

**Risk Assessment Studies  
Report No. 70**

Microbiological Hazard Evaluation

**MICROBIOLOGICAL QUALITY OF  
NON-HOT SERVED DISHES WITH  
CHICKEN MEAT**

September 2023  
Centre for Food Safety  
Food and Environmental Hygiene Department  
The Government of the Hong Kong Special Administrative Region

This is a publication of the Centre for Food Safety of the Food and Environmental Hygiene Department of the Government of the Hong Kong Special Administrative Region. Under no circumstances should the research data contained herein be reproduced, reviewed or abstracted in part or in whole, or in conjunction with other publications or research work unless a written permission is obtained from the Centre for Food Safety. Acknowledgement is required if other parts of this publication are used.

Correspondence:  
Risk Assessment Section  
Centre for Food Safety  
Food and Environmental Hygiene Department  
43/F, Queensway Government Offices,  
66 Queensway, Hong Kong  
Email: [enquiries@fehd.gov.hk](mailto:enquiries@fehd.gov.hk)

## Table of Contents

	<b><u>Page</u></b>
Executive Summary	2
Objectives	6
Introduction	6
Scope of Study	7
Methodology	8
Results	13
Discussion	15
Conclusion and Recommendations	19
References	20

Risk Assessment Studies  
Report No. 70

**MICROBIOLOGICAL QUALITY OF  
NON-HOT SERVED DISHES WITH  
CHICKEN MEAT**

## EXECUTIVE SUMMARY

Chicken meat is a common ingredient in many local non-hot served ready-to-eat dishes, and there are quite a number of shops selling takeaway shredded chicken and chopped chicken in recent years. The preparation process of chicken meat for non-hot served dishes may result in greater microbiological risks, due to the potential risk of insufficient cooking and involvement of manual handling. Chicken may only be cooked just done for tenderness, while inadequately controlled cooking may not be able to kill all pathogens that are commonly isolated from chicken carcasses (e.g. *Salmonella* species). Cooked chicken may be further processed manually for preparing different non-hot served dishes; post-cooking contamination with pathogens (e.g. *Staphylococcus aureus*) may result if food handlers do not observe Good Hygienic Practices (GHPs). Furthermore, cooling is usually required before serving, and improper temperature control during storage of the dishes may allow the growth of pathogens. These necessitate a study on the potential risk associated with these food products available in local market.

The Centre for Food Safety (CFS) conducted a study to assess the microbiological quality of these products available in the local market, especially those containing chicken ingredients that are likely to be subject to manual handling after cooking.

### **Methodology**

Between September and November 2022, 100 samples of non-hot served chicken meat dishes were collected from takeaway shops or stalls and restaurants in different regions of Hong Kong. The microbiological quality of non-hot served chicken meat dish samples was assessed against the criteria stipulated in the Microbiological Guidelines for Food. The microbiological criteria include (a)

aerobic colony count (ACC, a quality indicator), (b) *Escherichia coli* (a hygiene indicator), and (c) specific foodborne pathogens.

## **Results and Discussion**

The overall microbiological quality of non-hot served dishes with chicken meat was found satisfactory. All samples complied with the microbiological food safety criteria for pathogenic bacteria (i.e. *Salmonella* spp., *Listeria monocytogenes* and *Staphylococcus aureus*). Although no unsatisfactory samples were found, the need to enhance the awareness on the food safety control of some food preparation processes has been identified during the visits to some shops selling these products.

Chicken meat ingredients used in the non-hot served dishes can be prepared from raw chicken, both chilled or frozen, or ready-to-eat chicken. The thawing, cooking and cooling processes of raw chicken meat have to be controlled well. Inadequate defrosting of frozen meat before cooking may render its inside undercooked and unable to kill pathogens. Chicken meat may be cooked by soaking in boiled water with heat removed for tenderness, but usually there is no monitoring of internal temperature to ensure sufficient cooking. Incomplete thawing coupled with insufficient cooking temperature, which may happen for larger preparation volumes, allows the survival of pathogens if present. Cooling without proper time-temperature control may allow the multiplication of bacteria which will further increase the risk of food poisoning. Food business operators have to follow relevant hygienic practices on thawing, cooking and cooling processes.

All chicken samples were shredded or chopped on-site, the handling of ready-to-eat chicken meats at retail shops after cooking greatly affects the microbiological quality of the products. Apart from observing personal hygiene, preparation and

display areas for ready-to-eat chicken meat have to be cleaned on a daily basis. To minimise cross-contamination, separate utensils should be used for handling raw food and ready-to-eat food, including prepared chicken meat. Preparation and storage areas for ready-to-eat chicken should be separated from areas for handling of raw food, including the areas for thawing frozen meat, as far as possible. If ready-to-eat chicken and raw food are stored in the same refrigerator, they should be covered and placed in the upper compartment and the lower compartment of the refrigerator respectively.

