

本期內容 IN THIS ISSUE

焦點個案

奶類中驗出大腸菌羣代表含有惡菌嗎？

食物安全平台

食物中的生物危害：致病細菌（上篇）

食物事故點滴

沙門氏菌與番茄

風險傳達工作一覽

Incident in Focus

Coliforms in Milk – Presence of Bad Bugs?

Food Safety Platform

Biological Hazard in Food – Pathogenic Bacteria (Part I)

Food Incident Highlight

Salmonella and Tomato

Summary of Risk Communication Work

編輯委員會 EDITORIAL BOARD

總編輯

何玉賢醫生

顧問醫生(社會醫學)(風險評估及傳達)

行政編輯

馮宇琪醫生 首席醫生(風險評估及傳達)

編輯委員

吳志翔醫生 首席醫生(風險管理)

竺湘瑩獸醫 高級獸醫師(獸醫公共衛生)

李偉正先生 高級總監(食物安全中心)1

譚志偉先生 高級總監(食物安全中心)2

李富榮先生 高級化驗師(食物化驗)

郭麗璣醫生 風險評估組主管

肖穎博士 食物安全主任(風險評估)

Editor-in-chief

Dr. Y Y HO

Consultant (Community Medicine)
(Risk Assessment and Communication)

Executive Editor

Dr. Anne FUNG

Principal Medical Officer
(Risk Assessment and Communication)

Editing Members

Dr. Henry NG

Principal Medical Officer (Risk Management)

Dr. Shirley CHUK

Senior Veterinary Officer
(Veterinary Public Health)

Mr. W C LEE

Senior Superintendent
(Centre for Food Safety)1

Mr. C W TAM

Senior Superintendent
(Centre for Food Safety)2

Mr. F W LEE

Senior Chemist (Food Chemistry)

Dr. Priscilla KWOK

Head (Risk Assessment Section)

Dr. Y XIAO

Food Safety Officer (Risk Assessment)

焦點個案

Incident in Focus

奶類中驗出大腸菌羣代表含有惡菌嗎？ Coliforms in Milk – Presence of Bad Bugs?

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,
Centre for Food Safety

背景

二零零八年五月二十九日，食物安全中心（中心）公布最新的食物監察計劃結果，發現同一批次三個經巴士德消毒奶類樣本的大腸菌羣含量超逾法例所訂的奶類及奶類飲品微生物標準。中心已通知有關當局，而有關食品已暫停進口。中心將會在有關食品恢復進口時加強監察工作。本文將會集中探討這組細菌、它們對奶類的重要性和奶類的微生物標準。



牛奶 Milk

Background

On 29 May 2008, the Centre for Food Safety (CFS) released the latest food surveillance results. Three samples of pasteurised milk of the same consignment were detected with coliform organisms which exceeded the microbiological standard in the law for milk or milk beverage. The CFS has informed the relevant authority

and importation of the products has been suspended; the CFS will step up surveillance of the product concerned upon the resumption of importation. In this article, we shall focus on this particular group of bacteria and their significance in milk as well as the microbiological standard for milk.

奶類的熱處理

無論對人類還是細菌，奶類都可提供豐富的營養。為了殺死未經加工奶類中的致病細菌和延長保質期，奶類通常會經過巴士德消毒或消毒（消毒法和超高溫法）兩大處理方法。巴士德消毒是在一段指明時間內以低於沸點的溫度處理未經加工奶類，既可殺死奶類中大部分微生物，又不會嚴重影響其營養和味道。由於這種方法不會殺死所有微生物，故經巴士德消毒的奶類必須冷藏。另一方面，超高溫法則是在極短的時間內以超高溫對奶類進行消毒，然後放進已消毒的容器內再行封蓋。以這種方法處理的奶類會有較長的保質期，可貯存在密封容器內而無須冷藏長達數月。由於消毒法的處理條件（以攝氏100度處理奶類超過25分鐘）較巴士德消毒劇烈（即採用較高溫度和經過較長時間），故消毒法可能會破壞奶類的營養價值和味道，而巴士德消毒對奶類的營養價值和味道影响甚少。

