

# 本港售賣的壽司和刺身 的微生物質素

## Microbiological Quality of Sushi and Sashimi in Hong Kong

風險評估研究 2014-2015

Risk Assessment Study 2014-2015

# 壽司和刺身

## Sushi and Sashimi

- 壽司和刺身為本地受歡迎的即食食物之一，但它們都屬於風險較高的食物：
  - 大部分都是生吃或混有生吃食物
  - 配製的過程可能涉及許多經人手處理的步驟
- Sushi and sashimi have been among the popular food items in Hong Kong, but they are also high risk food items:
  - Most are raw food or mixed with raw food
  - May involve manual handling during preparation



# 刺身與壽司的分別

## Sashimi VS Sushi

### 壽司 **Sushi**

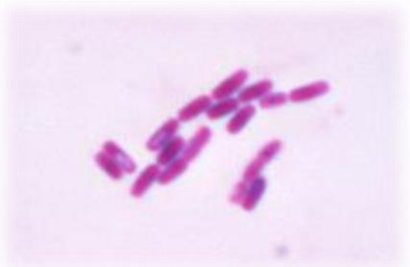
- 混合配料(生或熟) + 醋 + 飯  
Mixing of ingredients (raw or cooked) + vinegar + rice

米飯經適度加酸至酸鹼值4.6或以下，在攝氏25度或以上的環境中陳列四小時以上，致病細菌的數量才會達到危險水平。  
(新南威爾斯食物規管當局)

Product with proper acidification of rice (i.e. to pH  $\leq$ 4.6) would need to be displayed at 25°C or higher for more than **four hours** for pathogenic bacteria to reach dangerous levels.  
(The NSW Food Authority)

### 刺身 **Sashimi**

- 只有生的食材  
Raw ingredient only



蠟樣芽孢桿菌 *Bacillus cereus*  
(Photo: CDC/ Dr. William A. Clark)



# 以往的本地研究

## Previous local studies

### ➤ 研究食物監察計劃結果 Study on surveillance results (1997-1999)

	Sushi 壽司	Sashimi 刺身
衛生質素未能令人滿意 (平板菌落計數和大腸桿菌含量) Unsat. hygienic quality (Aerobic plate count & <i>E. coli</i> )	141/1020 (13.8%)	101/906 (11.1%)
致病菌 Pathogens	金黃葡萄球菌 <i>S. aureus</i> (2)	副溶血性弧菌 <i>V. parahaemolyticus</i> (1) 李斯特菌 <i>L. monocytogenes</i> (1) 沙門氏菌 <i>Salmonella</i> (1)

### ➤ 與消費者委員會(消委會)合作進行的研究 Joint CC study (2008)

	Sushi/hand roll/rice with sashimi (rice served cold) 手卷/壽司/魚生飯 (供冷食的飯類製品)
衛生質素未能令人滿意 (平板菌落計數和大腸桿菌含量) Unsat. hygienic quality (Aerobic plate count & <i>E. coli</i> )	3/19 (15.8%)
致病菌 Pathogens	金黃葡萄球菌 <i>S. aureus</i> (1)





# 目前情況

## Current situation

- 過往的研究顯示，衛生質素有待改善。
  - 過往的研究未有探討適度加酸可減輕風險這個因素。
  - 有必要了解現今市面上的壽司和刺身的質素。
- 
- Previous studies suggested that there is room for improvement in hygienic quality.
  - Previous studies did not take into account the reduction of risk by proper acidification.
  - An update overview on the quality of sushi and sashimi is required.



# 目的

## Objectives

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- 了解本港現時市面上出售的壽司和刺身的微生物質素
  - 了解壽司飯酸鹼值的大致情況
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- To provide an update on the microbiological quality of sushi and sashimi available in the local market
  - To provide an overview on the pH value of rice from sushi



# 研究範圍

## Scope

- 壽司和刺身
- 亦包括生牛肉、泰式生蝦等高風險食物
- 涵蓋不同的陳列或售賣模式：堂食、自助餐、外賣店等

- Sushi and sashimi
- Also included some other higher risk items, e.g. raw beef, Thai-style raw shrimp
- Different sale or display formats were included: dine-in (order), buffet, takeaway shop, etc.



# 刺身

## Sashimi

魚生

Raw fish



生的介貝類

Raw shellfish



熟北寄貝  
Pouched surf clam

其他生的食材

Other raw ingredients



Raw beef is included as sashimi.

