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焦點個案

Incident in Focus

飲料中的溴化植物油

Brominated Vegetable Oils in Beverages

Reported by Ms. Joey KWOK, Scientific Officer,
Risk Assessment Section,
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二零一四年五月初，傳媒報道兩間全球飲料製造商因應消費者的關注，宣布停止在旗下所有飲料中使用食物添加劑溴化植物油。本文將探討溴化植物油在食物，尤其是飲料中的用途、安全性和規管。

溴化植物油的用途和安全性

溴化植物油由橄欖油、大豆油和粟米油等植物油溴化而成，在國際編碼系統中的編號是INS 443。在果味飲料中，溴化植物油可以用作乳化劑和穩定劑，以保持香料油(例如柑橘油)懸浮於飲料中，提高飲料穩定性並呈混濁狀。

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(JECFA)在一九七零年曾對溴化植物油進行安全評估。短期毒性研究結果顯示，高劑量的溴化植物油可能會對實驗動物造成退化性心肌損害。此外，脂質和與脂質結合的溴可積聚於人類和實驗動物的脂肪組織及其他組織細胞中。由於當時沒有長期毒性研究的資料，JECFA未能為溴化植物油訂立每日可攝入量。基於沒有證據確定其使用安全，JECFA的結論是溴化植物油不應用作食物添加劑。JECFA此後未有再對溴化植物油進行安全評估。

雖然北美地區使用溴化植物油製造果味飲料已有很長時間，但其實市場上已有經JECFA評估認為可在食物中安全使用，並能達致溴化植物油在有味飲料中的技術功能的替代品，例如異丁酸蔗糖乙酸酯(INS 444)和松香甘油酯(INS 445(iii))。

In early May 2014, media reported that two global beverage manufacturing companies announced their plan to stop using the food additive brominated vegetable oils (BVO) in all their beverages in response to consumers' concerns. This article discusses the uses, safety and regulation of BVO in foods, particularly in beverages.

Uses and Safety of BVO

BVO, which may be identified with International Numbering System (INS) number "443", is produced from vegetable oils, such as olive oil, soya bean oil and corn oil, with the addition of bromine. It is used as an emulsifier and stabiliser in fruit-flavoured beverages. It helps keep flavour oils, such as citrus oils, in suspension in the beverages, providing stability and a cloudy appearance to the products.

The safety of BVO was evaluated by the Joint FAO/WHO Expert Committee on Food Additives (JECFA) in 1970. Studies on short-term toxicity indicated that high doses of BVO could cause degenerative cardiac lesions in experimental animals. Also, accumulation of lipid and lipid-bound bromine was shown in adipose tissue and in intracellular fat of various other tissues in human and experimental animals. No long-term toxicity studies were available at the time of evaluation. JECFA did not establish an Acceptable Daily Intake (ADI) for BVO, and concluded that BVO should not be used as food additive in the absence of evidence indicating its safety. JECFA has not re-evaluated BVO afterwards.

Although BVO has a long history of use in the manufacture of fruit-flavoured beverages in North America, there are suitable alternatives which have been evaluated by JECFA. These alternatives, such as sucrose acetate isobutyrate (INS number "444") and glycerol ester of wood rosin (INS number "445(iii)"), are considered safe for food use and can achieve the technical functions of BVO in flavoured beverages.



溴化植物油主要用於果味飲料中，以保持香料油懸浮於飲料中，並令飲料呈混濁狀。

BVO is mainly used in fruit-flavoured beverages to keep flavour oils in suspension and give the product a cloudy appearance.



食物中溴化植物油的規管

食品法典委員會並沒有為溴化植物油訂立使用條款，而在歐盟、澳洲、紐西蘭、中國內地、新加坡和日本等地，溴化植物油亦不在允許使用的食物添加劑之列。然而，在美國和加拿大，溴化植物油是允許使用於製作果味飲料時需用的某些香料油中，果味飲料製成品中的溴化植物油含量不得超過百萬分之十五。

在香港，法例規定所有出售的食物必須適宜供人食用。鑑於JECFA認為溴化植物油不應用作食物添加劑，而且市場上已有替代品，食物環境衛生署(食環署)在二零零五年向業界和市民明確指出，不應在食物中使用溴化植物油。食物安全專家委員會在二零一四年六月初舉行的會議上亦認同不應在食物中使用溴化植物油。

監測本港食物中的溴化植物油

食環署一向有就食物中的溴化植物油進行專項監察，過去所檢測的73個樣本全部不含溴化植物油。因應最近的事態發展，食物安全中心(中心)在今年五月和六月檢測了25個從北美地區進口的飲料樣本，其中一個的配料表上列有溴化植物油，並檢出含百萬分之零點九溴化植物油。該款產品目前沒有在本港出售。如有足夠證據，中心會提出檢控。以該樣本測出的溴化植物油含量，正常飲用不會影響健康，消費者無須憂慮。