視乎所使用的熱處理方法，《奶業規例》（第132AQ章）對奶類及奶類飲品訂有以下不同的微生物標準：

未經加工的奶類（進行熱處理前）	
總含菌量	每毫升少於200 000個細菌
大腸菌羣	在0.001毫升樣本內沒有發現
經巴士德消毒的奶類	
總含菌量	每毫升少於30 000個細菌
大腸菌羣	在0.1毫升樣本內沒有發現
經消毒的奶類（包括經超高溫法處理的奶類）	
菌落計數	少於10個

Heat Treatments of Milk

Milk is nutritious for human, but also for bacteria. In order to kill pathogens in raw milk and to extend shelf life, processes called pasteurisation and sterilisation (sterilisation method and ultra-high-temperature (UHT) method) are often used. Pasteurisation uses temperature below boiling point to treat raw milk for a specific period of time to eliminate most microorganisms, while the nutrition and taste are not significantly affected. Since pasteurisation does not kill all microorganisms, pasteurised milk must be refrigerated. On the other hand, longer shelf-life can be achieved with UHT treatment which sterilises the milk at a very high temperature in a very short period followed by sealing it in sterilised containers. UHT-treated milk can be stored in the sealed containers without refrigeration for months. Conditions for sterilisation method (treatment at 100°C for more than 25 minutes) are more severe than pasteurisation, i.e. higher temperature and longer time. While pasteurisation of milk has little effect on nutrition and taste, sterilisation method may cause changes in nutrition and taste.

Subject to different heat treatment method employed, there are different microbiological standards under the Milk Regulation (Cap. 132AQ) for the milk and milk beverage:

Raw milk (before heat treatment)	
Total bacterial count	≤ 200 000/ml
Coliform organisms	Absent in 0.001 ml
Pasteurised milk	
Total bacterial count	≤ 30 000/ml
Coliform organisms	Absent in 0.1 ml
Sterilised milk (includes UHT-treated milk)	
Colony count	< 10

檢測奶類中的大腸菌羣

大腸菌羣並非單一品種的細菌，而是一組呈桿狀結構的革蘭氏陰性細菌，常用來監察奶類的質量，它們具有類似的生化特性：處於攝氏35度的環境下可於48小時內發酵乳糖產生酸和氣體，並可以在有氧或無氧的環境下繁殖。未經加工的奶類、肉類及家禽或其他生的食物通常會有少量大腸菌羣。由於大腸菌羣含量測試簡單方便，因此會在常規的化驗中用作反映一般微生物質量的衛生指標。由於熱力能輕易殺死大腸菌羣，故這類細菌的存在亦可用作顯示熱處理方法不當或食物經熱處理後再受污染。

注意重點：

1. 巴士德消毒是一種熱處理方法，可減少奶類中的細菌。經巴士德消毒的奶類並非無菌的。
2. 大腸菌羣測試可用作監察食品的衛生質量。
3. 食物含有大腸菌羣未必表示含有致病細菌。

大腸菌羣以往曾用作致病菌的指標，但現已不建議作此用途，因為泥土和水一般也會有大腸菌羣存在，而不只是在糞便污染中出現。有人可能會問，有大腸菌羣存在是否就表示經糞便傳播的致病細菌（特別是沙門氏菌和志賀氏菌）亦同時存在呢？正如上文所述，大腸菌羣不足以用作糞便污染的指標，再者有一點必須留意的是，沙門氏菌和志賀氏菌均不屬於大腸菌羣。

在有關奶類樣本中驗出大腸菌羣未必表示含有致病細菌。含有大腸菌羣代表熱處理程序可能失效，又或奶類樣本經熱處理後再受污染。在這些情況下，食物製造商須找出加工程序有何問題，並確保產品安全。

管制措施應與問題的嚴重性相稱。在上述個案中，中心要求進口商停售該批有問題奶類，並在出口層面進行調查。由於有關食品對健康造成影響的風險偏低，中心認為無須向消費者回收食品。這種做法與其他食物安全當局的做法一致。

為對奶類進行監察和管制，中心會抽取各種奶類樣本作測試。在二零零七年，中心抽取了超過80個未經加工的奶類樣本，780個經巴士德消毒的奶類樣本和1 700個經消毒的奶類樣本，其中不合格樣本分別各有一個。中心已採取適當行動。

