Hygiene Guidelines on Preparation of Sous Vide Food

Introduction

Sous vide, which has become popular in recent years, is a French traditional cooking method where food is vacuum-sealed in a special plastic bag, and cooked for longer than usual cooking time at a precise temperature, in order to accurately control the doneness, tenderness and taste of the food, and produce a quality that is difficult to achieve by traditional direct heating.

When preparing sous vide food, in addition to the use of special equipment and packaging materials, special attention should be paid to microorganism-related food safety risks that may be brought about by improper temperature and time control during the cooking process. The general cooking method can kill most of the microorganisms in the food by heating thoroughly at a high temperature, but in the case of sous vide cooking, if the food is contaminated by bacteria that can produce spores or anaerobic and facultative anaerobic bacteria that can grow without oxygen (such as *Bacillus cereus*, *Clostridium perfringens*, *Clostridium botulinum*), these bacteria may grow and reproduce under improper cooking and chilling, and some anaerobic bacteria will even produce lethal toxins. Improper temperature and time control during the sous vide cooking process will increase the risks of foodborne illnesses.

Therefore, food producers and business operators should strictly follow the steps of sous vide cooking and implement relevant food safety measures, including properly vacuum sealing the food, strictly controlling the cooking temperature and time, and completing the chilling procedure after cooking, so as to ensure the supply of safe sous vide food.

Objective:

This guideline aims to remind the food trade of the precautions to be taken in the preparation and processing of sous vide food, so as to reduce the risks of foodborne

diseases[1] among the public.

Scope of Applicability:

1. This guideline mainly targets sous vide meat and aquatic food;
2. This guideline applies to food and beverage establishments that prepare and serve sous vide meat and aquatic food, including stores offering takeout or dine-in services.

Content:

1. Planning and Preparation
    1) Developing a food safety plan
        - Learn about the precautions for making sous vide food, work out appropriate sous vide recipes based on the operation mode and equipment of the food production and operation establishment, and develop a corresponding food safety plan (see Table 2 for examples of sous vide food safety plan);
        - Test and verify the planned recipes multiple times and record the results to analyse whether the actual operation meets the control points (especially the critical control points) specified in the plan, and make appropriate adjustments where necessary to ensure the effectiveness of the plan;
        - When implementing the plan, if the equipment, formula, food weight or thickness needs to be changed, the effectiveness of the plan should be re-verified;
        - Even when no changes are made to the recipes or hardware and software configurations, the plan should be verified in a timely manner for its effectiveness and modified if necessary.

[1] These guidelines for the trade launched by the Municipal Affairs Bureau (IAM) aim to assist food producers and business operators in Macao in adopting the correct means and measures to improve food safety and hygiene. In addition to acting on the suggestions of these guidelines, members of the trade may also employ other scientifically proven methods in light of the actual situation to achieve the objective mentioned in these guidelines.

2) Selecting ingredients

- Purchase meat and aquatic products of good quality and hygiene from reputable suppliers;
  - Do not use minced meat and whole birds as ingredients[2] for sous vide cooking;
  - It is advisable to season the meat and aquatic products for sous vide cooking in a simple way, such as only adding a small amount of salt, pepper and herbs instead of sauce or vegetables, so as not to affect the heating temperature and time.

3) Providing equipment and appliances

- Special or suitable equipment and appliances should be provided as appropriate, including but not limited to:
  - Vacuum packaging bags
    - Special vacuum packaging bags should be used according to the instructions on them, and ordinary food sealing bags[3] should not be used.
  - Sous vide immersion circulator
    - Select a suitable sous vide immersion circulator according to the actual situation (such as the expected quantity of each production, production process, etc.);
    - If the sous vide immersion circulator has the function of measuring the temperature of water bath, the temperature measurement's accuracy should be verified in a timely manner.
  - Food thermometer
    - A calibratable probe thermometer with a resolution of 0.1°C and high accuracy should be used to accurately measure the food core temperature (please refer to GL 002

[2] When raw meat is being minced, the bacteria on its surface will spread to the whole patty through contact with the blade multiple times. Furthermore, since the air in the chest cavity of whole birds cannot be removed via vacuum packaging, the safety of sous vide whole birds will be directly affected.
3 The dedicated packaging bags for sous vide food have specific requirements regarding heat resistance, strength, thickness, and materials, and hence cannot be substituted by ordinary sealed bags for food.

DSA 2017 "Guidelines on Use of Food Thermometers" for details);

- During the process of verifying the recipes, the food core temperature in the vacuum-sealed packaging should be measured, which should be assisted by the equipment (such as special foam tape, etc.) that protects the vacuum state of the packaging.

