香港成年人從食物攝取非二噁英樣多氯聯苯的情況

Dietary Exposure to Non-Dioxin-Like Polychlorinated Biphenyls (PCBs) of Hong Kong Adult Population

食物環境衞生署
Food and Environmental Hygiene Department

食物安全中心
Centre for Food Safety

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- 什麼是非二噁英樣多氯聯苯?
- 研究目的及方法
- 結果及討論
- 給市民的建議

- What is polychlorinated biphenyls (PCBs)?
- What is non-dioxin-like PCBs?
- Objectives & methodology
- Results and discussion
- Advice to public

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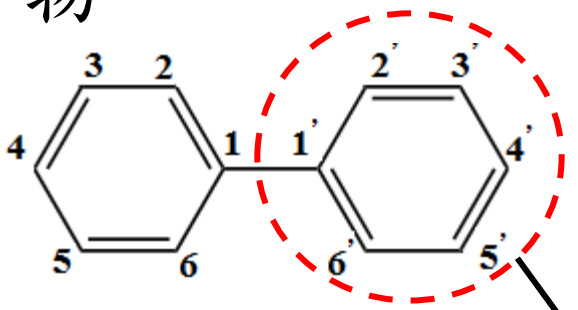
什麼是多氯聯苯?
What is polychlorinated biphenyls (PCBs)?

多氯聯苯

- 一組具相似基本結構的化合物
  (聯苯 - 兩個苯相連)

- 氯的數目及位置不同



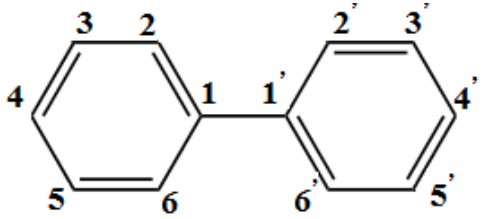
苯環
a phenyl ring

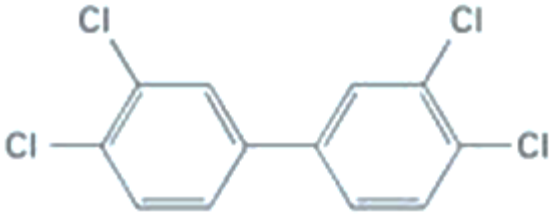
Polychlorinated biphenyls (PCBs)

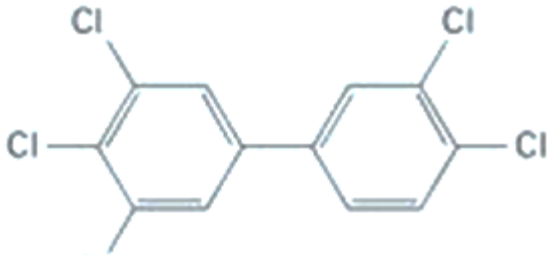
- a group of chemicals with similar basic structure
  (biphenyls - two connected phenyl rings)

- number and position of chlorine attached to biphenyl are different

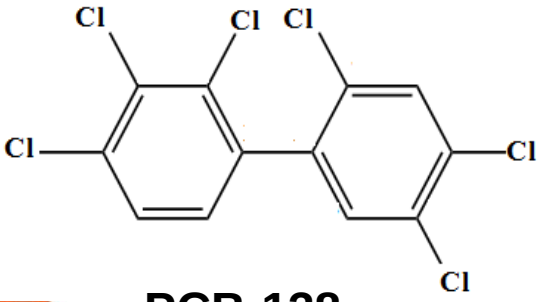
什麼多氯聯苯?
What is polychlorinated biphenyls (PCBs)



