食物安全焦點
Food Safety Focus

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食物環境衞生署 Food and Environmental Hygiene Department

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草酸鈣 — 植物中會刺人的晶體

Calcium Oxalate – the Stinging Crystals in Plants

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,
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二零二零年八月，衞生署衞生防護中心調查一宗懷疑與草酸鈣針晶體有關的食物中毒個案。事實上，在二零零三年至二零一七年轉介予醫院管理局毒理學參考化驗室的植物中毒個案中，約有四分之一與草酸鈣針晶體有關。到底草酸鈣是什麼？為何會對人體造成傷害？

草酸鈣為何會對人體造成傷害？

許多植物都含有草酸鹽。草酸鹽有水溶性的，例如草酸鈉及草酸鉀，也有些形成不溶的晶體，例如草酸鈣及草酸鎂。已知有200多個植物科屬及幾乎所有這些植物的組織，包括葉、莖、根甚至花藥，都含有草酸鈣晶體。

圖1a：野芋莖及球莖中的草酸鈣針晶體顯微影像。
(由醫院管理局毒理學參考化驗室提供)
Figure 1a: Microscopic examination of calcium oxalate raphides in the stem and corm of wild taro.
(Courtesy of the Hospital Authority Toxicology Reference Laboratory)

植物中的草酸鈣晶體有數種形狀，包括針狀的「針晶體」、鉛筆狀的「柱晶體」、塊狀的「沙晶體」及蓮座狀的「簇晶體」。當中以針狀的針晶體最引起臨床關注。

尖利針狀的針晶體在植物細胞內大多成束存在。當植物細胞在咀嚼過程中受破壞，水分便會進入並使細胞膨脹起來，因而把尖利的針晶體大力推進至口腔環境中，刺痛舌頭、牙齦及咽喉等敏感組織，導致口腔組織受傷。

部分草酸鈣晶體的刺激性不大

針狀草酸鈣的刺激性被認為是最強的，而其他形狀的草酸鈣造成損害的可能性則較低。野芋中的草酸鈣晶體為針狀，而菠菜的則為塊狀。因此，雖然野芋及菠菜均含有草酸鈣晶體，但只有野芋中的晶體可引起強烈刺激，而菠菜中的晶體則刺激性甚微。

草酸鈣晶體引起刺激的主要原因，除了是由於形狀之外，還涉及其他因素。舉例來

In August 2020, the Centre for Health Protection of the Department of Health investigated a suspected food poisoning case related to calcium oxalate raphides. In fact, among plant poisoning cases referred to the Hospital Authority Toxicology Reference Laboratory from 2003 to 2017, around one-fourth are related to calcium oxalate raphides. So, what is calcium oxalate and why does it hurt?

Ouch! Why Does Calcium Oxalate Hurt?

Many plants contain oxalates. Some oxalates, such as sodium and potassium oxalates, are water soluble, and others form insoluble crystals, such as calcium and magnesium oxalates. Calcium oxalates crystals have been found in more than 200 plant families and in almost all types of tissues of these plants, including leaf, stem, root and even anther.

Calcium oxalate crystals are found in several shapes in plants, including needle-shaped 'raphides', pencil-shaped 'styloids', block-shaped 'crystal sand' and rosette-shaped 'druses'. Among them, the needle-shaped raphides catch the most clinical attention.

The sharp needle-shaped raphides are packed in bundles within plant cells. Damage to the plant cells during chewing causes water to enter and swell up the cells. This stimulates the forceful propulsion of the sharp raphides into the surrounding environment, stabbing the sensitive tissues of the tongue, gums and throat and resulting in tissue injuries in the oral cavity.

Some Calcium Oxalate Crystals Are Less Irritating

It is believed that the needle-shaped calcium oxalate is the most irritating, while other shapes are less likely to inflict damage. The calcium oxalate crystals of wild taro are needle-shaped, compared with those block-shaped ones found in spinach. Therefore, although calcium oxalate crystals are present in both wild taro and spinach, only the crystals in wild taro can cause agonising irritation, whereas those in spinach have little effect.

