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雪卡毒魚類中毒

Ciguatera Fish Poisoning

食物安全中心風險評估組
科學主任林漢基博士報告

Reported by Dr. John LUM, Scientific Officer,
Risk Assessment Section, Centre for Food Safety

食物安全中心在2022年8月接獲一宗懷疑雪卡毒魚類中毒個案的通報，患者在進食魚類大約5小時後出現腹痛、腹瀉、眩暈及四肢麻痺。有關的魚類為一條10斤重的沙巴龍躉。到底何謂雪卡毒魚類中毒？

何謂雪卡毒魚類中毒？

雪卡毒魚類中毒是一種由進食含雪卡毒素的海產(主要是珊瑚魚)引致的疾病。雪卡毒素包含逾20種同系物，化學結構成梯狀(圖1)。

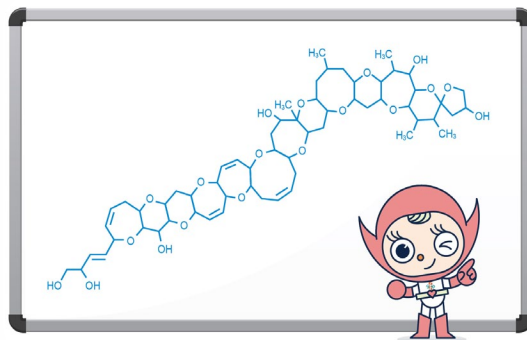


圖1：雪卡毒素同系物CTX1B的化學結構(摘自美國食品及藥物管理局2012年編製的Bad Bug Book, Foodborne Pathogenic Microorganisms and Natural Toxins)

Figure 1: Chemical structure of ciguatoxin congener CTX1B (Adapted from Food and Drug Administration, Bad Bug Book, Foodborne Pathogenic Microorganisms and Natural Toxins, 2012)

雪卡毒素的特性

雪卡毒素屬脂溶性、耐熱、沒有氣味及味道，也不受烹煮或冷藏影響。雪卡毒素主要積聚在魚類的頭、肝、腸和卵。雪卡毒素並非由魚類產生，而是源於稱為雙鞭毛藻(干比亞藻屬和福岡屬)的水藻。珊瑚魚吃下這些有毒水藻而變得有毒。這些有毒水藻生長在珊瑚礁一帶平靜及受保護的水域。活得較久及體積較大的魚類所含的雪卡毒素水平一般較高。然而，因進食養殖魚類而引致雪卡毒魚類中毒的風險則非常低。

雪卡毒魚類中毒的病徵

雪卡毒魚類中毒可引發超過100種腸胃、神經及心血管系統的病徵，如口腔刺痛麻痺、噁心、嘔吐、腹瀉和暈眩等。患者會在進食有毒魚類後30分鐘至24小時內出現急性中毒徵狀。大部分病徵與其他食物中毒不適類似，但冷熱感覺顛倒(即觸碰冷物會引起灼熱感)，則是雪卡毒魚類中毒的典型特別病徵。

The Centre for Food Safety (CFS) received notification in August 2022 of a suspected ciguatoxin poisoning case who developed abdominal pain, diarrhoea, dizziness and limb numbness about five hours after consuming fish. The incriminated fish was a 10-catty Sabah Giant Grouper. So, what is ciguatera fish poisoning?

What is Ciguatera Fish Poisoning?

Ciguatera fish poisoning (CFP) is an illness caused by eating certain seafood, primarily coral reef fish, which contains the poisonous ciguatoxin. Ciguatoxins are a group of toxins that consist of more than 20 congeners, with a ladder-like chemical structure (Figure 1).

Characteristics of Ciguatoxins

Ciguatoxins are lipid-soluble, heat stable, odourless, tasteless and not affected by cooking or freezing. They mainly accumulate in the head, liver, intestines and roe of fish. Ciguatoxin is not produced by fish, but rather originated from algae known as dinoflagellates (*Gambierdiscus* and *Fukuyoa* spp.) that are found in calm and protected waters around coral reefs. Coral reef fish become toxic from feeding on these toxic algae. In general, older and larger fish contain higher levels of ciguatoxins. However, the risk of CFP from eating farmed fish is very low.