Shredded or chopped chicken dishes are usually sold at ambient temperature, while time control is necessary to ensure food safety. Ready-to-eat potentially hazardous food can be left under ambient conditions for a period of not more than four hours (i.e. 4-hour rule). All durations during shredding or other handling of ready-to-eat chicken meat as well as other perishable ingredients, e.g. shredded cucumber, between 4°C and 60°C must be taken into account. Alternatively, chicken products can be stored or displayed under temperature control (i.e.  $\leq 4^{\circ}\text{C}$ ) for a longer period of time. In that case, preparation time should be limited to two hours before storing in the refrigerator, and the products can be left out of time control after taking out from the refrigerator for two hours until the four-hour limit.

## **Conclusion**

In this study, the overall microbiological quality of chicken meat in non-hot served dishes was satisfactory. All samples complied with the microbiological food safety guideline levels for pathogenic bacteria as well as the guideline level for the hygiene indicator organism (i.e. *E. coli*) stipulated in the Microbiological Guidelines for Food.

Chicken meats are potentially hazardous food and they are subject to handling after cooking and may be kept under ambient condition. Proper time and temperature control should be implemented to ensure food safety. Besides, good

personal and environmental hygienic practices should be observed to minimise the chance of cross contaminations and the growth of bacteria. Food businesses also have the responsibility to provide sufficient ongoing food safety/hygiene training to their staff as well as correct and appropriate information about their products to consumers for the safe handling of non-hot served chicken dishes.

Below is some advice for the public and trade regarding the safe handling of non-hot served chicken dishes.

### Advice to Trade

Good Hygiene Practices for preventing contamination in food should be followed at all times. Food businesses also have the responsibility to provide sufficient ongoing food safety/hygiene training to their staff (i.e. food handlers in their businesses). Furthermore, a preventive food safety management system (such as the Hazard Analysis and Critical Control Point (HACCP) system) should be established to ensure that effective control measures are in place to minimise potential contamination of the products during the manufacturing process. The CFS has issued “Chicken Dishes with Post-cooking Handling (Applicable to Shredded Chicken and Poached chicken) - Food Safety Guidelines for the Trade” that can be accessed via the following link:

[https://www.cfs.gov.hk/english/food\\_leg/files/Guidelines\\_Poached\\_Chicken\\_Trade\\_e.pdf](https://www.cfs.gov.hk/english/food_leg/files/Guidelines_Poached_Chicken_Trade_e.pdf)

### Advice to Public

- Consume non-hot served ready-to-eat chicken dishes as soon as possible after purchase.
- Refrigerate non-hot served ready-to-eat chicken dishes at 4°C or below if they are not to be consumed immediately.



# Microbiological Quality of Non-hot Served Dishes with Chicken Meat

---

## OBJECTIVES

The purpose of the study is to assess the microbiological quality of non-hot served dishes with chicken meat which are likely to be subject to manual handling.

## INTRODUCTION

2. Chicken meat is a common ingredient in many local non-hot served ready-to-eat dishes, and there are quite a number of shops selling takeaway shredded chicken and chopped chicken in recent years. For these non-hot served dishes, there have been reports on food poisoning outbreaks and also samples found with excessive levels of pathogens<sup>1,2,3</sup>; this necessitates a study on the potential risk associated with these food products available in local market.

3. The preparation process of chicken meat for non-hot served dishes may result in greater microbiological risks. As a general practice to make the chicken meat tender and juicy, some food handlers choose to cook the chicken meat by immersing it in boiled water (i.e. water with the heat source removed after being boiled) for a period of time. Inadequately controlled cooking may not be able to kill all pathogens that are commonly isolated from chicken carcasses (e.g. *Salmonella* species), especially if the whole chicken was cooked just done in this manner. As exemplified in the United States, food-handling errors and inadequate cooking were among the most common factors contributing to poultry-associated outbreaks, in which *Salmonella* was the most common pathogens.<sup>4</sup>

4. Cooked chicken is sometimes handled extensively with bare hands, for example, when shredding the chicken manually, or mixing shredded chicken meat with other ingredients in preparation of cold dishes. Post-cooking contamination with pathogens (e.g. *Staphylococcus aureus*) may result if food handlers do not observe good hygienic practices. Locally, 11% of staphylococcal food poisoning outbreaks were reported to be associated with chicken, and poor hygiene of the food handlers was often identified as one of the contributing factors in causing these outbreaks.<sup>5</sup>

