

本港市面水產中的有機錫化合物

Organotin compounds in aquatic products available at local markets

風險評估研究
Risk Assessment Study

2019年4月10日
10 April 2019

研究內容及目的

The Study and the Aim

- 食物安全中心(中心)完成了一項有關「本港市面水產中的有機錫化合物」的研究
- 檢測本地市面341個水產樣本中四種有機錫化合物(即三丁基錫TBT、二丁基錫DBT、三苯基錫TPT及二辛基錫DOT)的水平
- 估算本港成年人從這些水產樣本攝入有機錫化合物的情況
- 評估從攝入上述物質對健康可能帶來的風險

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- Centre for Food Safety (CFS) has just completed a study on “Organotin compounds in aquatic products available at local markets”
 - Analysed organotin compounds, OTC (TBT, DBT, TPT and DOT) levels in 341 samples of aquatic products available in the local market
 - To estimate the dietary exposure to OTC of the Hong Kong adult population arising from the consumption of these aquatic products

- Assessed the potential health impact due to exposure to OTC from aquatic products

有機錫的污染來源

Sources of organotin compounds contamination

- 有機錫化合物(尤其是三丁基錫(TBT)和三苯基錫(TPT))，一般用作船底防污的除藻劑和殺螺劑以及農用除害劑
 - 有機錫會長時間存留在環境，並會通過食物鏈在生物體內積聚
 - 根據歐洲食物安全局的報告，進食魚類和海產是市民攝入有機錫的主要來源
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- OTC, in particular tributyltin (TBT) and triphenyltin (TPT) have been used as algicides and molluscicides in antifouling products on ship as well as pesticides for agricultural purposes
 - OTC are relatively persistent and have a tendency to bioaccumulate in the environment through the food chain
 - According to EFSA's report, the general public is exposed to OTC mostly through intake of fish and seafood

對健康的影響

Health effects

- 動物研究顯示有機錫會影響免疫系統，干擾內分泌，損害生殖能力和影響發育
- 但現時並沒有足夠數據證明有機錫會對人體產生相關的健康問題

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- Although there are animal studies showing OTC affects the immune system, having endocrine disrupting effects, and influence reproductive and development of the organisms
 - However, there is not enough data to prove that OTC can cause related health problems to the human body

採樣 Sampling

主要從市民普遍購買水產的地方採樣，包括：

- 超級市場
- 街市

樣本分為3個水產組別，40多種產品，共341個樣本，包括：
魚類、軟體類動物和甲殼類動物

Samples were mainly collected from places where the public commonly purchase aquatic products, including:

- Supermarkets
- Wet markets

More than 40 types of aquatic products in 3 groups were collected, total 341 samples including: fish, molluscs and crustaceans

