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雪卡毒素及珊瑚魚

Ciguatoxins and Coral Reef Fish

食物安全中心
風險評估組
科學主任朱源強先生報告
Reported by Mr. Johnny CHU, Scientific Officer,
Risk Assessment Section,
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二零一七年三月底/四月初,食物安全中心接獲六宗懷疑雪卡毒魚類中毒個案的報告,涉及共11人。調查顯示,他們曾食用同一進口商所供應的魚類。本文將簡介雪卡毒魚類中毒事故,並向市民及業界提供預防雪卡毒魚類中毒的建議。

雪卡毒魚類中毒

雪卡毒魚類中毒是全球最常見的其中一種海產食源性中毒,糧食及農業組織(糧農組織)估計,全球每年有一萬至五萬人感染該疾病。珊瑚魚因直接或簡接進食有毒微藻(干比亞藻)而變得具有毒性,人類吃了這些珊瑚魚會引致雪卡毒魚類中毒(圖1)。有關的微藻會產生毒素(稱為雪卡毒素),主要在熱帶或亞熱帶的特定水域生長。

In late March/early April 2017, the Centre for Food Safety was notified of six suspected ciguatera fish poisoning (CFP) cases involving 11 persons. Investigations showed that they had consumed fish supplied by the same importer. This article describes the occurrence of CFP and provides advice to the public and the trade on the prevention of CFP.

Ciguatera Fish Poisoning

CFP is one of the most common types of marine food-borne poisoning worldwide; the Food and Agriculture Organization (FAO) estimated that 10 000 to 50 000 people worldwide annually suffer from this illness. CFP is caused by the consumption of coral reef fish that have become toxic from feeding directly or indirectly on toxic microalgae (*Gambierdiscus toxicus*) (Figure 1). The microalgae produce toxins known as ciguatoxins and the occurrence of these microalgae are mainly confined to specific patches of oceans in the tropics or subtropics.

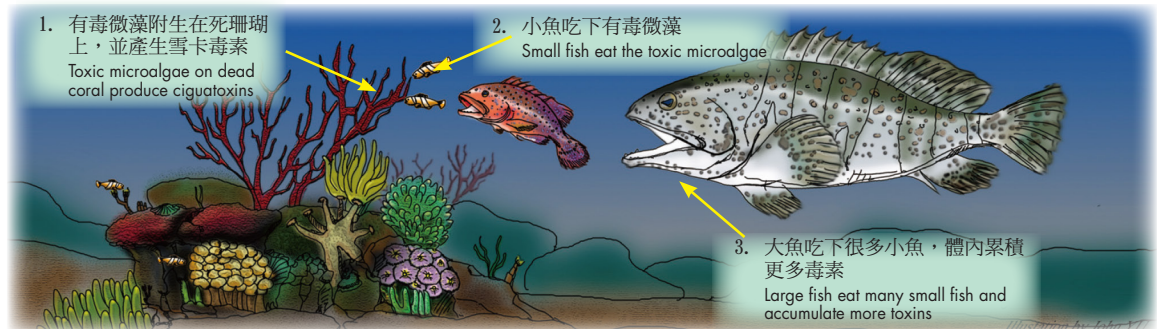


圖1. 由有毒的單細胞水藻所產生的雪卡毒素會在食物鏈層層累積。
Figure 1. Ciguatoxins produced by toxic single-celled algae and accumulated up the food chain.

一些與雪卡毒魚類中毒有關的要點:

- 珊瑚魚是否含毒性視乎捕撈水域而定。至於香港的雪卡毒魚類中毒個案,最常受雪卡毒素影響的捕魚區有南沙羣島、南太平洋及海南島;
- 某些珊瑚魚較常引致雪卡毒魚類中毒(例如紅鰭、老虎斑、燕尾星斑、東星斑、西星斑及油魷);
- 一些研究顯示,養魚引致雪卡毒魚類中毒的風險極低;
- 由於毒素可留在受污染魚類組織多年,故淨化處理並無效果;
- 含雪卡毒素的魚類不能從外觀、氣味或味道分辨;
- 體積愈大的魚多會累積較多毒素,涉及雪卡毒魚類中毒的魚類體重通常為兩公斤(三斤)以上;
- 受影響魚類的頭、內臟、肝臟及生殖器的雪卡毒素含量較其他部位高50至100倍;
- 雪卡毒素耐熱,魚類在烹煮後仍含毒素。