5. Chicken dishes may not be served hot in which the chicken meat (whole or parts) usually is cooked and cooled before being served to customers. They may be refrigerated or left under ambient condition. Improper temperature control during storage of the dishes may allow the growth of pathogens. In addition, sauces or other raw ingredients may be added right before the dishes are sold to customers. Without further heat treatment before serving, bacteria resulting from cross-contamination will survive. Chinese cold dishes, usually prepared from raw vegetables and cooked meats, without further heating immediately before consumption, were also identified as a high-risk food for *Listeria monocytogenes* contamination.<sup>6</sup>

6. Non-hot served chicken dishes have been implicated in local food poisoning outbreaks and there have been reports of unsatisfactory samples of non-hot served chicken under the food surveillance programme.<sup>7,8</sup> Considering the potential risks, this study was conducted to assess the microbiological quality of these products available in the local market.

## **SCOPE OF STUDY**

7. This study focused on the chicken meat in non-hot served dishes,

including shredded chicken, chopped chicken, shredded chicken dishes and shredded chicken salad. These chicken ingredients are likely to be subject to manual handling after cooking.

## METHODOLOGY

### Sampling

8. Between September and November 2022, 100 samples of non-hot served chicken meat dishes were collected from different types of premises in different regions of Hong Kong (Table 1).

**Table 1: Sampling distribution of non-hot served chicken meat dishes**

Region	No. of Samples Taken		Region Total
	Takeaway shop or stall	Restaurant	
Hong Kong Island	10	21	31
Kowloon	12	26	38
New Territories	17	14	31
<b>Total</b>	<b>39</b>	<b>61</b>	<b>100</b>

9. Different types of chicken dishes were collected to include chicken ingredients subjected to different ways of handling or processing (Table 2). Among the 100 samples taken, 40 were taken for each of shredded chicken and chopped chicken and 15 were taken for shredded chicken dishes; the remaining five were taken for shredded chicken salad. Hot dishes were not collected and collected samples were maintained at either cold temperature or ambient temperature. For dishes with chicken meat as one of the ingredients or served on the side, only the chicken ingredient was isolated as far as possible and sent for analysis. Sample types selected for this study were considered of high microbiological risk where they were likely to be subject to manual handling and

cooled before serving.

**Table 2. Sampling distribution of different types of samples**

Type	Total
Shredded chicken	40
Chopped chicken	40
Shredded chicken dishes	15
Shredded chicken salad	5
<b>Total</b>	<b>100</b>

10. Health inspectors of the Centre for Food Safety (CFS) were responsible for collecting samples. Target samples were maintained at either cold temperature or ambient temperature and hot dishes were not collected. For non-hot served chicken meat served alongside a dish, only the portion of non-hot served chicken meat was tested. Except for those mixed with chicken meat in advance, raw ingredients were avoided as far as possible so that the criterion of aerobic colony count (ACC) can be applied for assessing the quality of chicken meat. Samples were selected based on the following criteria:

- (i) Samples should be collected from different districts within each region;
- (ii) Only one sample should be collected from a sampling site;
- (iii) No more than two samples should be collected from the same brand/retail chain

#### Laboratory analysis

11. After collecting the samples, they were immediately stored at 0°C to 4°C and were delivered to the Public Health Laboratory Services Branch of the Centre for Health Protection, Department of Health, within four hours of sampling. ACC, *Escherichia coli* count, presence or absence of *Salmonella* spp. in 25 g sample, *S. aureus* and other coagulase-positive staphylococci count, and *L. monocytogenes* count were used to reflect the microbiological quality of chicken

meat samples.

12. The enumeration of ACC in samples was performed using bioMérieux TEMPO Aerobic Count (AC) kits. *E. coli* count in samples was performed using the AOAC Official Methods 991.14 (Revised: March 1998) (Petrifilm Method). *S. aureus* count was enumerated according to Method MFLP-21 Health Products and Food Branch, Ottawa (2004). The detection of *Salmonella* spp. was performed according to National Standard Method F13 issue 1 published by Health Protection Agency in the UK. Enumeration of *L. monocytogenes* was conducted according to ISO 11290-2:2017(E).<sup>9</sup>

### Result analysis

13. The microbiological results of the non-hot served chicken meat dish samples were analysed by the Risk Assessment Section of the CFS, and assessed against the criteria in CFS' Microbiological Guidelines for Food (the Guidelines).<sup>10</sup> The relevant criteria are extracted from the Guidelines and listed in Tables 3 and 4. Furthermore, selected shops selling samples of different microbiological quality (three with samples of borderline quality and another three with samples of satisfactory quality) were visited to understand the food handling and preparation of non-hot served chicken dishes by interviewing the food handlers with a set of questionnaires.

