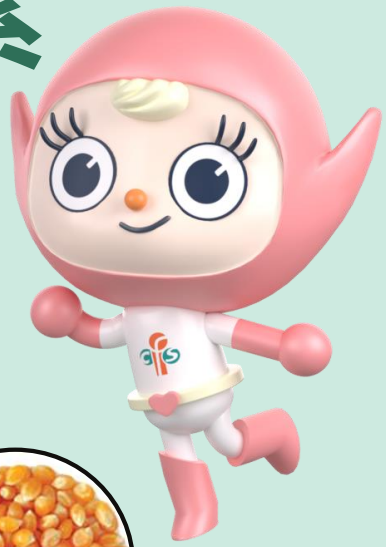
食物中的T2-毒素、HT-2毒素和4,15-二乙酰蕉草鐮刀烯醇

T-2 toxins, HT-2 toxins and 4,15-diacetoxyscirpenol in Food



風險評估研究

Risk Assessment Study

2025年6月

JUNE 2025

食物環境衞生署
Food and Environmental Hygiene Department

食物安全中心
Centre for Food Safety

研究內容及目的

- 食物安全中心(食安中心)完成了一項有關「食物中的T2-毒素(T-2)、HT-2毒素(HT-2)和4,15-二乙酰藨草鐮刀烯醇(DAS)」的研究
- 檢測本地市面超過300 個食物樣本中T-2、HT-2和DAS的水平
- 估算本港成年人和較年輕群組從這些食物樣本攝入上述物質的情況
- 評估從攝入上述物質對健康可能帶來的風險

The Study and the Aim

- Centre for Food Safety (CFS) has just completed a study on "T-2 toxins, HT-2 toxins and 4,15-diacetoxyscirpenol in Food"
- Analysed T-2, HT-2 and DAS levels in over 300 samples available in the local market
- Estimated the dietary exposure to T-2、HT-2 and DAS of the Hong Kong adult and younger populations arising from the consumption of these products
- Assessed the potential health impact due to exposure to T-2、 HT-2 and DAS from products

背景

T-2、HT-2和DAS

- A型單端孢霉烯族毒素
- 結構相近
- 由不同品種的鐮刀菌產生
- 清涼潮濕條件下滋長和入侵農作物
- 主要污染穀類及其製品
  - 米、小麥、燕麥和大麥
  - 麵粉、麵包、早餐穀物、麵條和啤酒

Background

T-2, HT-2 and DAS

- Similar structure
- Type A trichothecenes
- Produced by various Fusarium species
- Grow and invade crops under cool, moist conditions
- Mainly contaminate cereals and their derived products
  - Rice, wheat, oat and barley
  - Flour, bread, breakfast cereals, noodles and beer

對健康的影響

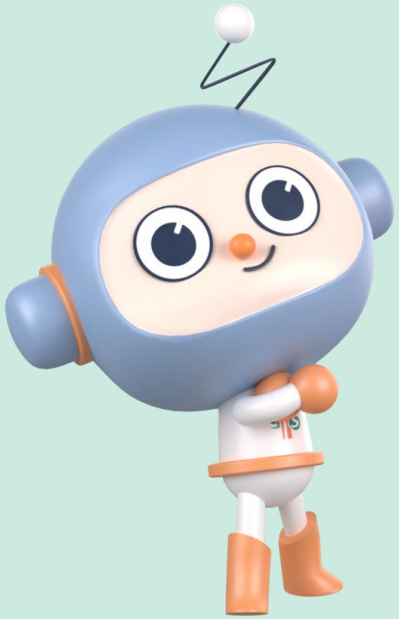
T-2

- 影響免疫系統
- 主要代謝物為HT-2
- 和HT-2誘發不良影響的效能相若
- 強度比DAS為高
- 第 3 組物質(未能分類會否令人類患癌)

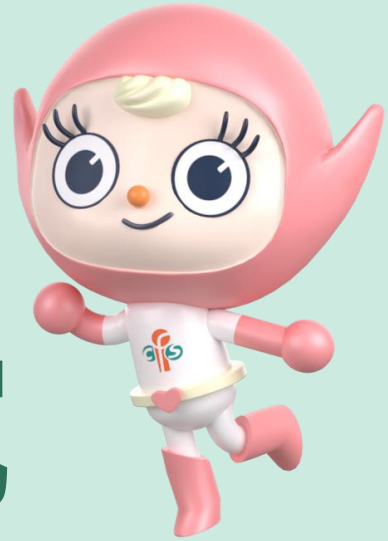
Health Effects

T-2

- The immune system was the target for T-2 toxicity
- HT-2 is the primary metabolite
- T-2 and HT-2 induce adverse effects with similar potency
- More potent than DAS
- Group 3 (not classifiable with regard to its carcinogenicity to humans)



