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Incident in Focus

平衡吃魚的利弊： 甲基汞的風險與DHA及EPA的益處

Balancing the Risks of Methylmercury and the Benefits of DHA and EPA from Fish

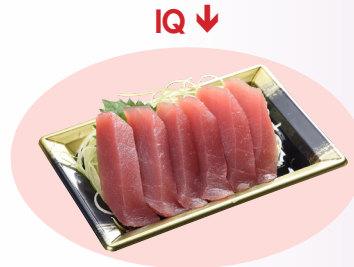
食物安全中心風險傳達組
科學主任陳蓉蓉女士報告

Reported by Ms. Melva CHEN, Scientific Officer,
Risk Communication Section, Centre for Food Safety

某消費者組織最近發表報告，指本港市面一些吞拿魚刺身樣本被檢出甲基汞含量偏高，引起一些消費者對吃魚的關注。其實，食物安全中心(中心)在過去十多年來作了多項相關的研究，並提出了多項吃魚的建議。本文將闡述吃魚的利與弊，讓消費者知所選擇。



IQ ↑



IQ ↓

圖一：孕婦適量進食各種魚類，或有助提高胎兒日後的智商。反之，經常進食吞拿魚等某些捕獵性魚類，或會導致胎兒日後的智商較低。

Figure 1. Pregnant women eating a variety of fish in moderation may boost their children's intelligence quotient (IQ). Contrarily, those eating certain predatory fish such as tuna too often may decrease their children's IQ.

甲基汞影響神經系統，尤其是胎兒及嬰兒發育中的腦部。雖然大部分魚類含有少量甲基汞，但魚含有多種人體必要的營養素，例如奧米加-3脂肪酸、DHA(二十二碳六烯酸)及EPA(二十碳五烯酸)，有利腦部發育。

魚類為何含有甲基汞？

汞(俗稱水銀)是一種天然存在的重金屬，隨工業廢物進入環境中，以不同的形態存在。水中的微生物把汞轉化為毒性較強的甲基汞，為水中的生物所吸收，積聚在食物鏈內。因此，捕獵性魚類的甲基汞含量通常較高。

進食各種魚類，利多於弊

世界衛生組織(世衛)指出，母親在懷孕期間從魚類攝入甲基汞、DHA及EPA對兒童智商的影響，可以量化。為了量度有關影響，中心化驗了不同魚類的甲基汞、DHA及EPA的平均含量，然後按本港20至49歲育齡婦女對魚類的食用量，根據世衛的模式進行利弊分

A recent report published by a consumer organisation about high levels of methylmercury detected in some locally-sourced tuna sashimi has raised concern of some consumers about eating fish. In fact, over the past decade, the Centre for Food Safety (CFS) has conducted several relevant studies and formulated advice on fish consumption. This article will discuss the risks and benefits of eating fish to help consumers make informed choices.

Methylmercury affects the nervous system, particularly the developing brain of foeti and infants. While the levels of methylmercury in most fish are low, there are many essential nutrients in fish such as omega-3 fatty acids, docosahexaenoic acid (DHA) and eicosapentaenoic acid (EPA) which are beneficial to brain development.

How Does Fish Contain Methylmercury?

Mercury is a heavy metal that occurs naturally and being introduced into the environment from industrial waste. Mercury exists in different forms. Microorganisms in the water convert mercury into the more toxic methylmercury which is readily taken up by living organisms in the water and accumulates up the food chain. Thus, predatory fish usually contain higher levels of methylmercury.

Benefits Outweigh the Risks by Consuming a Variety of Fish

According to the World Health Organization (WHO), the effects on children's intelligence quotient (IQ) resulting from the intake of methylmercury and DHA and EPA from fish by their mothers during pregnancy could be quantified. To measure the effects, the levels of methylmercury and DHA and EPA in different types of fish were analysed. Based on the WHO's model, a risk-benefit analysis was conducted by the CFS using the consumption data of fish of women of childbearing age

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析。結果顯示，平均每星期吃450克(約12兩)市面常見魚類的母親，其胎兒日後的智商或會有所提高(高達5.6分)。

