

本期內容 IN THIS ISSUE

- ❖ 甜味劑：迷思與真相
- ❖ 細菌含量超標：品質、衛生還是安全問題？
- ❖ 魚類中的甲基汞與食物安全
- ❖ 雪卡毒與食物中毒
- ❖ 風險傳達工作一覽
- ❖ Sweeteners: Myths and Facts
- ❖ Excessive Bacterial Count: Quality, Hygiene or Safety Issues?
- ❖ Methylmercury in Fish and Food Safety
- ❖ Ciguatoin and Food Poisoning
- ❖ Summary of Risk Communication Work

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甜味劑：迷思與真相

Sweeteners: Myths and Facts

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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過去數十年來，甜味劑一直用以幫助減少糖的攝取量。即使你未必會在飲食中添加甜味劑，甜味劑會常在多種食品上用作為配料，特別是用於汽水和糖果。儘管甜味劑的安全使用有着長久的歷史，但人們仍然擔心其潛在的健康風險。在本文中，我們將消除一些關於甜味劑的謬誤。

Sweeteners have been used for decades to help to reduce sugar intake. Even though you may not add sweeteners in your diet, sweeteners are often used as ingredients in various food products, especially soft drinks and candies. Despite sweeteners' long history of safe usage, there have been concerns about their potential health risks. In this article, we are dispelling some of the fallacies about sweeteners.

什麼是甜味劑？

甜味劑是用以代替糖來為食物／飲品添加甜味的食物添加劑。非營養性甜味劑如天冬酰胺和糖精的甜度遠高於砂糖（甜度高出30至20 000倍），因此只需少量便可達致食物中與砂糖相同的甜度。由於非營養性甜味劑所需的用量極少，其提供的卡路里微不足道。

What are Sweeteners?

Sweeteners are food additives that are used instead of sugars to sweeten foods/beverages. Non-nutritive sweeteners, e.g. aspartame and saccharin, are substantially sweeter (30 to 20,000 times sweeter) than table sugar, thus, smaller amounts can achieve the same level of sweetness as sugars in food. Since only tiny amounts of non-nutritive sweeteners are required, their caloric contribution is negligible.

糖醇（又稱為多元醇或多羥醇）是另一種的甜味劑，例子有山梨糖醇及木糖醇。糖醇是天然存在於水果和蔬菜中的少量碳水化合物，也可進行商業生產。有別於非營養性甜味劑，糖醇的甜度通常較砂糖低，其甜度為砂糖的百分之二十五至一百。由於糖醇在進食後不被人體完全吸收，因此其提供的卡路里會比砂糖少。

Another type of sweeteners is sugar alcohols (also known as polyols or polyhydric alcohols), e.g. sorbitol and xylitol, which are carbohydrates naturally found in small amounts in fruits and vegetables and are also produced commercially. Unlike non-nutritive sweeteners, sugar alcohols are generally not as sweet as table sugar; their sweetness ranges from 25% to 100% to that of table sugar. Since they are incompletely absorbed after ingestion, they contribute less calories as compared with sugars.



圖1：市面上常見添加了甜味劑的食品
Figure 1: Common food products with sweeteners on the market

關於甜味劑的真相

所有甜味劑都是人造的嗎？

儘管部分甜味劑是人造的，例如天冬酰胺和糖精，但也有些甜味劑是從植物中提取的，例如甜菊醇糖苷和山梨糖醇。

甜味劑安全嗎？

一如其他食物添加劑，甜味劑已通過嚴格的安全評估，才獲准用於食物中。國際及各國的食物安全當局，例如聯合國糧食及農業組織 / 世界衛生組織食物添加劑聯合專家委員會（專家委員會），根據所有的毒理及相關資料進行科學審查，來評估甜味劑的安全性。

有些早期的動物研究顯示，個別甜味劑（即環己基氨基磺酸和糖精）與實驗動物患膀胱癌有關聯，故一度引起對甜味劑跟癌症的關注。不過，其後對經准許的甜味劑的研究顯示，並無證據證明甜味劑會使人類患癌。國際癌症研究機構把環己基氨基磺酸和糖精分類為「在會否令人類患癌方面未能分類」（組別3）。

最近，國際癌症研究機構基於有限的人類致癌性證據，於2023年把天冬酰胺分類為「或可能令人類患癌」（組別2B）。然而，專家委員會基於動物和人類研究的證據，認為沒有證據表明進食天冬酰胺後會產生不良影響，也沒有令人信服的證據確認攝取天冬酰胺與人類患上癌症有聯繫。專家委員會得出結論，認為在此前所訂定的每日每公斤體重0-40毫克天冬酰胺每日可攝入量範圍內，從飲食攝取天冬酰胺不會對健康造成影響。