There are some important features relating to CFP:

- The toxicity of coral reef fish depends on where the fish are caught. For CFP cases in Hong Kong, the most frequently identified at-risk contaminated fishing grounds are the Nansha Island, South Pacific and Hainan Island;
- Certain coral reef fish are more likely to cause CFP (e.g. Black fin red snapper, Tiger grouper, Lyretail, Leopard coral grouper, Areolated coral grouper and Moray eel);
- Some studies showed that the risk of CFP from farmed fish is extremely low;
- Depuration is not effective because contaminated fish tissue can remain toxic for years;
- Ciguatoxic fish cannot be identified by appearance, smell, or taste;
- Larger fish tend to accumulate more toxins. The fish involved in CFP is usually greater than 2 kg (3 catties);
- Ciguatoxins are up to 50 to 100 times more concentrated in the head, viscera, liver and gonads of affected fish;
- Ciguatoxins are heat stable and remain toxic after cooking.

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焦點個案
Incident in Focus

氣候轉變、貿易全球化及雪卡毒

近年，有毒微藻已擴散至多處新水域。事實上，有愈來愈多證據顯示，氣候轉變(例如水溫上升、暴雨及颶風繁密)令珊瑚礁受干擾，影響了有毒微藻的分布及繁殖，並令雪卡毒魚類中毒事故較難預測。此外，隨着國際魚類貿易擴展，雪卡毒魚類中毒事故有可能增加。

對健康的影響

根據糧農組織表示，當魚類的雪卡毒素含量約為每公斤含0.1微克或以上時，便會令人類中毒。雪卡毒魚類中毒的徵狀包括腸胃、神經及心血管系統失調。患者通常在進食有毒魚類後30分鐘至24小時內出現中毒徵狀。所有人均有可能中雪卡毒。其他因素，例如以往曾中過雪卡毒、飲用了含酒精的飲料或食用了果仁及種籽製品，亦會令個別人士較易出現雪卡毒魚類中毒的徵狀。

規管情況

食品法典委員會現正考慮就雪卡毒素含量訂定限量標準，以及制訂風險管理指引的可能性。香港法例並無特別規例規管魚類的雪卡毒素含量。儘管如此，在港出售的所有食物必須適合供人食用。

中心採取的行動

中心在收到食物中毒個案報告後，已指示零售商／進口商停止出售同一來源的珊瑚魚。

預防措施

業界應避免從已知有很大機會含雪卡毒素魚類的水域進口魚類，或從來歷不明或有可疑的來源採購珊瑚魚。為了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，販商(例如進口商及零售商)須妥善備存準確的交易記錄。

注意要點：

1. 含雪卡毒素的魚類不能從外觀、氣味或味道分辨。
2. 涉及雪卡毒魚類中毒的珊瑚魚體重通常為兩公斤(三斤)以上。
3. 珊瑚魚的頭、肝臟、皮及卵的毒素含量較高。

給業界的建議

- 避免從已知有含雪卡毒素魚類的水域採購魚類。
- 嚴格遵守《食物安全條例》有關備存記錄的規定。

給市民的建議

- 減少進食珊瑚魚。避免進食珊瑚魚的頭、肝臟、皮及卵。
- 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。

Climate Change, Globalisation of Trade and Ciguatera

In recent years the toxic algae have been found spreading into new areas. In fact, evidence is accumulating that coral reef disturbance by climate change (such as increased water temperature and frequency of storms and hurricanes) impacts on the distribution and proliferation of the toxic algae and makes the occurrence of CFP less predictable. Besides, CFP is likely to increase with expanding international fish trade.

Public Health Significance

According to FAO, ciguatoxins, when present at concentrations of about 0.1 µg/kg or greater in fish will cause human poisoning. The symptoms of CFP include gastrointestinal, neurological and cardiovascular disturbances and often appear within 30 minutes and up to 24 hours after ingestion of the toxic fish. All humans are susceptible to ciguatera toxins. Sensitivity of an individual to CFP could be increased due to factors like previous CFP episode, and consumption of alcoholic beverages, nuts and seed products.

Regulatory Control

Codex is currently considering establishment of maximum limits for ciguatoxins and the possibility of development of risk management guidelines. There is no specific regulation on ciguatoxins in fish stipulated in the laws of Hong Kong. Nevertheless, all foods for sale in Hong Kong must be fit for human consumption.