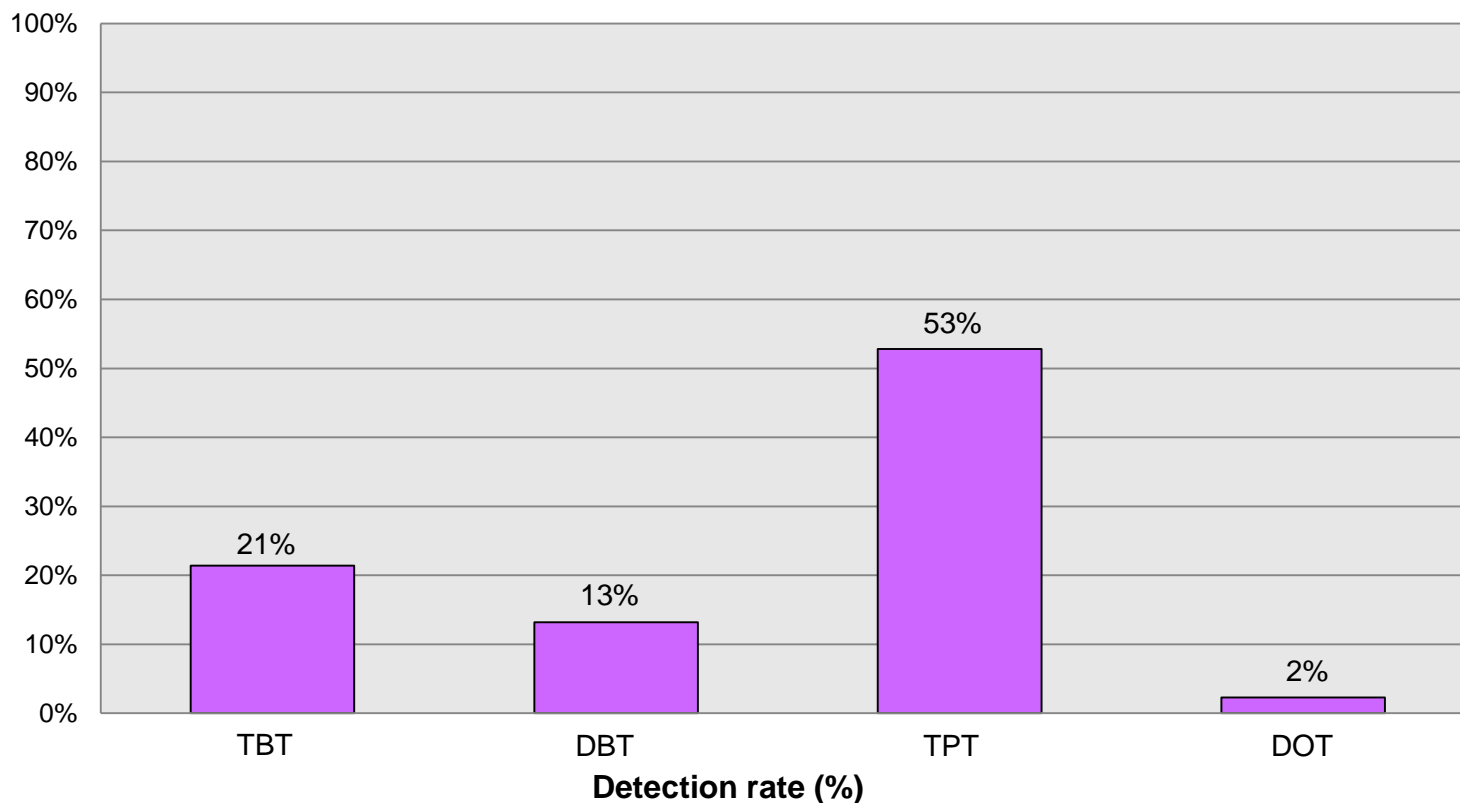
化驗結果

Analytical results

- 在是次研究的341個市民日常食用的水產樣本中，其中205個(60%)樣本測出含有至少一種有機錫化合物
- 205 samples (60%) out of 341 samples of aquatic products commonly consumed by the Hong Kong population have at least one OTC detected at quantified levels

有機錫檢測率

Detection Rate of Organotin Compounds



化驗結果

Analytical results (2)

在測試的四種有機錫化合物中，最常檢測到的是TPT，其次按順序為TBT，DBT和DOT

Among the four OTC examined, TPT was the most commonly detected, followed by TBT, DBT and DOT

化驗結果

Analytical results

水產樣本 Items in each group	有機錫總含量平均值 Mean OTC levels 微克錫/公斤 (mcg/kg) as Sn	有機錫總含量值域 Range of OTC levels 微克錫/公斤 (mcg/kg) as Sn
Fish 魚類		
Cod 鱈魚	1.1	ND - 3.0
Sole 撻沙	24	0.34 - 44
Sea bass 鱸魚	48	0.36 - 170
Turbot 多寶魚	1.3	ND - 3.7
Sardine 沙甸魚	17	ND - 67
Giant grouper 龍躉	73	3.6 - 460
Horse head 馬頭	26	16 - 41
Bigeye 大眼雞/木棉魚	15	ND - 45
Mangrove snapper 紅魷/紅友/紅鮪	160	14 - 490
Mud carp 鯪魚	0.13	ND - 1.0

化驗結果

Analytical results

水產樣本 Items in each group	有機錫總含量平均值 Mean OTC levels 微克錫/公斤 (mcg/kg) as Sn	有機錫總含量值域 Range of OTC levels 微克錫/公斤 (mcg/kg) as Sn
Fish 魚類		
Grass carp 鯪魚	0.17	ND - 0.80
Salmon 三文魚	ND	—
Tuna 吞拿魚	45	ND - 290
Eel 鱧	0.03	ND - 0.25
Grey mullet 烏頭	0.11	ND - 0.85
Mandarin fish 桂花魚	0.18	ND - 0.75
Chinese noodle fish 白飯魚	30	ND - 240
Big head 大頭魚	1.6	ND - 9.8

