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## 焦點個案 Incident in Focus

# 盆菜中的蠟樣芽胞桿菌

## *Bacillus cereus* in "Poon Choi"

食物安全中心

風險評估組

科學主任莊梓傑博士報告

Reported by Dr. Ken CHONG, Scientific Officer,

Risk Assessment Section,

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今年十月七日，食物安全中心(中心)公布八月份食物安全報告，一個盆菜樣本和一個沙嗲豬肉湯樣本驗出超過上限的蠟樣芽胞桿菌，含量分別為每克250萬個和每克81萬個，而這種致病菌的上限是每克食物10萬個。中心已抽取跟進樣本，並向有關食肆發出警告。本文將會探討盆菜中為何會有蠟樣芽胞桿菌，以及這種細菌的特點。



盆菜"Poon Choi"

On 7 October 2009, the Centre for Food Safety (CFS) released its Food Safety Report for August. A sample of "Poon Choi" and a sample of soup vermicelli with pork satay were found to contain the pathogen *Bacillus cereus* at excessive levels of 2.5 million per gram and 810 000 per gram respectively, while the relevant limit is 100 000 per gram. The CFS has taken follow-up samples and warned the food premises concerned. In this article, we would discuss why *Bacillus cereus* was found in "Poon Choi" and the characteristics of this bacterium.

### 盆菜中的食源性致病菌

在盆菜中發現大量蠟樣芽胞桿菌並非不常見的事情。由二零零六至零八年，在檢測蠟樣芽胞桿菌的80個盆菜樣本中，有4個(佔5%)屬於不合格樣本。不過，盆菜等雜燴菜式的材料豐富，而且經過人手處理，在這類菜式中驗出超逾有關上限的致病菌並不限於蠟樣芽胞桿菌。上述4個盆菜樣本中便有2個分別驗出含有超逾有關上限的產氣莢膜梭狀芽孢桿菌和金黃葡萄球菌。此外，二零零六年曾發生由盆菜引致的食物中毒事故，有480人受影響，肇因可能是副溶血性弧菌。

### 蠟樣芽胞桿菌的特點

蠟樣芽胞桿菌在環境中無處不在，常見於泥土、穀物及蔬菜等。有報告指，每克泥土可含有約1 000至100 000個孢子，因此，在食物中發現這種細菌不足為奇，尤其是生的農產品(例如生的蔬果和香草)。這類食物通常含有每克少於100個孢子，但有些香草及香料可能含有較多孢子。

蠟樣芽胞桿菌可產生孢子，這些孢子能抵受熱力，承受烹煮溫度。這種細菌亦可在有或無氧的環境下生長。蠟樣芽胞桿菌的最佳生長溫度約為攝氏30至37度。在低於攝氏10度的環境下，

### Foodborne Pathogens in "Poon Choi"

High amounts of *Bacillus cereus* found in "Poon Choi" are not uncommon. From 2006 to 2008, 4 (5%) out of 80 "Poon Choi" samples tested for *Bacillus cereus* were found unsatisfactory. However, mixed dishes like "Poon Choi" contain many ingredients and involve manual handling processes, pathogenic bacteria that were found to exceed relevant limits are not confined to *Bacillus cereus*. Two of the "Poon Choi" samples mentioned above had also been found to contain *Clostridium perfringens* and *Staphylococcus aureus* respectively exceeding relevant limits. Furthermore, *Vibrio parahaemolyticus* had been identified as a possible cause in a food poisoning outbreak affecting 480 people caused by consuming "Poon Choi" in 2006.

### Features of *Bacillus cereus*

*Bacillus cereus* is ubiquitous in the environment. It is readily isolated from soil, cereal crops, and vegetables, etc. It has been reported that soil can contain approximately 1 000 to 100 000 spores per gram. Hence, it is not uncommon to find this bacterium in food, especially in raw agricultural products such as raw fruits and vegetables, raw herbs. These foods usually contain less than 100 spores per gram, but higher amount may be found in some herbs and spices.