Presentation of Ciguatera Fish Poisoning

CFP has been reported to cause more than 100 gastrointestinal, neurological, and cardiovascular symptoms, such as numbness and tingling around the mouth, nausea, vomiting, diarrhoea and dizziness. Acute symptoms appear from 30 minutes to 24 hours after eating the toxic fish. While most symptoms are similar to other food poisoning illnesses, hot and cold reversal – a burning sensation induced by contact with cold objects – is a classic CFP symptom.

There is no antidote or specific treatments for CFP. Previous CFP episodes, as well as the ingestion of alcoholic beverages, nuts and seed products, may exacerbate the severity of CFP symptoms.

In some patients, symptoms can persist for months or years. Symptoms may also recur from time to time up to years, triggered by eating certain foods (e.g. alcohol, nuts, dairy products and fish), changing behaviours (e.g. intense physical activity) or other factors (e.g. sun exposure).

現時沒有解毒劑或專門療法可治療雪卡毒魚類中毒。以往曾中過雪卡毒、飲用含酒精的飲料或食用果仁及種籽製品均有可能加劇病徵的嚴重程度。

部分病人的病徵可持續多月或多年。病徵也有可能受進食某些食物(例如酒、果仁、乳製品及魚類)、行為改變(例如劇烈體能活動)或其他因素(例如受陽光照射)引發而不時再次出現,有時會長達多年。

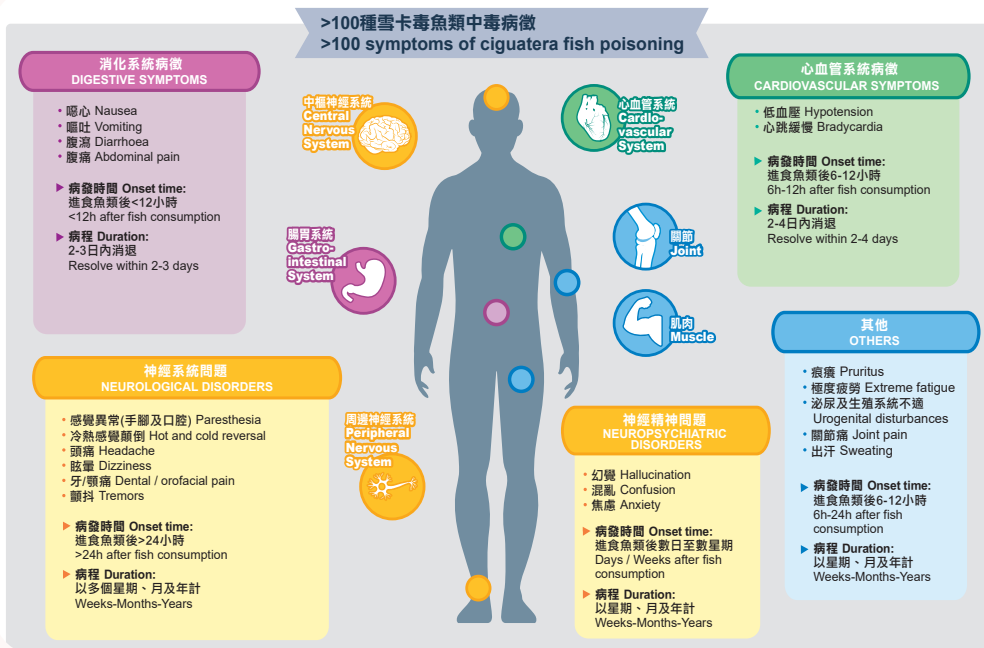


圖2：雪卡毒魚類中毒示例(摘自聯合國糧食及農業組織/世界衛生組織2020年編製的Report of the Expert Meeting on Ciguatera Poisoning)
Figure 2: Example of acute symptoms of ciguatera fish poisoning. (Adapted from FAO and WHO. Report of the Expert Meeting on Ciguatera Poisoning, 2020)