刺身包括生牛肉

食物環境衛生署

Food and Environmental Hygiene Department

# 壽司 Sushi

## 壽司或卷物 Sushi or roll



## 手卷 Hand Roll





# 採樣

## Sampling

- 在2014年7月至10月期間抽取樣本。
  - 共取得98個壽司樣本和99個刺身樣本。
- 
- Sampling work was conducted from July to October 2014.
  - A total of 98 sushi samples and 99 sashimi samples were collected.



# 採樣

## Sampling

陳列或售賣模式 Display or serving form	壽司 Sushi	刺身 Sashimi	總數 Total
餐廳(堂食) Dine-in restaurants	61	60	121
外賣店及外賣速遞服務 Takeaway shops and home delivery service	37	39	76
總數 Total	98	99	197



# 化驗測試

## Laboratory tests

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- 衛生署轄下的公共衛生化驗服務處進行微生物測試
  - 中心的食物研究化驗室進行壽司飯的酸鹼值測試（僅限於壽司樣本）
- 
- Microbiological tests were conducted by Public Health Laboratory Services Branch of the Department of Health
  - pH value of sushi rice was tested by the Food Research Laboratory of the CFS (For sushi samples only)



# 微生物含量準則

## Microbiological criteria

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# 微生物含量準則

## Microbiological criteria

- 根據中心2014年8月出版的《食品微生物含量指引》
- According to the “Microbiological Guidelines for Food” issued by the CFS in Aug 2014





# 微生物含量準則

## Microbiological criteria

### ➤ (I) 衛生質素

- 需氧菌落計數 - 一般質素
- 大腸桿菌 - 直接或間接受糞便污染

### ➤ (II) 食物安全：致病菌

- 副溶血性弧菌、金黃葡萄球菌、沙門氏菌屬、蠟樣芽孢桿菌(僅限於壽司樣本)
- 如檢出或含過量，可能影響健康

### ➤ (III) 酸鹼值

- 沒有包括在指引中，會以pH 4.6為參考值

### ➤ (I) Hygienic quality

- Aerobic colony count (ACC) – general quality
- *E. coli* – direct or indirect faecal contamination

### ➤ (II) Food Safety: Pathogens

- *V. parahaemolyticus*, *S. aureus*, *Salmonella* spp., *B. cereus* (for sushi samples only)
- May affect health if presence or presence in excessive levels

### ➤ (III) pH value

- Not included in the Guidelines, use pH 4.6 as reference



# (I) 衛生質素 – 需氧菌落計數 Hygienic quality – ACC

Food categories based on ingredients

按配料區分的食物類別

食物類別 Food Categories	微生物質素檢測結果 (每克樣本的菌落形成單位) Microbiological quality Result (colony-forming unit (cfu/g))		
	滿意 Satisfactory	尚可 Borderline	不滿意 Unsatisfactory
需氧菌落計數 [攝氏30度/48 小時] Aerobic colony count (ACC) [30°C /48 hours]			
5. 經烹煮並冷凍，在出售或進食前經若干處理程序的食物 Cooked foods chilled but with some handling prior to sale or consumption	$<10^5$	$10^5 - <10^7$	$\geq 10^7$
7. 加入調料醬的食物、蘸料、抹醬 Food mixed with dressings, dips, pastes	$<10^6$	$10^6 - <10^7$	$\geq 10^7$
9. 生的即食肉類和魚類、凍煙燻魚類 Raw ready-to-eat meat and fish, cold smoked fish			
10. 醋漬、醃漬或鹽漬的醃製食品 Preserved food products – pickled, marinated or salted	不適用 N/A	不適用 N/A	不適用 N/A
12. 新鮮水果和蔬菜、含有生的蔬菜的食品 Fresh fruit and vegetables, products containing raw vegetables			

# (I) 衛生質素 - 大腸桿菌

## Hygienic quality - *E. coli*

	微生物質素 檢測結果 (每克樣本的菌落形成單位) Microbiological quality Result (colony-forming unit (cfu/g))		
	滿意 Satisfactory	尚可 Borderline	不滿意 Unsatisfactory
大腸桿菌 <i>E. coli</i>	<20	20 - ≤10 <sup>2</sup>	>10 <sup>2</sup>