焦點個案  
Incident in Focus

蠟樣芽胞桿菌不能產生可令人嘔吐的毒素。因此，控制食物的貯存溫度對預防由蠟樣芽胞桿菌引起的食源性疾病至為重要。

注意要點：

1. 蠟樣芽胞桿菌可產生孢子，在環境中無處不在。
2. 蠟樣芽胞桿菌可引致兩類食物中毒，即致吐型(令人嘔吐)和致腹瀉型食物中毒。
3. 預先煮熟的食物應妥善冷卻和貯存，以免蠟樣芽胞桿菌的繁殖細胞生長，令食物含有大量這種細菌。

蠟樣芽胞桿菌食物中毒

蠟樣芽胞桿菌可產生不同的毒素，引致兩類食物中毒。致吐型(引致嘔吐)中毒是由在食物中預先形成的耐熱毒素(能抵受攝氏126度長達90分鐘)引起，患者會在進食有問題食物後數小時內出現噁心和嘔吐等症狀，部分隨後更會有腹瀉。至於另一類中毒，則屬於致腹瀉型，其症狀是伴隨腹痛的水狀腹瀉。致腹瀉型食物中毒與由產氣莢膜梭狀芽胞桿菌引致的疾病類似，患者因吃下孢子或繁殖細胞而令毒素在腸道中產生。這兩類食物中毒的病情一般輕微，不會持續超過24小時。

預先煮熟的食物可為蠟樣芽胞桿菌提供有利的生長環境。部分盆菜材料可能會預先煮熟，然後在供應給顧客前才翻熱。此外，這些材料(尤其是農產品)可能會含有孢子。烹煮的熱力可誘發孢子發芽成為繁殖細胞，並殺死其他與蠟樣芽胞桿菌競爭生長的細菌。如食物放置在室溫下過久，繁殖細胞便會生長和產生耐熱毒素。翻熱食物可殺死繁殖細胞，但不能消除耐熱毒素，因此必須要妥善貯存食物，即切勿把食物放在室溫下過久，以免產生毒素。此外，此舉亦可防止金黃葡萄球菌產生耐熱的毒素。

雖然食物經常含有蠟樣芽胞桿菌，但只要沒有讓孢子發芽和大量繁殖，少量的孢子通常不會引起問題。一般而言，每克食物需含有超過100 000個蠟樣芽胞桿菌細胞才會令人患病。

給業界的建議

- 在收貨時檢查食物和食物材料的質量。
- 把食物和食物材料貯放在安全溫度，例如把易變壞的食品(包括新鮮河粉和米粉)存放在攝氏4度或以下。
- 避免過早配製盆菜及盆菜材料。
- 如需運送盆菜，應把熱盆菜保持在攝氏60度以上，而冷凍的盆菜則應保持在攝氏4度或以下。
- 縮短已煮熟食物的冷卻時間，例如將食物分成較小份；放在較淺的容器內；以及／或把有食物的容器“冰鎮”(放在有冰塊的水中)。

給消費者的建議

- 如非即時進食盆菜，應把盆菜保持在攝氏60度以上。
- 避免把盆菜放在室溫下過久；如放置在室溫下超過4小時，應棄掉盆菜。

*Bacillus cereus* can form spores which are able to resist heat and survive the cooking temperature. It can grow in either the presence or absence of oxygen. The optimal growth temperature for *Bacillus cereus* is around 30°C to 37°C. At temperature below 10°C, *Bacillus cereus* is unable to produce toxin that causes vomiting. Therefore, controlling storage temperature of food is important to prevent foodborne disease caused by this bacterium.

Key Points to Note:

1. *Bacillus cereus* is spore-forming and ubiquitous in the environment.
2. It can cause two types of food poisoning known as emetic (cause vomiting) and diarrhoeal food poisoning.
3. Pre-cooked food should be cooled and stored properly to avoid the multiplication of vegetative cells of *Bacillus cereus* to a high amount in food.

Bacillus cereus Food Poisoning

There are two types of food poisoning caused by different toxins produced by *Bacillus cereus*. Emetic (cause vomiting) intoxication is caused by a heat-stable toxin (can resist 126°C for 90 minutes) pre-formed in food. Symptoms including nausea and vomiting occur in the first few hours after ingestion of incriminated food, followed by diarrhoea in some cases. Another type of poisoning is diarrhoeal, which is characterised by watery diarrhoea associated with abdominal pain. This type resembles the illness caused by *Clostridium perfringens* in which the toxins are produced in the intestine by ingested spores or vegetative cells. The illnesses of these two types of food poisoning are generally mild and persist no longer than 24 hours.