### *Quality and Hygiene – Aerobic Colony Count and E. coli*

14. Aerobic colony count is the total number of bacteria found in food. The level of ACC in food depends on the type and duration of processing that the food has received during production as well as how the food is handled and stored thereafter.<sup>11</sup> The number of bacteria increases significantly over time in response to poor temperature control of the product. Hence, ACC can highlight potential

problems of storage and handling since production and provide clues for early detection of problems as well as about how the problems should be solved. It is worth noting that ACC is an indicator of quality but not safety.<sup>10</sup> As the microbiological quality of chicken meats is the study target, raw ingredients were avoided as far as possible so that ACC of chicken meat samples could be determined.

15. The Guidelines classify ready-to-eat food products<sup>i</sup> into 13 categories because several factors (such as the types of raw ingredients used and the nature of processing) may affect the ACC of a product at the point of sale. For example, heat processes such as cooking will result in low ACC, and products containing raw ingredients such as fresh vegetables will have much higher ACC due to the natural flora present. Handling after heat processing such as slicing, portioning, packaging, etc. may increase the ACC, although this should be minimised by Good Hygienic Practices (GHPs).

16. Taking the ingredients and the nature of processing into consideration, for the purpose of this study, chicken meat samples in this study were classified into category 5 according to the Guidelines (Table 3). Non-hot served chicken meat ingredients will not be cooked prior to sale, and are likely to be further handled (e.g. slicing, shredding, or mixing with other ingredients, etc.) during preparation; hence, they are expected to have higher ACC in comparison with hot-served chicken. As for those chicken meat ingredients mixed with raw vegetables (such as shredded cucumber or salad vegetables), they are classified into category 12, as raw vegetables can contain high levels of bacteria as part of their normal micro-flora and hence, are likely to have high ACC.

17. *E. coli* is a bacterium found in the gastrointestinal tract of humans and

---

<sup>i</sup>“Ready-to-eat food” means food intended by the producer or the manufacturer for direct human consumption without the need for cooking or other processing effective to eliminate or reduce to an acceptable level the microorganisms of concern.

is commonly used as a faecal indicator to reflect the hygienic quality of a food product. *E. coli* are killed by the heat processes used in food production and should be readily removed from the equipment and surfaces by appropriate cleaning procedures. Its presence in food indicates direct or indirect faecal contamination, and a substantial number of *E. coli* in food suggests a general lack of cleanliness in handling and improper storage.<sup>10</sup>

**Table 3. ACC and *E. coli* criteria used in this study**

Food category in the Guidelines	Microbiological quality Result (colony-forming unit (cfu/g))		
	Satisfactory	Borderline	Unsatisfactory
<b>Aerobic colony count (ACC) [30°C /48 hours]</b>			
5. Cooked foods chilled but with some handling prior to sale or consumption	<10 <sup>5</sup>	10 <sup>5</sup> -<10 <sup>7</sup>	≥10 <sup>7</sup>
12. Fresh fruit and vegetables, products containing raw vegetables	N/A	N/A	N/A
<b>Hygiene indicator organisms</b>			
<i>E. coli</i>	<20	20 - ≤10 <sup>2</sup>	>10 <sup>2</sup>

Remarks:

1. Category numbers as marked for the food categories under ACC are directly adapted from the CFS' Microbiological Guidelines for Food.
2. For ACC, the detection limit is 100 cfu/g. For *E. coli*, the detection limit is 10 cfu/g.

### *Microbiological safety – Pathogens*

18. *Salmonella* spp., *L. monocytogenes*, and *S. aureus* are pathogenic bacteria. They have been involved in a number of local and overseas food poisoning outbreaks and therefore were used to assess the safety of chicken meat in this study.