- 適用於所有壽司和刺身  
Apply to all sushi and sashimi



# (II) 微生物安全 - 致病菌

## Microbiological safety - Pathogens

準則 Criterion	檢測結果(每克樣本的菌落形成單位)(除非另有註明) Result (cfu/g unless otherwise specified)		
	滿意 Satisfactory	尚可 Borderline	不滿意 (可能危害健康及/ 或不宜供人食用) Unsatisfactory: potentially injurious to health and/or unfit for human consumption
沙門氏菌屬 <i>Salmonella</i> spp.	在25克樣本中 沒有檢出 n.d. in 25g	不適用 N/A	在25克樣本中檢出 Detected in 25g
副溶血性弧菌 <i>V. parahaemolyticus</i>	< 20	20 - ≤ 10 <sup>3</sup>	> 10 <sup>3</sup>
金黃葡萄球菌及其他凝 固酶陽性葡萄球菌 <i>S. aureus</i> and other coagulase-positive staphylococci	< 20	20 - ≤ 10 <sup>4</sup>	> 10 <sup>4</sup>
蠟樣芽孢桿菌 <i>B. cereus</i>	< 10 <sup>3</sup>	10 <sup>3</sup> - ≤ 10 <sup>5</sup>	> 10 <sup>5</sup>

僅限於壽司  
For sushi only

# 檢測結果

# Results





# (I) 衛生質素 - 需氧菌落計數檢測結果

## Hygienic quality – ACC results

	微生物檢測結果 Microbiological results		
	滿意 Satisfactory	尚可 Borderline	不滿意 Unsatisfactory
壽司 <b>Sushi (n=83)</b>	63	19	1 (1.2%)
刺身 <b>Sashimi (n=99)</b>	82	15	2 (2.0%)

介乎  
每克  $2.0 \times 10^7$  至  $3.0 \times 10^7$  個菌落形成單位

Ranged from  
 $2.0 \times 10^7 - 3.0 \times 10^7$  cfu/g



# (I) 衛生質素 - 大腸桿菌檢測結果

## Hygienic quality - *E. coli* result

	檢測結果 (每克樣本的菌落形成單位)		
	Microbiological results (cfu/g)		
	滿意 Satisfactory	尚可 Borderline	不滿意 Unsatisfactory
	<20	20 - ≤10 <sup>2</sup>	>10 <sup>2</sup>
壽司 Sushi (n=98)	97	1	0
刺身 Sashimi (n=99)	97	1	1

大腸桿菌含量為每克200  
個菌落形成單位  
200 cfu/g of *E. coli*



# (II) 微生物安全 – 致病菌檢測結果

## Microbiological safety – Pathogen results

### 刺身 Sashimi (n=99)

準則 Criteria	微生物檢測結果 Microbiological results		
	滿意 Satisfactory	尚可 Borderline	不滿意 Unsatisfactory*
副溶血性弧菌 <i>V. parahaemolyticus</i>	97	2	0
金黃葡萄球菌 <i>S. aureus</i>	90	9	0

### 壽司 Sushi (n=98)

準則 Criteria	微生物檢測結果 Microbiological results		
	滿意 Satisfactory	尚可 Borderline	不滿意 Unsatisfactory*
副溶血性弧菌 <i>V. parahaemolyticus</i>	98	0	0
金黃葡萄球菌 <i>S. aureus</i>	97	1	0
蠟樣芽孢桿菌 <i>B. cereus</i>	98	0	0

\*可能危害健康及 / 或不宜供人食用  
Potentially injurious to health and/or unfit for human consumption



# (III) 壽司飯的酸鹼值

## pH of sushi rice

- 在所取得的98個壽司樣本中，檢測到96個(98.0%)樣本的米飯酸鹼值在4.6或以下。有兩個樣本的米飯酸鹼值為4.7。
- 店戶一般會按一定比例在飯中加入酸醋攪拌而成，和在配製好壽司飯後均沒有測量壽司飯的酸鹼值。
- 96/98 (98.0%) sushi rice portions had a pH value of less than or equal to 4.6. Two samples had a pH value of 4.7.
- In general, vendors mix rice and vinegar in proportion, and do not measure the pH of rice after preparation.