Pre-cooked food may create a favourable environment for *Bacillus cereus* to grow. Some ingredients of "Poon Choi" may be pre-cooked and reheated before serve. The ingredients, especially those agricultural products may contain spores. Heat of cooking can activate the spores to germinate into vegetative cells and kill other bacteria competing to grow with *Bacillus cereus*. If the food is left at room temperature for too long, the vegetative cells can multiply and produce the heat-stable toxin. Reheating the food can kill vegetative cells, but cannot eliminate the heat-stable toxin. Hence, it is important to store food properly, i.e. not leaving food at room temperature for too long, to prevent the formation of toxins. This can also prevent formation of heat-stable toxin by *Staphylococcus aureus*.

Although *Bacillus cereus* found in foodstuffs is not uncommon, presence of a small amount of the spores is usually not a concern, provided that the spores are not allowed to germinate and grow to a large number. In general, the presence of more than 100 000 cells of *Bacillus cereus* per gram of food is required to cause disease.

Advice to Trade

- Check the quality of food and food ingredients upon receipt.
- Store food and food ingredients at safe temperatures e.g. perishable items including fresh rice noodles and vermicelli at 4°C or below.
- Avoid preparing "Poon Choi" and its ingredients too far in advance.
- For "Poon Choi" to be transported, keep hot "Poon Choi" above 60°C and chilled "Poon Choi" at 4°C or below.
- Reduce the cooling time of cooked food, for example, by dividing into small portions, placing in shallow containers and/or placing in ice bath.

Advice to Consumers

- Keep "Poon Choi" above 60°C if it is not consumed immediately.
- Avoid prolonged storage of "Poon Choi" at room temperature. Discard if it has been held at room temperature for more than four hours.



# 有關減低食物危害的食物加工處理技術

## Food Processing Technology to Minimise Food Hazards

食物安全中心  
風險評估組  
科學主任王慧琮女士報告

Reported by Ms. Waiky WONG, Scientific Officer,  
Risk Assessment Section,  
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古時，人們不知道當中的科學原理而嘗試以各種方法把食物保存較長時間，例如把食物製乾和使用糖或鹽，這成為了現今延長食物保質期的食物加工處理技術的基礎。

### 食物腐壞的原因

幾乎所有食物在收割後都會逐漸腐壞，以致影響食物的味道、營養價值和安全。食物的腐壞速度受多項因素影響，例如溫度、水活性\*、氧氣、微生物、酶、光和時間。食物保存是一種重要的食物加工處理技術，可盡量減少上述的變壞情況，從而向消費者提供安全、優質的食物。

### 食物保存方法

食物保存方法包括熱處理；低溫貯存；製乾；使用酸、糖、鹽和化學物；氣控或氣調貯存；以及輻射。這些方法在大多數情況下會混合使用，以控制食物腐壞的因素和盡量減低食物危害。

#### 熱處理

熱處理利用不同的處理時間及溫度來消滅食物中的微生物，其中最常用的巴士德消毒和消毒可分別消滅致病微生物和致病微生物及孢子。此外，經消毒的食物在一般環境下可保存較長時間。舉例說，一些需要冷凍保存的奶類和果汁產品就是經巴士德消毒的產品(例如奶類加熱達到至少攝氏72度並保持至少15秒)，而罐頭食品 and 經超高溫處理奶類或飲料產品則是經消毒的產品(例如奶類加熱達到至少攝氏132度並保持至少1秒)。

#### 低溫貯存

低溫貯存包括冷凍和冷藏，用以延緩微生物的生長而並非消滅它們。在某些情況下，經巴士德消毒的食物(例如經巴士德消毒的奶類)應保持冷凍或冷藏，以保持食物的安全和質量。

#### 製乾

製乾是去除食物中水分的過程，減少食物的水活性以抑制微生物生長和酶活性。傳統的製乾過程涉及熱力的使用，但會破壞食物的味道和營養。為了更好保存食物的味道和營養，食物業採用現代化製乾過程——凍乾法，無需加熱食物就能減少當中的水活性。首先，食物會作冷藏，然後在真空環境下把水分由冰直接蒸發成氣體，無須經過溶解過程。這種方法常用來生產乾製蔬果。

