食物安全焦點
Food Safety Focus

食物安全中心 Centre for Food Safety

食物環境衞生署 Food and Environmental Hygiene Department

二零零七年十月 · 第十五期 October 2007 · 15th Issue

食物環境衞生署食物安全中心出版 Published by the Centre for Food Safety, Food and Environmental Hygiene Department

本期內容 IN THIS ISSUE

編輯委員會 EDITORIAL BOARD

焦點個案 Incident in Focus

乾果和醃菜中的防腐劑
Preservatives in Dried Fruits and Pickled Vegetables

食物安全中心
風險傳達組
科學主任郭麗儀女士報告

Reported by Ms. Joey KWOK, Scientific Officer,
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背景

食物安全中心(中心)的恒常食物監察計劃顯示，乾果和醃菜偶然會有防腐劑超標問題。為更深入了解有關情況，中心近日就醃製水果和蔬菜中的防腐劑(包括二氧化硫、苯甲酸及山梨酸)使用情況，進行專項食品調查，有關結果已於九月二十七日公布。在測試的460多個樣本中，有40個(即9%)不合格，其中絕大多數涉及防腐劑超標問題，極少數則因有關食品使用了法例不容許的防腐劑。中心已採取適當的跟進措施，並呼籲業界在使用防腐劑時遵從相關的法例規定。

何謂保存食物？

食物是會變壞的物品。保存食物的首要目的，是防止或減慢霉菌、酵母菌和細菌生長，因為這些微生物的生長會令食物腐壞。

現時，我們有多種保存食物方法，利用最有效控制微生物生長和生存的方式運作，當中包括製乾、醃燻、酸化、發酵、加熱處理、冷藏、真空或氣調包裝和使用防腐劑等。這些保存食物方法往往會混合使用，令食物更安全、更優質和更易為消費者接受。

乾果和醃菜通常會如何保存？

乾果的例子：杏脯(左)；提子乾(右)。
Examples of dried fruits: apricots (left); raisins (right).

製乾屬於最古老的保存食物方法之一，是配製乾果時使用的主要技術。透過曬乾或利用其他人工烘乾設備，可除去水果內的大部分水分，從而抑制微生物的生長。此外，亦可能會在食物中加入防腐劑，尤其是二氧化硫，以保存杏脯和提子乾等乾果的顏色。

至於醃菜，則有各式各樣的配製方法。鹽經常會添加在醃菜中，但使用的分量可能差異極大。配製德國酸菜和韓國泡菜等醃菜通常會經過發酵，但這過程並非應用於所有醃菜。發酵過程中產生的酸可防止有害的微生物生長。至於不經發酵的醃菜，有時只須加入大量的鹽來配製，便可令細菌無法在高鹽分的環境中生長，此外，醋亦會用於醃菜。山梨酸和苯甲酸是配製醃菜時較常使用的兩種防腐劑。前者能有效減慢多種可令食物變壞的細菌生長，而後者在防止酵母菌和霉菌生長方面的效用尤佳。

使用防腐劑的一般原則為何？

食物添加劑(包括防腐劑)的使用必須是有利的或能發揮特定的技術用途。此外，最重要的是其使用不應對消

Background

As revealed by routine food surveillance carried out by the Centre for Food Safety (CFS), excessive levels of preservatives have been detected occasionally in dried fruits and pickled vegetables. To get a better understanding of the situation, the CFS has recently conducted a targeted food surveillance on the use of preservatives (including sulphur dioxide, benzoic acid and sorbic acid) in preserved fruits and vegetables, the results of which were released on 27 September 2007. Some 460 samples were tested, 40 samples (9 per cent) were unsatisfactory. The vast majority of unsatisfactory samples were related to the presence of excessive levels of preservatives whereas a very small fraction was related to the use of preservatives that are not permitted to be applied in the respective food items. The CFS has taken appropriate follow-up actions, and advised the food trade to comply with legal requirements when using preservatives.

中式醃菜的例子：梅菜(左)；鹹菜(中)；藠頭(右)。
Examples of Chinese-style preserved vegetables: mustard greens (left); cabbage-leaf mustard (middle); rakkyo (shallots) (right).

What is Food Preservation?

Food is a perishable commodity. The primary objective of food preservation is to prevent or slow down the growth of micro-organisms including moulds, yeasts and bacteria as the growth of these micro-organisms causes spoilage of food.