# 外賣食物的處理方式

## Handling practices - takeaway

- 在153個受訪店戶中，有11個（7.2%）會為外賣食物提供冰袋或冰塊。
- 至於店鋪內陳列以供外賣的樣本，
  - 在72個樣本中，有14個（19.4%）的表面溫度高於攝氏4度。
  - 14個樣本 - 平均：攝氏7度；最高為攝氏17度
- 11/153 (7.2%) respondents would provide ice pack or ice cube for takeaway.
- For samples displayed for takeaway,
  - 14/72 (19.4%) samples were found to have an external temperature higher than 4°C.
  - 14 samples - Average : 7.0°C; Maximum 17°C





# 檢測結果總結

## Summary of results

### ➤ (I) 衛生質素：

- 四個樣本的需氧菌落計數(海膽和蝦刺身；三文魚子壽司)或大腸桿菌含量(三文魚刺身)為不滿意水平。

### ➤ (II) 食物安全：致病菌

- 沒有樣本涉及食物安全問題。

### ➤ (III) 酸鹼值

(只適用於壽司樣本)

- 差不多所有米飯酸鹼值在4.6或以下。

### ➤ (I) Hygienic quality:

- Four samples were found to have unsatisfactory levels of ACC (sashimi: sea urchin and shrimp; sushi: fish roe) or *E. coli* (salmon sashimi).

### ➤ (II) Food Safety: Pathogens

- No samples found to have safety problem.

### ➤ (III) pH value

(for sushi samples only)

- Almost all were found to be of pH 4.6 or below.



# 討論

# Discussion



# 是衛生而非安全問題

## Hygiene but not safety issues

- 微生物質素普遍令人滿意；只有少數樣本的衛生質素欠佳
    - 可能原因：食品原材料質素欠佳、處理過程不合衛生，以及 / 或貯存溫度控制不足
  - 若根據一樣的準則作比較，質素比過往研究略佳
  - 金黃葡萄球菌含量不多，測出含金黃葡萄球菌的刺身樣本數量較壽司樣本多；溫度控制不當容易滋生細菌
- 
- Microbiological quality are generally satisfactory; a few samples found with hygienic issues
    - Possible causes: Quality of raw materials, unhygienic handling, and/or inadequate temperature control
  - The quality is slightly better than previous studies if using the same criteria for comparison
  - *S. aureus* was not found at high levels, but more found to be present in sashimi samples than in sushi samples; temperature abuse may allow bacterial growth.



# 跟進行動

## Follow-up actions

- 食物安全中心已向相關的食物店鋪發出衛生建議，並再次抽取樣本進行跟進。
- 跟進樣本的檢測結果全部合格，除了一個樣本在跟進巡查中發現已沒有出售。
- The CFS gave health advice to relevant parties and took follow-up samples, where available.
- No unsatisfactory results were found for the follow-up samples, while one of samples was not found in follow-up visits.



# 改善壽司和刺身的處理方式

## Improvement on handling of sushi and sashimi

- (I) 測量酸飯的酸鹼值的相關建議
- (II) 存放壽司和刺身的開放式陳列保鮮櫃的溫度不夠低？

- (I) Recommendation on measuring the pH of acidified rice
- (II) Open reach-in display refrigerators cannot maintain a low temperature for sushi and sashimi?



# (I)有關測量酸鹼值的建議

## Recommendation on pH measurement

- 沒有測量酸鹼值；一般是按一定比例在飯中加入酸醋攪拌而成。
- 除了兩個樣本外，其他樣本的米飯酸鹼值均在4.6或以下。整體而言，壽司飯的酸化程度都足夠。
- 應不時檢測壽司飯的酸鹼值，尤其當有新的員工或壽司配製方法時。

- No pH measurement; generally prepare acidified rice by mixing rice and vinegar in proportion
- All except 2 were at pH 4.6 or below. In general, sushi rice are sufficiently acidified.
- Measure the pH of acidified rice from time to time, especially for new staff and for the use of new recipe.

生長或產生毒素

Growth or toxin production

酸鹼值 pH	最低 Min.	最適 Optimum	最高 Max.
蠟樣芽孢桿菌 <i>B. cereus</i>	5	6 - 7	8.8
金黃葡萄球菌 產生毒素 <i>S. aureus</i> toxin production	4.5	7 - 8	9.6
副溶血性弧菌 <i>V. parahaemolyticus</i>	4.8	7.8 - 8.6	11

(Source : ICMSF)





# (I) 有關測量酸鹼值的建議

## Recommendation on pH measurement



### Record 記錄

Date 日期	Batch 批次	pH 酸鹼值	Person 負責人	Remark 備註
24/7	11 am	5.3	Chan	未完全混合好
24/7	11 am	4.2	Chan	
27/7	5 pm	4.0	Lam	