甜味劑可用於控制體重嗎？

雖然甜味劑可安全食用，但世界衛生組織(世衛)在2023年發布的指引建議不要使用非糖甜味劑來控制體重。有關建議是根據現有證據進行的系統性文獻回顧的結果而作出的。現有證據顯示，非糖甜味劑不會對減少成人 / 兒童的體脂帶來任何長期益處。然而，世衛指出，有關證據可能受研究參與者的基線特徵和非糖甜味劑使用模式的複雜性擾亂。世衛也表示，有關指引並不適用於糖醇及已患有糖尿病的人士。

世衛建議，控制體重的關鍵在於在攝取和消耗熱量之間達至能量平衡。人們需要考慮其他方法來減少攝取游離糖，例如進食含有天然糖分的食物（如水果），或進食不加糖的食物及飲品。人們應從小開始全面減少飲食中的甜味，以改善健康。

如何規管甜味劑？

在本港，甜味劑受《食物內甜味劑規例》（第132U章）所規管。目前，第132U章列出十種經准許的甜味劑。為了與國際規管食物中甜味劑的發展保持一致，食物安全中心已就法例對甜味劑的規管開始檢討工作。甜味劑應在符合優良製造規範的情況下使用，即添加於食物內的分量，以發揮預期作用的最低分量為限。此外，所有添加了甜味劑的預先包裝食物均須加上適當標籤，列明該添加劑的作用類別及其本身所用名稱或識別編號。

給業界的建議

- 減少使用糖 / 甜味劑，以降低食品的甜度。
- 確保食品符合本地的規定，包括有關食物添加劑和標籤的規定。

給消費者的建議

- 保持均衡飲食，選擇含有較少或沒有添加糖 / 甜味劑的食物 / 飲品。
- 參閱食物標籤，以作出有依據的選擇。

Truth about Sweeteners

Are all sweeteners artificial?

While some sweeteners are artificially made, e.g. aspartame and saccharin, some are derived from plants, e.g. steviol glycosides and sorbitol.

Are sweeteners safe?

Like other food additives, sweeteners have undergone rigorous safety evaluation before permitted for food use. International and national food safety authorities, such as the Joint FAO/WHO Expert Committee on Food Additives (JECFA), evaluate the safety of sweeteners based on scientific reviews of all available toxicological and related data.

Concerns about sweeteners and cancer initially arose when early animal studies linked certain sweeteners (i.e. cyclamate and saccharin) with bladder cancer in laboratory animals. However, subsequent studies of the permitted sweeteners showed that there was no evidence demonstrating that sweeteners would cause cancer in humans. The International Agency for Research on Cancer (IARC) classified cyclamate and saccharin as not classifiable as to their carcinogenicity to humans (Group 3).

Recently, IARC in 2023 classified aspartame as possibly carcinogenic to humans (Group 2B) based on limited evidence for carcinogenicity in humans. Nonetheless, JECFA, based on the evidence from animal and human studies, considered that aspartame had not been found to have adverse effects after ingestion, and the evidence of an association between aspartame consumption and cancer in humans was not convincing. JECFA concluded that dietary exposure to aspartame within the previously established Acceptable Daily Intake of 0-40 mg/kg body weight did not pose a health concern.

Can sweeteners be used for weight control?

While sweeteners are safe for consumption, the World Health Organization (WHO) released in 2023 a guideline which recommended against the use of non-sugar sweeteners (NSS) to control body weight. The recommendation was based on the findings of a systematic review of the available evidence which suggested that the use of NSS did not confer any long-term benefit in reducing body fat in adults/children. However, WHO acknowledged that the evidence might have been confounded by baseline characteristics of study participants and complicated patterns of NSS use. WHO also remarked that the guideline did not apply to sugar alcohols or individuals with existing diabetes.

WHO advised that the key to weight control is to achieve an energy balance between calories consumed and burnt. People need to consider other ways to reduce free sugars intake, such as consuming food with naturally occurring sugars, like fruit, or unsweetened food and beverages. To improve health, people should reduce the sweetness of the diet altogether, starting early in life.

How are Sweeteners Regulated?