An array of preservation techniques have been developed which operate through those factors that most effectively control microbial growth and survival. These may include drying, curing, acidification, fermentation, heat treatment, refrigeration, vacuum and modified-atmosphere packaging, use of preservatives, etc. A combination of these preservation techniques are often applied together so as to achieve higher product safety, quality and acceptability.

How are Dried Fruits and Pickled Vegetables Typically Preserved?

Drying is one of the oldest methods of food preservation, and is the principal preservation technique applied in the preparation of dried fruits. Through sun drying or the use of other artificial drying equipment, a significant proportion of water is removed from the fruits so that the growth of micro-organisms is inhibited. Preservatives, particularly sulphur dioxide, may also be added so as to preserve the colour of some fruits such as apricots and raisins.

As regards pickled vegetables, the processing steps could be diverse. Salt is often added, although its quantities may vary considerably. Fermentation is often included in the preparation of pickled vegetables (e.g. sauerkraut, kimchi) but not all. Acid is formed during fermentation which in turn prevents the growth of undesirable micro-organisms. For non-fermented pickled vegetables, they are sometimes preserved simply by adding large quantities of salt so as to create an environment so salty that it is unsuitable for microbial growth. Vinegar may also be used to pickle vegetables. Sorbic acid and benzoic acid are two of the preservatives more frequently used in the preparation of pickled vegetables. Sorbic acid is effective at retarding the growth of many food spoilage organisms

焦點個案
Incident in Focus

費者的健康帶來可見的風險，亦不得誤導消費者。業界應按照《優良製造規範》內的規定使用防腐劑，所添加的分量只限於在食物中發揮預期技術用途所需的最低分量。

防腐劑的規管途徑是透過制訂在各類指明食物中的最高使用量，以確保人們從所有含防腐劑的食物攝取到的防腐劑總量不會超出相關安全參考值(即在一生中攝入防腐劑而不致對健康帶來可見風險的估計分量)。各國就防腐劑所訂的最高使用量或會不同，而各類食物獲准使用的防腐劑種類亦有異。因此，食物製造商須留意當地和食物銷售國或地區的有關規例。

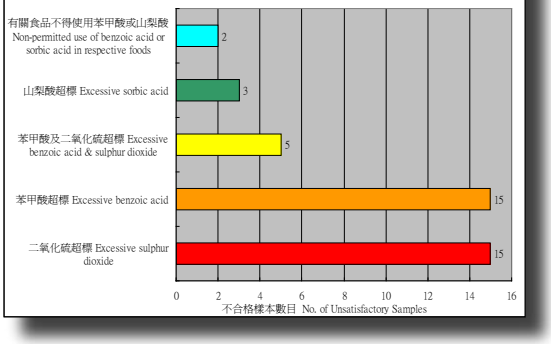
專項食品調查結果如何？

在測試的460多個樣本中，約有290個屬於水果樣本，170個屬於蔬菜樣本，當中15個水果樣本和25個蔬菜樣本不合格，即乾果和醃菜的不合格比率分別為5%和15%。有關食物樣本的不合格原因見圖一。

不合格的乾果樣本(尤其是提子乾和杏脯)絕大多數涉及二氧化硫超標問題。至於醃菜方面，我們在不同樣本(包括多種中式醃菜)發現山梨酸、苯甲酸及／或二氧化硫超標情況，其中以**薑**頭問題最嚴重，在測試的12個樣本中有8個發現苯甲酸超標。

二氧化硫、苯甲酸和山梨酸已安全使用多年，三者的急性和慢性毒性影響均屬低水平。在一般食用的情況下，有關醃製水果和蔬菜不會對消費者的健康造成明顯的影響。

圖一: 醃製水果和蔬菜樣本的不合格原因
Figure 1: Reasons for Failure in the Unsatisfactory Preserved Fruit and Vegetable Samples



本港對防腐劑有何規管？

防腐劑是受《食物中的防腐劑規例》(第132BD章)所規管。有關規例現正進行檢討，以配合食物科學和技術的最新發展，以及與國際標準看齊。有關法例修訂的詳情，請瀏覽中心網頁。

給業界的建議

1. 在使用防腐劑時，遵從法例規定和根據食物類別選用適合的防腐劑。
2. 奉行《優良製造規範》，只在食物中添加能發揮預期技術用途所需的最低分量。
3. 向可靠的供應商採購食物和配料。