Besides the shape of the calcium oxalate crystals which mainly contributes to the irritating effect, other factors are also involved. For example, the presence of enzymes in some plant cells that facilitate the breakdown of proteins may further potentiate the irritation through triggering an inflammatory reaction. Some raphides even have grooves which hold these enzymes. This is the reason why the acrid taste of raw edible taro is substantially reduced after cooking, as cooking destroys

焦點個案
Incident in Focus

說，有些植物細胞含有促進蛋白質分解的酶，可能會透過誘發炎症反應而進一步加劇刺激。一些針晶體甚至帶有坑紋以容納這些酶。可食用的芋頭在煮熟後麻刺感會大減，就是因為那些酶在烹煮過程中被分解了。然而，烹煮無法消除野芋的毒性，因此切勿食用。

草酸鈣中毒

草酸鈣中毒主要局部引致口腔出現刺激症狀，有時甚至波及上呼吸道。由於針晶體會即時導致口腔疼痛及腫脹，中毒者通常不會進一步大量進食涉事植物，因此全身性吸收草酸鈣的情況甚為罕見。草酸鈣中毒的症狀是迅速及即時發作的，大多數病情輕微，並在短時間內得以緩解。

懷疑與草酸鈣針晶體中毒有關的食物

本港以往發生的草酸鈣針晶體食物中毒個案，主要涉及進食含有草酸鈣針晶體的野芋。其他個案涉及不同種類的蔬菜，例如蕹菜/通菜、白菜、菜心及西洋菜。這些蔬菜不應含有草酸鈣針晶體，故懷疑可能混入了小量含針晶體的植物。有些個案便可能涉及在運送及加工處理蔬菜期間以野芋葉包裹或覆蓋蔬菜。

預防措施

草酸鈣晶體不溶於水，而且耐熱，因此清洗及烹煮均不能清除有毒植物中的草酸鈣。預防草酸鈣中毒的最有效方法，是切勿進食不可食用的植物，並避免這些植物污染其他供食用的蔬菜。

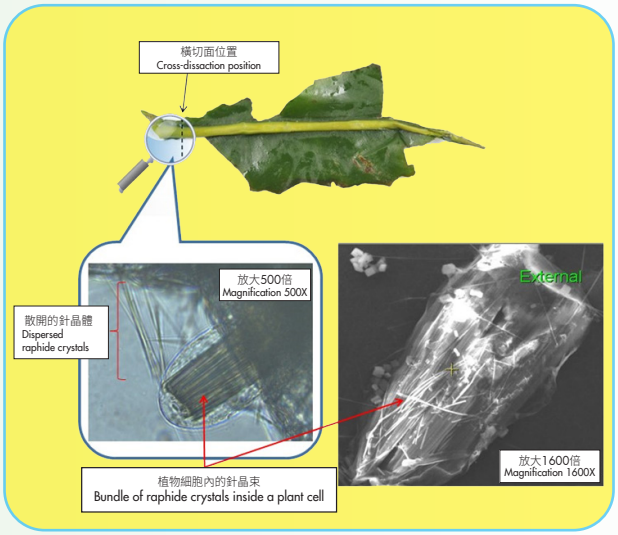

圖1b：食物投訴個案的葉樣本顯微影像，顯示樣本含有草酸鈣針晶體。(由政府化驗所提供)
Figure 1b: Microscopic examination of a leaf sample from a food complaint case, showing the presence of calcium oxalate raphides in the sample. (Courtesy of the Government Laboratory)

圖2：含有草酸鈣針晶體的野芋葉。葉的斷裂部分可能會在運送或加工處理蔬菜期間污染蔬菜。
Figure 2: Leaf of wild taro, which is known to contain calcium oxalate raphides. Broken parts of the leaf may contaminate vegetables during transportation or processing.

the enzymes. However, cooking cannot remove the poisoning effect of wild taro and it should not be consumed.

Presentation of Calcium Oxalate Poisoning

The symptoms of calcium oxalate poisoning are mainly localised, causing oral and sometimes upper airway irritation. Systemic absorption of the chemical is nevertheless rare, as the instantaneous pain and swelling of the mouth caused by raphides usually stop the affected person from further ingesting a significant quantity of the plant. Rapid and immediate in onset, these symptoms are mild in most cases, usually resolving within a short period of time.

Suspected Food Items Related to Calcium Oxalate Raphide Poisoning

Locally, previous food poisoning cases of calcium oxalate raphides mainly involved the consumption of wild taro, which is known to contain calcium oxalate raphides. Other cases involved different types of vegetables, such as water spinach, Chinese white cabbage, Chinese flowering cabbage and watercress. These vegetables are not supposed to contain calcium oxalate raphides, and it is postulated that the vegetables might have been mixed with small amount of raphide-containing plants and consumed. In some of these incidents, leaves of wild taro may have been used to wrap or cover vegetables during transportation and processing.

