Store whole eggs (egg in shell) in their original packaging (to avoid cross-contamination) in a refrigerator or cool room.
- Avoid temperature fluctuations and only take out what is required for service.
- Don't store fresh egg pulp that has been collected (pooled) in a bowl for use during a food service. Discard at the end of the food service (generally 2 hours).

5.3 Other foods

Potentially hazardous foods and certain raw products will need to be stored under refrigeration at or below 5°C. This includes meat, chicken, seafood, dairy products and eggs.

- Only receive foods that are within their 'Use-by' date or 'Best Before' date.
- Only receive potentially hazardous food that has been transported under temperature control.
- Once received, all potentially hazardous foods must be placed under refrigerated storage at or below 5°C.
- Refrigerated raw ingredients must be stored separately from ready-to-eat foods and ingredients.
- 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 unpackaged foods and ingredients must be covered during receipt and storage to protect against contamination.
- Store foods in accordance with the manufacturer's instructions.

6 Hygiene, food premises and equipment

Raw foods can contain bacteria and, if not handled correctly, the numbers of bacteria can grow. Employing good hand hygiene and cleaning and sanitising utensils and equipment before and after use is important to prevent cross-contamination. Below are some practices that help prevent cross-contamination.

6.1 Personal hygiene

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

- people who are sick with vomiting, diarrhoea or fever must not prepare or serve food
- take all practicable measures to prevent unnecessary contact with ready-to-eat food
- wash hands prior to preparing food 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.

6.1.1 Use of disposable gloves

It is not mandatory for food handlers to use disposable gloves. Gloves must be used correctly to minimise contamination. If using disposable gloves, they must be:

- only used for one continuous task and then discarded
- regularly changed to avoid cross-contamination
- always discarded and not kept for later use once taken off
- removed and discarded before using the toilet, smoking, eating, drinking or touching the hair, scalp or body.

6.2 Premises

The cleanliness of the premises, fixtures and fittings assists in minimising cross-contamination. In particular, it is important that the business has a dedicated handwashing facility that includes:

- warm running water
- soap
- single-use hand towels, e.g. paper towels.

6.3 Equipment and utensils

- All equipment and utensils must be in good condition and able to be easily cleaned and sanitised.
- Food contact surfaces such as equipment, benches and utensils are to be clean and sanitised before use and between preparing different foods. This is especially important when preparing foods that will not have a further microbiological kill step such as cooking (e.g. raw egg products).
- Use a sanitised egg separator to separate egg yolk from egg whites. Eggs must not be separated using their shells as the shells may contain traces of Salmonella on the surface.

6.4 Storage and display

Products must be stored and displayed in a way that prevents cross-contamination. This includes:

- preparing and storing in the same container that will be used for service (to prevent extra handling and the potential for cross-contamination)
- using date labels to ensure only fresh batches are used
- not topping up or mixing batches
- storing for no longer than 24 hours and discarding at the end of the day

- for acidified raw egg products:
 - making fresh batches daily
 - storing at 5°C or below
 - discarding at the end of the day.
- for sous vide pasteurised eggs:
 - storing in their shells at 5°C or below
 - discarding within ten days of pasteurisation.

6.5 Temperature control

Temperature control throughout the operation is critical in minimising microbiological growth, i.e. raw egg product must be at 5°C or below. This includes all operations during receipt, processing, storage and display. Businesses handling potentially hazardous foods must have a temperature measuring device, and ensure that:

- potentially hazardous food are kept at certain temperatures (below 5°C or above 60°C) to ensure that bacteria that may be present or toxins they produce, do not make the food unsafe. Alternatively, strict adherence to the 2-hour/4-hour rule applies (unless another method that ensures the safety of the food can be demonstrated [clause 25, standard 3.2.2]). Egg products held within the temperature danger zone must only be held for that service period (generally up to 2 hours) then discarded.

Temperature danger zone

The temperature range between 5°C and 60°C is often referred to as the 'temperature danger zone' because food poisoning bacteria can grow rapidly in this range.

- if a business uses the '2-hour/4-hour rule', then a documented system is in place to demonstrate evidence that it is being used effectively

2-hour/4-hour rule

For 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.

Note: for raw egg products held warm (such as hollandaise or béarnaise sauce, or similar), it is recommended that the product is prepared just before service and must only be held for that service period (generally up to 2 hours) then discarded.

- thermometers are easily accessible and accurately measure temperatures to +/- 1°C
- thermometers are calibrated regularly
- an example thermometer calibration record template is provided (Appendix 5).