氣候轉變如何影響雪卡毒魚類中毒？

雪卡毒魚類中毒是北緯35度至南緯35度之間區域的風土疾病,病源主要圍繞南太平洋、印度洋和加勒比海一帶水域的珊瑚礁。然而,雪卡毒魚類中毒已因為國際海產貿易而成為全球問題,在沒有發現這些有毒水藻的地區也因為進口魚類而發生中毒個案。

隨著水溫上升,全球暖化或會影響有毒水藻的生長和擴散。另一方面,部分水域也許會因為水溫太高而導致有毒水藻難以生長。其他全球暖化的影響,如海平面上升及降雨量增加,也可能改變有毒水藻的分布和數量。

雪卡毒的安全水平

聯合國糧食及農業組織和世界衛生組織曾評估雪卡毒的毒性,認為未能根據已有數據制定(急性或慢性)健康參考值。一些海外食物安全機關則建議,以每公斤魚肉0.01微克CTX1B作為不會引致雪卡毒魚類中毒病徵的含量上限^{1,2}。

注意要點

1. 雪卡毒魚類中毒是由進食含雪卡毒素的珊瑚魚所致。
2. 雪卡毒素耐熱,不受烹煮或冷藏影響。
3. 雪卡毒素主要積聚在魚類的頭、肝、腸和卵。活得較久及體積較大的魚類多會含較多雪卡毒素。

給消費者的建議

- 減少進食珊瑚魚,尤其是體型較大的珊瑚魚,並避免進食珊瑚魚的頭、皮、內臟(例如肝、腸及卵巢)和卵。
- 進食珊瑚魚時,避免喝酒和吃花生、果仁或豆類食物。
- 如出現雪卡毒魚類中毒病徵,應立即求醫。

給業界的建議

- 避免購買來歷不明或可疑的魚類。避免從已知有魚類受雪卡毒素污染的水域採購魚類。
- 嚴格遵守《食物安全條例》有關備存記錄的規定,以致在發生雪卡毒魚類中毒個案時得以迅速採取有效的管制措施。

How Climate Change Affects CFP?

CFP is endemic between latitudes 35°N and 35°S, primarily around coral reefs in the South Pacific, Indian Ocean and Caribbean regions. CFP has become a global problem due to international seafood trade and has been reported in areas where the toxic algae is not found but stemming from imported fish.

Global warming could affect the growth and expansion of toxic algae because of the increased water temperature. On the other hand, other water areas may become too warm for the growth of toxic algae. Other global warming effects, such as sea-level rise and increases in precipitation, could also change the distribution and abundance of toxic algae.

Safety Level of Ciguatoxin

The Food and Agricultural Organization and the World Health Organization have evaluated the toxicity of ciguatoxins and could not establish a health-based guidance value (both acute and chronic) based on the available data. Some overseas food safety authorities have proposed a maximum concentration of 0.01 mcg CTX1B per kg fish flesh as being unlikely to cause CFP symptoms^{1,2}.

Key Points to Note

1. CFP is caused by eating coral reef fish which contains the poisonous ciguatoxin.
2. Ciguatoxins are heat stable and would not be affected by cooking or freezing.
3. Ciguatoxins mainly accumulate in the head, liver, intestines and roe of fish. Older and larger fish are more likely to contain higher levels of ciguatoxins.

Advice to Consumers

- Consume less coral reef fish, especially large ones, and avoid eating the head, skin, viscera (e.g. liver, intestine and ovary) and roe.
- Avoid alcoholic beverages, peanuts, nuts or beans when consuming coral reef fish.
- Seek medical treatment immediately when CFP symptoms appear.

Advice to the Trade

- Avoid purchasing fish from unknown or suspicious sources. Avoid sourcing fish from areas knowingly at risk of having fish contaminated with ciguatoxins.
- Adhere strictly to the Food Safety Ordinance in record keeping, such that prompt and effective control measures could be taken for any CFP cases.