19. *Salmonella* can be found in a variety of foods, including chicken, beef, pork and eggs, and chicken is one of the major sources. In the United States, it is estimated that one in every 25 packages of chicken at the grocery store are contaminated with *Salmonella*.<sup>12</sup> *L. monocytogenes* is universally present in the environment. It can survive and multiply at temperature as low as 0°C but can

be easily destroyed under normal cooking temperature. Growth of this bacterium following contamination of cooked foods will result in disease transmission.<sup>10</sup> Cooked chicken meat may be contaminated during the handling process and subsequent storage can allow the proliferation of the bacterium. *S. aureus* is one of the common food poisoning microorganisms in Hong Kong. The most common way of contamination of food is by contact with food handlers' hands, especially in the cases where the food is handled after cooking, and once contaminated with *S. aureus*, prolonged storage without refrigeration allows *S. aureus* to grow to high numbers and form enterotoxins. Although staphylococcal enterotoxins can also be produced in food by some other coagulase-positive staphylococci such as *S. intermedius*, most coagulase-positive staphylococci which cause foodborne illness are *S. aureus*.<sup>10</sup>

20. The microbiological safety of the samples was determined using the criteria for pathogens of the Guidelines (Table 4).<sup>10</sup>

**Table 4. Pathogen criteria of the Guidelines**

Criterion	Result (cfu/g unless otherwise specified)		
	Satisfactory	Borderline	Unsatisfactory: potentially injurious to health and/or unfit for human consumption
<i>Salmonella</i> spp.	Not detected in 25g	N/A	Detected in 25g
<i>Listeria monocytogenes</i> ● For other ready-to-eat food	< 10	10 - ≤ 100	> 100
<i>S. aureus</i> and other coagulase-positive staphylococci	< 20	20 - ≤ 10 <sup>4</sup>	> 10 <sup>4</sup>

Remark: In general, the limits of "Satisfactory" are also the detection limits for respective pathogens.  
Remark: The detection limit of the test for *S. aureus* and other coagulase-positive staphylococci is 10 cfu/g.

## RESULTS

### Specific foodborne pathogens



21. No samples were detected with *Salmonella* spp., *L. monocytogenes*, and *S. aureus*, at levels that are considered potentially injurious to health (Table 4).

Quality and hygiene indicators – ACC and *E. coli* count

22. Among the 100 non-hot served chicken meat samples taken, 95 samples, and 5 samples were classified into categories 5 and 12 respectively. For the 95 samples in category 5, none of them were of unsatisfactory quality, and three samples were rated as borderline quality (i.e.  $1.3 \times 10^6$  cfu/g,  $2.4 \times 10^5$  cfu/g, and  $1.7 \times 10^5$  cfu/g respectively) (Table 5). All these three were shredded chicken samples.

23. For the five samples classified under category 12, they all contained raw ingredients (e.g. fresh vegetables such as lettuce, tomato, and cucumber, etc.) which inherently contained high ACC as natural flora. Hence, the ACC criterion does not apply to these samples.

**Table 5. ACC results (Number of applicable samples=95)**

	Microbiological results (cfu/g)					
	<10 <sup>3</sup>	10 <sup>3</sup> -<10 <sup>4</sup>	10 <sup>4</sup> -<10 <sup>5</sup>	10 <sup>5</sup> -<10 <sup>6</sup>	10 <sup>6</sup> -<10 <sup>7</sup>	≥10 <sup>7</sup>
<b>Microbiological quality (Food category 5)</b>	<b>Satisfactory</b>			<b>Borderline</b>		<b>Unsatisfactory</b>
Cooked foods chilled but with some handling prior to sale or consumption	83	8	1	2	1	0

24. As regards the hygienic quality, 99 samples were rated as satisfactory because their *E. coli* counts were less than 20 cfu/g (Table 3). One sample was rated as borderline, with 30 cfu/g *E. coli* detected, and this sample was also rated as borderline for ACC criterion.

### Chicken preparation practice

25. While all chicken meats were shredded or chopped on site, some were prepared from ready-to-eat chicken delivered to retail shops and some were prepared from raw chicken, either chilled or frozen, and were cooked on site, as noted from the visits to some shop selling non-hot served chicken dishes.

26. During sample collection, 25 (25%) samples were kept under refrigeration and the rest were left under ambient conditions.

### **DISCUSSION**

27. In this study, the overall microbiological quality of non-hot served chicken meats was satisfactory. All samples complied with the microbiological food safety guidance levels for pathogenic bacteria as well as the guidance level for the hygienic indicator (i.e. *E. coli*), both being stipulated in the Microbiological Guidelines for Food.

28. As regards the ACC, there were three shredded chicken samples with borderline quality, one of which was also detected with a borderline level of *E. coli*. The causes of the increased level of ACC were likely due to improper practices of food handling, such as inadequate cooking, improper storage of chicken ingredients after cooking and/or leaving the chicken ingredients at room temperature for a prolonged period. *E. coli* is an indicator of direct or indirect faecal contamination, the borderline level of *E. coli* suggested that a review of all hygiene procedures, both personal and environmental hygiene, may be required. To improve the microbiological quality the foods, the vendors of the shops were reminded to follow GHPs when handling ready-to-eat ingredients to prevent cross-contamination and the growth of bacteria. Follow-up samples were taken from the concerned shops and the levels of ACC and *E. coli* were satisfactory.