給消費者的建議

1. 向可靠的店鋪購買食物。
2. 保持均衡飲食，以免因偏吃少種類食物而過量攝入食物添加劑(包括防腐劑)。
3. 患有敏感的人應參閱預先包裝食物的標籤，以免攝入某些可致敏的防腐劑，例如對二氧化硫敏感的哮喘病人應避免攝入二氧化硫。

更多資料

如需更多有關防腐劑的資料，請瀏覽下列網頁：

- 中心進行的醃製水果和蔬菜中的防腐劑專項食品調查
- 中心編製有關食物中的防腐劑單張

whereas benzoic acid is particularly effective in preventing the growth of yeasts and moulds.

What are the General Principles as Regards the Use of Preservatives?

The use of food additives including preservatives is justified only when such use has an advantage or serves particular technological function(s). Most importantly it should not present an appreciable health risk to consumers, and should not be used to mislead consumers. Preservatives should be used under conditions of Good Manufacturing Practice, in which the quantity added to food should be limited to the lowest possible level necessary to accomplish the desired technological effect.

Preservatives are regulated by maximum use levels which are specific for various food groups to ensure that the intake of preservatives from all their uses does not exceed their respective safety reference values (estimated amounts of preservatives that can be ingested over a lifetime without appreciable risk). The maximum use levels may vary between countries, so do the types of preservative that are permitted to be used in various food groups. Food manufacturers, therefore, should be aware of their relevant local regulations as well as the regulations in the country/region of sale.

What do the Targeted Surveillance Results Tell Us?

Among some 460 samples tested, approximately 290 were fruit samples and 170 were vegetable samples. Of them, 15 fruit samples and 25 vegetable samples were found unsatisfactory, giving rise to unsatisfactory rates of 5 per cent and 15 per cent for dried fruits and pickled vegetables, respectively. The reasons for failure in these unsatisfactory samples are summarised in Figure 1.

Excessive levels of sulphur dioxide gave rise to the vast majority of unsatisfactory samples in dried fruits, especially in raisins and apricots. As regards pickled vegetables, excessive levels of sorbic acid, benzoic acid and/or sulphur dioxide were detected in various samples including a wide variety of Chinese-style preserved vegetables. The problem was most prominent in rakkyo samples where excessive levels of benzoic acid were detected in 8 out of 12 samples tested.

Sulphur dioxide, benzoic acid and sorbic acid all have long history of safe use. They are generally of low acute and chronic toxic effects, and should not pose significant health effect to consumers upon normal consumption of the preserved fruits and vegetables concerned.

How are Preservatives Regulated in Hong Kong?

Preservatives are regulated under the Preservatives in Food Regulations, Cap.132 BD. The Regulations are currently under review with a view to reflecting the latest development in food science and technology, and to keeping abreast of international standards. Details of the legislative review are available from the CFS website.

Advice to the Trade

1. Comply with the legal requirements and choose the suitable type for the specific food when using preservatives.
2. Adhere to the Good Manufacturing Practice in a way that only the minimum amount is added to achieve the desired technological effect.
3. Source food and ingredients from reliable sources.

Advice to Consumers

1. Buy food from reliable suppliers.
2. Maintain a balanced diet to avoid excessive exposure to additives including preservatives from a small range of food items.
3. People with history of allergy should read food labels of pre-packaged foods to avoid certain preservatives as appropriate (e.g. avoidance of sulphur dioxide in asthmatic patients who are allergic to sulphur dioxide).

Further Information

Further information about preservatives can be obtained from the following webpages:

- The CFS Targeted Food Surveillance on Preservatives in Preserved Fruits and Vegetables
- The CFS Pamphlet on Preservatives in Food

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

風險傳達工作一覽（二零零七年九月） Summary of Risk Communication Work (September 2007)	數目 Number
事故/食物安全個案 Incidents / Food Safety Cases	68
公眾查詢 Public Enquiries	136
食物投訴 Food Complaints	407
教育研討會/演講/講座/輔導 Educational Seminars / Lectures / Talks / Counselling	111
上載到食物安全中心網頁的新訊息 New Messages Put on the CFS Website	17