¹ 聯合國糧食及農業組織/世界衛生組織Report of the Expert Meeting on Ciguatera Poisoning (2020) FAO/WHO Report of the Expert Meeting on Ciguatera Poisoning (2020)

² 世界衛生組織Food Safety Digest - Ciguatera Poisoning (2020) WHO Food Safety Digest - Ciguatera Poisoning (2020)

風險評估如何有助我們了解食物風險？

How Can Risk Assessment Inform Us of a Food Risk?

食物安全中心風險評估組
科學主任張鳳文女士報告

Reported by Ms. Iris CHEUNG, Scientific Officer,
Risk Assessment Section, Centre for Food Safety

坊間不同的調查偶爾會在食品中檢出一些可致癌的化學物質，報告內容或會使部分人感到擔憂，影響他們購買食物的決定和意欲。要作出明智的選擇，我們需要了解在食物中檢出的物質以及它們對消費者構成風險的關係。

危害與風險的分別

有些人認為危害和風險是一樣的，而事實上，兩者相關但並不相同。從科學角度來看，危害指某媒介或處境造成不良影響的潛在能力。另一方面，風險則是出現不良後果的機率。舉例來說，在日常環境中，一輛行駛中的汽車便是一種危害。當我們留在家中，被該輛汽車撞到的風險微乎其微。然而，我們在日常生活中難免需要出外，因而有機會遇上行駛中的汽車。當我們在適當的過路處（例如行人天橋、隧道或斑馬線）橫過馬路時，被車撞倒的風險很低。但是，若我們不理會交通規則或胡亂橫過馬路（例如沒有使用指定過路處、或在行人過路燈的紅燈亮起時橫過馬路），風險便會增加。（圖3）

就食物安全而言，危害是指食物中可能對消費者構成不良健康影響的物質，包括生物（例如致病細菌）、化學（例如重金屬）或物理（例如金屬碎片）性質。有關物質可從食物鏈的不同環節進入食物內，包括生產、收割、加工、包裝、貯存、配製、甚至上菜。

所有有危害的食物都意味着不可接受的食物安全風險嗎？

這是不一定的！「風險」一詞儘管意味着危害已經存在，但我們還需考慮進食有關食物的機會、個人或整體人口對該種危害的攝入量、以及它對健康可能造成影響的嚴重程度。要評估一種食物會否對消費者構成不可接受的食物安全風險，我們首先需要了解食物中的風險和這些風險如何影響健康。

以化學風險為例，汞（俗稱水銀）是廣泛存在於環境中的重金屬，來自大自然和人类的活動。汞主要以其有機形態甲基汞積聚於食物鏈中，尤其是魚類。如過量攝入甲基汞，可能會對人體發育中的神經系統造成損害。三文魚含豐富的奧米加-3脂肪酸，有助心血管健康，但三文魚亦有機會含有甲基汞。我們應否不惜一切避免進食三文魚呢？

要找出進食三文魚會否令你受到甲基汞的不良影響，風險評估員會將甲基汞的攝入量（根據甲基汞在三文魚檢出的含量和進食三文魚的分量計算出來）與其健康參考值進行比對。健康參考值是人的一段時間內攝入某種物質而不致對健康帶來可見風險的分量。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）等國際機構已認可健康參考值為安全攝入量的建議，並用於決定風險是否屬可接受。就食物安全中心（食安中心）過去進行的研究所

Occasionally, surveys conducted by various parties may report the detection of certain chemicals in food products and that these chemicals can cause cancer. These reports may worry some audiences, influencing their decisions and desire to purchase foodstuff. In order to make a sensible food choice, we need to understand the relationship between the detection of certain substances in food and the risk that these substances pose to the consumer.