不過，利弊分析亦發現，若經常進食的魚類是吞拿魚等捕獵性魚類，則或會導致胎兒日後的智商較低。世衛表示，個人智商稍為下降幾分也許不為人所注意，但可導致整體人口智力水平產生重大變化。本港約有11%育齡婦女的甲基汞攝入量超出健康參考值。因此，婦女在懷孕期間宜適量進食各種魚類，但應避免吃體型較大的捕獵性魚類及甲基汞含量可能偏高的魚類。

保障市民健康，避免攝入過量甲基汞

在本港，中心恆常監測食物中的汞含量。過去三年，中心抽取了2700個水產樣本進行檢測，當中九個樣本的汞含量超出法定上限，中心已採取相應的跟進行動。

《食物攙雜(金屬雜質含量)(修訂)規例》(第132V章)將於二零一九年十一月起分階段實施。魚類的甲基汞含量上限為每公斤0.5毫克，較食品法典委員會就吞拿魚所訂的甲基汞含量上限每公斤1.2毫克更為嚴格。這是考慮到本港育齡婦女攝入的甲基汞分量較高，因而作出的審慎決定，以加強保障胎兒的健康成長。與此同時，中心發出了《孕婦、計劃懷孕的婦女和幼童進食魚類建議》。

(20-49 years old). The results revealed that there could be net gain of children's IQ (up to 5.6 points) from mothers of average consumption group who ate 450g (~12 taels) per week of those commonly available fish in markets.

However, the risk-benefit analysis also found that pregnant women who ate certain types of predatory fish such as tuna too often might cause a decrease in IQ points of their children. The WHO stated that losses in few IQ points may go unnoticed in an individual, but it can cause an important shift in intellectual capacity at the population level. In Hong Kong, about 11% of women of childbearing age had methylmercury level exceeding the health-based guidance value. Therefore, moderate consumption of a variety of fish and avoid choosing [large predatory fish and fish which may contain high levels of methylmercury](#) in diet during pregnancy are recommended.

Protecting the Public from Exposure to Excessive Methylmercury

Locally, routine surveillance of mercury in food is in place. Over the past three years, the CFS has taken 2700 aquatic products for testing. Nine samples were found to be exceeding the legal limit, with follow-up actions taken accordingly.

The Food Adulteration (Metallic Contamination) (Amendment) Regulation (Cap. 132V) will come into effect in phases from November 2019. The maximum limit for methylmercury in fish will be 0.5 mg/kg, a level which is more stringent than the Codex standard of 1.2 mg/kg methylmercury for tuna. This prudent decision was made by taking the relatively high exposure to methylmercury in local women of childbearing age into account to enhance protection of the healthy development of foeti. In parallel, the CFS has issued an "[Advice for Pregnant Women, Women Planning Pregnancy and Young Children on Fish Consumption](#)".

注意事項

1. 甲基汞是汞的形態之一，毒性較強，影響神經系統，尤其是胎兒及嬰兒發育中的腦部。
2. 孕婦適量進食各種常見魚類及魚類製品，或有助提高胎兒日後的智商。反之，經常進食體型較大的捕獵性魚類或甲基汞含量偏高的魚類，或會導致胎兒日後的智商較低。
3. 市民應避免攝入過量甲基汞。

Key Points to Note:

1. Methylmercury is a more toxic form of mercury affecting the nervous system, particularly the developing brain of foeti and infants.
2. Pregnant women eating a variety of commonly available fish and fish products in moderation may boost their children's IQ. Contrarily, those eating large predatory fish or fish which contain high levels of methylmercury too often may decrease their children's IQ.
3. Consumers should avoid excessive exposure to methylmercury.

給消費者的建議

- 孕婦、計劃懷孕的婦女及幼童應避免食用體型較大的捕獵性魚類及甲基汞含量可能偏高的魚類。
- 魚類含有多種人體必要的營養素，例如奧米加-3脂肪酸及優質蛋白質。為了飲食均衡，宜適量進食各種魚類。
- 保持均衡並多元化的飲食，以免因偏吃而攝入過量金屬污染物。

Advice to Consumers

- Pregnant women, women planning for pregnancy and young children should avoid eating large predatory fish and fish which may contain high levels of methylmercury.
- Fish contain many essential nutrients, such as omega-3 fatty acids and high quality proteins. Moderate consumption of a variety of fish is recommended for a balanced diet.
- Maintain a balanced and varied diet so as to avoid excessive exposure to metallic contaminants from a limited range of food items.