風險評估研究
Risk Assessment Study



研究目的

- 檢視本港市場選定食物的T-2、HT-2和DAS含量
- 估算本港成年人和較年輕群組從膳食攝入T-2、HT-2和DAS的總量
- 評估相關的潛在健康風險

Study objectives

- Examine the levels of T-2, HT-2 and DAS in selected food items available at local markets
- Estimate the dietary exposure to the sum of T-2, HT-2 and DAS of local adult and younger populations
- Assess the associated potential health risk

研究方法

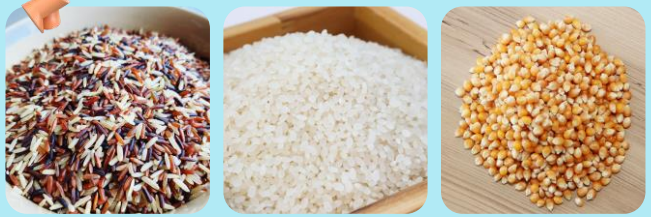
- 於2023年10月至12月期間，從本港零售商收集了327個食物樣本(涵蓋61項食品)
- 選取樣本的主要準則包括:
  - 文獻所載
  - 有關食品在本地的受歡迎程度
  - 抽樣期內有關食品在本地市場的供應情況

Methodology

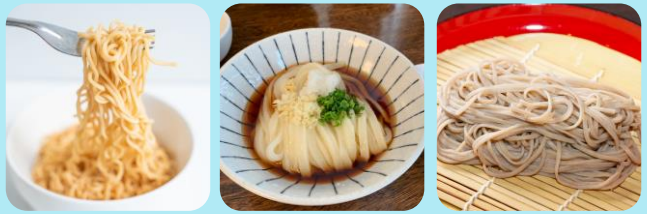
- A total of 327 food samples (included 61 food items) were collected from local retailers such as supermarkets, online shops and grocery stores between October to December 2023
- The samples were chosen mainly based on
  - The occurrence data reported in the literature
  - Their popularity among local population
  - Their availability in the local market during the sampling period

採樣 Sampling

涵蓋10個食品組別
Covered 10 groups of foods



穀類 Cereal Grains



粉麪 Pasta & Noodles

烘焙食品 Bakery and Pastry Items

早餐穀類食品 Breakfast Cereal

麪粉 Flour

蔬菜、堅果和種子 Vegetables, Nuts & Seeds

調味小食
Savoury Snacks

澱粉代用品
Starch substitute

植物油
Vegetable oils

飲料
Beverages

化驗結果

- 73個樣本(約22%)檢出含有至少一種上述霉菌毒素
  - 穀類: 41個樣本
  - 早餐穀類食品: 12個樣本
  - 烘焙食品: 9個樣本
- 所有食物樣本均沒有檢出T-2、HT-2和DAS
  - 澱粉代用品
  - 粉麪

Analytical results

- 73 samples (about 22%) were reported to contain at least one of these mycotoxins
  - Cereal grains: 41 samples
  - Breakfast cereal: 12 samples
  - Bakery and pastry items: 9 samples
- All samples were not detected with T-2, HT-2 and DAS
  - Starch substitute
  - Paste & noodles

不同食物組別中T-2、HT-2和DAS的平均含量
Mean Concentration of T-2、HT-2 and DAS in Different Food Groups

食物組別 Food Group	平均值(微克/公斤) [範圍] Mean (μg/kg) [range]			
	下限 LB		上限 UB	
Breakfast Cereal 早餐穀類食品	2.687	[0-23.718]	2.726	[0.11-23.718]
Vegetable Oils 植物油	1.075	[0-3.43]	1.222	[0.11-3.44]
Cereal Grains 穀類	0.304	[0-7.038]	0.381	[0.11-7.038]
Bakery and Pastry Items 烘焙食品	0.168	[0-4.3]	0.264	[0.11-4.31]
Beverages 飲料	0.027	[0-0.1]	0.120	[0.11-0.16]
Flour 麪粉	0.019	[0-0.08]	0.119	[0.11-0.14]
Vegetables, Nuts & Seeds 蔬菜、堅果和種子	0.008	[0-0.036]	0.115	[0.11-0.136]
Savoury Snacks 調味小食	0.005	[0-0.028]	0.113	[0.11-0.128]

健康風險評估

- 2022年，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)
  - 重新評估T-2、HT-2和DAS的毒性
  - 訂定組合每日可容忍攝入量(單獨或組合計): 每公斤體重25納克
- 把DAS的膳食攝入量與組合每日可容忍攝入量作比較時，應乘以相對強弱因子值0.2