從日常生活中攝取鉛的情況
Lead Exposure in Our Everyday Life

食物安全平台
Food Safety Platform

食物安全中心
風險傳達組
科學主任郭麗儀女士報告

Reported by Ms. Joey KWOK, Scientific Officer,
Risk Communication Section,
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人們不時會關注從食物或其他途徑攝取鉛的安全問題，而最新例子就是由鉛漆引起的一連串玩具回收事件。今期我們將會繼續上期推出的《食物中的金屬污染物》系列，集中探討日常生活中攝取鉛的途徑，以及減少攝入鉛的方法。

鉛是什麼？鉛來自何處？

鉛是自然蘊藏於地殼的一種金屬，在環境中無處不在。鉛的工業用途廣泛，例如用於生產汽油、電池、漆油和陶器釉面。此外，亦會用於配水管和食物金屬罐接縫上的焊料，以及水晶玻璃餐具。不過，隨着各地規管日趨嚴格和科技不斷進步，上述一些用途已逐漸淘汰。

人們如何攝入鉛？

鉛可透過進食、吸入和皮膚吸收進入人體。從事油漆及裝飾工程、水管工程、建築工程和汽車維修的人會從工作環境中攝取較多鉛。至於吸煙者，吸煙是他們攝取鉛的另一途徑。由於鉛是空氣中的污染物，所有人都會透過呼吸攝取一定分量的鉛。在水管系統仍然使用鉛(例如鉛製水管和配件)的地方，水管系統可能會釋出或滲出鉛，因此食水可能是人們攝取鉛的來源。本港的水管系統並沒有使用鉛製水管和配件，因此食水不是本港市民攝取鉛的主要來源。

一般成年人主要從飲食攝取鉛，而兒童的攝入途徑主要是飲食、空氣和塵垢或泥土。幼童經常把手指和其他物件放進口中，因而較易吃下含鉛漆的碎片，以及可能含有鉛粒子的家居塵垢或泥土。

過去二三十年間，世界各地致力減低人們的鉛攝取量，其中包括推行環境規管措施(例如有些國家禁止使用含鉛汽油)，以及規管食物加工程序(例如使用更安全的裝罐方法)，導致人們的整體鉛攝取量和從食物攝取鉛的分量逐步下降。

鉛如何進入食物？

泥土中的鉛可能會被植物(例如穀類和蔬菜)吸收，而空氣中的鉛粒子亦可能會積聚在植物葉子和莖幹的表面。食用水產(尤其是貝類)會從受污染的水和沉積物而積聚鉛。

此外，鉛有時亦會在食物中刻意用作添加劑，例如用於傳統醃製皮蛋的方法。不過，近年已出現其他採用銅或鋅化合物的醃製方法，以取代鉛的使用。另一方面，鉛亦會透過含鉛食具(例如食物金屬罐、陶器餐具和水晶玻璃餐具)滲進食物。

鉛對健康有何影響？

鉛對人體並無重要功能，反之卻會產生多種不良影響。短期攝取大量的鉛可造成腹痛、嘔吐和貧血，而長期攝取小量的鉛則可令兒童的認知和智力發展遲緩。嬰兒、幼童和胎兒較容易受到鉛毒的影響，特別是導致他們的中樞神經系統受損。

糧食及農業組織／世界衞生組織聯合食物添加劑專家委員會已訂定，鉛的暫定每周可容忍攝入量，按每公斤體重計算是25微克。較早前進行的一項研究顯示，本港中學生從食物攝取鉛的分量遠低於暫定每周可容忍攝入量，換言之，他們從食

From time to time, there are safety concerns over our exposure to lead, be it through dietary or other routes. The more recent episode has been the series of toy recall in relation to lead-containing paint. The following article, being the second in this series on "Metallic Contaminants in Food", will focus on the various sources from which people are exposed to lead in their everyday life, as well as the ways that people may reduce their exposure to this particular metal.

What is Lead? Where does it Come from?

Lead is a metal that exists naturally in the Earth's crust and is ubiquitous in the environment. Lead has many industrial uses such as production of petrol, batteries, paints and ceramic glazes, and is used in solder applied to water distribution pipes and to seam of food cans, and in crystal glassware, although some of its usages have already been or are in the process of phasing out due to tighter regulatory control or advances in technology.

How are People Exposed to Lead?

Lead can enter the human body via ingestion, inhalation and skin absorption. For those people who are involved in occupations such as painting and decorating, plumbing, construction work, and car repair, they are exposed to higher levels of lead from their work environment. For tobacco smokers, smoking is another source of lead exposure. As lead can exist as an airborne contaminant, all people are exposed to certain amounts of lead through breathing. In places where lead may still be used in the plumbing systems e.g. lead pipes and fittings, drinking water can be a source of exposure as lead may leach or dissolve from the plumbing system. In Hong Kong, lead pipes and fittings are not used in the plumbing systems, therefore drinking water is not a significant source of lead in the territory.