給業界的建議

- 向可靠的供應商採購食物。
- 妥善保存貨源資料，以便有需要時可追溯來源。
- 向顧客提供所售賣和供應的魚類品種，以及魚製品所使用的魚類品種資料。

Advice to the Trade

- Obtain food supplies from reliable sources.
- Maintain proper records to enable source tracing when required.
- Inform customers of the type of fish that is sold, served, or used in fish products.

食物中的脫氧雪腐鐮刀菌烯醇及棒曲霉素

Deoxynivalenol and Patulin in Food

食物安全中心風險評估組
科學主任馬嘉明女士報告

Reported by Ms. Janny MA, Scientific Officer,
Risk Assessment Section, Centre for Food Safety

上一期我們討論過黃曲霉毒素這種已知致癌性最強的霉菌毒素。除了致癌之外，這些由霉菌(真菌)所產生的天然毒素可對人類及動物健康造成其他不良影響。現在讓我們繼續談談食物中另外兩種影響健康的霉菌毒素，分別是脫氧雪腐鐮刀菌烯醇及棒曲霉素。



圖二：果萼展開的蘋果較易出現果核腐爛
Figure 2. Apples with an open calyx are more susceptible to core rots.

In the last article, we talked about [aflatoxins](#), the most potent cancer-causing mycotoxins identified. Apart from cancer, these naturally occurring toxins produced by moulds (fungi) can also cause some other adverse health effects to both humans and animals. Now, let's continue with two other mycotoxins of health concern, namely deoxynivalenol (DON) and patulin, which may also be found in our food.

什麼是脫氧雪腐鐮刀菌烯醇？

脫氧雪腐鐮刀菌烯醇(又稱嘔吐毒素)主要由禾穀鐮刀菌及黃色鐮刀菌產生，是一組化學上相關、稱為B型單端孢霉烯的霉菌毒素中的主要化合物。這些產生脫氧雪腐鐮刀菌烯醇的霉菌可在土壤中找到，是穀物(尤其是小麥及玉米)的致病菌。

脫氧雪腐鐮刀菌烯醇最令人關注的安全問題，是攝入後可能引發急性疾病。人類在攝入後30分鐘內會出現噁心、嘔吐、腹瀉、腹痛及發燒等徵狀，與其他胃腸道疾病，例如由蠟樣芽孢桿菌的致吐毒素所引致的徵狀相若，不易分辨。國際癌症研究機構把某些鐮刀菌衍生的毒素(包括脫氧雪腐鐮刀菌烯醇)列為第3組物質，即未能分類會否令人類患癌。

本港市民從膳食中攝入脫氧雪腐鐮刀菌烯醇的情況

食物安全中心進行了總膳食研究，估算本港市民從膳食中攝入各種霉菌毒素，包括脫氧雪腐鐮刀菌烯醇的分量。研究結果顯示，大部分(83%)的食物樣本都檢測不到脫氧雪腐鐮刀菌烯醇，而穀物及穀物製品則是攝入脫氧雪腐鐮刀菌烯醇的主要來源。報告亦指出，本港市民從膳食中攝入脫氧雪腐鐮刀菌烯醇的分量，對健康造成嚴重不良影響的機會不大。

如何減少穀物中的脫氧雪腐鐮刀菌烯醇

由於霉菌無處不在，目前要完全消除穀物中的脫氧雪腐鐮刀菌烯醇是不可能的。儘管如此，遵循優良務農規範及優良製造規範，可減少穀物受脫氧雪腐鐮刀菌烯醇污染的機會。有關措施包括但不限於：減少田間的蟲害及霉菌感染；新收割的穀物應視乎情況立即進行乾製處理；把穀物貯存在乾爽及通風良好的地方，並避免溫度變化過大；妥為進行篩選和清潔，以去除受污染的穀物。

此外，穀粒外層的脫氧雪腐鐮刀菌烯醇含量通常較高。在加工前去麩可大幅減少由胚乳製成的穀物製品(例如白麵粉)所含的脫氧雪腐鐮刀菌烯醇分量。

什麼是棒曲霉素？

棒曲霉素是由多種霉菌(例如青霉菌屬及曲霉菌屬)所產生的另一種霉菌毒素。雖然棒曲霉素可在其他食物中找到，但大多存在於蘋果及蘋果製品中，例如蘋果汁。

動物攝入大量棒曲霉素，可引致肝臟、脾臟及腎臟受損，以及對免疫系統造成毒性損害。至於人類，有報告指會出現噁心、胃腸道不適及嘔吐徵狀。雖然棒曲霉素被認為具有基因毒性(破壞基因)，但國際癌症研究機構表示由於未有足夠證據，未能就棒曲霉素會否令人類

What is DON?