注意要點：

- JECFA的結論是沒有證據確定溴化植物油的使用安全，因此不應用作食物添加劑。
- 食品法典委員會及部分國家不准使用溴化植物油作為食物添加劑。
- 溴化植物油有安全可用的替代品。

給業界的建議

1. 切勿在食物中使用溴化植物油。
2. 使用其他可在食物中安全使用的替代品作為乳化劑和穩定劑。

給市民的建議

1. 保持均衡飲食，以免因偏食幾類食品而過量攝入食物添加劑。

Regulation of BVO in Foods

Provision for the use of BVO has not been included in Codex Standard, nor is BVO included in the list of permitted food additives in places including countries in the European Union, Australia, New Zealand, Mainland China, Singapore and Japan. In the US and Canada, nevertheless, BVO is permitted in certain flavourings for use in fruit-flavoured beverages at a maximum level of 15 ppm in the beverages as consumed.

In Hong Kong, all foods for sale in Hong Kong must be fit for human consumption. Taking into consideration JECFA's opinion that BVO should not be used as food additive and that there are available alternatives, the Food and Environmental Hygiene Department (FEHD) made known to the trade and public in 2005 that BVO should not be used in foods in Hong Kong. The Expert Committee on Food Safety also agreed during their latest meeting held in early-June 2014 that BVO should not be used in foods.

Surveillance on BVO in Foods in Hong Kong

The FEHD had conducted targeted surveillance on BVO in foods in the past; none of the 73 samples tested were found positive. In response to the recent development, the Centre for Food Safety (CFS) took 25 beverage samples imported from North America in May and June this year for testing. It was noticed that one sample had BVO listed as an ingredient and the presence of BVO at a level of 0.9 ppm was confirmed in laboratory test. The CFS noted that the product in question is currently not available for sale in the local market. Prosecution action will be taken if there is sufficient evidence. Based on the level of BVO detected in the concerned beverage sample, there is no evidence suggesting that usual consumption would cause significant health risk, and there is no need for undue alarm for consumers.

Key Points to Note:

- JECFA has concluded that BVO should not be used as food additive in the absence of evidence indicating its safety.
- Codex and some countries do not include BVO in the list of permitted food additives.
- Suitable alternatives to BVO are available.

Advice to the Trade

1. Not to use BVO in foods.
2. Use suitable alternative emulsifiers and stabilisers that are safe for food use.

Advice to the Public

1. Maintain a balanced diet so as to avoid excessive exposure to food additives from a small range of food items.

風險傳達 工作一覽 Summary of Risk Communication Work

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食物、致癌物質與癌症 — 下篇

Food, Carcinogens and Cancer - Part II

食物安全中心
風險評估組
科學主任游天頌先生報告

Reported by Mr. Arthur YAU, Scientific Officer,
Risk Assessment Section,
Centre for Food Safety

我們這幾期會探討食物、致癌物質與癌症三者之間的關係，本文為該系列之二。

致癌物質是如何引致癌症的？

致癌物質是指會引發癌症的物質，按其致癌機理可分為基因毒性致癌物和非基因毒性致癌物兩類。基因毒性致癌物是透過直接破壞脫氧核糖核酸(DNA)而誘發癌症。這類致癌物沒有一個絕對安全的攝入量，即使少量也有可能破壞基因物質，從而增加發生癌症的機會，因此不可能為基因毒性致癌物釐定一個安全參考值。非基因毒性致癌物則不是與DNA產生反應，而是通過破壞細胞結構、改變細胞分裂速率及其他增加基因錯誤風險的作用而致癌。非基因毒性致癌物通常可確定閾值，低於此值將觀察不到毒性或致癌作用。

評估物質的致癌性

致癌性是指可引致癌症的能力或傾向。物質的致癌性評估過程極其複雜且涉及嚴謹細密的科學判斷，通常由權威癌症研究組織，例如世界衛生組織(世衛)轄下的國際癌症研究機構統籌進行。該機構在評估物質對人類的致癌性時，會通盤考慮所有掌握的證據，以作出全面的判斷。根據人體研究結果、動物實驗結果以及其他相關數據等證據的充分程度，有關物質被分為四組。

This is the second article in a series on the relation of food, carcinogens and cancer.

How do Carcinogens Act?

A carcinogen is a substance that can cause cancer. Carcinogens can be classified according to their mode of action into genotoxic and non-genotoxic. Genotoxic carcinogens induce cancers via a mechanism involving direct damage to DNA. For this type of carcinogens, it is assumed that no level of exposure is entirely safe and even at low levels, some damage to the genetic material may increase the chance of developing cancer. Therefore, no safe reference value can be established. For non-genotoxic carcinogens, instead of acting on DNA, they induce cancers through other mechanisms such as disrupting structure of the cell, changing the rate of cell division and other processes that increase the risk of genetic error. There is usually a threshold dose for non-genotoxic carcinogens, below which no toxic or carcinogenic effects are seen.