Prevention

Calcium oxalate crystals cannot be dissolved in water and are heat resistant. Therefore, washing and cooking cannot reliably remove calcium oxalates from the toxic plants. The most effective way to prevent calcium oxalate poisoning is not to consume plants that are not known to be edible, and to avoid their contamination to edible vegetables.

注意事項

1. 一些植物(例如野芋)含有針狀的草酸鈣針晶體，切勿食用。
2. 攝入草酸鈣針晶體會引起口腔組織刺激及疼痛。
3. 清洗及烹煮均不能清除植物中的草酸鈣針晶體。

Key Points to Note

1. Some plants (e.g. wild taro) are known to contain needle-shaped calcium oxalate raphides and should not be consumed.
2. Upon ingestion, calcium oxalate raphides cause tissue irritation and pain in the mouth.
3. Washing and cooking cannot reliably remove calcium oxalate raphides from plants.

給消費者的建議

- 野生植物可能有毒(例如野芋)，切勿採食。
- 向可靠的供應商購買蔬菜。
- 去除任何混在蔬菜中的不明植物及異物。
- 進食後如感到不適，應立即求醫。如有剩餘的食物，亦應一併帶往就診。

Advice to Consumers

- Never pick and eat wild plants such as wild taro, as they could be poisonous.
- Buy vegetables from reliable suppliers.
- Remove any unidentified plants and objects mixed with vegetables.
- In case of feeling unwell after food consumption, seek immediate medical attention and bring along the food remnant, if any.

給業界的建議

- 在運送及加工處理蔬菜期間，不要以野芋葉覆蓋或包裹蔬菜，因為可能會污染蔬菜。
- 慎防蔬菜混入其他不可食用的植物。

Advice to the Trade

- Do not use leaves of wild taro to cover or wrap vegetables during transportation and processing, as they may cross-contaminate the vegetables.
- Care should be taken to prevent the mixing of vegetables with other inedible plants.

食物安全平台
Food Safety Platform

齊來確保外送食物服務的食物安全

Let's Join Together: Uphold Food Safety of Food Delivery

食物安全中心風險傳達組
衞生總督察袁偉倫先生報告

Reported by Mr. Allan YUEN, Chief Health Inspector, Risk Communication Section, Centre for Food Safety

背景

在2019冠狀病毒病疫情持續下，食肆外送食物服務越來越受歡迎。隨着手機應用程式及技術越趨進步，只要動一動指尖，便可輕鬆訂餐。然而，從廚房到顧客的餐桌涉及許多處理程序，不禁令人關注外送食物服務的食物安全風險，包括在送遞過程中缺乏適當的溫度控制及存有交叉污染的風險。要確保外送食物可供安全食用，必須有賴食物業經營者、送遞服務員與顧客攜手合作。

圖3：外送食物服務的良好衞生守則及溫度控制
Figure 3: Proper hygienic practices and temperature control for food delivery service

食肆外送食物服務的食物安全風險

食物業經營者預早製備食物以應付繁忙時段較大量的需求，是常見的情況。半製成的配料或煮熟的餐盒會存放一段時間，然後才翻熱及包裝以供送遞。製備食物待用、送遞及顧客延遲食用的時間越長，食物若置於攝氏4度至60度的危險溫度範圍內，滋生引致食物中毒的細菌的風險便越大。此外，包裝變形及密封不當、食物容器隔熱不足，以及送遞途中不合衞生的處理方式，例如雙手不潔擅動食物或改換包裝，亦會帶來食物交叉污染的風險。

安全外送食物貼士

雖然先進的外送食物手機應用程式能使餐飲供應商接受更多散布不同地點的顧客訂餐，但餐飲供應商及送遞商均應密切監察員工在食物貯存及送遞過程中的實際衞生情況。就外送食物服務而言，「食物安全重點控制」計劃或以「食物安全重點控制」為基礎的食物安全系統是廣受認可的有效工具，可供有系統地分析和確定從食物製備、包裝、貯存到最終送遞的過程中不同食物危害的可行控制重點。風險控制重點應着眼於製備過程中的食物衞生、食物溫度控制及衞生措施，以確保在食物送遞期間所有食物接觸面的清潔。