- Related equipment and appliances should be regularly repaired and maintained to keep good performance.

4) Providing training

- Food producers and business operators have a responsibility to provide relevant training to food processing personnel;
- Personnel who handle sous vide food should thoroughly understand the sous vide food safety plan and take corresponding measures in a timely manner;
- The personnel should also have a clear understanding of other basic hygiene requirements not listed in this guideline. For details of other food safety and hygiene guidelines, please refer to the Food Safety Information website.

2. <u>Precautions for the Preparation Process of Sous Vide Food</u>

1) Vacuum packaging

- The vacuum packaging process should be duly completed to minimise the time that the meat and aquatic products are kept at dangerous temperatures;
- Before vacuum packaging, remove sharp parts from the food (e.g. sharp bones, etc.) to avoid puncturing the packaging bags;
- Food should be vacuum-sealed in the portions, sizes and shapes specified in the recipe;
- Food should not be stacked in the packaging bags to avoid affecting the cooking times;
- Separate vacuum packaging machines should be used for raw food

and cooked food to prevent cross-contamination;

- Food should be vacuum-sealed in the vacuum pressure specified in the recipe in order to achieve optimal heat distribution;
- Carry out checks to ensure the food is properly vacuum-sealed (e.g. the packaging bag is properly sealed; all oxygen is removed from the bag; etc.);
- Information such as the name of the food and date of vacuum packaging should be labelled on the packaging bags;
- Once vacuum-sealed, do not open and re-vacuum/ re-seal[4] the bags. If the package is inadvertently broken during food preparation, it is advised to cook the meat or aquatic products and consume them directly.

2) Low-temperature refrigeration
   - Vacuum-sealed food should be stored at or below 3°C[5], and it is advised to consume within 2 days;
   - Measure and record the temperature of the refrigerator on a daily basis.

3) Temperature-controlled water bath cooking (pasteurisation[6])
   - Meat and aquatic products should not be left out for more than 2 hours without temperature control;
   - Before temperature-controlled water bath cooking
     - The minimum acceptable temperature for temperature-controlled water bath cooking is 55°C for meat (except poultry) and aquatic products, and 60°C for poultry;
     - The immersion circulator should be turned on in advance, so that

[4] Once the vacuum package is opened, the shelf life of the food will be shortened even if it is re-vacuum-sealed immediately.
[5] In the production process of sous vide food, the food is vacuum-sealed most of the time, which provides a suitable environment for the growth of Clostridium botulinum that can produce extremely potent neurotoxins. Since Clostridium botulinum grows in the temperature range between 3.3°C and 45°C, vacuum-sealed food should be stored at 3°C or below to minimise the risk of botulism.
[6] Pasteurisation is a relatively mild form of heat treatment to eliminate pathogens which can usually be achieved below 100°C with a variety of temperature and time combinations. Pasteurisation can inactivate enzymes and destroy heat-sensitive and pathogenic microorganisms in food.

the water bath temperature reaches the pre-set temperature before the vacuum-seal food is put in the water bath attached with the immersion circulator.

- During temperature-controlled water bath cooking
  - Cook a certain amount of vacuum-sealed food in the water bath attached with the immersion circulator each time according to the recipe, and leave enough space between packaging bags for optimal heat distribution;
  - The food should be fully immersed in the water bath attached with the immersion circulator;
  - The food should be cooked according to the water bath temperature and time specified in the recipe;
  - The food core temperature and the cooking times should meet the requirements for pasteurisation (refer to Table 3);
  - The water temperature in the water bath attached with the immersion circulator (namely the water bath temperature) should be measured and recorded using a food thermometer, and the start and finish times should be recorded as well;
  - Do not add additional vacuum-sealed food during the cooking process as it may affect the pre-set temperature and time;
  - The food should be discarded if it has been cooked in a water bath below 55°C for more than 4 hours.

4) Prompt cooling
   - Sous vide food cooked in temperature-controlled water bath should be cooled to 3°C or below within 2 hours;
   - Ideal cooling method: immerse the food into a 50/50 mixture of ice and water, and add ice at appropriate times during the cooling process;
   - After cooling, sous vide food should be stored in a refrigerator at 3°C or below as soon as possible.
5) Low-temperature refrigeration
   - Information including the cooking date, shelf-life, and whether the food is pasteurised should be marked on the label of the sous vide

food;

- After pasteurisation, the food is cooked and should be stored in a specific refrigerator (the temperature of the refrigerator should be 3°C or below) to avoid cross-contamination;
- It is advised to consume sous vide food within 3 days after pasteurisation;
- Measure and record the temperature of the refrigerator on a daily basis.