Evaluation of Substances for the Likelihood of Causing Cancer

Carcinogenicity refers to the ability or tendency to produce cancer. As evaluation of the carcinogenicity of substances involves complicated processes and complex scientific judgement, the work is often coordinated by esteemed cancer research organisations such as the International Agency for Research on Cancer (IARC) of the World Health Organization (WHO). When evaluating the carcinogenicity of substances to humans, IARC considers the body of evidence as a whole in order to reach an overall evaluation. The substances are classified into four groups according to the strength of evidence derived from studies in humans and in experimental animals and other relevant data.

國際癌症研究機構按物質致癌性制定的分類
IARC classifications of substances based on their carcinogenicity

組別 Group	說明 Description	與食物有關的例子 Food-related Examples
1	令人類患癌： • 對人類致癌性證據充分。 Carcinogenic to humans: • Evidence is sufficient in humans.	黃曲霉毒素、酒精飲品、無機砷化合物、苯並[a]芘、六價鉻化合物、二噁英、多氯聯苯、中式鹹魚 Aflatoxins, alcoholic beverages, inorganic arsenic compounds, benzo[a]pyrene (B[a]P), chromium (VI) compounds, dioxins, polychlorinated biphenols (PCBs), Chinese-style salted fish
2A	可能令人類患癌： • 對人類致癌性證據有限，對實驗動物致癌性證據充分。 Probably carcinogenic to humans: • Evidence is limited in humans; and is sufficient in experimental animals.	丙烯酰胺、無機鉛化合物、經由飲食攝入的硝酸鹽和亞硝酸鹽而產生的某些亞硝基化合物 Acrylamide, inorganic lead compounds, certain nitroso compounds resulted from ingested nitrate / nitrite
2B	或可能令人類患癌： • 對人類致癌性證據有限，對實驗動物致癌性證據並不充分；或 • 對人類致癌性證據不足，但對實驗動物致癌性證據充分。 Possibly carcinogenic to humans: • Evidence is limited in humans; and is less than sufficient in experimental animals; or • Evidence is inadequate in humans; but is sufficient in experimental animals.	蕨菜、伏馬毒素B ₁ 、赭曲霉毒素A Bracken fern, fumonisin B ₁ , ochratoxin A
3	在會否令人類患癌方面未能分類： • 對人類致癌性證據不足，對實驗動物致癌性證據不足或有限。 Not classifiable as to its carcinogenicity to humans: • Evidence is inadequate in humans; and is inadequate or limited in animals.	三價鉻化合物、金屬鉻、桔霉素、棒曲霉素 Chromium (III) compounds, metallic chromium, citrinin, patulin
4	可能不會令人類患癌。 Probably not carcinogenic to humans.	-

健康生活模式可減低患癌風險

癌症由多種因素引起，其中吸煙被確定為最主要的致癌成因。其他的致癌因素還包括膳食、飲酒、體能活動、傳染病、激素和輻射等。據世衛估計，在工

Healthy Lifestyle Can Reduce Cancer Risk

Cancer is caused by a variety of factors. The most important established cause of cancer is tobacco smoking; others include diet, alcohol consumption, physical activity, infections, hormonal factors and radiation. According to the WHO, dietary factors are estimated to account for about 30% of cancers in industrialised

業化國家，膳食因素約與30%的癌症有關，成為僅次於煙草，理論上可預防的致癌因素。而在發展中國家，估計這一比例大概亦佔20%左右。因此，只要建立健康的飲食習慣和生活模式，便能減低患癌的風險。世衛除了強調保持體重適中和定期進行體能活動的重要性外，在飲食方面還提出了下列建議：

- 每日應進食最少400克蔬果。只要遵循衛生署的建議，每天進食最少兩份水果和三份蔬菜，便可達到這個目標。
- 建議不要飲用含酒精的飲料。
- 經發酵的中式鹹魚的食用量要適中，尤其是在兒童期。鹽醃食物和食鹽的總食用量應適中。
- 不要食用太多醃製肉類(如香腸、沙樂美腸、煙肉、火腿等)。
- 盡量減少攝入黃曲霉毒素。黃曲霉毒素是一類霉菌毒素，較常見於發霉的花生、木本堅果、玉米、無花果乾、穀物和上述食物的製品中。
- 不要食用太熱(滾燙)的食物或飲料。

下一期我們會詳細探討幾種食物中的致癌物質，以及如何減少這些物質在食物中的含量。

countries, making diet second only to tobacco as a theoretically preventable cause of cancer. This proportion is thought to be about 20% in developing countries. Hence, you can reduce your risk of developing cancer by having a healthy diet and lifestyle. The WHO, besides stressing the importance of maintaining suitable body weight and regular physical activity, gives the following recommendations related to foods and drinks:

- Consumption of at least 400g per day of total fruits and vegetables is recommended. This can be achieved by following the [Department of Health's recommendation](#) of having at least two servings of fruits and three servings of vegetables daily.
- Consumption of alcoholic beverages is not recommended.
- Chinese-style fermented salted fish should only be consumed in moderation, especially during childhood. Overall consumption of salt preserved foods and salt should be moderate.
- Consumption of preserved meat (e.g. sausages, salami, bacon, ham, etc.) should be moderate.
- Exposure to aflatoxins should be minimised. Aflatoxins are mycotoxins that are more likely to be found in mouldy peanuts, tree nuts, corn, dried figs, cereals and their products.
- Do not consume foods or drinks when they are at a very high temperature, i.e. scalding hot.

In the next issue, we will go into more details about certain food carcinogens and the measures to reduce their levels in foods.

食物事故點滴 Food Incident Highlight

確保學校午餐安全

上月本港發生一宗懷疑食物中毒個案，93人於學校進食午膳後出現腹瀉、肚痛、嘔吐、噁心和發燒等症狀。有關人員在視察食物製作過程時發現，該校的午膳供應商存放食物的溫度不當。

學校午餐一般是由食物製造廠預先大量烹製後放在保溫箱或飯盒裏直至用餐時間。如溫度控制不當便容易滋生細菌和產生毒素。為防滋生有害微生物，熱食應存於攝氏60度以上；冷食須存於攝氏4度或以下。食物供應商應確保員工保持良好的個人和環境衛生，並在準備飯盒時遵從**食物安全五要點**。食物處理人員如出現發燒、腹瀉及嘔吐等症狀，便不應處理食物。學校管理層在挑選午餐供應商時可參考食物安全中心編製的《[如何確保學校午餐安全指引](#)》。

Keep School Lunches Safe

Last month, a suspected food poisoning case was reported where 93 persons developed diarrhoea, abdominal pain, vomiting, nausea and fever after having lunch in school. Review of the production process showed that the school lunch provided by the caterer had been kept under inadequate temperature.

Foods for school lunches are usually prepared in bulk by food factories and kept in insulated containers or lunch boxes before serve. Failure to adequately control the holding temperature allows the growth of bacteria and toxin production. To keep harmful microorganisms at bay, hot food should be kept at above 60°C and cold food at 4°C or below. Members of the trade are advised to observe good personal and environmental hygiene, and follow the [Five Keys to Food Safety](#) when preparing lunch boxes. Food handlers having symptoms such as fever, diarrhoea and vomiting should not handle food. Management of schools can make reference to the "[Guidelines on How to Ensure School Lunches Ordered Are Safe](#)" prepared by the Centre for Food Safety when selecting lunch suppliers.

美國爆發與有機奇異籽粉有關的沙門氏菌感染事件

食物安全中心(中心)上月透過恆常的食物事故監察系統，得悉美國疾病預防及控制中心公布指美國多州爆發與美國製有機奇異籽粉有關的沙門氏菌感染事件。中心經調查後確認其中一款受影響的產品在本港有售。中心已立即通知業界停止出售有關產品，並發出**食物警報**，提醒市民切勿食用。

感染沙門氏菌可引致發燒、嘔吐、肚痛及腹瀉等，嚴重者更會造成全身感染。沙門氏菌對免疫力較低的人士會有較嚴重的影響，甚至可引致死亡。持有該款產品的市民，應立即停止食用。如食用上述產品後感到不適，應盡快求醫。中心會密切監察情況，並繼續與美國有關當局保持聯繫，跟進事件。

Outbreak of Salmonella Associated with Organic Sprouted Chia Powder in the US

Last month, the Centre for Food Safety (CFS) detected through its routine Food Incident Surveillance System that the Centers for Disease Control and Prevention (CDC) in the United States (US) reported a [multistate outbreak of Salmonella infections associated with organic sprouted chia powder](#) manufactured in the US. Investigation by the CFS revealed that one of the products concerned was available for sale in the local market. The CFS has immediately alerted the trade to stop sale and issued a [food alert](#) warning the public not to consume the affected product.

Salmonella infection may cause fever, vomiting, abdominal pain and diarrhoea. In severe cases, the infection can become systemic. The effects on people with lowered immunity could be more severe and sometimes may even lead to death. Consumers who possess the affected product should stop consuming it immediately and seek medical treatment if feeling unwell after eating the product. The CFS will continue to closely monitor the situation and liaise with the US authorities to follow up on the outbreak.



受影響的奇異籽粉 (照片來自美國食物及藥物管理局)

The affected chia seed powder (Photo by courtesy of the US Food and Drug Administration)