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食物中的金屬污染物第III部分 – 食物攙雜（金屬雜質含量）規例的建議修訂

Metallic Contaminants in Food Part III – Proposed Changes to the Food Adulteration (Metallic Contamination) Regulations

食物安全中心
風險評估組化驗師施均樂博士及
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Reported by Dr. Gloria SZE, Chemist, Risk Assessment Section,
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我們在本系列較早時的文章探討過食物含有的鉛、鎘及甲基汞及所造成的影響後，本文將集中討論未來對食物中重金屬的規管將有何等改變。

After examining the presence and impact of lead, cadmium and methylmercury in food on health in the earlier articles in this series, we will now focus on the upcoming changes to the regulatory level of heavy metals in food.

鉛、鎘及甲基汞等金屬天然存在於環境中，可以多種方式進入我們的食物供應鏈。對不少人來說，膳食是一個攝入這些有害物質的主要途徑。為減少公眾從食物攝入金屬污染物，大部分司法管轄區（包括香港）已通過管制措施，例如引入法定規管制度，對食物中金屬污染物的類別和含量作出規範。

Metals such as lead, cadmium, and methylmercury are naturally found in the environment and can enter our food supply through various means. For many people, diet is an important source of exposure to these harmful substances. In order to reduce the exposure to metallic contaminants from food in the population, regulatory measures such as the establishment of statutory control over the types and levels of metallic contamination in food are adopted in most jurisdictions, including Hong Kong.

修訂建議

現時，本港的食物攙雜（金屬雜質含量）規例就不同類型的食物中14種金屬污染物訂明了含量上限。為加強保障公眾健康、提高規管工作的成效，以及促使本港標準與國際標準接軌，政府檢視了現行規例。規例的建議修訂旨在為使食物

Proposed Amendments

Currently, Hong Kong's Food Adulteration (Metallic Contamination) Regulations have established maximum levels for 14 types of metallic contaminants in various types of food. The Government conducted a review on the Regulations with a view to better protecting public health, facilitating effective regulation and promoting harmonisation between local and international standards. The proposed amendments to the Regulations aim to



圖1:《食物攙雜（金屬雜質含量）規例》的修訂建議所涉及的食物種類例子。有關修訂建議的完整清單，可參閱載於此文文的附件。
Figure 1: Examples of the food types involved in the proposed amendments to the Food Adulteration (Metallic Contamination) Regulations. The complete list of proposed changes is available in the annexes to this paper.

中的金屬污染物含量上限與國際發展接軌。建議修訂參考 [食品法典委員會](#) 及主要食物進口地的最新標準，在規例新增27個指明食物中的指明金屬（食物組合）含量上限及就現有相關食物組合更新9個含量上限。規例附表第2部的含量上限總數將會由144個增加至171個。

建基於國際指引的新標準

在27項建議新增的金屬含量上限中，16個參考食品法典委員會有關鉛、鎘及甲基汞等金屬的標準。當中新增含量上限的食物有朱古力及可可粉和魚類。例如，根據國際間的建議，新增五個可可粉及不同朱古力產品的鎘含量上限由每公斤0.3至2.0毫克不等，六種特定魚類中甲基汞的含量上限由每公斤0.8至1.7毫克不等。與此同時，餘下的11個新增含量上限則參考了如中國國家標準、韓國標準等相關標準。經考慮本地食物消費模式和進口食物的主要來源地後，我們建議就某些種類的食用菇類、糖和糖漿新增含量上限。

另外，在參考食品法典委員會及內地標準後，九個現有含量上限將會更新，其中可食用什臍、鹽、脂肪塗醬和其他非指明食用真菌的含量上限將作出調整。

本港情況及健康考慮因素

食物安全中心（食安中心）一直密切留意國際間食物安全標準的最新發展，這些修訂建議是經考慮本地食物消費模式和風險評估結果後作出的。食安中心會繼續向本港市民，特別是高危人士提供有助減少從食物攝入金屬污染物的膳食建議。

評估對食物供應的影響

鑑於食品法典委員會的標準是由其成員經過深入討論後制定，並以協商方式通過，因此，以食品法典委員會的標準為本次建議修訂的骨幹，預計不會對香港的貿易和食物供應造成實質影響。此外，在這次修訂工作中，我們為食物組合建議含量上限時，亦已參照食品法典委員會的「可合理做到的盡可低水平」原則。根據食安中心的食物監察計劃和額外進行的基線研究，本港市場出售的食物金屬污染物含量一般能符合建議的含量上限（超過99%的食物樣本均符合建議的含量上限）。