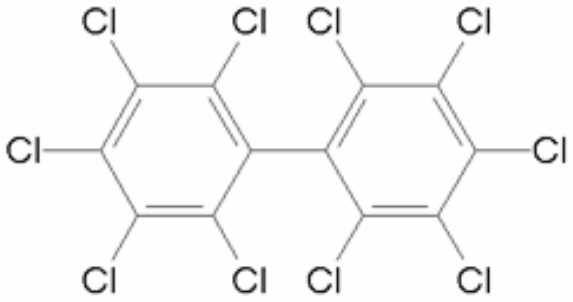




- 共有兩百多種化合物
- a group of more than 200 chemicals



PCB-138



PCB-209

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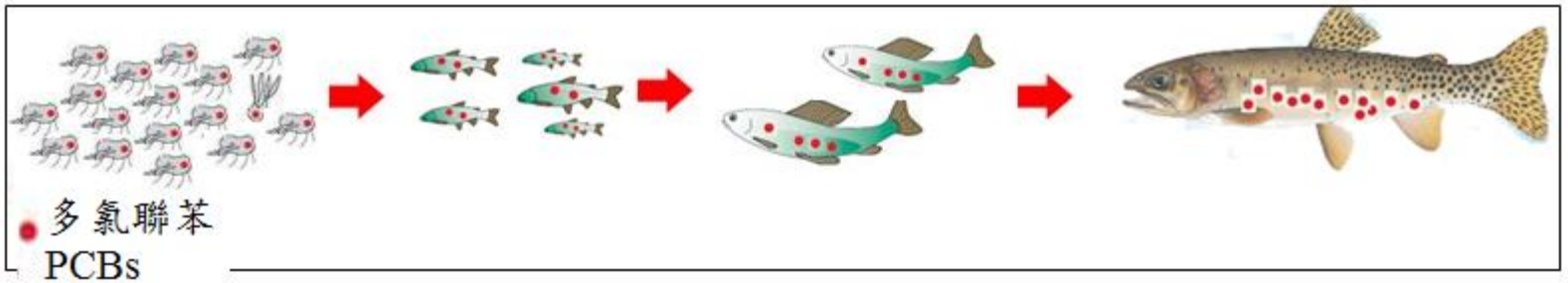
什麼是多氯聯苯?
What is polychlorinated biphenyls (PCBs)?

- 人造環境污染物
- 自1930年代開始大量生產，並廣泛應用於工業上，如電絕緣體
- 非常穩定
- 對環境及人體健康有害
- 從70年代起，禁止使用

- man-made environmental contaminants
- mass production since 1930 and used in a number of industrial applications such as electrical insulators
- very stable
- cause harm to environment and human health
- banned for use since 1970s

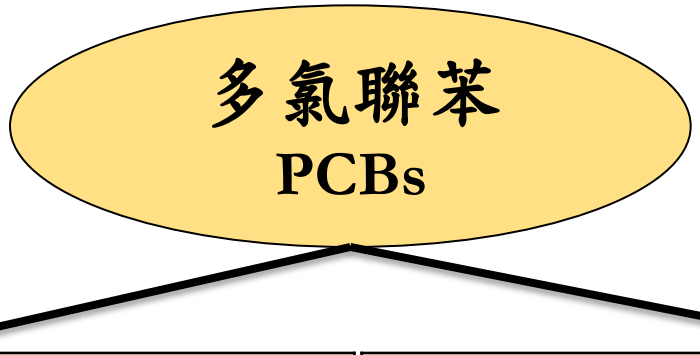
什麼是多氯聯苯?
What is polychlorinated biphenyls (PCBs)?

- 會長時間存留在環境，並在食物鏈中生物累積
- 屬脂溶性
- 主要攝入來源
  - 魚類、肉類、奶類和蛋等動物源性食品



- persist in the environment and bioaccumulate in the food chain
- fat soluble
- main route of exposure
  - foods of animal origin such as fish, meat, dairy products and eggs

什麼是非二噁英樣多氯聯苯?
What are non-dioxin-like polychlorinated biphenyls (PCBs)?



二噁英樣多氯聯苯 **Dioxin-like PCBs**	非二噁英樣多氯聯苯 **Non-dioxin-like PCBs**
毒理性質與二噁英**相似** toxicological properties **similar to dioxins**	毒理性質與二噁英**不同** toxicological properties **different from dioxins**
可視為不同的化合物**分開研究** they can be considered **separately**	

什麼是非二噁英樣多氯聯苯?
What are non-dioxin-like polychlorinated biphenyls (PCBs)?

二噁英樣多氯聯苯
Dioxin-like PCBs

毒理性質與二噁英相似
toxicological properties similar to dioxins

2011年研究

- 一般市民的健康受到二噁英和二噁英樣多氯聯苯不良影響的機會不大。

Study in 2011

- the general population was unlikely to experience undesirable health effects of dioxins and dioxin-like PCBs.

什麼是非二噁英樣多氯聯苯?
What are non-dioxin-like polychlorinated biphenyls (PCBs)?