For ordinary adults, diet is the main source of lead exposure whereas diet, air and dust or soil are the main exposure sources for children. Young children frequently put their fingers and other objects into their mouths, and thus are more prone to ingestion of lead paint chips and house dust or soil that may contain lead particles.

As a result of global efforts to reduce human exposure to lead in the past two to three decades, which may include measures in regard to environmental control (e.g. banning the use of leaded petrol in some countries) and food processing (e.g. better canning methods), both total and dietary exposures to lead are generally on a declining trend.

從食物攝取鉛的來源例子：葉菜(上)；皮蛋(中)；貝類(下)。
Examples of sources of dietary lead: leafy vegetables (top); lime-preserved eggs (middle); shellfish (bottom).

How does Lead Enter Our Food?

Lead present in soil may be taken up into plants (e.g. cereals and vegetables), or lead particles in air may deposit on the surfaces of their leaves and stems. Aquatic food animals, especially shellfish, may accumulate lead from contaminated waters and sediments.

Lead is sometimes added to food intentionally as an additive, for example, in the traditional way of manufacturing lime-preserved eggs (also known as thousand-year-old eggs), although alternative methods using copper or zinc compounds are now available. On the other hand, lead may be inadvertently transferred to food from lead-containing utensils such as food cans, ceramic ware and crystal glassware.

What are the Effects of Lead on Health?

Lead has no essential function in man, but has a number of adverse effects. Short term exposure to high levels of lead can cause abdominal pain, vomiting and anaemia, whereas chronic low-level exposure can cause retarded cognitive and intellectual development in children. Infant, young children and foetus are more sensitive to toxic effects of lead, especially in regard to the damages to their central nervous system.

The Joint FAO/WHO Expert Committee on Food Additives (JECFA) has established a provisional tolerable weekly intake (PTWI) of 25μg/kg body

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物中攝取鉛而導致健康受損的機會不大。

給消費者的建議

1. 在烹煮前徹底浸洗蔬菜，尤其是葉菜，因為此舉能大幅減少可能積聚在蔬菜表面上含鉛的塵垢和泥土。
2. 保持均衡飲食，只吃小量含鉛量可能偏高的食物，例如皮蛋和貝類水產。
3. 使用專供盛載食物的器皿，而不應以裝飾器皿來處理食物。

給業界的建議

遵守優良的農業和製造守則，盡量減低食物受鉛污染的機會。

weight/week for lead. A study conducted earlier revealed that dietary exposures to lead among local secondary school students were well below the PTWI, meaning that their dietary exposure to lead was unlikely to cause harmful effects.

Advice to Consumers

1. Soak and wash vegetables, particularly leafy vegetables, thoroughly in water before cooking as this can remove a significant portion of lead-contaminated dust and soil that may have been deposited on the surfaces of the vegetables.
2. Maintain a balanced diet and consume food items that may have high lead contents (e.g. lime-preserved eggs and shellfish) only in moderation.
3. Use containers that are designed for food use as oppose to ornamental purposes for handling food.

Advice to the Trade

Observe good agricultural and manufacturing practices to minimise lead contamination in food.

食物事故點滴
Food Incident Highlight

禽流感病毒與食物安全

鑑於日前廣東省雛鴨爆發H5N1型禽流感，令市民再次關注禽流感由家禽及其製品傳染給人類的風險。

禽流感是由一組甲型流感病毒引起的雀鳥傳染病。世界衞生組織(世衞)認為，人類感染禽流感的主要途徑是透過直接接觸受感染的活家禽。

徹底煮熟禽鳥的肉和蛋(中心溫度達攝氏70度或以上)可預防感染禽流感，因高溫可令病毒喪失活性。現時並無證據顯示，經徹底煮熟的家禽製品是傳播禽流感的源頭。

此外，市民應時刻保持良好的個人、食物及環境衞生習慣，以盡量減低感染風險。在選購時，應避免直接接觸活家禽及其糞便或用口吹其尾部。此外，一般預防方法還包括在處理家禽製品或蛋後徹底清潔雙手和用具，以及分開處理生和熟的食物，避免交叉污染。如需更多有關禽流感的資料，請瀏覽中心網頁。

雛鴨 Ducklings

Avian Influenza Viruses and Food Safety

In light of the recent outbreak of avian influenza (H5N1) among ducklings in Guangdong province, there are again concerns over the risk of transmission of avian influenza from poultry and their products to humans.