In Hong Kong, sweeteners are regulated under the Sweeteners in Food Regulations (Cap. 132U). At present, a total of ten permitted sweeteners are listed under Cap.132U. To align with the latest international developments on the regulation of sweeteners in food, the Centre for Food Safety has commenced the work to review the regulatory control of sweeteners. Sweeteners should be used under the condition of Good Manufacturing Practice with the quantity added to food limited to the lowest possible level necessary to accomplish the desired effect. Moreover, all prepackaged foods added with sweeteners are required to be properly labelled with their functional classes and specific names or identification numbers.

Advice to the Trade

- Reduce the sweetness of food products by using less sugar or fewer sweeteners.
- Ensure products comply with local regulations, including food additives and labelling requirements.

Advice to the Public

- Maintain a balanced diet and select foods/beverages with less or no sugar/sweetener added.
- Read food labels to make informed choices.

細菌含量超標：品質、衛生還是安全問題？

Excessive Bacterial Count: Quality, Hygiene or Safety Issues?

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

有些人可能認為，含菌量是決定某種食物是否有受微生物污染的唯一因素。這種看法只是部分正確，因為含菌量超標可能表示部分食物或存在品質問題，但有些食物如沙律則天然可能含菌量較高。食物安全中心（食安中心）已發出[食品微生物含量指引](#)（指引），概述不同的微生物含量準則，即需氧菌落計數、衛生指示微生物及指定食源性致病菌。食物若含有如沙門氏菌等食源性致病菌便顯然有害，也容易理解，但部分人或許不清楚需氧菌落計數和衛生指示微生物所擔當的角色。讓我們在本文中深入認識這些準則及其指示的情況。

什麼是需氧菌落計數？

需氧菌落計數是顯示在攝氏30度的有氧環境下，食物樣本內增殖的細菌總數的準則，說明含菌量總數或食物質素，類似於平板菌落總數或總含菌量。有關個別微生物及污染來源的具體資訊是無法從需氧菌落計數中取得的。要找出致病菌（如有）的種類，便需要進行指定測試。視乎食物所經過的各種處理或控制程序，含菌量會有所變化。經過進一步加工（如冷卻、斬切或與其他配料混和）的已烹煮食物與剛烹煮完的食物相比，含菌量較有可能會增加。至於沒有經過烹煮的食物如沙律，或含發酵劑培養物的食物如發酵食物，其需氧菌落計數自然較高，所以此準則並不適用這些食品。指引對即食食品作出分類，以進行需氧菌落計數評估。此外，總含菌量（如[奶業規例](#)訂定的標準）可反映奶類或奶類飲品有否進行適當的熱處理。

遵循良好衛生規範，可保持需氧菌落計數低於各種食物適用的水平。需氧菌落計數超過限值往往反映衛生情況不良、貯存溫度不當或保質期延長，導致質素欠佳。另一方面，食物的整體衛生品質則由衛生指示微生物反映。

衛生指示微生物是什麼？

指引列出兩個指標，即大腸桿菌和腸桿菌科細菌。大腸桿菌常見於人類和動物的腸道內，大部分屬無害，部分更是保持健康不可缺少的。然而，小部分大腸桿菌能引致感染，稱為產志賀毒素大腸桿菌的這類別大腸桿菌更能引致嚴重疾病。故此，食物樣本含有大腸桿菌未必表示不能安全食用，只有某些大腸桿菌菌株是會致病的。事實上，此準則常用於指示食物直接或間接受到糞便污染，與個人衛生，例如沒有正確洗手的關係較大。有[刺身樣本](#)驗出含過量大腸桿菌，便可能是由於處理過程不合衛生所致。

腸桿菌科細菌是一大類在生物化學和遺傳上彼此相關的細菌，包括大腸桿菌和一些致病菌（見插圖）。妥善清洗及消毒能輕易殺死這些細菌，因此有關細菌適合用以評估食物的一般衛生情況。若然有關細菌存在於加熱處理的食物，即表示食物烹煮不足或在處理後受到污染。腸桿菌科細

Some people may believe that bacterial count is the only factor to determine whether a food is microbiologically safe or not. This is only partially true, as excessive count could suggest potential quality issues of some foods while foods like salad may naturally contain a high bacterial load. The Centre for Food Safety (CFS) has issued the [Microbiological Guidelines for Food](#) (the Guidelines), which outlines different microbiological criteria, namely aerobic colony count (ACC), hygiene indicator organisms (HIOs) and specific foodborne pathogens. Foodborne pathogens, like *Salmonella*, are obviously undesirable in foods and easy to understand, while some people may not be familiar with the roles played by ACC and HIOs. In this article, let us take a closer look at these criteria and their indications.

What is Aerobic Colony Count?