給業界的建議

- 向持牌奶品廠採購新鮮和再造奶類。
- 向獲食物環境衛生署批准的製造商進口奶類或奶類飲品。
- 就奶類和奶製品製造程序制定質量和安全控制計劃，例如食物安全重點控制。

給消費者的建議

- 嚴格遵從標籤上的指示貯存奶類及奶製品。
- 在開封飲用前，先檢驗奶類及奶製品的食用限期。

Detection of Coliforms in Milk

Coliforms, which are often used to monitor the quality of milk, are not a single species of organism. They are a group of gram negative rod-shaped bacteria that have similar biochemical characteristics – being able to ferment lactose with the production of acid and gas within 48 hours at 35°C and grow with or without oxygen. They are usually present in small number in raw milk, meat, poultry or other raw foods. Coliforms count is simple and easy to conduct, hence it can be used as a hygienic indicator to reflect the general microbiological quality in routine test. As coliform organisms can be easily killed by heat, these bacteria can also be used as an indicator of heat treatment failure as well as post heat treatment contamination.

Key Points to Note:

1. Pasteurisation is a heat treatment method to reduce bacteria in milk, and pasteurised milk is not sterile.
2. Testing of coliform organisms is used to monitor the hygienic quality of food products.
3. Presence of coliform organisms does not necessarily mean that pathogenic bacteria are present.

In the past, coliforms have been used as an indicator for pathogens, but they are no longer recommended for this purpose due to the fact that coliform organisms are present as normal inhabitants of soil and water, not just specifically from faecal contamination. Some people may wonder if there is co-relationship between the presence of pathogenic bacteria from faecal source, especially *Salmonella* and *Shigella* species, and the presence of coliforms. As mentioned before, coliforms are not specific enough for that purpose and it is important to note that these two bacterial species are not coliforms.

In the milk sample concerned, coliform organisms were detected, but it does not necessarily mean that there were pathogenic bacteria. Presence of coliforms means there may have been problems in the efficiency of heat treatment or re-contamination after heat treatment. In these cases, the food manufacturer is required to check for process failure and ensure product safety.

Control measures should be proportional to the magnitude of the problem. In the above case, the importer was asked to cease sale of the affected batch of milk and conduct investigation at the exporting end. Consumer level recall was considered unnecessary in view of the low health risk of the product. The practice was in line with that of other food safety authorities.

For the purpose of monitoring and control, CFS takes different kinds of milk samples for examination. In 2007, 1 out of over 80 raw milk samples, 1 out of over 780 pasteurised milk samples and 1 out of over 1 700 sterilised milk samples were found unsatisfactory. Appropriate actions had been taken.

Advice to Trade

- Obtain supplies of fresh and reconstituted milk from licensed milk factories.
- Import milk or milk beverage from manufacturer approved by the Food and Environmental Hygiene Department.
- Establish quality and safety control plans such as HACCP for milk and dairy product manufacturing.

Advice to Consumers

- Store milk and dairy product strictly in accordance with the instructions on the labels.
- Check the expiry date for milk and dairy product before opening for consumption.

食物中的生物危害：致病細菌（上篇）

Biological Hazards in Food – Pathogenic Bacteria (Part I)



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,
Centre for Food Safety

本欄曾簡介食物中的生物危害，包括細菌、病毒和寄生生物。我們由今期起會一連四期深入探討這三種對人體有害的生物媒介。

食物中的細菌

夏季時，新聞報導中常常提及有關由細菌引致食物中毒的個案。細菌是本港食物中毒個案的最常見肇因。不過，並不是食物中所有細菌都會令人患病，有些細菌更會在配製食物時刻意添加，例如乳酪中的益生菌。除了有用的細菌外，食物中還會有腐敗細菌和致病細菌。