Although no unsatisfactory samples were identified, recommendation on GHPs is needed considering the potential microbiological risk of these products.

29. As noted from visits to some shops selling non hot-served chicken dishes, chicken meat ingredients used in the non-hot served dishes can be prepared from raw chicken, both chilled or frozen, and ready-to-eat whole chicken.

30. For chicken meat ingredients prepared from raw chicken at retail shops, the thawing, cooking and cooling processes have to be controlled well. Frozen chicken or chicken meats should be defrosted thoroughly before cooking, otherwise, it may be cooked on the outside but raw inside that unable to kill pathogens.<sup>13,14</sup> Defrosting by keeping in the refrigerator (4°C) and under running water can be used for larger batch sizes in food businesses. The latter way takes a shorter time, while the meat has to be cooked immediately after defrosting. For cooking, chicken or chicken meats may be cooked by soaking in boiled water with heat removed for tenderness while internal temperature is not monitored. Incomplete thawing coupled with insufficient cooking temperature, which may happen for larger preparation volumes, allows the survival of pathogens if present.<sup>14</sup> After cooking, chicken meats in non-hot served dishes are cooled before serving, possibly accustoming to consumers' preference. Cooling without proper time-temperature control may allow the multiplication of bacteria which will further increase the risk of food poisoning.

31. Shredding or chopping of whole chicken is usually conducted at retail shops, in which there is no further heat treatment before serving customers. As such, the handling of chicken meats at retail shops greatly affects the microbiological quality of the products. In this study, one samples was detected with a borderline level of *E. coli*, an indicator organism indicating direct or indirect faecal contamination, which suggests potential cross-contamination.<sup>10</sup> Though not to a concerned level, a review on cleanliness in handling and storage condition

may be needed. Well-separation of raw and cooked food and the frequency of refrigerator cleaning were identified factors that reduce the risk of listeriosis for Chinese cold dishes;<sup>6</sup> these should also apply to non-hot served chicken meat dishes. For retail shops selling these dishes, apart from observing personal hygiene, preparation and display areas for ready-to-eat chicken meat have to be cleaned on a daily basis. Separate utensils should be used for handling raw food and ready-to-eat food, including prepared chicken meats. Preparation and storage areas for ready-to-eat chicken should be separated from areas for handling raw food, including the areas for thawing frozen meats, as far as possible. If ready-to-eat chicken and raw food are stored in the same refrigerator, they should be covered and placed in the upper compartment and the lower compartment of the refrigerator respectively.

32. Shredded or chopped chicken dishes are usually sold at ambient temperature, while time control is necessary to ensure food safety. The Food Hygiene Code of Food and Environmental Hygiene Department (FEHD) states that a ready-to-eat potentially hazardous food may be displayed or stored at ambient temperature for a period of not more than four hours (i.e. 4-hour rule). If the business chooses to sell or display non-hot served chicken meat at ambient condition, it should limit the period of time under which the prepared chicken meat and other potentially hazardous ingredients are out of temperature control. As discussed above, the total allowable time of prepared chicken meat can stay out of temperature control is four hours. As such, all durations during shredding or other handling of ready-to-eat chicken meat as well as other perishable ingredients, e.g. shredded cucumber, between 4°C and 60°C must be taken into account. Furthermore, in case the business has limited space for storage and display, it should only prepare an amount of chicken products that can be sold within the allowable time. The adherence to the time and temperature requirements for handling of cooked chicken can also be recorded to avoid chicken products being left under ambient conditions for too long.

33. Alternatively, chicken products can be stored or displayed under temperature control (i.e.  $\leq 4^{\circ}\text{C}$ ) for a longer period of time. In that case, preparation time should be limited to two hours before storing in the refrigerator, whereas the products can be left out of time control after taking out from the refrigerator for two hours until the four-hour limit. In addition, if high risk ingredients such as raw vegetables are added, they should be kept under refrigeration for sale as far as possible.

34. Sauces or dressings are usually added to shredded chicken dishes, after the preparation of chicken meat or immediately before selling to customers. Packaged sauces or dressings sold at ambient conditions may be used, while food handlers have to check the manufacturers' instructions about storage after opening. The sauces or dressings are usually need to be stored at  $4^{\circ}\text{C}$  or below once their packages are opened.