## (II)有關陳列溫度的建議

### Recommendation on displaying temperature

- 米飯經適度加酸至酸鹼值4.6或以下，可抑制致病細菌滋生，但加進壽司飯的配料可能會令製成品的酸鹼值改變。
  - 配製好的壽司應以攝氏4度或以下的低溫存放。否則，便須於四小時內內進食；超過四小時，即須予以丟棄。
  - 陳列的刺身應保持在攝氏4度或以下的低溫存放，但供生吃的活介貝類不在此列。
- 
- Proper acidification of rice to a pH of 4.6 or below can inhibit the growth of pathogenic bacteria. However, ingredients added to sushi rice may alter the pH of the finished sushi.
  - Finished sushi should be kept at temperature at 4°C or below or be consumed within 4 hours and discard after 4 hours.
  - Sashimi, except for live shellfish intended for raw consumption, should be kept at temperature  $\leq 4^{\circ}\text{C}$  for display.



# 研究的局限

## Limitations

- 樣本數目有限：不足200個樣本
- 由於抽樣方法和微生物準則不同，只能與之前研究作簡單比較。
- Limited sample size : <200 samples
- Only brief comparison with previous RA study was conducted, due to differences in sampling and microbiological criteria.



# 結論

## Conclusion

- 沒有壽司和刺身涉及微生物食物安全的問題，大部分樣本的微生物質素為滿意或尚可，但少數樣本的衛生質素欠佳。衛生質素比過往研究略佳。
  - 店戶配製好壽司飯後，一般都沒有測量壽司飯的酸鹼值，然而壽司飯的酸鹼值大致上不高於4.6。整體而言，壽司飯的酸化程度都足夠。
- None of the sushi and sashimi samples were found to have microbiological food safety concern. Most of them are of satisfactory or borderline quality, but a few samples found with hygienic issues; pH values of sushi rice are generally equal to or below 4.6. Hygienic quality is slightly better than that in previous studies.
  - Vendors generally did not measure the pH of rice after preparation, but most sushi rice samples were found to be at pH 4.6 or below. In general, sushi rice are sufficiently acidified.



# 給公眾的建議

## Advice to public

- 確定刺身和壽司仍保持新鮮及存放的溫度適當，方才進食。
- 應盡快食用外賣的刺身及壽司，否則應將食物存放在攝氏4度或以下，以減低食物風險。
- 免疫力較低的人士、長者、孕婦和幼童患食源性疾病的風險較高，應避免進食生或未經徹底煮熟的食物。



- Check if sashimi and sushi are fresh and kept under suitable temperature at time of consumption.
- Consume take-away sashimi or sushi soon after purchase, or keep them at 4°C or below to minimise risk.
- People with weakened immunity, elderly, pregnant women and young children should avoid raw or partially cooked food.



# 給業界的建議

## Advice to trade

- 配製好的壽司和刺身應在攝氏4度或以下的低溫存放。
- 如在攝氏4度以上的溫度陳列壽司，則應設立時間管理系統，有關資料妥為記錄以備核查，確保壽司的陳列時間不會過長。
- 考慮不時檢測壽司飯的酸鹼值
- 保持新鮮。如壽司和刺身表面變得黏滑、濕淋或色澤暗淡，須立刻棄掉。



- Prepared sushi and sashimi should be kept at temperature at 4°C or below.
- If sushi is to be displayed at temperature higher than 4°C, a documented time control system should be in place to ensure that sushi is not displayed for prolonged periods of time.
- Consider to measure pH of acidified rice from time to time
- Maintain freshness. Sushi and sashimi with slimy surface, in dripping state or of dull colour must be immediately discarded.

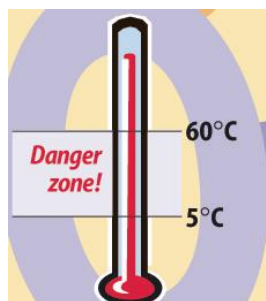
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# 給業界的建議

## Advice to trade



Keep at safe temperature

貯存於安全溫度



Choose safe raw materials  
選擇安全的原材料

- Food to be eaten raw should be accompanied with valid and recognised official health cert.  
生吃的食物須附有原產地有關當局簽發的衛生證明書。



Separate raw and cooked food  
分開生熟食

- Designated a separate area and utensils for handling the food eaten raw  
須有指定的獨立部分和用具處理生吃的食物。



Cook thoroughly  
徹底煮熟食物



Keep hands and utensils clean  
保持雙手及用具清潔





~謝謝~

~Thank you~