

食物中的柄曲霉素 Sterigmatocystin in Food

風險評估研究

RISK ASSESSMENT STUDY

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研究內容及目的

The Study and the Aim

- 食物安全中心(食安中心)完成了一項有關「食物中的柄曲霉毒素」的研究
 - 檢測本地市面超過 300 個食物樣本中柄曲霉毒素的水平
 - 估算本港成年人從這些食物樣本攝入柄曲霉毒素的情況
 - 評估從攝入上述物質對健康可能帶來的風險
- Centre for Food Safety (CFS) has just completed a study on “Sterigmatocystin in Food”
 - Analysed sterigmatocystin (STC) levels in over 300 samples of products available in the local market
 - Estimated the dietary exposure to STC of the Hong Kong adult population arising from the consumption of these products
 - Assessed the potential health impact due to exposure to STC from products

柄曲霉素的性質

About Sterigmatocystin

- 一種霉菌毒素，可由多種真菌產生
- 因食物在貯存時受霉菌污染而造成，不會在田間的農作物出現
- 人類主要從受霉菌污染的食物攝入柄曲霉素
- 穀類、穀類製品、芝士、咖啡豆、香料、堅果和啤酒等都被發現含有柄曲霉素
- A mycotoxin that can be produced by many different fungal species
- Formed on food commodities that are spoiled by moulds during storage rather than on crops in the field
- Human exposure to STC occurs primarily through ingestion of food contaminated by fungi
- Grains, grain-based products, cheese, coffee bean, spices, nuts and beer have been found to contain STC

對健康的影響

Health effects

- 動物研究顯示柄曲霉毒素可引致急性中毒，主要受影響的器官是肝臟和腎臟
- 國際癌症研究機構把柄曲霉毒素列為第 2B 組物質，即可能令人類患癌的物质

- In animal studies, liver and kidneys are the main target organs of acute STC toxicity
- The International Agency for Research on Cancer (IARC) classified STC as group 2B carcinogen, possibly carcinogenic to humans

規管

Regulatory Control

- 現時，食品法典委員會和其他主要國家及地區，例如美國、歐盟、澳洲、新西蘭和中國大陸等均未有為食物中柄曲霉素的最高含量訂定標準
 - 根據《公眾衛生及市政條例》(第 132 章)，在香港，所有供出售及擬供人食用的食物必須適宜供人食用
- The Codex Alimentarius Committee (Codex) and other jurisdictions such as the United States, European Union, Australia, New Zealand and Mainland China have not established any standards for STC in food
 - In Hong Kong, as stipulated in the Public Health and Municipal Services Ordinance (Cap. 132), all food available for sale on the market must be fit for human consumption

採樣 Sampling

- 參照海外研究發現含柄曲霉毒素的食物種類，從本地零售市場採集了 331 個食物樣本進行化驗
- 樣本分屬 12 個食物組別，包括“麵粉”、“早餐麥片”、“香料”、“穀類”、“粉麵”、“烘焙食品”、“咖啡豆”、“澱粉代用品”、“花生及堅果”、“芝士”、“啤酒”和“醃製肉類”
- A total of 331 samples which have been reported to contain STC from overseas studies were collected from the local retail market
- Samples were classified into 12 different food groups, including “flour”, “breakfast cereal”, “dried spices”, “grains”, “pasta and noodles”, “bakery and pastry items”, “coffee beans”, “starch substitutes”, “peanuts and tree nuts”, “cheese”, “beer” and “cured meat”

化驗結果

Analytical results

- 在是次研究的 331 個食物樣本中，只有約一成樣本 (即 32 個樣本) 檢出柄曲霉素，分別來自食物組別“麵粉”、“早餐麥片”、“香料”、“穀類”、“粉麵”、“烘焙食品”和“咖啡豆”
- “澱粉代用品”、“花生及堅果”、“芝士”、“啤酒”和“醃製肉類”的所有食物樣本，均沒有發現柄曲霉素
- Of the 331 samples analysed, 32 samples (about 10%) were found to contain STC. They are coming from the food group “flour”, “breakfast cereal”, “dried spices”, “grains”, “pasta and noodles”, “bakery and pastry items” and “coffee beans”
- STC was not detectable in all samples of the food groups “starch substitutes”, “peanuts and tree nuts”, “cheese”, “beer” and “cured meat”