由細菌引致的食物腐壞

腐敗細菌可以在食物中大量繁殖，令食物腐壞，發出異味或變味，影響其質量。由微生物引致的食物腐壞過程較為突然，因為細菌能以倍數繁殖，在最佳條件下一個細菌只需15分鐘便可增至兩個，在同一條件下，一個細菌只需六小時便可增至超過1 600萬個！腐敗細菌通常不會令人患病，但如果吃下相當大量的腐敗細菌，也會令人腸胃不適。把容易變壞的食物冷藏是其中一種常用方法去減慢食物腐壞的過程。

食源性致病細菌

致病細菌可令人患病，引致食物安全問題。這些細菌可以入侵人體，或產生毒素因而令人患病。食物中的致病細菌往往需要繁殖至一定數量才會令人患病，感染劑量就是指令人患病所需要的細菌數量。炎熱的夏季正有利於食源性致病細菌的繁殖，這些細菌大多喜歡溫暖、潮濕的環境。細菌本身及／或其毒素都會令人患病，人們一旦吃下足夠數量的細菌或其毒素，經過潛伏期（即由吃下含細菌／毒素的食物至出現病徵之間的一段時間）後便會出現病徵。潛伏期的長短由數小時至數日不等，視乎細菌品種和進食細菌數量／毒素含量而定，在這段期間內，細菌會在腸胃中繁殖及／或入侵身體。下表列出即食食物中常見食源性致病細菌的感染劑量和潛伏期：

致病細菌	潛伏期	估計感染劑量
沙門氏菌	6至48小時(通常為12至36小時)	可以少至15至20個細菌；通常需要100 000至1 000 000個細菌才會令人患病
李斯特菌	高危羣組為1至90日(平均數為30日)；一般人為11小時至7日(中位數為18小時)	高危羣組約為100至1 000個細菌；一般人則為進食含有每克超過100 000個細菌的食物
副溶血性弧菌	4至74小時(平均數為12至46小時)	約為200 000至30 000 000個細菌
金黃葡萄球菌	30分鐘至7小時(平均數為2至4小時)	每克食物含有超過100 000個細菌才可產生足夠毒素
蠟樣芽孢桿菌	致吐型(引致嘔吐)：1至6小時 致腹瀉型：10至12小時	每克食物含有超過100 000個細菌才可產生足夠毒素或令人患病
產氣莢膜梭狀芽孢桿菌	6至24小時(通常為10至12小時)	約為100 000 000個細菌

資料來源：美國食物及藥物管理局編製的《惡菌書》(Bad Bug Book)及新西蘭食物安全局編制的微生物病菌資料單(Microbial Pathogen Data Sheets)

Previously in this column, we have introduced the topic of biological hazards in food which include bacteria, viruses and parasites. They are the biological agents that can cause harmful effects in humans. In this issue and the coming three issues, we are going to take a closer look at these agents.

Bacteria in Food

In summer, there are often more news reports on food poisoning cases caused by bacteria. Bacteria are locally the most common cause of food poisoning. However, not all the bacteria in food can make you sick, some are even added intentionally during the preparation of foods such as probiotics in yoghurt. Other than those desirable bacteria, there are also spoilage and pathogenic (being able to cause disease) bacteria in food.

Food Spoilage by Bacteria

Spoilage bacteria in food are able to grow in large number, decompose the food and cause taste/smell changes in food, which affect the quality of food. Microbial spoilage of food occurs in a relatively sudden manner, because bacteria grow by multiplication, i.e. one bacterium can become two in just 15 minutes under the best conditions. Under the same condition, one bacterium can multiply to over 16 million in just six hours! Spoilage bacteria do not normally cause illness, however, when consumed in very large numbers, they can cause gastrointestinal disturbance. Refrigeration of perishable food is one of the common ways to retard the spoilage process.