6) Fine finishing and supply

- Fine finishing and supply procedures should be completed as quickly as possible;
- If the sous vide food cannot be pasteurised[7] during the temperature-controlled water bath cooking process, it should be heated until thoroughly cooked to ensure food safety;
- If a customer requests a food producer and business operator to provide unpasteurised or undercooked sous vide food, the food producer and business operator should take the initiative to inform the customer of the relevant consumption risks[8] so that the customer can make more conscious and reasonable choices while understanding the risks of consumption.

[7] Among various preparation methods for sous vide food, temperature-controlled water bath cooking is the most recommended practice for pasteurising sous vide food during the process.
[8] Consuming unpasteurised or undercooked sous vide food can be extremely risky, especially for high-risk individuals such as pregnant women, infants, the elderly, and people with a weak immune system.

3. Timely Verification

- Verification records should be kept for each sous vide recipe, including but not limited to (see Table 1 for example):
  - The actual temperature of the water bath and the entire cooking time during temperature-controlled water bath cooking;
  - The food core temperature reached and duration for pasteurisation during temperature-controlled water bath cooking;
  - The temperature shown on the sous vide immersion circulator;
  - The food core temperature and the time during the cooling process.

Table 1 Example of verification records of sous vide sirloin steak recipe

Temperature-controlled water bath cooking process	**Time**	**Pre-set temperature**	**Water temperature**	**Food core temperature**
Start cooking	9:00	65 ℃	64.5 ℃	3.5℃
Start pasteurisation process	10:30		64.5 ℃	64 ℃
Finish cooking	10:45		64.5 ℃	64 ℃

Cooling process	**Time**	**Food core temperature**
Start	10:50	55 ℃
Finish	11:35	3 ℃

March 2023

Figure 1 Flow chart for cooking sous vide food (the preparation steps in dark blue are the critical control points):