不同食物組別中柄曲霉素的平均含量

Mean Concentration of STC in Different Food Groups

食物組別 Food Group	平均值 (微克/公斤) [範圍] Mean (mcg/kg) [range]			
	下限 LB		上限 UB	
	麵粉 Flour	4.9	[0-210]	5.0
香料 Dried Spices	0.15	[0.087]	0.18	[0.05-0.87]
粉麵 Pasta and Noodles	0.023	[0-0.74]	0.07	[0.05-0.74]
早餐麥片 Breakfast Cereal	0.022	[0-0.21]	0.064	[0.05-0.21]
穀類 Grains	0.0072	[0-0.21]	0.055	[0.05-0.21]
咖啡豆 Coffee Beans	0.0066	[0-0.079]	0.052	[0.05-0.079]
烘焙食品 Bakery and Pastry Items	0.0043	[0-0.082]	0.051	[0.05-0.082]

健康風險評估

Health Risk Estimation

- 根據聯合國糧食及農業組織／世界衛生組織食品添加劑聯合專家委員會 (JECFA) 的資料，柄曲霉素誘發雄性大鼠肝臟血管肉瘤發病率增加10%的最低基準劑量可信限下限 (BMDL₁₀) 為每天每公斤體重 0.16 毫克
 - 以這最低基準劑量可信限下限計算暴露限值 (MOE)，可評估人類攝入柄曲霉素的**健康風險**
 - 歐洲食物安全局 (EFSA) 認為，暴露限值如在 10 000 或以上，則對公眾健康的影響輕微
- According to the information from Joint FAO/WHO Expert Committee on Food Additives (JECFA), the lowest benchmark dose lower confidence limit for a 10% excess cancer risk (BMDL₁₀) for hepatic haemangiosarcoma in male rats treated with STC is 0.16 mg/kg body weight per day
 - BMDL₁₀ is applied to determine the Margin of Exposure (MOE) value in estimating human health risk
 - The European Food Safety Authority (EFSA) considered that an MOE value of 10 000 or higher would be of low public health concern

攝入柄曲霉素的情況

Dietary Exposure to STC

	一般消費者 Average consumers	攝入量高的消費者 (第90百分位) High consumers (90 th percentile)
每日膳食攝入總量 (微克/每公斤體重) (下限-上限) Dietary Exposure (mcg/kg bw/day) (LB – UB)	0.000012 – 0.00017	0.000025 – 0.00033
暴露限值 Margin of Exposure (MOE)	13 000 000 – 940 000	6 400 000 – 480 000

攝入量評估

Dietary Assessment

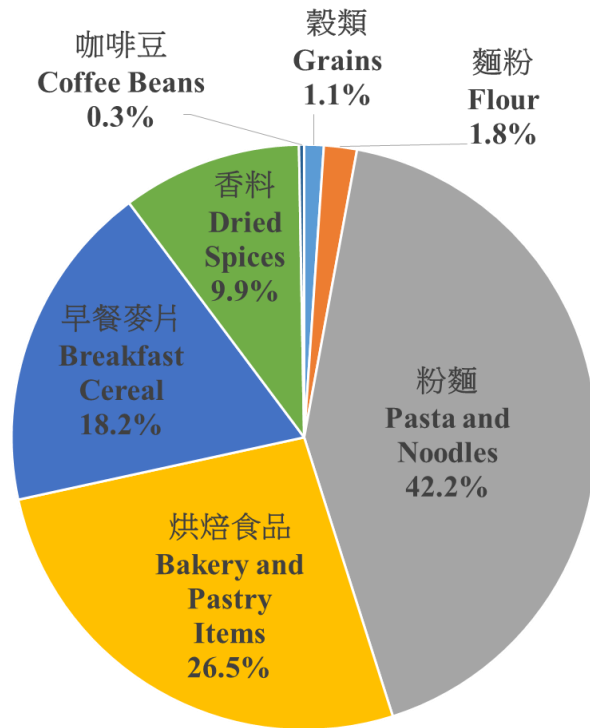
- 攝入量一般和攝入量高的市民，從這項研究涵蓋的食物組別攝入柄曲霉素的上限，分別為每日每公斤體重 0.00017 微克和每日每公斤體重 0.00033 微克，暴露限值則分別為 940 000 和 480 000
- The UB dietary exposures to STC were estimated to be 0.00017mcg/kg body weight per day and 0.00033mcg/kg body weight per day for average and high consumers respectively. The calculated MOE values for average and high consumers were 940 000 and 480 000 respectively