公眾諮詢

為期兩個月的公眾諮詢期已於2024年12月16日展開。政府會舉辦諮詢會，讓市民、持份者及業界有機會表達對修訂建議的意見，詳情載於 [食安中心網站](#)。

過渡到新標準的安排

我們將設立過渡期，讓食物業能遵守新訂定和已更新的標準。期間，食物可完全符合現行或經修訂的規例，但不可兩者各符合一部分。此安排能為業界提供彈性，確保順利過渡。

keep abreast of international development on maximum levels (MLs) of metallic contaminants in food. Twenty-seven new MLs for specified metal in specified food (food pair) are proposed to be added and 9 MLs for existing food pairs are proposed to be updated in the Regulations, with reference to latest standards of [Codex Alimentarius Commission](#) (Codex) and major food importing places. The total number of MLs will increase from 144 to 171 in Part 2 of the Schedule to the Regulations.

New Standards Based on International Guidelines

Among the proposed 27 new MLs, reference has been made to the Codex standards for metals like lead, cadmium and methylmercury for 16 of them. Chocolate and cocoa powder and fish are among the foods that have newly established MLs. For instance, the proposed MLs for cadmium in cocoa powder and various chocolates range from 0.3 to 2.0 mg/kg, while for methylmercury in six specified species of fish range from 0.8 to 1.7 mg/kg, in accordance with international recommendations. Meanwhile, reference has been made to relevant standards such as the Chinese GB, Korea standards, etc. with regard to the remaining 11 of the new MLs. After taking into consideration local consumption patterns and the major sources of food imports, new MLs are proposed for certain types of edible mushrooms, sugars and sugar syrups.

In addition, nine existing MLs will be updated with reference to Codex and Mainland standards. This includes adjustments in the MLs for lead and cadmium in foods like edible offal, salts, fat spreads and other non-specified edible fungi.

Local Context and Health Considerations

The Centre for Food Safety (CFS) has been monitoring the latest international developments in food safety standards closely, and these proposed changes have already considered local consumption patterns and results of risk assessments. The CFS will continue to provide dietary advices to the local population, susceptible groups in particular, in order to reduce their exposure to metallic contaminants from food.

Assessment on Implications on Food Supply

The proposed amendments, with Codex standards as the backbone, are expected to have no substantive impact to the trade and Hong Kong's food supply, as Codex standards are developed through thorough discussion among its members and adopted by consensus. In addition, in proposing the MLs for food pairs in this amendment exercise, we have taken into account Codex's ALARA (As Low as Reasonably Achievable) principle. According to the results of the food surveillance programme and additional baseline studies of CFS, the levels of metallic contamination in foods available in local market can generally comply with the proposed MLs (more than 99% of the food samples can meet the proposed MLs).

Public Consultation

A two-month public consultation commenced on 16 December 2024. Consultation forums will be conducted, providing opportunities for members of the public, stakeholders and the industry to voice their opinions and concerns regarding the proposed changes. The details are available on the [CFS website](#).

Transition to New Standards

A transitional period will be provided for food businesses to comply with the new and updated standards. During this time, food items can either comply with the existing or the revised regulations wholly, but not a combination of both. This can provide flexibility to the trade to ensure a smooth transition.

糖醇概覽

Sugar Alcohols – an Overview

食物安全中心風險評估組
科學主任黃詩雯女士報告

Reported by Ms. Sosanna WONG, Scientific Officer
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上一期我們討論了天冬酰胺和糖精等部分甜味劑。相對於這些非營養性甜味劑，事實上還有其他含熱量的“非糖”增甜物質。這一期，讓我們繼續增甜之旅，認識又稱為多元醇或多羥醇的營養性甜味劑糖醇。

糖醇是什麼？

大家可能會問，糖醇到底屬於糖還是醇。糖醇是化學結構與糖和醇（酒精）均相近的碳水化合物。然而，有別於糖，糖醇不含乙醇（存在於酒精飲品中的醇）。

事實上，糖醇天然少量存在於蘋果和菇類等多種水果和蔬菜中，也可用糖和澱粉大量生產作商業用途。糖醇的例子包括山梨糖醇、木糖醇、赤蘚糖醇、甘露糖醇及麥芽糖醇。

糖醇的特性

糖醇雖然帶有甜味，但一般來說其甜度較砂糖低，其特性與具有強烈甜度的非營養性甜味劑不同。糖醇的甜度為砂糖的百分之二十五至一百。現時，糖醇經常會和非營養性甜味劑混合使用，使味道更佳。糖醇普遍用作一些無糖及減糖食品中的代糖，包括糖果、香口膠、曲奇餅和雪糕等。