DON (also known as vomitoxin), mainly produced by *Fusarium graminearum* and *Fusarium culmorum*, is the major compound in a group of chemically-related mycotoxins called type B trichothecenes. These DON-producing moulds can be found in soil and are pathogens of cereals, particularly wheat and maize.

The primary safety concern of DON in humans is its potential to induce acute illness upon ingestion. Symptoms including nausea, vomiting, diarrhoea, abdominal pain and fever can develop within 30 minutes of exposure and are not easy to distinguish from other gastrointestinal illnesses, for example those caused by the emetic toxins of *Bacillus cereus*. The International Agency for Research on Cancer (IARC) classified toxins derived from certain *Fusarium* species including DON as Group 3 agents, i.e. not classifiable to its carcinogenicity to humans.

Dietary Exposure to DON in the Local Population

The Centre for Food Safety has conducted a [Total Diet Study](#) to estimate the dietary exposure to various mycotoxins including DON in the local population. Results of the study revealed that the majority of the food samples were not detected with DON (i.e. 83%) at all while cereals and their products were the main dietary source of DON. It also suggested that the local population was unlikely to experience major undesirable health effects of DON.

Ways to Reduce DON in Cereals

Due to the ubiquity of moulds, complete elimination of DON in cereals is not possible in the meantime. Nevertheless, implementation of Good Agricultural Practices and Good Manufacturing Practices can reduce contamination of DON in cereals. These include, but are not limited to, minimising insect damage and fungal infection in the field; drying freshly harvested cereals immediately as appropriate; storing grains in a dry, well-vented place with minimal temperature fluctuations; removing contaminated grains by proper sorting and cleaning, etc.

In addition, outer parts of the cereal kernels typically contain higher levels of DON. Removal of the bran layers before processing can significantly reduce the level of DON in products derived from the endosperm, e.g. white flour.

What is Patulin?

[Patulin](#) is another mycotoxin, produced by a variety of moulds such as *Penicillium* and *Aspergillus*. Even though patulin can be found in other foods, patulin mostly occurs in apples and their products (e.g. apple juices).

Ingesting high doses of patulin can induce liver, spleen and kidney damage, as well as toxicity to the immune system in animals. For humans, nausea, gastrointestinal disturbances and vomiting have been reported. Although patulin is considered to be genotoxic (DNA-damaging), IARC concluded that no evaluation could be made due to inadequate evidence regarding the carcinogenicity of patulin to humans i.e. not classifiable as to its carcinogenicity to humans (Group 3).

致癌作出評估，即未能分類會否令人類患癌(第3組物質)。

如何減少蘋果汁中的棒曲霉毒素

由於棒曲霉毒素通常存在於腐爛的蘋果中，因此蘋果應妥為處理和貯存，以盡量避免在食品供應鏈中受損和滋生霉菌。

要留意的是，在生產蘋果汁前清洗蘋果或去除發霉組織，不一定能消除蘋果內所有已存在的棒曲霉毒素，這是因為部分棒曲霉毒素或已擴散至看似健康的組織。因此，不應進食腐爛或發霉的蘋果，也不應用來製作果汁。

此外，果萼(花托)展開的蘋果品種特別容易出現果核腐爛，因為霉菌可以早在蘋果生長時已進入果核，故應定期在榨汁前檢查這些品種蘋果的內部有否腐爛。另外值得注意的是，加熱處理(例如巴士德消毒)一般能消滅蘋果汁中的霉菌，但不能消除已存在的棒曲霉毒素。

Ways to Reduce Patulin in Apple Juices

Since patulin is often found in rotten apples, apples should be handled and stored properly so as to minimise damage and mould growth along the food supply chain.