Actions Taken

Upon notification of the food poisoning cases, the retailers/importer were instructed to stop selling coral reef fish of the same origin.

Preventive Measures

The trade should avoid importing fish from areas known to have a high chance of carrying ciguatoxins, or coral reef fish from unknown or suspicious sources. To allow prompt and effective control measures in case of the occurrence of CFP cases, the traders such as importers and retailers are required to keep proper and accurate transaction records.

Key Points to Note:

1. Ciguatoxic fish cannot be identified by appearance, smell, or taste.
2. Coral reef fish involved in CFP is usually greater than 2 kg (3 catties).
3. Head, liver, skin and roe of coral reef fish have a higher concentration of toxins.

Advice to the Trade

- Avoid sourcing fishes from areas known to be at risk of ciguatoxins.
- Adhere strictly to the Food Safety Ordinance in record keeping.

Advice to the Public

- Consume less coral reef fish and avoid eating the head, liver, skin, and roe of coral reef fish.
- Avoid alcoholic beverages, peanuts, nuts or beans when consuming coral reef fish.
- Seek medical treatment immediately when symptoms of CFP appear.

風險傳達 工作一覽 Summary of Risk Communication Work

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生肉與熟肉中的細菌

Bacteria in Raw Meat vs Cooked Meat

Reported by Dr. Fiona FONG, Research Officer,
Risk Assessment Section,
Centre for Food Safety

食物安全中心
風險評估組
研究主任方朗茵博士報告

近日，肉類受細菌污染的問題備受市民關注。根據世界衛生組織表示，食物受微生物污染是全球關注的公共衛生議題，大部分國家均有記錄顯示，在過去數十年，由食物中的微生物所引致的疾病事故大幅增加。我們將會在本文介紹一些令食物滋生細菌的因素，並探討生肉及熟肉中的細菌所涉及的不同食物安全考慮，以及就降低由細菌引致食物中毒風險所採取的措施。

令食物滋生細菌的因素

當內在及外在特性有利細菌滋生，細菌的生長情況便最理想。內在特性是指食物固有部分的特性(例如酸鹼度及水活性)，而外在特性是指貯存食物的環境特性(例如溫度)。水活性與食物的水分含量並不相同。水活性是用作量度食物中的自由水分子(數值由0至1不等)，以決定細菌的生長及生存狀況。透過控制這些因素(例如控制食物的貯存溫度)便能防止細菌在食物中大量繁殖。

生肉中的細菌

鮮肉營養豐富，其水活性為約0.99，適合大部分微生物生長。生肉一般含有細菌，包括致病細菌及腐敗細菌。由於細菌(例如沙門氏菌)可存在於溫血動物的腸道內，在屠宰過程(例如去臟及處理屠體程序)中，生肉或會受細菌污染。此外，在屠宰過程中所使用的儀器及工具、處理人員的雙手及衣物，以及環境亦可能令肉類被細菌污染。

Recently, bacterial contamination of meat has attracted public attention. According to the World Health Organization, contamination of food by microbiological agents is a worldwide public health concern; and most countries have documented significant increases over the past few decades in the incidence of diseases caused by microorganisms in food. In this article, we will introduce some factors that determine the growth of bacteria in food, and discuss the different food safety considerations for bacteria in raw meat and cooked meat and the measures to reduce risks of food poisoning caused by bacteria.

Factors Determining the Growth of Bacteria in Food

Bacteria grow best when intrinsic and extrinsic properties are optimal for their growth. Intrinsic properties are the properties that are inherent parts of the food, such as pH and water activity, while extrinsic properties are the properties of the environment in which the food is stored, such as temperature. Water activity is not the same as the moisture content of the food but is a measure, ranging from 0 to 1, of the availability of water in food which determines the growth and survival of bacteria. By controlling these factors (e.g. controlling the storage temperature of the food), bacterial overgrowth can be prevented.

Bacteria in Raw Meat

Fresh meat is a highly nutritious substrate with water activity of about 0.99, meaning that it is suitable for the growth of most microorganisms. Raw meat in general contains bacteria, including pathogenic and spoilage ones. As warm-blooded animals naturally carry bacteria such as *Salmonella* spp. in their intestines, raw meat may be contaminated with bacteria during the slaughtering process such as evisceration and dressing procedures. In addition, the equipment and tools used in the processes, the hands and clothing of personnel as well as the environment may also contaminate the meat with bacteria.