除了增加甜味，糖醇也在食物中有另外幾種作用。糖醇與糖相似，能增加食物的體積和提升質感。糖醇也有助保留食物的水分和防止食物在加熱後變成褐色，因此是具有多種技術用途的食物添加劑。

由於糖醇在小腸內緩慢並且不被完全吸收到血液中，因此每克所提供的能量（每克約0.2至3千卡能量）比砂糖（每克約4千卡能量）為少，而且相對於蔗糖和葡萄糖等其他碳水化合物，對血糖水平產生的改變也會較小。

糖醇有別於糖，不會引致蛀牙問題，因為口腔內細菌的代謝會分解糖和澱粉以釋出引致蛀牙的酸素，但糖醇不受這種代謝作用影響。食物中大量添加糖醇，可在口腔內產生冰涼的感覺，能與薄荷的味道互相搭配，因此常用於無糖香口膠和糖果。

糖醇的安全性

糖醇對健康可能造成的風險曾引起疑慮。舉例來說，一些研究的結果顯示，赤蘚糖醇在血液中較高的水平可能與心血管疾病及相關風險因素有關聯。然而，歐洲食物安全局在2023年發表評估報告，認為現有的研究未能確立從膳食攝入赤蘚糖醇與患上心血管疾病之間的因果關係。

一如其他食物添加劑，糖醇必須通過嚴格的安全評估，才准許使用於食物中。事實上，聯合國糧食及農業組織/世界衛生組織聯合食物添加劑專家委員會（專家委員會）曾評估部分糖醇（即赤蘚糖醇、異麥芽糖醇、乳糖醇、麥芽糖醇、麥芽糖醇液、甘露糖醇、聚葡萄糖醇液、山梨糖醇、山梨糖醇液和木糖醇）的安全性，並將其每日可攝入量定為「不詳列」，意即使用作食物添加劑不會影響人體健康。

不過，個別人士若進食過量糖醇，可能會出現腹瀉和腹部脹氣等腸胃不適，原因是糖醇沒有在腸內完全吸收。出現這些徵狀的可

In the last issue, we have discussed some sweeteners like aspartame and saccharin. In contrast to those non-nutritive sweeteners, there are in fact some other “non-sugar” sweetening substances that contain calories. In this article, let us continue our sweet journey with sugar alcohols, also known as polyols or polyhydric alcohols, which are nutritive sweeteners.

What are Sugar Alcohols?

Some people may wonder whether sugar alcohols belong to sugar or alcohol. Sugar alcohols are carbohydrates the chemical structures of which resembles both sugar and alcohol. However, they are different from sugar and do not contain ethanol (the type of alcohol present in alcoholic beverages).

In fact, sugar alcohols are naturally found in small quantities in a range of fruits and vegetables such as apples and mushrooms. They can also be produced from sugars and starches in larger quantities for commercial use. Examples of sugar alcohols include sorbitol, xylitol, erythritol, mannitol and maltitol.

Properties of Sugar Alcohols

Although sugar alcohols have a sweet taste, they are typically not sweet as table sugar, in contrast to non-nutritive sweeteners that have an intense sweetness. They range from 25% to 100% of table sugar in terms of sweetness. Nowadays, sugar alcohols are often used in combination with non-nutritive sweeteners to create a better flavour profile. Sugar alcohols are commonly used as some of the sugar substitutes in sugar-free and sugar-reduced products, including candies, chewing gum, cookies and ice cream.

Beyond just adding sweetness, sugar alcohols also serve several purposes in food. Similar to sugars, sugar alcohols in food add bulk and texture. They also help food retain moisture and prevent browning when heated, making them food additives with multiple technological functions.

Since sugar alcohols are slowly and incompletely absorbed from the small intestine into the blood, they provide fewer calories per gram (approximately 0.2 to 3 kcal per gram) compared with sugar, which has about 4 kcal per gram, and produce a smaller change in blood glucose than other carbohydrates such as sucrose and glucose.

Unlike sugar, sugar alcohols are considered not to promote tooth decay because they are resistant to metabolism by bacteria in the mouth that break down sugars and starches to release decay-causing acids. When added to food in high quantities, sugar alcohols also produce a cooling sensation in the mouth, which goes well with the flavour of mint. For this reason, they are frequently found in sugar-free chewing gum and candies.

Safety of Sugar Alcohols

Concerns have been raised regarding the potential health risk of sugar alcohols. For instance, the results of some studies suggested a possible association between higher circulating blood levels of erythritol and cardiovascular disease and related risk factors. However, the European Food Safety Authority (EFSA) in its evaluation published in 2023 considered that the available

studies had not demonstrated a causal relationship between dietary exposure to erythritol and the risk of cardiovascular diseases.