#### 使用酸、糖和鹽

酸鹼值較低(即酸性)(通常酸鹼值 $<4.6$ )的食物在消毒過程中所需的熱力較低。食物中的酸可以是天然存在、經發酵形成或人工添加的。加添糖或鹽可通過滲透作用減低食物中的水分。

#### 使用化學物

在食物中加入食物添加劑有助保持或改善食物的質量，例如加入苯甲酸鈉、山梨酸鉀等防腐劑可延緩食物中微生物的生長。

\* 水活性是一數值，用來描述在食物中可供進行微生物、酶或化學活動的水分。

In ancient days, without knowing the science behind, people tried ways to keep food for a longer period, such as drying of food and use of sugar or salt, which formed the foundation of food processing technology for extending the shelf-life nowadays.

### Factors Causing Food Deterioration

Almost all foods would undergo deterioration after harvest, and, as a result, sensory and nutritional quality and food safety would be affected. Many factors, such as temperature, water activity\*, oxygen, microorganisms, enzymes, light and time, would affect the rate of food deterioration. Food preservation is an important food processing technology to help minimise such negative changes in order to produce safe and quality food for consumers.

### Food Preservation Methods

Food preservation methods include heat treatment, cold storage, drying, the use of acid, sugar and salt, the use of chemicals, controlled- or modified-atmosphere storage, and radiation, and in a large extent, they can be applied in combinations, to control factors causing food deterioration, as well as to minimise food hazards.

#### Heat Treatment

Heat treatment is applied to destroy microorganisms in food, under various time and temperature combinations, in which pasteurisation and sterilisation are the two most common ones for destroying the pathogenic microorganisms, and the pathogenic microorganisms and spores, respectively. In addition, food undergone sterilisation can keep for a longer time under ambient condition. For example, some milk and juice products requiring refrigeration are products that have undergone pasteurisation (e.g. milk is heated at least 72°C for at least 15 seconds), while canned food and ultra high temperature (UHT) milk or drink products are products that have undergone sterilisation (e.g. milk is heated at least 132°C for at least 1 second).

#### Cold Storage

Cold storage including refrigeration and freezing is used to retard the growth of microorganisms, rather than destroy them. In some cases, food after pasteurisation (e.g. pasteurised milk) should be kept refrigerated or frozen, in order to maintain the food safety and quality.

#### Drying

Drying is a process for removing water from food and as such it reduces the water activity in food for inhibition of the microbial growth and enzyme activity. The conventional drying process involves the use of heat, however, the sensory and nutritional quality would be affected. To better retain the sensory and nutritional quality, a modern drying process – freeze drying is applied to reduce water activity without heating the food, in which the food is first frozen and then water is evaporated from ice without the ice melting under vacuum condition. It is commonly used in production of dried fruit and vegetables.

#### The Use of Acid, Sugar and Salt

The heat required for sterilisation is reduced in food with a lower pH (i.e. acidic) (usually  $\text{pH} < 4.6$ ). Acid may be present in food naturally, produced by fermentation or added artificially. The addition of sugar or salt would reduce the water content in food through osmosis.

#### The Use of Chemicals

Food additives are added in food to maintain or improve quality of food, for example, preservatives (e.g. sodium benzoate, potassium sorbate) are added in food to retard the growth of microorganisms.

\* Water activity is a value to describe the availability of water in food for microbial, enzyme or chemical activity.



經巴士德消毒奶類和經超高溫處理奶類  
Pasteurised milk and UHT milk

## 氣控或氣調貯存

控制或調節食物存放地方的空氣能減少食物腐壞情況，並抑制微生物生長。抽掉氧氣或注入二氧化碳或氮氣均可達到效果。這種方法最常用於貯存收割後的水果和蔬菜。

## 輻射

輻射是較新的食物保存方法，用以消滅食物中的微生物和令酶喪失活性。電離輻射和微波是現時應用於食物保存的輻射形式。為讓讀者了解更多這些較新的方法，我們將在未來數期探討如何使用電離輻射和微波來減少食物危害。

## Controlled- or Modified-atmosphere Storage

Control or modification of the storage atmosphere surrounding a food could reduce food deterioration and inhibit microbial growth. It can be done by removing the oxygen or adding carbon dioxide or nitrogen. It is most commonly used for storage of fruits and vegetables after harvest.