The ACC is a criterion that quantifies the total number of bacteria in a food sample that can proliferate in an aerobic environment at 30°C. This provides an overall measure of the microbial load or quality of the food, similar to total plate count or total bacterial count. No specific information about individual microorganisms and source of contamination can be obtained from the ACC. To find out more about what types of pathogens, if any, are present, specific testing is needed. The bacterial load can vary depending on the different treatments or manipulations the food has undergone. With cooked foods that have undergone further processing such as cooling, chopping or mixing with other ingredients, the bacterial load would likely increase in comparison with that of foods just cooked. Food without cooking, like salad, or with starter culture, such as fermented food, would naturally have high ACC and hence the criterion is not applicable. In the Guidelines, ready-to-eat foods are categorised for ACC assessment. Furthermore, the total bacterial count, such as the standard in the [Milk Regulation](#), can reflect proper heat treatment or handling of milk or milk beverage.

By following good hygiene practices, the ACC can be kept below respective levels. Foods with excessive ACCs often indicate poor sanitation, improper storage temperatures or an extended shelf life, which result in unsatisfactory quality. On the other hand, overall hygienic quality of a food is reflected by HIOs.

What are Hygiene Indicator Organisms?

There are two indicators in the Guidelines, i.e. *Escherichia coli* and Enterobacteriaceae. *E. coli* are commonly found in intestines of humans and animals, with most of them harmless and some of them essential to good health. Nevertheless, a few *E. coli* can cause infection and a specific group called Shiga toxin-producing *E. coli* (STEC) can cause serious illness. So, the presence of *E. coli* in a food sample does not

necessarily mean the food is unsafe to eat. Only a subset of *E. coli* is actually pathogenic. In fact, this criterion in food is commonly used for indication of direct or indirect faecal contamination. It is more relevant to personal hygiene, such as improper hand washing. That a [sashimi sample](#) was found to contain excessive *E. coli* was possibly due to unhygienic handling.

Enterobacteriaceae are a large family of biochemically and genetically related bacteria that includes *E. coli* as well as some pathogens (See illustration). They are easily killed by proper cleaning and sanitisation, hence suitable for assessment of general hygiene status of a food product. Their presence in heat treated food indicates inadequate cooking or post-processing contamination. Enterobacteriaceae testing casts a wider net and indicates general sanitation problems, providing an early warning for contamination.



圖2: 選定準則與病原體之間的關係
Figure 2: Relationships between selected criteria and pathogens

菌測試網羅的範圍較大，顯示出一般衛生問題，能及早對污染問題提出警告。

超出準則上限的食物仍然安全嗎？

儘管需氧菌落計數和衛生指示微生物含量高表示一般即食食品可能有潛在問題，但不一定代表該食物不安全或不宜食用。需氧菌落計數是概括的質素指標，衛生指示微生物則顯示衛生情況。兩者的微生物含量超出指引水平並不直接導致食品被視為不安全，但卻表示應作進一步調查、加強監察並採取矯正行動。若問題持續，可考慮抽取食物樣本作調查之用。

另一方面，在詮釋這些準則時，應按照指引所列的食物類別作詮釋。舉例來說，室溫下可保質的罐裝或瓶裝食物從容器取出時一般都是無菌的，若檢測出微生物，即使含量低，也須立即採取跟進行動。此外，指引也涵蓋適用於指定食品的準則，例如擬供生吃的雙殼貝類軟體動物的數值若過高，則可能表示食物在源頭受到污染，或會對健康構成風險。

Is the Food still Safe if these Criteria are Exceeded?

While high levels of ACC and HIOs can signal potential problems for general ready-to-eat food, they do not necessarily mean the food is unsafe or unfit for consumption. The ACC is a broad quality indicator and HIOs indicates the hygiene status. Exceeding guidance levels for ACC or HIOs does not directly lead to a food being considered as unsafe, but it does prompt further investigation, increased monitoring and corrective actions. Investigative food samples can be considered to see if the problem persists.

On the other hand, these criteria have to be interpreted in the context of the food type as stated in the Guidelines. For example, shelf-stable canned or bottled food products are normally sterile when sampled from containers and the detection of ACC, albeit at low levels, would require immediate follow-up actions. Furthermore, in the Guidelines, there are criteria for specific food items, such as *E. coli* in bivalve molluscs intended for raw consumption, in which excessive count would indicate possible contamination at source and potential health risks.