給食物業經營者的建議

食物處理人員應運用「食物安全五要點」，並實施「食物安全重點控制」系統或遵循其原則，以確保食物安全。在食物處理方面，食物業經營者亦應適時製備食物，以配合送遞時間。員工必須保持雙手衞生，在處理外送食物前清洗雙手。送遞容器應有良好隔熱，以耐用物料製成，並能妥為蓋好。劃定清潔乾爽的地方存放餐盒以待送遞。不應把冷熱餐盒放在同一個大容器內，以免難以保持適當的溫度。

給外送食物服務供應商的建議

食物送遞商應保持運輸工具的衞生，並密切監察貯存溫度是否恰當，以確保食物免受交叉污染。管理人員應查核時間記錄以檢視是否有任何送遞上的延誤，從而嚴格控制送遞時間。良好的物流安排亦可縮短食物送遞時間。

Background

Upon the on-going COVID-19 epidemic, food delivery from food premises is becoming more popular. With the advance of mobile applications and technology, food orders can be easily made at people's fingertips. Involving a number of handling procedures from the kitchen to the customers' table, food delivery can however raise concerns on food safety risks arising from a lack of suitable temperature control and risk of cross-contamination throughout the delivery procedures. Food operators, delivery service staff concerned and customers have to join hands to ensure the delivery of food safe for human consumption.

Food Safety Risks of Food Delivery from Restaurants

It is not uncommon for food operators to prepare food in advance to cater for the surge in demand during peak hours. Partially processed ingredients or cooked meal sets will be stowed for some time till being finally reheated and packed for delivery. The longer the time for food preparation, delivery and customers' deferred consumption, the higher will be the risk of the growth of food-poisoning bacteria of the food left within the temperatures between 4°C and 60°C, the temperature danger zone. In addition, distorted and improperly sealed packaging, inadequate thermal insulation of food containers and unhygienic handling such as tampering the food by dirty bare hands or altering the packaging in the course of delivery also pose risks of cross-contamination of the food.

Tips for Safe Food Delivery

Although advanced food delivery mobile applications enable food caterers to take more orders from scattered locations, both food caterers and delivery agents should pay heed to monitoring real-life hygienic practices of staff on food storage and delivery. The Hazard Analysis Critical Control Point (HACCP) plans or HACCP-based food safety systems are well-recognised and effective tools for the food delivery services to systematically analyse and identify possible control points against different food hazards from food preparation, packing and storage to, finally, delivery. Risk control points should be focused on food hygiene during preparation, food temperature control and hygienic measures to secure cleanliness of all food contact surfaces during food delivery.

Advice to Food Business Operators

Food handlers should adopt the Five Keys to Food Safety and implement the HACCP system, or follow its principles, to ensure food safety. On food handling, food business operators should also prepare food timely to match the delivery. Staff have to practise hand hygiene by washing hands before handling food for delivery. Good thermal insulated delivery containers of durable materials with fitted covers should be used. Store food packs in a clean and dry designated area pending delivery. Cold and hot food packs should not be put together in the same bulk container to avoid undesirable temperature maintenance.

Advice to Food Delivery Service Providers

Food delivery agents should safeguard food against cross-contamination by hygienic transportation means and close monitoring of the right storage temperature. The service management should control strictly its delivery capacity by checking the time record against any delayed deliveries. Well-organised logistics can also shorten the food delivery time.

每次送遞前後，均應使用消毒劑或梘液徹底清潔送遞容器及電單車貯物箱(例如後行李箱或車尾箱)的接觸面。

冷熱食物應分開存放在隔熱袋內，熱食保持於攝氏60度以上，冷食則保持於攝氏4度或以下。在容器及食物貯存箱安裝溫度計以供記錄溫度，有助推行食物溫度控制措施。提醒員工有序整理外送的食物，以盡可能避免送遞途中因不必要地翻找而把餐盒置於環境溫度下。

給消費者的建議

市民應向可靠的供應商或就近的餐飲處所訂購適當數量的食物，以避免長途送遞。消費者使用外送食物服務時，宜訂購徹底煮熟的食物。延誤送遞或包裝明顯有問題的食物，不應接受。食物送抵後應立即食用，而剩餘的食物則應按照2小時及4小時原則處理。

Contact surfaces of delivery containers and motorcycle storage compartment like rear trunk or tail box case should be cleaned by sanitisers, disinfectants or liquid soap thoroughly before and after each delivery.

Store cold and hot food separately in insulated bags and keep hot food at above 60°C and cold food at or below 4°C. Installation of thermometers for temperature records at containers and food storage compartment are useful for validating food temperature control measures. Staff are reminded to organise well the delivery load to minimise unnecessary ransacking and exposing the food packs at ambient temperature.