## Radiation

Radiation is a relatively new method for food preservation to destroy the microorganisms and inactivate enzymes in food, in which ionising radiation and microwave are forms of radiation being applied in food preservation. To enable readers to have a better understanding on these newer methods, we are going to discuss more about the use of ionising radiation and microwave to reduce food hazards in the coming issues.

## 食物事故點滴 Food Incident Highlight

### 乾梅中的鉛

美國和馬來西亞食物當局於上月發現進口乾梅產品的鉛含量超出當地的法定上限。

鉛是天然存在於地殼表面的金屬，可通過進食、吸入和皮膚吸收進入人體。鉛對人並無重要功能，但卻會造成一些影響，尤其是小童，若長期攝入鉛，可導致兒童的認知和智力發展遲緩。

食物安全中心（中心）因應上述事件抽取了乾梅樣本作分析，全部測試結果合格。不過，乾梅產品一般鈉含量偏高，因此中心提醒市民只宜適量進食這類食品，並應保持均衡飲食。

### Lead in Dried Plum

Last month, food authorities in the United States and Malaysia found levels of lead exceeding their legal limits in imported dried plum products.

Lead is a metal that exists naturally in the Earth's crust. It can enter the body via ingestion, inhalation and skin absorption. Lead has no essential function in man, but has a number of adverse effects. In particular, chronic exposure can cause retarded cognitive and intellectual development in children.

In response to the incident, the Centre for Food Safety (CFS) collected samples of dried plums for analysis. All test results were found satisfactory. Nevertheless, dried plum products generally have high sodium contents, the CFS advises the public that these products should only be consumed in moderation. Moreover, a balanced diet is recommended.

## 食物智庫 Food for Thought

### 鯪魚

鯪魚是粥品和火鍋的常用食材。要安全享用這些食物，消費者應注意以下各點。

### Grass Carp

Grass carp is a common food item served in congee and hotpot. To enjoy these foods safely, consumers are advised to note the following.

主要的食物安全問題／益處 Significant Food Safety Concerns / Benefits	給市民的建議 Advice to the Public
寄生蟲感染 — 鯪魚是中華肝吸蟲的宿主。中華肝吸蟲可造成膽管、胰腺管和膽囊感染而令人患病，並與膽管癌有關。 Infestation of parasites – grass carp is a host for the fluke <i>Clonorchis sinensis</i> which can cause illnesses by infecting the bile ducts, pancreatic ducts and gallbladder in humans. It is linked with cancer of the bile duct.	<ul style="list-style-type: none"> <li>切勿進食生或未經徹底煮熟的鯪魚。 Do not consume raw or undercooked grass carp.</li> <li>徹底煮熟才可進食，特別是粥品和火鍋中的鯪魚片。 Cook thoroughly before consumption, particularly grass carp slices in congee and hotpot.</li> </ul>
鯪魚膽汁含有毒素（例如鯪醇），鯪科淡水魚的膽汁亦有這些毒素。 Toxins (such as cyprinol) in the bile of grass carp gallbladder, which is also found in bile of freshwater fish belonging to the family of Cyprinidae. 有報告指，單吃一個魚膽已可引致急性中毒，甚至死亡。 Acute poisoning or even death has been reported following ingestion of as few as one gallbladder.	<ul style="list-style-type: none"> <li>切勿進食鯪魚膽，毒素不會透過烹煮過程消除。 Do not consume grass carp gall bladder. The toxins cannot be destroyed by cooking.</li> </ul>
魚類含有多種人體所需的營養素，包括優質蛋白質。 Fish contains many essential nutrients including high quality proteins.	<ul style="list-style-type: none"> <li>進食多種魚類，因為魚類是均衡飲食的重要部分。 Eat a variety of fish as it is an important component of a balanced diet.</li> </ul>

## 風險傳達 工作一覽 Summary of Risk Communication Work

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