化驗結果

Analytical results

水產樣本 Items in each group	有機錫總含量平均值 Mean OTC levels 微克錫/公斤 (mcg/kg) as Sn	有機錫總含量值域 Range of OTC levels 微克錫/公斤 (mcg/kg) as Sn
Fish 魚類		
Goldfish carp 鯛魚	0.1	ND - 0.93
coral fish 珊瑚魚	12	ND - 68
Yellow croaker 黃花魚	31	4.2 - 70
Rabbitfish 泥鯚	11	2.5 - 44
Golden thread 紅衫	44	31 - 59
Seabream 鯷魚	40	ND - 160
Mackerel 鯖魚	17	ND - 68
Pomfret 鯧魚	16	ND - 56

化驗結果

Analytical results

水產樣本 Items in each group	有機錫總含量平均值 Mean OTC levels 微克錫/公斤 (mcg/kg) as Sn	有機錫總含量值域 Range of OTC levels 微克錫/公斤 (mcg/kg) as Sn
Molluscs 軟體類動物		
Scallop 扇貝/帶子	0.97	ND - 2.2
Oyster 蠔	0.67	ND - 1.3
Mussel 青口	0.77	ND - 3.1
Clam 蜆	97	ND - 240
Geoduck 象拔蚌	1.9	ND - 4.5
Razor clam 蠶子	0.25	ND - 0.69
Squid 魷魚	10	ND - 49
Octopus 八爪魚	24	ND - 120
Cuttlefish 墨魚	53	17 - 100
Sea cucumber 海參	ND	—
Coral clam 珊瑚蚌	1.2	ND - 4.5
Babylon shell 東風螺	0.26	ND - 0.98
Areolate Babylon 花螺	16	—
Jade spiral shells 翡翠螺	ND	—

化驗結果

Analytical results

水產樣本 Items in each group	有機錫總含量平均值 Mean OTC levels 微克錫/公斤 (mcg/kg) as Sn	有機錫總含量值域 Range of OTC levels 微克錫/公斤 (mcg/kg) as Sn
Crustaceans 甲殼類動物		
Lobster 龍蝦	1.1	ND - 4.8
Mantis shrimp 濼尿蝦	48	0.31 - 91
Shrimp 蝦	5.8	ND - 42
Crab 蟹	ND	—

化驗結果

Analytical results (3)

在魚類、軟體類動物和甲殼類動物這三個食物組別中，有機錫總含量平均值最高的樣本分別為紅魷(每公斤160微克錫)、蜆(每公斤97微克錫)和瀨尿蝦(每公斤48微克錫)

Mangrove snapper (160 $\mu\text{g}/\text{kg}$ as Sn), clam (97 $\mu\text{g}/\text{kg}$ as Sn) and mantis shrimp (48 $\mu\text{g}/\text{kg}$ as Sn) were found to contain the highest mean concentrations of total OTC in the food group fish, molluscs and crustacean respectively.

化驗結果

Analytical results

有機錫總含量 Total OTC 微克錫/公斤 mcg/kg as Sn	水產樣本 (全部) All samples	魚類 Fish	軟體類動物 Molluscs	甲殼類動物 Crustaceans
平均值 Average	20	24	15	14

化驗結果

Analytical results (4)

三個水產組別的有機錫總含量平均值，以魚類為最高(每公斤24微克錫)，其次是軟體類動物(每公斤15微克錫)和甲殼類動物(每公斤14微克錫)

For the mean total OTC levels in different food groups, fish contained the highest level at 24 $\mu\text{g}/\text{kg}$ as Sn, followed by molluscs (15 $\mu\text{g}/\text{kg}$ as Sn) and crustaceans (14 $\mu\text{g}/\text{kg}$ as Sn)

健康參考值

Health-based guidance value

歐洲食品安全局評估了有機錫的安全性，為一組有機錫化合物（TBT、DBT、TPT和DOT）訂定健康參考值，以錫計算，每日可容忍攝入量為每公斤體重零點一微克

European Food Safety Authority (EFSA) has evaluated the safety of OTCs and established a health based guidance value for TPT, TBT, DBT and DOT compounds, which is equivalent to 0.1 microgram/kilogram body weight/day when expressed as Tin(Sn)

攝入量評估

Exposure assessment

	有機錫總含量攝入量 (微克錫/每日每公斤體重) Total OTC exposure (mcg/kg as Sn bw/day)	健康參考值(微克錫/ 每日每公斤體重) HBGV (mcg/kg as Sn bw/day)	有機錫總含量 攝入量佔健康 參考值的百分比 % HBGV for Total OTC exposure
攝入量一般的市民 Average consumers	0.020	0.1	20
攝入量高的市民 High consumers	0.057		57