6.5.1 How to calibrate a thermometer

A thermometer should be regularly calibrated, as it can lose accuracy over time or if it is dropped or bumped. Only food businesses that have the necessary knowledge, skills and equipment to calibrate thermometers should do their own calibrations. If a correction of more than 1°C is required, the thermometer must be replaced or professionally adjusted.

To indicate whether the thermometer is working properly, test the thermometer's temperature in an ice slurry **and** in boiling water as follows.

Ice point calibration

1. Fill a plastic container with crushed ice.
2. Mix enough chilled water to produce slurry, but not enough to float the ice.
3. Stir the slurry vigorously, insert the probe of the thermometer into the iced slurry.
4. Wait for the thermometer to reach a steady reading (approximately three minutes).
5. Record the reading and calculate the difference from 0°C.
6. To ensure the readings are correct and accurate, allow the thermometer to come back to room temperature, then take another reading in an ice slurry. The results should be within 1°C of each other.
7. If the readings are more than 1°C different then the thermometer needs to be replaced or serviced.
8. Record your temperature readings. An example record template is provided (Appendix 5).

Boiling point calibration

1. Heat a saucepan of water on the stove.
2. Wait for the water to come to a continuous rolling boil.
3. Insert the probe of the thermometer into the water.
4. Wait for the thermometer to reach a steady reading (approximately three minutes), then record the reading.
5. The reading should be 100°C. However, water's boiling temperature may not be exactly 100°C, depending on the altitude above sea level.
6. To ensure the readings are correct and accurate, allow the thermometer to come back to room temperature, then take another reading in boiling water. The results should be within 1°C of each other.
7. If the readings are more than 1°C different then the thermometer needs to be replaced or serviced.
8. Record your temperature readings. An example record template is provided (Appendix 5).

7 Processing eggs – practical steps to control *Salmonella*

Preparing foods can involve a great deal of handling of both raw and cooked foods.

The characteristics of a food, including its pH, water activity, solidity, complexity of ingredients, etc., will determine how favourable the food environment is for pathogens to multiply or produce toxins. Potentially hazardous foods, including raw eggs, can contain harmful bacteria, and if not handled or stored correctly, bacteria can multiply to dangerous levels that can cause foodborne illness.

Because raw egg products are eaten without any further cooking it is important that they are prepared correctly and safely. Below are some steps to assist in proper preparation of raw egg products.

7.1 Handling of eggs

Because eggs can harbour *Salmonella* on the surface, the handling of eggs is critical. When handling eggs, follow these guidelines:

- do not use dirty, cracked or unstamped eggs
- visually inspect eggs before use to ensure there are no hairline cracks
- do not wash eggs (washing makes eggs more susceptible to contamination as it may allow surface material to enter the egg through pores in the shell surface)
- use raw egg pulp immediately - do not pool or store raw egg in batches
- use a sanitised egg separator
- regularly prepare fresh batches of raw egg mixture:
 - for acidified egg product:
 - document pH and storage times
 - store for maximum of 24 hours at 5°C or below
 - for raw egg product that is out of temperature control (i.e. not at 5°C or below), then:
 - storage times and temperatures must be documented to demonstrate evidence of compliance with the '2-hour/4-hour rule'. An example record template is provided (Appendix 4).

7.2 Preparation of acidified raw egg product

At pH values of 4.2 or less, pathogenic bacteria will not grow, form spores or produce toxins. However, bacteria, yeasts and moulds are not killed. Acidifying egg products with vinegar, lemon juice or another acidifying ingredient to a pH of 4.2 or less can be used as a control measure.

For correct preparation of acidified raw egg product to improve product safety:

- it must be acidified to a pH of 4.2 or lower, which inhibits the growth of pathogenic bacteria, including Salmonella
- the acidifying ingredient should be added to the egg or egg yolk and emulsified prior to adding other ingredients, to prevent growth of pathogenic bacteria that may have transferred from the egg shell
- once the raw egg product has been prepared, place a small sample (1/4 cup) in a clean container and follow the manufacturer's instructions to check the pH (see section 7.2.1 below for methods to measure pH)
- the pH of the final raw egg product must be measured to make sure it has reached or is below the pH limit of 4.2. If the pH is greater than 4.2, add more acidifier, then take another pH reading. If extra vinegar is needed, raw egg product recipe should be revised to account for the extra vinegar required, so that it can be added to the egg prior to other ingredients being added
- it is important that the pH level is recorded as evidence to show that all practicable measures are being taken to process safe and suitable food. An example record template is provided (Appendix 2)
- once acidified, the product must be covered when not being used
- the acidified product must be stored at 5°C or below and the '2-hour/4-hour' rule observed
- for raw egg products that are to be held warm (e.g. hollandaise or béarnaise sauce, or similar), it is recommended that the product is prepared just before service and must only be held for that service period (generally up to 2 hours) then discarded
- other acidified products must be discarded at the end of the day and a new batch prepared daily. The products must not be stored for longer than 24 hours.