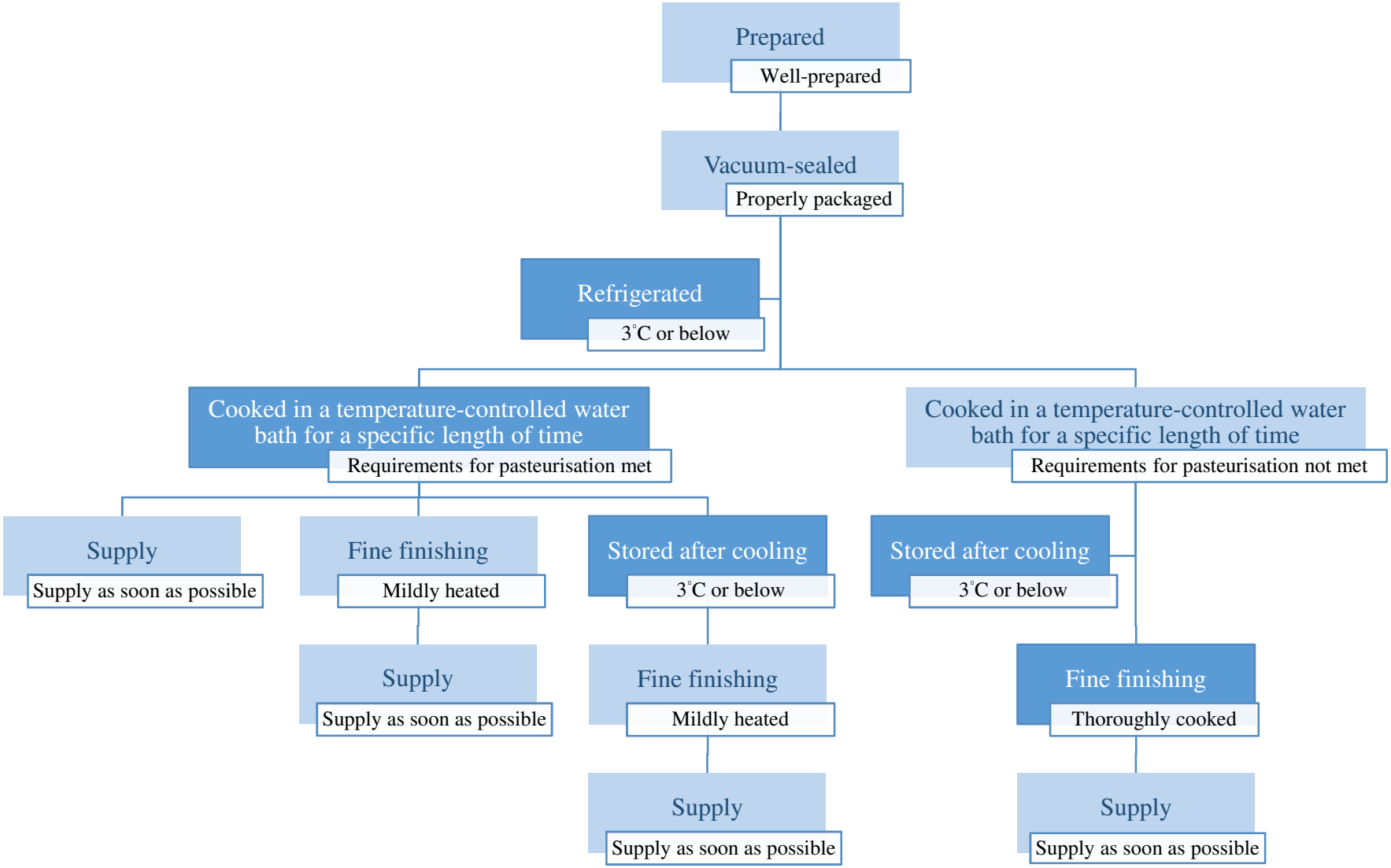

Table 2 Example of preparation process of sous vide sirloin steak, corresponding critical control points and corrective measures[9]:

	Control points (the critical control points are in red)	Control measures	Corrective measures
Products received	Legitimate source	Check the product documentation	Reject food of unknown origin
	Good hygiene	Check the product condition	Reject any food which is rotten or with damaged package
	Stored at below 5°C	Measure and record the temperature of the vehicle compartment and the product	Reject potentially hazardous food that is kept without temperature control
Stored in a refrigerator	Stored at below 5°C	Measure and record the temperature of the refrigerator on a daily basis	Adjust the temperature of the refrigerator Repair the refrigerator Transfer the food to another refrigerator or discard it
Vacuum-sealed	Properly vacuum-sealed sirloin steak	Check the vacuum package	Re-vacuum-seal
Cooled	Vacuum-sealed sirloin steak should be stored at 3°C or below and cooked within 2 days	Measure and record the temperature of the refrigerator on a daily basis	Adjust the temperature of the refrigerator Repair the refrigerator Transfer the food to another refrigerator or discard it
		Check the product label	Use or discard the food immediately
Cooked in a water bath	Set the water bath temperature and cooking time as per the verified sirloin steak recipe	Measure and record the water bath temperature and duration	Adjust the temperature and time combination for pasteurisation and then thoroughly heat the food during fine finishing

[9] The relevant examples are for reference only. Food producers and business operators should develop their own food preparation flow charts based on the actual situation.

	Control points (the critical control points are in red)	Control measures	Corrective measures
Cooled	Cooled to 3°C or below within 2 hours	Measure and record the core temperature and cooling time of the sirloin steak	Use or discard the food immediately
Cooled	Stored at 3°C or below and used within 3 days	Measure and record the temperature of the refrigerator on a daily basis	Adjust the temperature of the refrigerator Repair the refrigerator Transfer the food to another refrigerator or discard it
		Check the product label	Use or discard the food immediately
Fine finishing	Pan-fry the sirloin steak until it gets a brown crust	Not applicable	Not applicable

Table 3 Food core temperature and duration required for pasteurisation during water bath cooking[10]:

Food core temperature (°C)	Duration required for food core temperature
64	12 minutes and 37 seconds
65	9 minutes and 17 seconds
66	6 minutes and 50 seconds
67	5 minutes
68	3 minutes and 42 seconds
69	2 minutes and 43 seconds
70	2 minutes
71	1 minutes and 28 seconds
72	1 minutes and 5 seconds
93	48 seconds
74	35 seconds
75	26 seconds

Reference:

1. "Sous Vide and Food Safety" issued by Food Safety Authority of Ireland. July 2014 https://www.fsai.ie/publications/sous-vide-and-food-safety
2. "Guidelines for restaurant sous vide cooking safety in British Columbia" issued by BC Centre for Disease Control. July 2017 http://www.bccdc.ca/resource-gallery/Documents/Guidelines%20and%20Forms/Guidelines%20and%20Manuals/EH/FPS/Food/SVGuidelines_FinalforWeb.pdf
3. "Sous vide: Food safety precautions for restaurants" issued by New South Wales Food Authority. May 2022 https://www.foodauthority.nsw.gov.au/sites/default/files/_Documents/scienceandtechnical/sous_vide_food_safey_precautions.pdf
4. "Slow Cooking and Food Safety" issued by the Centre for Food Safety of the HKSAR Government. May 2014 https://www.cfs.gov.hk/english/multimedia/multimedia_pub/multimedia_pub_fsf_94_02.html

[10] The relevant suggestions are derived from "Sous Vide and Food Safety" issued by the Food Safety Authority of Ireland.