生肉應徹底烹煮後才進食。

Raw meat should be cooked thoroughly before consumption.

肉類有機會帶有食源性致病菌，可令人患病，並引致食物安全問題。這些致病細菌可以入侵人體，或產生毒素因而令人患病。這些細菌在肉類上無色無臭，但正常的烹煮情況(即食物中心部分的溫度至少達到攝氏75度，或其他有效的時間與溫度組合來烹煮)一般能殺死細菌。

在肉類上，致病細菌或需與其他菌群(例如腐敗細菌)競爭生長。部分致病細菌(例如金黃葡萄球菌)的競爭力較弱，生長情況或會遠遜於其他菌群。腐敗細菌可令肉類變壞或品質變差，肉類會產生異味或表面出現黏膩感等特徵，易被消費者察覺。腐敗細菌通常無害，但若大量攝入，也會令人腸胃不適。消費者一旦發現肉類有任何腐壞特徵，便應棄掉。

Meat has potential to carry foodborne pathogens that can cause illness and lead to food safety problems. These pathogenic bacteria are able to invade our bodies or produce toxins to cause illness. They cannot be seen or smelled on the meat, but can generally be killed by normal cooking conditions (i.e. cooking to a core temperature of at least 75°C instantaneously or other effective time/ temperature combinations).

Pathogenic bacteria may need to compete with other bacterial flora (e.g. spoilage bacteria) for growth on the meat. Certain pathogenic bacteria such as *Staphylococcus aureus* are relatively poor competitors and may be outgrown by other flora. Spoilage bacteria will cause food to deteriorate or lose quality by developing a bad odour or feeling sticky on the outside of the meat, signs that consumers would normally notice. These spoilage bacteria are normally not harmful, however, when consumed in very large numbers, they can cause gastrointestinal disturbance. Consumers should throw away the meat that shows any signs of food spoilage.

熟肉中的細菌

一如上文所述，通過徹底烹煮一般能消滅生肉中的大部分細菌，包括致病細菌。然而，若其後的食物安全措施稍有不足，仍有機會發生食物中毒。首先，生肉或會被某些致病細菌(例如產氣莢膜梭狀芽孢桿菌)的孢子污染，而這些孢子在一般烹煮溫度下不會輕易被消滅。烹煮的熱力反而誘發孢子發芽，成為繁殖細胞，在長時間放置在室溫下的食物中迅速繁殖。進食產氣莢膜梭狀芽孢桿菌繁殖細胞含量高的食物可導致食源性疾病。

此外，即食熟肉或會透過交叉污染被致病細菌污染。若貯存熟肉的溫度及時間不當，細菌便可大量繁殖，消費者進食後可能會患上食源性疾病。

減低食物中毒風險應採取的措施

為防止食物中毒，生肉應徹底煮熟後才進食。若即食熟肉放置於室溫下超過四小時，便應棄掉。若熟肉放置於室溫下少於兩小時，可放入雪櫃待用或在總時限四小時內食用。

此外，必須遵從優良的衛生規範。接觸生肉後，應徹底清潔雙手、砧板、刀及其他用具。人們亦應採取措施慎防生肉與即食食品(包括熟肉)交叉污染(例如使用一塊砧板處理即食食品，另一塊砧板處理生肉)。

Bacteria in Cooked Meat

As mentioned above, thorough cooking can generally destroy most bacteria on raw meat, including pathogenic ones. Nevertheless, if there are subsequent lapses in food safety practices, food poisoning may still occur. To start with, raw meat may be contaminated with spores of certain pathogenic bacteria (e.g. *Clostridium perfringens*) and spores are not readily destroyed by normal cooking temperature. Heat of cooking can rather activate the spores to germinate and develop into vegetative cells which can multiply rapidly in foods that are placed at ambient temperature for a long period. Consuming foods that contain high levels of *Clostridium perfringens* vegetative cells may lead to foodborne illness.

In addition, pathogenic bacteria may be introduced into the ready-to-eat cooked meat through cross-contamination and multiply to larger amount as a result of time and temperature abuse of the food, causing foodborne illness in consumers.