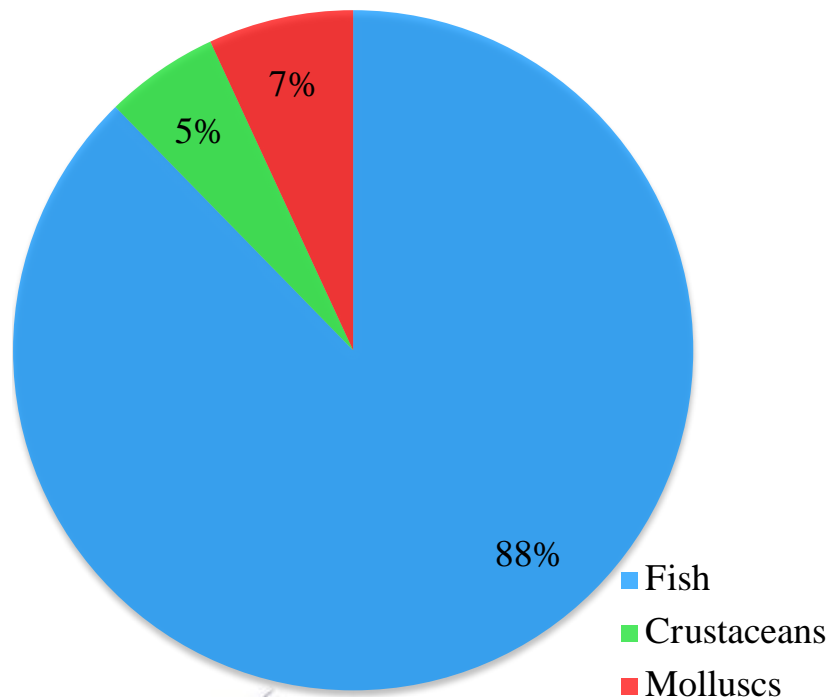
攝入量評估

Exposure assessment (1)

- 是次研究顯示，攝入量一般和攝入量高的本地成年人從膳食攝取有機錫化合物的分量均低於健康參考值
 - 本港成年人從本地售賣的水產攝取有機錫化合物以致健康受損的機會不大
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- The results showed that the dietary exposures to the total OTC of both the average and high consumers of the adult population were below the HBGV
 - Adverse health outcome due to OTC exposure of the Hong Kong adult population as a whole from aquatic products commonly available at local markets was unlikely

攝入量評估

Exposure assessment (2)



在各水產組別中，“魚類”是有機錫化合物攝入量的主要來源

Among the three groups of aquatic product, the food group “fish” was found to be the major contributor

結論(一)

Conclusion (1)

- 這項研究抽取的六成水產樣本被檢出含有至少一種有機錫化合物
 - 魚類是有機錫化合物的主要膳食來源
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- 60% of the aquatic samples extracted from this study were found to contain at least one organotin compound
 - The food group fish was the major contributor to the OTC dietary exposure

結論(二)

Conclusion (2)

本港成年人從本地售賣的水產攝取有機錫化合物以致健康受損的機會不大

Adverse health outcome due to OTC exposure of the Hong Kong adult population as a whole from aquatic products commonly available at local markets was unlikely

建議

Recommendations

- 市民應保持飲食均衡和多元化，包括進食多種肉類和蔬果，避免因偏食某幾類食物而攝入任何過量污染物
 - 魚類含有奧米加-3脂肪酸、優質蛋白質等多種人體所需的營養素，市民宜進食不同類別和品種的魚，切勿偏吃某幾種魚類
-
- The public is advised to maintain a balanced and varied diet which included a wide variety of meat, vegetables and fruits so as to avoid excessive exposure to any contaminants from a small range of food items
 - As fish contain many essential nutrients, such as omega-3 fatty acids and high quality proteins, moderate consumption of a variety of fish is recommended

有機錫化合物在環境中的水平

OTC level in the environment

- 減少水產中的有機錫化合物含量主要透過控制其使用，以保障海洋生態及人們健康
- 隨著更多國家及地區限制有機錫化合物用作船底防污漆，以及農用除害劑，環境受有機錫化合物污染的情況預計將日趨改善

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- Reduction of OTC in aquatic products relies mainly on the control of their use and release in order to safeguard the marine ecosystem and human health.
 - With the increasing number of places to restrict the use of OTC in antifouling paints in ships and pesticides, OTC in the environment are expected to be in a decreasing trend

謝謝
Thank You