35. Chicken meat can become contaminated at any stage during production, and measures to prevent such contamination are part of the GHPs relevant to the preparation of non-hot served chicken dishes. Business operators have to prevent potential hazards in the chicken products, despite that samples collected in this study were satisfactory. Thorough implementation of GHPs, mainly on adequate cooking, prevention of cross-contamination and storage, at the final food preparation step could potentially reduce foodborne disease burden.<sup>15</sup> They have to ensure that GHPs are well recognised by food handlers and relevant staff by on-going training.

### Limitations

36. In this study, only 100 samples were taken and the focus was on the chicken meat ingredients. Because of the wide variety of non-hot served chicken

meat dishes available in the market, only selected types were covered due to limited laboratory resources. The microbiological quality of final products might be affected by other ingredients added to the dishes.

37. Collected samples were categorised based on ingredients and information given to the health inspectors. It should be noted that the food production process, the ingredients, and the storage condition, may vary among food producers.

## **CONCLUSION AND RECOMMENDATIONS**

38. In this study, the overall microbiological quality of chicken meat in non-hot served dishes was satisfactory. All samples were compliant with the microbiological food safety guideline levels for pathogenic bacteria as well as the guideline level for the hygiene indicator organism (i.e. *E. coli*) stipulated in the Microbiological Guidelines for Food.

39. Chicken meats are potentially hazardous food and they are subject to handling after cooking and may be kept under ambient condition. Proper time and temperature control should be implemented to ensure food safety. Besides, good personal and environmental hygienic practices should be observed to minimise the chance of cross contaminations and the growth of bacteria. Food businesses also have the responsibility to provide sufficient ongoing food safety/hygiene training to their staff as well as correct and appropriate information about their products to consumers for the safe handling of non-hot served chicken dishes.

40. Some advice for trade and the public about the safe handling of non-hot served chicken dishes are provided as follows:

## Advice to Trade

GHPs for preventing contamination in food and proper storage of food, particularly ready-to-eat food, should be followed at all times. Food businesses also have the responsibility to provide sufficient ongoing food safety/hygiene training to their staff (i.e. food handlers in their businesses). Further, a preventive food safety management system (such as the Hazard Analysis and Critical Control Point (HACCP) system) should be established to ensure that effective control measures are in place to minimise potential contamination of the products during the manufacturing process. The CFS has issued “Chicken Dishes with Post-cooking Handling (Applicable to Shredded Chicken and Poached chicken) - Food Safety Guidelines for the Trade” that can be accessed via the following link:

[https://www.cfs.gov.hk/english/food\\_leg/files/Guidelines\\_Poached\\_Chicken\\_Trade\\_e.pdf](https://www.cfs.gov.hk/english/food_leg/files/Guidelines_Poached_Chicken_Trade_e.pdf)

## Advice to Public

- Consume non-hot served ready-to-eat chicken dishes as soon as possible after purchase.
- Refrigerate non-hot served ready-to-eat chicken dishes at 4°C or below if it is not to be consumed immediately.

## **REFERENCES**

---

<sup>1</sup> CFS, 2021. Press Release: CFS finds Salmonella in drunken chicken sample. August 18, 2021. Available from: URL: [https://www.cfs.gov.hk/english/press/20210818\\_8844.html](https://www.cfs.gov.hk/english/press/20210818_8844.html) [Accessed 17 Aug 2023]

<sup>2</sup> CFS, 2021. Press Release: CFS finds excessive coagulase-positive staphylococci organisms in sample of rice with chicken. June 29, 2021. Available from: URL: [https://www.cfs.gov.hk/english/press/20210629\\_8766.html](https://www.cfs.gov.hk/english/press/20210629_8766.html) [Accessed 17 Aug 2023]

<sup>3</sup> Lau M., 2012. Review of Food Poisoning Outbreaks Related to Food Premises and Food Business in 2011. Food Safety Focus (69th Issue, April 2012) – Incident in Focus. Available from: URL: [https://www.cfs.gov.hk/english/multimedia/multimedia\\_pub/multimedia\\_pub\\_fsf\\_69\\_01.html](https://www.cfs.gov.hk/english/multimedia/multimedia_pub/multimedia_pub_fsf_69_01.html) [Accessed 17 Aug 2023]