Of note, neither washing of apples nor removal of mouldy tissues prior to production of apple juices will necessarily remove all patulin present in the apples. This is because some traces of patulin may have already diffused into apparently healthy tissues. Hence, rotten or mouldy apples should not be eaten nor used for making juices.

Besides, apple varieties with an open calyx (blossom end) are particularly susceptible to core rots as moulds can enter the core early during the fruits' development. These varieties should be examined for internal rots by regular checks immediately prior to pressing. It is also worth noting that heat treatment e.g. pasteurisation of apple juice can generally destroy moulds, but it cannot destroy any patulin which is already present.

食物事故點滴 Food Incident Highlight

本港市面水產中的有機錫化合物

Organotin Compounds in Aquatic Products Available in Local Markets

食物安全中心上月公布有關水產中有機錫化合物的風險評估研究結果。中心從本港市面抽取約340個水產樣本進行檢測，包括魚類、甲殼類動物及軟體類動物。

有動物研究顯示，有機錫化合物會影響免疫系統，干擾內分泌，損害生殖能力，並影響發育。有機錫化合物被用作木材防腐劑、船底防污劑及聚氯乙烯穩定劑，會長時間存留在環境中，並可通過食物鏈在生物體內積聚。

是次研究所抽取的樣本約有六成檢出含有有機錫化合物，而魚類是主要的膳食攝入來源。不過，攝入量一般及攝入量高的成年人從膳食所攝取的有機錫化合物分量，均低於健康參考值。研究結果顯示，本港成年人從本地售賣的水產攝入有機錫化合物以致健康受損的機會不大。

Last month, the Centre for Food Safety announced the results of a risk assessment study on organotin compounds (OTCs) in aquatic products. About 340 samples of aquatic samples including fish, crustaceans and molluscs were taken at local markets for testing.

OTCs affect the immune system, cause endocrine disruption and have reproductive and developmental effects in animal studies. They are used as wood preservatives, anti-fouling products on ships and polyvinyl chloride (PVC) stabilisers. OTCs are relatively persistent in the environment and capable of bioaccumulating along the food chain.

About 60% of the samples taken in the study contained OTCs and fish was the major contributor to OTC dietary exposure. However, the total OTC exposure of average and high consumers of the adult population was below the health-based guidance value. The findings indicated that adverse health effects due to OTC exposure from aquatic products available on the local market are unlikely in the Hong Kong adult population.

慎防紅豆杉引致中毒

Beware of Poisoning Caused by Taxus

最近，衛生署衛生防護中心接獲通報一宗飲用自製含紅豆杉酒的中毒個案。一名患者在飲用含紅豆杉酒不久後，出現肌肉痛、下肢無力及麻痺等病徵，需入院接受深切治療。

紅豆杉屬紫杉的一種。所有紫杉類植物均含高毒性物質紫杉鹼。服下紫杉後可能會出現腸胃病徵，然後出現肌肉無力等中毒徵狀。情況嚴重者會心跳過速，並隨之心跳緩慢、低血壓、呼吸困難、抽搐及昏迷，甚或致命。到目前為止，並無解毒藥物可治療紅豆杉中毒。

為免中毒，市民不應食用含有紅豆杉或不知名植物的產品，例如酒類。如懷疑因食用含紅豆杉的產品引致中毒，應立即求醫。

Recently, a poisoning case related to consumption of self-prepared wine containing taxus was reported to the Centre for Health Protection of the Department of Health. A victim suffered from muscle pain, lower limb weakness and numbness shortly after consumption of the taxus-containing wine and intensive care in hospital was required.

Taxus belongs to a genus of yew. All species of yew contain highly poisonous substances known as taxine alkaloids. Symptoms of intoxication including gastrointestinal symptoms followed by muscle weakness may occur after consumption. In severe cases, tachycardia followed by bradycardia, hypotension, respiratory depression, convulsion, coma and even death may result. To date, no specific antidote is available.

To prevent poisoning, public members should not consume products (e.g. wine) containing taxus or unknown plants. It is advised to seek immediate medical attention if poisoning related to consumption of taxus-containing product is suspected.

風險傳達工作一覽 (二零一九年四月)

Summary of Risk Communication Work (April 2019)