Foodborne Pathogenic Bacteria

Pathogenic bacteria can cause illness and lead to food safety problems. They are able to invade your body or produce toxins to cause illness. Pathogenic bacteria in food frequently need to multiply to a certain amount to cause disease. The number of organisms required to make individuals ill is called the infective dose. Hot weather during summer can promote the growth of foodborne pathogenic bacteria, which mostly prefer to grow in a warm, humid environment. The bacteria themselves and/or their toxins can make you sick. Once enough bacteria or their toxins have been swallowed, there is a delay called the incubation period (interval between the consumption of food containing bacteria/toxins and the onset of symptoms of the illness), which ranges from hours to days depending on the types of bacteria and the amount of bacteria/toxin ingested. In that period, bacteria can multiply in the gut and/or invade your body. The table below shows the infective dose and incubation period of some common foodborne pathogens in ready-to-eat food:

Pathogenic bacteria	Incubation period	Estimated infective dose
<i>Salmonella</i> spp.	6 to 48 hours (usually 12 to 36 hours)	As few as 15 to 20 organisms; 100 000 to 1 000 000 organisms are more likely to cause disease
<i>Listeria monocytogenes</i>	1 to 90 days (mean 30 days) for high risk group; 11 hours to 7 days for general population (median 18 hours)	~100 to 1 000 organisms for high risk group; consuming food containing >100 000 organisms per gram for general population
<i>Vibrio parahaemolyticus</i>	4 to 74 hours (mean 12 to 46 hours)	~200 000 to 30 000 000 organisms
<i>Staphylococcus aureus</i>	30 minutes to 7 hours (mean 2 to 4 hours)	>100 000 organisms per gram of food to produce enough toxin
<i>Bacillus cereus</i>	Emetic (cause vomiting): 1 to 6 hours Diarrhoeal: 10 to 12 hours	>100 000 organisms per gram of food to produce enough toxin or cause illness
<i>Clostridium perfringens</i>	6 to 24 hours (usually 10 to 12 hours)	~100 000 000 organisms

Source: Bad Bug Book from the US FDA and Microbial Pathogen & Data Sheets from the New Zealand Food Safety Authority

食物安全平台
Food Safety Platform

從上表可見，部分細菌需在食物內繁殖至相當多數量才會產生毒素，而這些毒素是部分食源性致病細菌令人患病的重要武器。

致病細菌可產生毒素

致病細菌可透過兩大方式產生毒素：在食物內產生毒素或在人體內釋出毒素。大家都知道，金黃葡萄球菌和蠟樣芽孢桿菌都可以在食物內產生耐熱的毒素，這兩種致病細菌的潛伏期較短，反映患者直接吃下毒素而迅速出現反應。另一方面，產氣莢膜梭狀芽孢桿菌等部分致病細菌則主要在人體內釋出毒素。亦有部分致病細菌可在人體內釋出少量毒素，從而協助入侵人體。部分細菌既會在食物中產生毒素，又會在人體內釋出血素，例如蠟樣芽孢桿菌可產生致吐腸毒素及／或致腹瀉腸毒素：食物中的致吐腸毒素（即上文提及的耐熱毒素）可令人嘔吐，而在人體內釋出的致腹瀉腸毒素則可引致腹瀉。雖然這些細菌據知可產生毒素，但並非所有菌株都能產生毒素。

我們將會在下一期再探討這些細菌的特性。

You may find that some organisms need to grow to considerable number in foods to produce toxins which are an important weapon of some foodborne pathogenic bacteria to make you sick.

Toxin Production by Pathogenic Bacteria

Pathogenic bacteria can produce toxin in two ways – secreting it into food or releasing it inside your body. *Staphylococcus aureus* and *Bacillus cereus* are notorious for being able to produce heat-resistant toxins in food. You may notice that the incubation period of these pathogens are relatively short, which reflects the rapid effect of direct consumption of toxins. On the other hand, some pathogenic bacteria like *Clostridium perfringens*, primarily release toxin inside your body. Some of the pathogenic bacteria may release a small amount of toxin within your body to help them to invade. Some bacteria can both secrete toxin into food and release toxin inside your body. For example, *Bacillus cereus* is able to produce emetic and/or diarrhoeal toxins: emetic one (heat-resistant toxin mentioned before) in food that can cause vomiting; diarrhoeal one released inside the body can cause diarrhoea. Although all these bacteria are known to be able to produce toxin, not all strains of them can produce toxin.

We will continue discussing characteristics of bacteria in the next issue.