Like other food additives, sugar alcohols have undergone rigorous safety evaluation before permitted for use in food. In fact, the Joint FAO/WHO Expert Committee on Food Additives (JECFA) have evaluated the safety of some sugar alcohols, namely erythritol, isomalt, lactitol, maltitol, maltitol syrup, mannitol, polyglycitol syrup, sorbitol, sorbitol syrup and xylitol, and established Acceptable Daily Intakes (ADIs) as “not specified” for them, meaning that their use as food additives does not represent a health concern.

However, when consumed in excess, sugar alcohols can cause laxative effects and gastrointestinal discomforts, including abdominal gas and

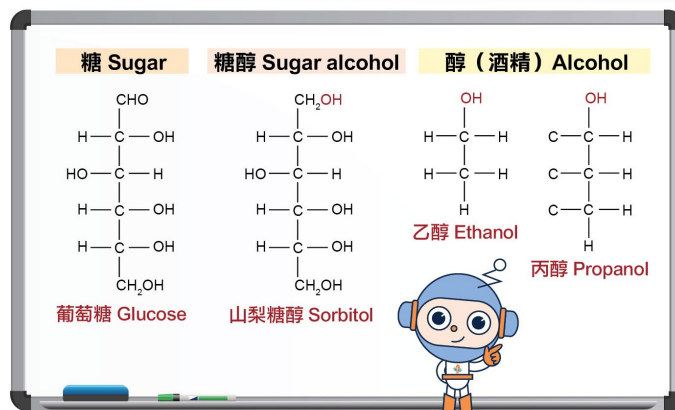


圖2: 糖醇（如山梨糖醇）、糖（如葡萄糖）和醇（如乙醇及丙醇）的化學結構
Figure 2: Chemical structures of sugar alcohol (e.g. sorbitol), sugar (e.g. glucose) and alcohol (e.g. ethanol and propanol)

| 糖醇 Sugar alcohols | 對比砂糖的相對甜度 Relative sweetness vs table sugar | 能量值(每克千卡能量) Calorie value (kcal per gram) |
|------------------------------------|---|---|
| 赤蘚糖醇 Erythritol | 60 – 80% | 0.2 |
| 異麥芽糖醇 Isomalt | 45 – 65% | 2 |
| 乳糖醇 Lactitol | 30 – 40% | 2 |
| 麥芽糖醇 Maltitol | 90% | 3 |
| 麥芽糖醇液 Maltitol syrup | 25 – 50% | 3 |
| 甘露糖醇 Mannitol | 50 – 70% | 1.6 |
| 聚葡萄糖醇液 Polyglycitol syrup | 40 – 90% | 3 |
| 山梨糖醇 Sorbitol | 50 – 70% | 2.6 |
| 山梨糖醇液 Sorbitol syrup | 25 – 50% | 3 |
| 木糖醇 Xylitol | 100% | 3 |
| 對比砂糖 Compared with: table sugar | 100% | 4 |

圖3: 糖醇的相對甜度和熱量值
Figure 3: Relative sweetness and calorie value of sugar alcohols

能性視乎進食的分量。因此，生產商應按照優良製造規範使用糖醇，即添加於食物內的分量以發揮預期作用的最低分量為限。

本地及國際情況

在本港，根據現行的《食物內甜味劑規例》（第132U章），甜味劑指任何帶甜味的化合物，但不包括糖或其他碳水化合物或多羥醇（即糖醇）。儘管現時糖醇不在第132U章的規管範圍內，但仍可按照優良製造規範的原則在食物內使用。

在國際上，食品法典委員會把上述10種經專家委員會評估的糖醇視作甜味劑。另外，根據食物添加劑通用標準，只要按照優良製造規範的原則，這些甜味劑均是准許在食物內使用的。

bloating, in some individuals. This occurs because sugar alcohols are not completely absorbed in the intestine. The likelihood of experiencing such effects depends on the quantity consumed. Therefore, it is important that manufacturers use sugar alcohols in accordance with Good Manufacturing Practice (GMP) i.e. limited to the lowest possible level necessary to accomplish the desired effect.

Local and International Situation

In Hong Kong, under the existing Sweeteners in Food Regulations (Cap. 132U), sweetener means any chemical compound which is sweet to the taste, but does not include any sugars or other carbohydrates or polyhydric alcohols (i.e. sugar alcohols). Even though sugar alcohols are currently not under the regulatory scope of Cap. 132U, they can still be used in food in accordance with GMP.