魚類中的甲基汞與食物安全 Methylmercury in Fish and Food Safety

最近，一個購自網店的進口劍魚腩刺身樣本經食物監測計劃被檢出其甲基汞含量超出法例標準。受影響產品已下架。

甲基汞是沿食物鏈積聚的有機汞。攝入過量甲基汞會影響胎兒腦部發育，並影響成人的視力、聽覺、肌肉協調性和記憶力。儘管大部分魚類只含有少量甲基汞，但世界衛生組織認為，進食捕獵性魚類是攝入汞的主要途徑。食安中心的總膳食研究報告發現，捕獵性魚類如吞拿魚、鯊魚和劍魚可能有較高汞含量。

要減少從食物攝入過量金屬污染物，較容易受甲基汞影響的人士，包括孕婦及計劃懷孕的婦女和幼童等，應避免進食捕獵性魚類。業界應向顧客提供所售賣的魚類品種，以及魚製品配料的資料。

Recently, a sample of imported swordfish sashimi obtained from an online shop was detected with methylmercury at a level exceeding the legal limit under the food surveillance programme. The affected product was removed from shelves.

Methylmercury is the organic form of mercury which accumulates along the food chain. Excessive intake of methylmercury can affect foetal brain development, and affect vision, hearing, muscle co-ordination and memory in adults. Though the levels of methylmercury in most fish are low, the World Health Organization is of the opinion that consuming predatory fish species is the main source of mercury intake. The report of the CFS's Total Diet Study also found that predatory fish such as tuna, shark and swordfish may contain high levels of mercury.

To minimise excessive exposure to metal contaminants in food, groups susceptible to the adverse effects of methylmercury such as pregnant women, women planning a pregnancy and young children should avoid eating predatory fish. The trade should inform customers of the fish types and the ingredients of fish products for sale.

雪卡毒與食物中毒 Ciguatera and Food Poisoning

2024年7月，食安中心接獲一宗懷疑雪卡毒食物中毒個案的**通報**。兩人在進食從日本沖繩帶回來的魚類6小時後出現**雪卡毒魚類中毒**的病徵，包括面部、舌頭和四肢麻痺、腹痛及腹瀉，其後在醫院接受治療，無須入院。

雪卡毒魚類中毒是一種因進食含雪卡毒素的海產(主要是珊瑚魚)而引致的疾病。雪卡毒素源於部分雙鞭毛藻，主要積聚在魚類的頭部、肝臟、腸道和卵子。這種毒素沒有味道及氣味，也不會受烹煮或冷藏破壞。

要預防雪卡毒魚類中毒，業界應避免購買來歷不明或可疑的魚類，並嚴格備存記錄。消費者應對自行捕獲的魚多加留神，尤其是當捕魚的地點在不熟悉的水域時。消費者也應減少進食珊瑚魚，尤其是體型較大的珊瑚魚，並避免吃珊瑚魚的頭、皮、內臟和卵子。進食珊瑚魚時，應避免同時喝酒，或吃花生、果仁、豆類等食物，因為這些食物可能會加重雪卡毒的中毒病徵。

A suspected case of ciguatera food poisoning was [reported](#) in July 2024. Two persons exhibited symptoms of [ciguatera fish poisoning \(CFP\)](#), which included numbness over face, tongue and limbs, abdominal pain and diarrhoea six hours after consuming fish brought from Okinawa, Japan. They were treated at a hospital and did not require hospitalisation.

CFP is an illness caused by eating certain seafood, primarily coral reef fish, which contains ciguatera. Ciguatera originates from certain dinoflagellates and mainly accumulates in the head, liver, intestines and roe of fish. The toxin is tasteless, odourless and cannot be destroyed by cooking or freezing.

To prevent CFP, the trade should avoid purchasing fish from unknown or suspicious sources and maintain strict record keeping. Consumers should be careful about the fish they catch themselves, especially from unfamiliar waters. One should consume less coral reef fish, especially large ones, and avoid eating the head, skin, viscera and roe. Avoid the consumption of alcoholic beverages, peanuts, nuts or beans together with coral reef fish as they may aggravate CFP.



風險傳達工作一覽 (二零二四年七月)

Summary of Risk Communication Work (July 2024)

事故/ 食物安全個案 Incidents/ Food Safety Cases: 478	公眾查詢 Public Enquiries: 213	業界查詢 Trade Enquiries: 309	食物投訴 Food Complaints: 643	給業界的快速警報 Rapid Alerts to Trade: 2
給消費者的食物警報 Food Alerts to Consumers: 2	懷疑食物中毒個案通報 Suspected Food Poisoning Alerts: 1	教育研討會/ 演講/ 講座/ 輔導 Educational Seminars/ Lectures/ Talks/ Counselling: 33	上載到食物安全中心網頁的新訊息 New Messages Put on the CFS Website: 51	