The Differences between Hazard and Risk

Hazard and risk may sometimes be loosely considered to be the same by some; they are in fact related but different. In scientific term, hazard is the inherent capability of an agent or a situation to have an undesirable effect. Risk, on the other hand, is how likely, or the probability, that the negative outcomes will occur. For example in everyday settings, a running car is a hazard. When we are staying at home, the risk of being hit by the running car is negligible or approaching zero. However, we need to go out to the street in our daily living and thus have the chance to meet a running car. When we cross the road at an appropriate crossing point, such as a footbridge, subway, or zebra crossing, the risk of being hit by a car is low. However, the risk increases if we disregard traffic rules or jaywalk, such as failing to use the designated crossing point or crossing the road when the red pedestrian light is on. (Figure 3)

In the context of food safety, a hazard is a biological (e.g. disease causing bacterium), chemical (e.g. heavy metal) or physical (e.g. metal fragment) substance present in food that has the ability or potential to cause an undesired health condition to the consumer. It can be introduced in food at any stage of the food chain, from primary production, harvesting, processing, packaging, storage, preparation to even serving.

危害HAZARD

是構成傷害的因素或媒介
is the potential to cause harm



過馬路時，行駛中的車是一種危害
when crossing a road,
a running car is a hazard

風險RISK

是受到傷害的機率
is the likelihood of harm taking place



胡亂過馬路時，
被車撞倒的風險為高
risk of getting hit by a car
is HIGH if jaywalking



在斑馬線橫過馬路時，
被車撞倒的風險為低
risk of getting hit by a car is
LOW if using a zebra crossing



進食魚類時，
甲基汞是對人體神經系統的一種危害
when eating a fish, methylmercury
is a hazard to our nervous system



進食體型較大的捕獵魚類，
神經系統受影響的風險為高
risk of affecting the nervous system
is HIGH if eating large predatory fish



進食體型較小的淡水魚類，
神經系統受影響的風險為低
risk of affecting the nervous system
is LOW if eating small freshwater fish

圖3：危害vs風險
Figure 3: Hazard vs Risk

Do All Foodstuff with a Hazard Imply Unacceptable Food Safety Risks?

Not necessarily! While risk already implies the existence of a hazard, the likelihood of consumption of the food, the level of intake by a person or the population as a whole, and the severity of the health effects that may occur due to exposure

to the particular hazard should be taken into account. To assess whether a food poses an unacceptable food safety risk to consumers, we first learn about the risks in food and how they affect health.

Take chemical risks as an example, mercury is a heavy metal that is abundant in the environment from natural and human sources. It primarily accumulates in the food chain in the organic form methylmercury, particularly in fish. Methylmercury, if consumed in excessive amount, has the potential to cause adverse effect to the developing neurological system in humans. A certain amount of methylmercury may inevitably be found in salmon, a fish that is a rich source of omega 3 fatty acids which benefit cardiovascular health. Should we avoid salmon at all costs?

To figure out if eating salmon makes you more likely to get adverse effects from methylmercury, risk assessors would compare the amount of methylmercury a person would get from salmon, based on the level of methylmercury found and the amount of salmon eaten, with the health-based guidance value (HBGV) of methylmercury. The HBGV is the amount of a substance a person can eat over time without putting their health at significant risk. International organisations, such as the Joint FAO/WHO Expert Committee on Food Additives (JECFA), have recognised HBGV as a safe level of intake recommendation and use it to decide if the risk is acceptable

得有關三文魚的平均甲基汞含量和本港市民的平均食用量，以及專家委員會所訂定的健康參考值而言，以一個體重為60公斤的人計算，孕婦從三文魚攝入甲基汞的分量相等於其健康參考值的(9.8%)，而一般市民則佔其健康參考值的(4.4%)。因此，孕婦和一般市民從三文魚攝入甲基汞而引致不良健康影響的風險屬低和可接受。

零風險並不存在

我們可以盡量降低食物安全風險，但要達至「零風險」是不大可能的。某些不良影響，例如會否致癌，或會令人意識到危害增加而有所警惕。然而，我們應參照風險評估結果，以衡量從食物攝入某種物質對健康的實際影響，因為食物含有該種物質並不一定等同於有損健康。

or not. Using the average level of methylmercury detected in salmon and average amount of salmon eaten by the local population from previous studies conducted by the Centre for Food Safety (CFS) and the HBGV developed by JECFA, for a 60-kg person, exposure to methylmercury from eating salmon accounts for only [9.8%] of the HBGV for pregnant women and [4.4%] for the general public. Hence, the risk of adverse effect to methylmercury from eating salmon is considered low and acceptable.