Health Risk Estimation

- In 2022, Joint FAO/WHO Expert Committee on Food Additives (JECFA)
  - Re-evaluated the toxicity of T-2, HT-2 and DAS
  - Established a Group tolerable daily intake (alone or in combination): 25 ng/kg body weight (bw)
- The relative potency factor of 0.2 should be applied in comparing the dietary exposure to DAS with the Group TDI

攝入T-2、HT-2和DAS的情況
Dietary Exposure to T-2、HT-2 and DAS

本港成年人 Local adult population	一般消費者 Average Consumers	攝入量高的消費者(第90百分位) High Consumers (90th Percentile)
每日膳食攝入總量 (納克/每公斤體重) (下限 -上限) Dietary Exposure (ng/kg bw/day) (LB-UB)	0.0753 – 0.8455	0.1907 – 1.2806
分量佔組合每日可容忍攝入量的百分比 % contribution to Group TDI	0.3% - 3.38%	0.76% - 5.12%

本港較年輕群組 Local younger population	一般消費者 Average Consumers	攝入量高的消費者(第90百分位) High Consumers (90th Percentile)
每日膳食攝入總量 (納克/每公斤體重) (下限 -上限) Dietary Exposure (ng/kg bw/day) (LB-UB)	0.3407 – 1.4703	0.7078 – 2.4047
分量佔組合每日可容忍攝入量的百分比 % contribution to Group TDI	1.36% - 5.88%	2.83% - 9.62%

攝入量評估

- 本港成年人和較年輕群組從所採集的食物組別得出有關T-2、HT-2和DAS的估計膳食攝入總量遠低於聯合專家委員會所訂定的組合每日可容忍攝入量

- 結果顯示攝入量一般和攝入量高的消費者從膳食中攝入T-2、HT-2和DAS而影響健康的機會不大

Dietary Assessment

- The dietary exposure estimates of local adult and younger population to the sum of T-2, HT-2 and DAS arising from the collected food groups were well below the Group TDI established by JECFA

- The results indicated that both average and high consumers of local adult and younger population were unlikely to experience adverse effects of T-2, HT-2 and DAS

攝入量評估

- 從各食物組別攝入T-2、HT-2和DAS的分量佔組合每日可容忍攝入量的百分比均低於5%
- 沒有一個食物組別獲確定為本港成年人和較年輕群組從膳食攝入T-2、HT-2和DAS的主要來源

Dietary Assessment

- The percentage contributions of different food groups were all less than 5% of the Group TDI of T-2, HT-2 and DAS
- None of the food group was identified as a significant source of dietary exposure to T-2, HT-2 and DAS for the local adult and younger population

結論

- 本港成年人和較年輕群組從膳食中攝入T-2、HT-2和DAS而影響健康的機會不大
- 沒有一個食物組別獲確定為本港成年人和較年輕群組從膳食攝入T-2、HT-2和DAS的主要來源

Conclusion

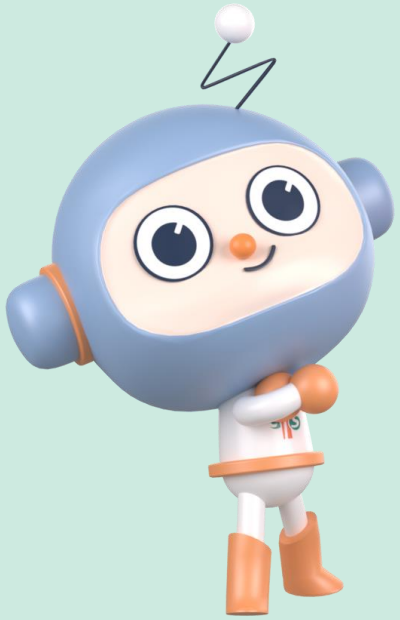
- Both average and high consumers of local adult and younger population were unlikely to experience adverse effects of T-2, HT-2 and DAS arising from the diet
- None of the food group was identified as a significant source of dietary exposure to T-2, HT-2 and DAS for the local adult and younger population

建議

- 市民
  - 向可靠的供應商購買穀類及其製品
  - 妥善存放在陰涼乾燥的地方，防止霉菌生長
  - 維持均衡多元的飲食，減低因偏吃而攝入某些污染物的風險
- 業界人士
  - 妥善貯存食品，避免霉菌滋長而令食品中的霉菌毒素含量增加

Recommendations

- Public
  - Purchase cereals and cereal-based products from reliable sources
  - Store them properly in a cool, dry place to prevent fungal growth
  - maintain a balanced and varied diet to minimise the risk of exposure to contaminants from a limited range of food items
- Members of the trade
  - Store the food commodities properly to avoid susceptible mould growth and increased mycotoxin levels imparted by the mould species



謝謝
Thank you