Measures to Reduce Risks of Food Poisoning Caused by Bacteria

To prevent food poisoning, raw meat should be cooked thoroughly before consumption. The ready-to-eat cooked meat should be discarded if it has been held at room temperature for more than 4 hours. If the cooked meat is held at room temperature for less than 2 hours, it can be refrigerated for final use later or used before the 4 hours limit is up.

Moreover, good hygienic practices should be observed. Hands, cutting boards, knives, and other utensils should be washed thoroughly after touching raw meat. Measures should be adopted to the prevention of cross contamination between raw meat and ready-to-eat foods including cooked meat, e.g. using one cutting board for ready-to-eat foods and a separate one for raw meat.

生／半生不熟的貝類水產(包括血蚶) — 食用風險甚高!

Raw/Partially-cooked Shellfish Including Blood Cockles – Risky to Consume!



食物事故點滴
Food Incident Highlight

因食用生／半生不熟的貝類水產而引致食物中毒的個案時有報導。最近，食物安全中心注意到，一些消費者可能進食了並非專供生吃的生血蚶或半生不熟血蚶。這些患者在進食含有血蚶(即魁蚶或粒蚶)的膳食後，出現腹瀉、嘔吐、腹痛及其他腸胃症狀。

一如所有貝類水產(濾食性軟體動物)，來自受污染水域的生／半生不熟的蚶、蜆、青口等可散播病原體，包括諾如病毒、甲型肝炎病毒及副溶血性弧菌。消費者，特別是高危一族(長者、幼童、孕婦及免疫力較弱的人)，應把所有貝類水產(包括血蚶)徹底烹煮才進食。業界應確保所出售的食物適宜供人食用，並符合食物法例的規定。

From time to time, food poisoning cases due to the consumption of raw or partially-cooked shellfish have been reported. Recently, it has come to the Centre for Food Safety's attention that some consumers might have eaten blood cockles not intended to be eaten raw but were served raw or partially cooked. These victims developed diarrhoea, vomiting, abdominal pain and other gastrointestinal symptoms after meals containing blood cockles (i.e. ark clam or granular ark).

Like all shellfish (filter-feeding molluscs), raw or partially-cooked cockles, clams, mussels, etc. harvested from contaminated waters can spread pathogens, including norovirus, hepatitis A virus, and *Vibrio parahaemolyticus*. Consumers, especially susceptible populations (elderly, young children, pregnant women and people with weakened immune systems) should cook all shellfish including blood cockles thoroughly before consumption. The trader should ensure the food sold is fit for human consumption and complies with the food laws.

魚類中的孔雀石綠

食物安全中心(中心)不時發現部分魚類及魚類產品含微量孔雀石綠。根據《食物內有害物質規例》(第132AF章)規定，食物不得含有孔雀石綠。

孔雀石綠是一種工業染料，也被水產養殖業用於治療魚類的寄生蟲、真菌及原蟲疾病。孔雀石綠可能帶有基因毒性及可引致癌症。鑑於孔雀石綠或其代謝物在食物內的殘餘並沒有一個安全水平能顯示食用風險可以接受，食品法典委員會表示，主管當局應禁止對食用動物施用孔雀石綠，以防止食物含有殘餘孔雀石綠。

業界應確保所出售的食物適宜供人食用，並符合本港法例要求。違例者會被檢控，一經定罪，可處罰款五萬元及監禁六個月。中心已知會涉事商戶有關違規情況，並會繼續跟進事件；如有足夠證據，便會考慮採取檢控行動。

Malachite Green in Fish

From time to time, the Centre for Food Safety (CFS) found some fish and fish products containing traces of malachite green, which is not allowed in food under the Harmful Substances in Food Regulations (Cap. 132AF).

Malachite green is an industrial dye. It has also been used in aquaculture for the treatment of parasitic, fungal and protozoan diseases in fish. Malachite green is possibly both genotoxic and carcinogenic. In view of that no safe level of residues of malachite green or its metabolites in food that represents an acceptable risk to consumers, Codex stated that competent authorities should prevent residues of malachite green in food by not using malachite green in food producing animals.

The trade shall ensure that the foods they sell are fit for human consumption and comply with local legislations. Offenders will be prosecuted and will be liable to a fine of \$50,000 and to imprisonment for six months upon conviction. The CFS has informed the vendor concerned of the irregularity, will continue to follow up on the incident, and will consider taking prosecution action should there be sufficient evidence.