Zero Risk Does Not Exist

As long as we eat, 'zero-risk' in food safety is probably unattainable, though we can reduce the risk as much as we can. Certain effects, such as the ability to cause cancer, might easily alarm people due to the heightened perceived danger. However, the impact of the presence of a certain substance in food should be better informed by science using the risk assessment result, as its presence does not necessarily equate to causing health harm.

慎防生蠔存有的風險

Beware of the Inherent Risks of Raw Oysters

供生吃的蠔在進食前沒有經過加熱處理殺死病原體，因此是**高風險食物**。除了活蠔以外，市面可供市民購買的生蠔往往是預先去殼的冷藏或冰鮮生蠔，處理不當可導致細菌污染及蠔隻變壞。

冷藏生蠔必須放在雪櫃內解凍，以免暴露於**危險溫度**中。在雪櫃內解凍需時較長，通常要解凍一夜。在解凍的過程中，生蠔應存放在容器中，以防交叉污染。避免進食在出口國家或地區已預先去殼，並未經烹煮的冰鮮生蠔，因為生蠔已經死亡，所以在生產和運輸過程中，容易出現溫度控制不當及交叉污染的情況。

孕婦、嬰幼兒、長者和免疫力弱人士應避免進食生或未煮熟的蠔。

Oysters for raw consumption are a **high-risk food** as there is no heat treatment to kill pathogens before eating. Besides those sold alive, raw oysters available in the local market are often pre-shucked in either frozen or chilled forms. If not handled properly, it can lead to bacterial contamination and deterioration of the shellfish.

Frozen raw oysters have to be defrosted in the refrigerator to avoid exposure to **dangerous temperatures**. Defrosting in the fridge can take a long time, usually overnight. During defrosting, raw oysters should be stored in containers to avoid cross-contamination. Avoid eating chilled raw oysters pre-shucked at the exporting countries without cooking, as they were killed and susceptible to temperature abuse and cross-contamination during production and transportation.

Pregnant women, infants and young children, the elderly and people with weakened immunity should avoid consuming raw or undercooked oysters.

船艇活動與食物安全

Boating and Food Safety

在炎炎夏日，遊船河是受歡迎的遊樂活動，參與者出遊時往往會帶備食物。然而，食物一般都是早已預先烹製，供較長時間在旅程中食用的，而且很多時不會翻熱。為確保食物可安全食用，市民應遵從「**食物安全五要點**」，特別是「精明選擇」、「保持清潔」以及「安全溫度」。

如要帶備預製食物上船，應選擇向持牌及信譽良好的商戶購買。使用冷凍容器及冰塊保持冷食於攝氏4度或以下，並保持熱食於攝氏60度或以上，讓食物遠離危險溫度。冷凍容器應避免受陽光直接照射。烹製好的食物若置於室溫中，則應應用「**2小時/4小時法則**」：放在室溫多於4小時的食物並不安全，應該丟棄。進食前用清水和視液清洗雙手。

Going on a boat trip is a popular way to enjoy summer, and people often bring refreshment for the excursion. However, the food is generally prepared much ahead of time for consumption at a later time during the trip, often not reheated. To ensure that the food is safe to eat, one should follow the "**Five Keys to Food Safety**", especially "Choose", "Clean" and "Safe Temperature".

When bringing prepared meals on board, choose to purchase from reputable, licensed vendors. Keep cold food cold at 4°C or below by using coolers and ice, and keep hot food hot at above 60°C so that the food stay out of dangerous temperatures. Keep the cooler away from direct sunlight. Apply the "**2 hours / 4 hours rule**" if the prepared food is left at room temperature: foods that have been at room temperature for more than four hours after cooking are unsafe and should be discarded. Wash hands with liquid soap and water before eating.



風險傳達工作一覽 (二零二二年八月)

Summary of Risk Communication Work (August 2022)

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