- 
- <sup>4</sup> Chai S.J., Cole D., Nisler A., and B.E. Mahon, 2017. Poultry: the most common food in outbreaks with known pathogens, United States, 1998-2012. *Epidemiol Infect.* 145(2):316-325. Available from: URL: <https://pubmed.ncbi.nlm.nih.gov/27780481/> [Accessed 17 Aug 2023]
- <sup>5</sup> CHP, 2011. Review of Staphylococcal Food Poisoning in Hong Kong. Available from: URL: [https://www.chp.gov.hk/files/pdf/review\\_of\\_staphylococcal\\_food\\_poisoning\\_in\\_hong\\_kong\\_r.pdf](https://www.chp.gov.hk/files/pdf/review_of_staphylococcal_food_poisoning_in_hong_kong_r.pdf) [Accessed 17 Aug 2023]
- <sup>6</sup> Niu Y.L., Wang T.Y., Zhang X.A., Guo Y.C., Zhang Y.W., Wang C., Wu Y.B., Jiang J.R., and X.C., Ma, 2022. Risk factors for sporadic listeriosis in Beijing, China: A matched case-control study. *Epidemiol Infect.* 21;150:1-21. Available from: URL: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8931803/> [Accessed 17 Aug 2023]
- <sup>7</sup> CFS, 2021. Press Release: CFS finds excessive coagulase-positive staphylococci organisms in sample of rice with chicken. Available from: URL: [https://www.cfs.gov.hk/english/press/20210629\\_8766.html](https://www.cfs.gov.hk/english/press/20210629_8766.html) [Accessed 17 Aug 2023]
- <sup>8</sup> Lau M., 2012. Review of Food Poisoning Outbreaks Related to Food Premises and Food Business in 2011. *Food Safety Focus* (69th Issue, April 2012) – Incident in Focus. Available from: URL: [https://www.cfs.gov.hk/english/multimedia/multimedia\\_pub/multimedia\\_pub\\_fsf\\_69\\_01.html](https://www.cfs.gov.hk/english/multimedia/multimedia_pub/multimedia_pub_fsf_69_01.html) [Accessed 17 Aug 2023]
- <sup>9</sup> CHP, 2021. Guide to Requests for Laboratory Testing: 3. Public Health (Revised August 2021). Available from: URL: <https://www.chp.gov.hk/en/healthprofessionals/30/index.html#PHL> [Accessed 17 Aug 2023]
- <sup>10</sup> CFS, 2014. Microbiological Guidelines for Food. Available from: URL: [http://www.cfs.gov.hk/english/food\\_leg/files/food\\_leg\\_Microbiological\\_Guidelines\\_for\\_Food\\_e.pdf](http://www.cfs.gov.hk/english/food_leg/files/food_leg_Microbiological_Guidelines_for_Food_e.pdf) [Accessed 17 Aug 2023]
- <sup>11</sup> Health Protection Agency, 2009. Guidelines for Assessing the Microbiological Safety of Ready-to-Eat Foods. London: Health Protection Agency. Available from: URL: [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/363146/Guidelines\\_for\\_assessing\\_the\\_microbiological\\_safety\\_of\\_ready-to-eat\\_foods\\_on\\_the\\_market.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/363146/Guidelines_for_assessing_the_microbiological_safety_of_ready-to-eat_foods_on_the_market.pdf) [Accessed 17 Aug 2023]
- <sup>12</sup> US CDC, 2022. *Salmonella* and Food. Available from: URL: <https://www.cdc.gov/foodsafety/communication/salmonella-food.html> [Accessed 17 Aug 2023]
- <sup>13</sup> CFS, 2022. Safe Kitchen – Defrosting. Available from: URL: [https://www.cfs.gov.hk/english/trade\\_zone/safe\\_kitchen/defrosting.html](https://www.cfs.gov.hk/english/trade_zone/safe_kitchen/defrosting.html) [Accessed 17 Aug 2023]
- <sup>14</sup> Oppegard S.J., Bethke A.R., Davy B.A., Johnson A.E., Daniel J.L., and S.E. Holmes, 2022. Notes from the Field: Outbreak of *Salmonella* Enteritidis at a Correctional Facility Using Mechanically Separated Chicken - Nebraska, 2022. *MMWR Morb Mortal Wkly Rep.* 15;71(28):908-909. Available from: URL: <https://pubmed.ncbi.nlm.nih.gov/35834419/>



---

[Accessed 17 Aug 2023]

<sup>15</sup> Augustin J.C., Kooh P., Bayeux T., Guillier L., Meyer T., Jourdan-Da Silva N., Villena I., Sanaa M., Cerf O., On Behalf Of The Anses Working Group On Consumer Information On Foodborne Biological Risks, 2020. Contribution of Foods and Poor Food-Handling Practices to the Burden of Foodborne Infectious Diseases in France. *Foods*. 11;9(11):1644. Available from: URL: <https://pubmed.ncbi.nlm.nih.gov/33187291/>[Accessed 17 Aug 2023]