7.2.1 Different pH measuring methods

pH paper

- The pH paper should be able to read pH in 0.3 units (although it can be difficult to distinguish less than 0.6 of a unit)
- incorrect readings can occur from improper handling (contamination from hands)
- pH paper requires careful handling.

pH strips

- The strips should read pH in units of 0.5 or less (although it can be difficult to distinguish less than whole units)
- pH strips are easy to use and do not require as careful handling as the pH paper.

Hand-held digital pH meter

- Meters read 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.

- The meter requires calibration before use with at least a single buffer (buffer pH 4.0 is suitable for acidified raw egg product).
- The pH meter comes with instructions but may require some training of operators.
- The pH meter may require regular servicing to ensure calibration remains accurate.

7.3 Egg pasteurisation using a sous vide method

Eggs can be pasteurised in shell using a sous vide method. The pasteurised eggs can then be used in sauces or desserts, just like raw eggs.

Sous vide

'Sous vide' is a process of cooking food under vacuum in sealed pouches (oxygen barrier bags) at precise temperatures and often for long times, then rapidly cooled, and used immediately or after a period of chilled storage.

An example recipe for sous vide pasteurised shell egg is to hold the eggs in a water bath at temperature of 57°C for at least 75 minutes (Baldwin, 2010)¹.

There are risks with the sous vide process that must be managed. If foods are held in the temperature danger zone (see page 10) for long periods of time, harmful bacteria can grow. Correct procedures should be followed to ensure the eggs are safe to use:

- every batch of sous vide cooking should be documented. An example record template is provided (Appendix 3)
- commercial equipment with adequate heating capacity and accurate temperature control should be used
- correct water temperature is essential for sous vide, and it should be checked using a tip sensitive digital thermometer that is accurate to 0.1°C
- raw shell eggs must be fully immersed in the water bath
- eggs cooked using sous vide methods should be used immediately or cooled and refrigerated
- if eggs are to be stored, they should be rapidly cooled in a 50:50 ice-water bath. Once cooled, they should be stored at 5°C or below in their shells for a maximum of ten days. They should be clearly labelled and stored separately from unpasteurised eggs.

¹ Baldwin, D.E. (2010). Sous vide for the home cook. Incline Village NV USA: Paradox Press.

Appendix 1. Food business egg safety checklist

Food business practices	Yes	No
Is your food business involved in the handling and/or sale of raw eggs or raw egg products? If yes, list these products:	<input type="checkbox"/>	<input type="checkbox"/>
Are separate cleaned and sanitised food grade containers used for each batch of egg product?	<input type="checkbox"/> *	<input type="checkbox"/>
Are eggs separated using the shell or with bare hands?	<input type="checkbox"/>	<input type="checkbox"/> *
Are eggs washed before use?	<input type="checkbox"/>	<input type="checkbox"/> *
Are eggs used immediately after they are cracked for use?	<input type="checkbox"/> *	<input type="checkbox"/>
Are whole eggs stored at $\leq 5^{\circ}\text{C}$?	<input type="checkbox"/> *	<input type="checkbox"/>
Are there any cracked eggs on the premises?	<input type="checkbox"/>	<input type="checkbox"/> *
Are there any dirty eggs on the premises?	<input type="checkbox"/>	<input type="checkbox"/> *
Are unused eggs within the expiry date?	<input type="checkbox"/> *	<input type="checkbox"/>
Are all eggs individually stamped with the producer's unique identification?	<input type="checkbox"/> *	<input type="checkbox"/>

* Indicates compliance with legislative requirements or recommendations for safe and suitable eggs.

Appendix 3. Sous vide egg pasteurisation record

Date of sous vide pasteurisation	Temperature of water bath	Length of sous vide pasteurisation	Egg supplier	Number of eggs	Signature	Date and time <i>Հ յ Յ Բ Բ Ը Ը [Լ Ե Ե Լ Ը Ը Ը Ը Ս Ի Գ Գ Կ Կ Ը Ը Ը Ը Ը Ը Օ Ը Ը Ը Ը Ը Ը Ը Ը Ը Ը Ը]</i>	Comments

Appendix 4. 2-hour/4-hour rule record

Food description	Date	Time taken out of temp. control	Activity	Time placed back in temp. control	Total time	Corrective action