攝入量評估

Dietary Assessment

- 攝入量一般和攝入量高的消費者，他們的暴露限值均遠高於 10 000。因此，本地成年人從這項研究選取的食物組別中所攝入的柄曲霉毒素分量對健康的影響不大
- The calculated MOE values for both average and high consumers were well above 10 000. Hence, health concern for the local adult population due to STC exposure from the selected food groups in this study is considered low

攝入量評估 Dietary Assessment



- 在各食物組別中，“粉麵”是柄曲霉素攝入量的主要來源
- 這是由於香港成年人在“粉麵”這個食物組別中的消費量較高
- Among different food groups, “pasta and noodles” was found to be the major contributor
- This is due to a higher consumption amount of food under the “pasta and noodles” food group by the Hong Kong adult population

與國際比較

International Comparison

	非洲 African Region	美洲 Region of the Americas	東地中海 Eastern Mediterranean Region	歐洲 European Region	西太平洋 Western Pacific Region	香港 Hong Kong
平均膳食攝入量 (微克/每公斤體重) (上限) Mean Exposure (mcg/kg bw/day) (UB)	0.017	0.0063	0.0035	0.022	0.0005	0.00017
暴露限值 Margin of Exposure (MOE)	9 400	25 000	46 000	NA	NA	940 000

與國際比較

International Comparison

	非洲 African Region	美洲 Region of the Americas	東地中海 Eastern Mediterranean Region	歐洲 European Region	西太平洋 Western Pacific Region	香港 Hong Kong
高膳食攝入量 (第90百分位) (微克/每公斤體重) (上限) High Exposure (90th percentile) (mcg/kg bw/day) (UB)	0.034	0.013	0.007	0.044	0.001	0.00033
暴露限值 Margin of Exposure (MOE)	4 700	12 000	23 000	NA	NA	480 000

與國際比較

International Comparison

- 聯合國糧食及農業組織／世界衛生組織食品添加劑聯合專家委員會 (JECFA) 於 2017 年評估了其中五個世界衛生組織區域內 (包括非洲、美洲、歐洲、東地中海及西太平洋)，有關從膳食攝入柄曲霉毒素分量的數據
- 與是次研究相比，本港成年人從膳食攝入柄曲霉毒素的分量相對較低
- In 2017, JECFA carried out dietary exposure assessment for 5 World Health Organisation's Regions (African Region, Region of Americas, Eastern Mediterranean Region, European Region and Western Pacific Region)
- Comparing to the results of current study with that of JECFA, the dietary exposure to STC of the local population was much lower

結論

Conclusion

- 這次研究收集的樣本，僅約 10% 驗出含柄曲霉毒素
 - 食物組別“粉麵”是本港成年人攝入柄曲霉毒素的主要來源
 - 攝入量一般和攝入量高的消費者，他們的暴露限值均遠高於10 000
 - 因此有關柄曲霉毒素影響市民健康值得關注的程度不高
- Only 10% of samples collected in this study were found to contain STC
 - Food group “pasta and noodles” was the major contributor to the dietary exposure of STC for local population
 - The calculated MOE values for both average and high consumers were well above 10 000
 - Therefore, health concern is considered to be low from the public health point of view

建議

Recommendations

- 由於柄曲霉毒素在食物貯存期間產生，食物應妥善貯存，例如放於陰涼乾燥的地方，可防止霉菌於食物中滋生，從而減低受柄曲霉毒素污染的風險
- STC is produced during storage of food commodities. Storage conditions of food should be managed properly, such as in cool and dry places, to prevent fungal infestation in food

謝謝
Thank you