Advice to Consumers

The public should place orders of appropriate food amount from reliable suppliers or catering premises of close proximity to avoid long-haul delivery. Consumers are encouraged to order thoroughly cooked food from food delivery service. Delayed delivery or food with noticeable packaging defects should be rejected. Delivered food has to be consumed immediately, whereas leftovers should be handled according to the two-hour and four-hour principle.

食物事故點滴
Food Incident Highlight

慎防魚類的甲基汞含量超標
Be Cautious of Excessive Methylmercury in Fish

最近一個進口的預先包裝冷藏青衣魚柳樣本被檢出甲基汞含量超出法例標準，受影響的產品已下架及予以回收。

甲基汞是海產中的金屬污染物。大多數魚類的甲基汞含量都很低，但一些體型較大或捕獵性魚類(例如鯊魚及劍魚)的甲基汞含量可能偏高，應加以注意。攝入過量甲基汞可影響人體的神經系統，阻礙胎兒腦部發育。

魚類含有多種人體所需的營養素，包括奧米加-3脂肪酸、DHA(二十二碳六烯酸)及優質蛋白質。消費者宜食用不同種類的魚，以攝取所需的營養素，同時避免因偏吃而攝入過量甲基汞。孕婦、計劃懷孕的婦女及幼童應盡量少吃捕獵性魚類。業界應向消費者提供所售魚類品種及魚製品成分的資料。

Recently, sample of imported prepackaged frozen green wrasse fillet was found to contain methylmercury exceeding the legal limit. Affected products were removed from shelves and recalled.

Methylmercury is a metallic contaminant in seafood. For many kinds of fish, the methylmercury levels are low. However, we should take note of some large or predatory fish such as sharks and swordfish which may contain higher levels of methylmercury. Excessive intake of methylmercury may affect our nervous system and hinder foetal brain development.

Fish contains many essential nutrients including omega-3 fatty acids, docosahexaenoic acid (DHA) and high quality proteins. Consumers are advised to consume different kinds of fish. This helps to avoid excessive exposure to methylmercury from a limited range of food while obtaining essential nutrients. Expectant mothers, women planning for pregnancy and young children should minimise eating predatory fish. The trade should inform consumers of the fish types and the ingredients of fish products for sale.

零食中的丙烯酰胺
Acrylamide in Snacks

有本地機構最近發表報告，指在一些煎炸零食中驗出丙烯酰胺。

動物實驗顯示，丙烯酰胺可能致癌。當烹煮含豐富碳水化合物的食物時，氨基酸天門冬酰胺與還原糖在超過攝氏120度下發生反應，便會形成丙烯酰胺。食物安全中心(食安中心)早前進行的總膳食研究顯示，與西方多個地方的膳食相比，本港市民的丙烯酰胺總攝入量屬低。就本地而言，雖然丙烯酰胺的主要膳食來源是炒菜，但零食食品亦是食物組別中位列第六的膳食來源。

食安中心一直鼓勵食物業遵循食安中心的指引，減低食品中的丙烯酰胺。市民應保持均衡及多元化的飲食，避免過量進食油炸食物。如選擇以油炸方式烹煮食物，應把食物煮至呈金黃色即可，避免以過高的溫度烹煮過長時間。烹煮葉菜時採用先焯後炒或者使用水煮或蒸的方法，也可減少所產生的丙烯酰胺。

A local organisation has recently released a report on detection of acrylamide in certain fried snacks.

Potentially causing cancers in experimental animals, acrylamide is formed during cooking of carbohydrate-rich food in the presence of the amino acid asparagine and reducing sugars at over 120°C. The Total Diet Study conducted earlier by the Centre for Food Safety (CFS) revealed that the overall acrylamide intake among local adults was lower than that of many western diets. Locally, while stir-fried vegetables were the main contributor to dietary intake of acrylamide, snack foods ranked sixth among other food groups.

All along the CFS encourages the food trade to follow the CFS guideline to reduce acrylamide in food. The public should maintain a balanced and varied diet and avoid over-indulgence in deep-fried foods. When choosing to deep-fry, aim for a golden colour and avoid cooking for too long at too high a temperature. Blanching leafy vegetables before stir-frying or cooking them by boiling or steaming can also reduce formation of acrylamide.

風險傳達工作一覽（二零二零年八月）
Summary of Risk Communication Work (August 2020)

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