Internationally, the aforementioned ten sugar alcohols evaluated by JECFA are considered as sweeteners by the Codex Alimentarius Commission. Besides, according to the General Standard for Food Additives, they are all permitted for use in food when utilized in compliance with the principles of GMP.

沙門氏菌與意大利芝士蛋糕 Salmonella and Tiramisu

據報在十月發生了兩宗與進食意大利芝士蛋糕有關的懷疑食物中毒個案，病原體懷疑是沙門氏菌。食物安全中心已指示有關處所暫停出售相關食品，並進行消毒。

調查結果發現，事故成因很可能是食物沒有徹底煮熟和貯存溫度不當。意大利芝士蛋糕一般在製作過程中不會徹底加熱，未能消滅病原體。事故中的蛋糕製作時雖然使用了經巴士德消毒的蛋黃液，但卻混合了未經巴士德消毒的生蛋白，或因此造成污染。細菌繁殖可能由意大利芝士蛋糕貯存不當所引致。

徹底煮熟食物，可消滅沙門氏菌及其他病原體。要減低食物安全風險，用經巴士德消毒的蛋製品取代生蛋製作非全熟菜式是不錯的選擇。為防止交叉污染，經巴士德消毒的蛋類不應與生蛋混合用於製作非全熟菜式，並應妥善存放在攝氏4度或以下的雪櫃內。

In October, two suspected food poisoning cases related to the consumption of tiramisu were reported. The suspected causative agent was *Salmonella*. The Centre for Food Safety has instructed the premises concerned to suspend the sale of relevant products and carry out disinfection.

According to investigation findings, inadequate cooking and improper holding temperature were the probable contributing factors for the outbreak. Tiramisu is typically made without thorough heat treatment to kill pathogens. Although pasteurised egg yolk solution was used, it was mixed with unpasteurised raw egg white which might have caused contamination. Bacterial proliferation might be the result of improper storage of the tiramisu.

Cooking food thoroughly can eliminate *Salmonella* and other pathogens. To reduce food safety risks, pasteurised egg products are a good substitute for raw eggs in lightly cooked dishes. To avoid cross contamination, pasteurised eggs should not be mixed with raw eggs in lightly cooked dishes and they should be properly stored at or below 4°C in refrigerators.

提防狂蜜病中毒 Beware of Mad Honey Poisoning

最近，本港接獲數宗狂蜜病中毒個案的通報，涉及進食從外地帶回港的蜂蜜，所有患者均須在醫院接受治療。經化驗後，部分剩餘的蜂蜜樣本證實含榎木毒素。

狂蜜病中毒由吃進含榎木毒素的蜂蜜引起。榎木毒素是由杜鵑花及其他杜鵑花科植物產生的神經毒素，可影響神經和肌肉。狂蜜病中毒徵狀包括嘔吐、肚瀉和頭暈。嚴重個案可能會出現低血壓、心律下跌或休克。進食含榎木毒素的蜂蜜或會令喉嚨有燒灼感。

要減低狂蜜病中毒的風險，市民及業界應向可靠的來源或養蜂場購買蜂蜜。從曾經發生蜂蜜引致的榎木毒素中毒個案的地區（包括印度、尼泊爾和土耳其黑海地區）帶回或進口蜂蜜時，應特別注意。棄掉帶有苦味或澀味的蜂蜜。食安中心已通過多種途徑，包括社交媒體及其網站加強有關狂蜜病中毒的公眾教育工作。

Recently, several cases of mad honey poisoning involving the consumption of honey brought from overseas were reported locally and all affected persons required treatment in hospitals. Upon testing, grayanotoxin was detected in some honey remnants.

Mad honey poisoning is caused by the ingestion of honey containing grayanotoxins. Rhododendrons and other plants in the *Ericaceae* family are the source of grayanotoxins. Grayanotoxins are neurotoxins which can affect nerves and muscles. Symptoms of mad honey poisoning include vomiting, diarrhoea and dizziness. In severe cases, hypotension, bradycardia or shock may occur. Honey containing grayanotoxin may cause a burning sensation in the throat when consumed.

To reduce the risk of mad honey poisoning, the public and the trade should purchase honey from a reliable source or apiary. Pay special attention when bringing or importing honey from regions including India, Nepal and the Black Sea region of Türkiye where honey-related grayanotoxin poisoning cases have been reported. Discard honey with a bitter or astringent taste. The Centre for Food Safety has enhanced public education on mad honey poisoning through various channels, including social media and its website.



風險傳達工作一覽（二零二四年十一月）

Summary of Risk Communication Work (November 2024)

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