食物事故點滴
Food Incident Highlight

沙門氏菌與番茄

今年六月初，美國食物及藥物管理局呼籲市民不要進食某些生的紅李番茄、紅羅馬番茄及圓紅番茄，因為有關番茄可能與多宗品種罕見的聖保羅沙門氏菌感染個案有關。據報，該國自四月中起因部分番茄含有聖保羅沙門氏菌導致至少1 017人染病和203人進院。食物安全中心正密切留意事態發展，並已抽取樣本化驗。化驗結果全部令人滿意。

沙門氏菌是一組可在人類、野生及飼養動物（包括家禽、豬和寵物（如狗、貓和爬蟲類動物））的腸道中存在的細菌。一般而言，沙門氏菌較常見於牛肉、豬肉、家禽、奶類、蛋類及前述食物的製品。不過，農作物在耕種期間亦可能會受糞肥、受污染的水、野生動物和工人所污染。吃下含有沙門氏菌的生的（包括生番茄）或未經徹底煮熟的食物，或進食受到沙門氏菌污染的其他食物或受感染人類交叉污染的已烹煮即食食物，均可引致食物中毒。潛伏期由6至48小時不等，通常約為12至36小時。病徵包括噁心、發燒、腹痛和肚瀉，有時更會出現嘔吐。這些病徵在嬰兒和長者身上會更為嚴重。生的食物中所含的沙門氏菌可經徹底煮熟殺死，而已煮熟食物則必須小心處理，以免再受沙門氏菌污染。

消費者在配製用作生吃的番茄時，應遵從中心建議。番茄一旦受沙門氏菌污染，就難以透過清洗擦掉表面上的沙門氏菌。因此，長者、兒童、孕婦及免疫力較弱的人應小心選擇食物，尤其是高風險食物，例如沙律（包括加了生番茄的沙律）。



涉及美國沙門氏菌感染個案的不同品種番茄（圖片來源：美國食物及藥物管理局）
Tomatoes implicated in the *Salmonella* outbreak in the USA (Photo: US FDA)

Salmonella and Tomato

In early June 2008, the United States (US) Food and Drugs Administration (FDA) warned the public not to eat certain red plum, red Roma and round red varieties of raw tomatoes in the US because they might be linked to outbreak of disease caused by *Salmonella* Saintpaul, an uncommon type of *Salmonella*. It was reported that at least 1 017 cases and 203 hospitalizations were caused by this particular type of *Salmonella* in some tomatoes in US since mid-April. The Centre for Food Safety is closely monitoring the situation and has taken samples for analysis. The test results were all satisfactory.

Salmonella is a group of bacteria that can be found in the intestinal tract of humans and both wild and domestic animals (including poultry, pigs and pets like dogs, cats and reptiles). Generally, *Salmonella* is more commonly found in beef, pork, poultry, milk, eggs and their products, but produce may be contaminated during the farming processes by manure, contaminated water, wild animals or workers. By eating raw (including raw tomatoes) or under-cooked food that contains the bacteria or by consuming cooked ready-to-eat food that had been cross-contaminated with *Salmonella* from other foods or infected humans, food poisoning can occur. The incubation period is from 6 to 48 hours, usually about 12 to 36 hours. The symptoms, which include nausea, fever, abdominal pain, diarrhoea and sometimes vomiting, are more severe in infants and the elderly. *Salmonella* present in raw food can be destroyed by cooking thoroughly, but care should be taken to prevent re-contamination with *Salmonella*.

Consumers should follow the CFS advice in preparing tomatoes for raw consumption. Once tomatoes are contaminated with *Salmonella*, it can be difficult to remove all the surface bacteria by washing. Therefore, the elderly, children, pregnant women and persons with lowered immunity should be careful when choosing food, especially high risk foods such as salads (including those with raw tomatoes).

風險傳達
工作一覽
Summary of
Risk Communication Work

風險傳達工作一覽 (二零零八年六月) Summary of Risk Communication Work (June 2008)	數目 Number
事故/食物安全個案 Incidents / Food Safety Cases	47
公眾查詢 Public Enquiries	131
業界查詢 Trade Enquiries	364
食物投訴 Food Complaints	371
教育研討會/演講/講座/輔導 Educational Seminars / Lectures / Talks / Counselling	97
上載到食物安全中心網頁的新訊息 New Messages Put on the CFS Website	24