Avian influenza is an infectious disease of birds caused by type A strains of influenza virus. According to the World Health Organization (WHO), direct contact with live infected poultry is considered as the principal source of human infection.

Thorough cooking of poultry meat and eggs, with centre temperature reaching at least 70°C, can prevent avian influenza infection as it inactivates the virus. There is no evidence that properly cooked poultry products can be a source of infection.

Members of the public are also advised to observe good personal, food and environmental hygiene at all times to minimise the risk of infection. Direct contacts of live poultry and their faeces or blowing their bottoms should be avoided at point of purchase. In addition, as general precautionary measures, hands and equipment should be cleaned thoroughly after preparing poultry products or eggs. Cross contamination of raw and cooked foods should be prevented. Please visit the CFS website for further information on avian influenza.

嬰兒配方奶粉中的阪崎氏腸桿菌

今年九月，一家德國嬰兒食品公司因一批嬰兒配方奶粉可能受阪崎氏腸桿菌污染而採取回收行動。

阪崎氏腸桿菌常見於日常生活環境中，是一種伺機性病原體，通常攻擊免疫力較弱的嬰兒。雖然受此菌污染的嬰兒配方奶粉可引起嚴重疾病，包括初生嬰兒腦膜炎，導致嚴重後遺症或死亡，但初生嬰兒感染阪崎氏腸桿菌的呈報病例罕見，當中大部分屬於早產或患有其他疾病的嬰兒。

母親宜以母乳餵哺嬰兒。至於選用嬰兒配方奶粉的人士應留意嬰兒配方奶粉並不是一種無菌的產品，奶粉可經由生產奶粉的設備、餵奶用具和沖調奶粉的人沾染到阪崎氏腸桿菌。嬰兒配方奶粉如經正確處理，阪崎氏腸桿菌不應對一般嬰兒構成威脅。照顧者必須保持雙手清潔，使用經消毒的餵奶用具和攝氏70度或以上的熱水沖調奶粉。沖調好的奶應在沖調後兩小時內飲用；如非即時飲用，則應放入攝氏4度或以下的雪櫃冷藏，但冷藏時間不宜超過24小時，並在飲用前必須徹底加熱。使用沸水沖調或經加熱的奶應加以冷卻及作適當處理，以免嬰兒遭到燙傷。

至於高風險嬰兒(即早產、體重不足或免疫力較弱的嬰兒)如未有以母乳餵哺，可選擇經商業無菌處理的液態嬰兒配方。

如需更多資料，請瀏覽中心網頁及世衞網頁(只有英文版)。

Enterobacter sakazakii in Powdered Infant Formula

In September 2007, a German baby food company recalled a batch of infant formula due to possible contamination with the *Enterobacter sakazakii* bacteria.

Enterobacter sakazakii is commonly found in our living environment. It is an opportunistic pathogen which usually attacks infants with impaired immune functions. Although contaminated powdered infant formula with *Enterobacter sakazakii* can cause severe diseases including neonatal meningitis leading to serious complications and deaths among infants, rare cases of neonatal *Enterobacter sakazakii* infection were reported mostly with premature infants or infants with underlying medical conditions.

Breastfeeding is encouraged for infants. For those who choose to use powdered infant formula should note that powdered infant formula is not a sterile product and can be contaminated with *Enterobacter sakazakii* by manufacturing equipment, infant feeding equipment and person preparing the feed. With proper treatment of infant formula, *Enterobacter sakazakii* should not pose a threat to normal infants. Feed should be prepared with clean hands, disinfected feeding equipment and water no less than 70°C. Reconstituted powdered infant formula has to be consumed within two hours. If not consumed immediately, reconstituted milk should be stored under refrigeration at 4°C or below for not more than 24 hours and reheated thoroughly before consumption. Formula prepared with boiling water or after heating should be cooled and handled appropriately as risk from burns may be resulted.

For high risk infants (preterm, low-birth-weight or immunocompromised infants) who are not breastfed, commercially sterile liquid formula are good alternatives.

Readers may visit website of the CFS and WHO for further information.