非二噁英樣多氯聯苯 **Non-dioxin-like PCBs**
● 毒理性質與二噁英不同 ● toxicological properties different from dioxins
● 沒有本地數據評估相關的健康風險 ● no local data for health risk assessment

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非二噁英樣多氯聯苯對健康的影響
Health effect of non-dioxin-like PCBs

- 對健康的影響
  - 影響內分泌系統
    - 干擾甲狀腺素的水平
  - 影響免疫系統
  - 影響改變神經行為的發育

- Health effects
  - affect endocrine system
    - disrupt thyroid hormone levels
  - affect immune systems
  - affect neurobehavioural development

非二噁英樣多氯聯苯對健康的影響
Health effect of non-dioxin-like PCBs

- 致癌性
  - 國際癌症研究機構(IARC)
    - 多氯聯苯
      - 列為第1組物質 (即確定的人類致癌物)

- Carcinogenicity
  - International Agency for Research on Cancer (IARC)
    - PCB
      - Group 1 agent, i.e. carcinogenic to human

目的
Objectives

- 檢測食物中非二噁英樣多氯聯苯的總和
- 估計香港成年人從食物攝取非二噁英樣多氯聯苯的情況
- 評估相關的健康風險

- to determine the sum of non-dioxin-like PCBs in food
- **to estimate the dietary exposure to non-dioxin-like PCBs of the Hong Kong adult population**
- **to assess the associated health risks**

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食物抽樣和處理
Food sampling and preparation

- 選取71種食物
  - 動物源性食物及其產品、油脂性食物
    - 魚類和海產及其製品
    - 肉類、家禽和野味及其製品
    - 乳類製品
    - 脂肪類
    - 蛋及蛋類製品
    - 混合食品
    - 不含酒精飲品
    - 穀物及穀物製品及其他

- 71 food items selected
  - animal origin and their products and oily food
    - Fish and seafood and their products
    - Meat, poultry and game and their products
    - Dairy products
    - Fats and oils
    - Eggs and their products
    - Mixed dishes
    - Beverages, non-alcoholic
    - Cereals and their products and others

食物抽樣和處理
Food sampling and preparation

- 12個月內分4次購買樣本
- 每次購買
  - 每種食物購買3個樣本
  - 把同一種食物的3個樣本合併成為混合樣本
- 共檢測了284個混合樣本

- 4 sampling occasions in twelve months
- Each occasion
  - **purchase 3 samples for each food items**
  - **combine the 3 samples of the same item into a composite sample**
- **analysed 284 composite samples in total**

化驗分析
Laboratory analysis

- 由食物安全中心的食物研究化驗所進行

- conduct by the Food Research Laboratory (FRL) of the CFS

健康參考值
Health-based guidance values (HBGVs)

- 評估健康風險
- 參照一些歐洲國家採用的健康參考值
  - 以六種非二噁英樣多氯聯苯之總和計算，每日可容忍攝入量為每公斤體重10納克
- 六種非二噁英樣多氯聯苯:
  - PCB-28 、 52 、 101 、 138 、 153及180

- to assess associated health risks
- make reference to HBGV from some European countries
  - 10 ng/kg bw/day for sum of the six non-dioxin-like PCBs
- six non-dioxin-like PCBs:
  - PCB-28, 52, 101, 138, 153 and 180

健康參考值
Health-based guidance values (HBGVs)

1微克=一百萬分之一克(1x 10^{-6}克)
1 μg (microgramme) = one millionth of a gramme (1x 10^{-6} g)

1納克=十億分之一克(1x 10^{-9}克)
1 ng (nanogramme) = one billionth of a gramme (1x 10^{-9} g)

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結果及討論
Results and discussion

- 284個樣本中，225個未檢出含非二噁英樣多氯聯苯 (79%)
- 不含非二噁英樣多氯聯苯的食品類別
  - 穀物及穀物製品
  - 蛋及蛋類製品
  - 混合食品
  - 不含酒精飲品

- 225 samples (out of 284) with no non-dioxin-like PCBs detected (79%)
- food groups with non-dioxin-like PCBs not detected
  - cereals and their products
  - eggs and their products
  - mixed dishes
  - beverages, non-alcoholic

結果及討論
Results and discussion

- 284個樣本中，只有59樣本檢出非二噁英樣多氯聯苯(21%)
  - 非二噁英樣多氯聯苯含量屬於低

- 這59個樣本中，50個屬於“魚類和海產及其製品”
  - 海外研究結果相若

- only 59 samples (out of 284) with detected non-dioxin-like PCBs (21%)
  - levels of non-dioxin-like PCBs were low
- among these 59 samples, 50 belonged to “fish and seafood and their products”
  - similar to overseas studies

結果及討論
Results and discussion

非二噁英樣多氯聯苯含量分布 (下限估量–上限估量)

Distribution of non-dioxin-like PCB (Lower bound – Upper bound)

食物組別 Food group	檢出非二噁英樣多氯聯苯樣本數目 (檢測樣本數目) No. samples with detected non-dioxin-like PCBs (no. of samples tested)	平均值(微克/公斤) Mean (µg/kg)
魚類和海產及其製品 Fish and seafood and their products	50 (76)	0.89 – 0.93
肉類、家禽和野味及其製品 Meat, poultry and game and their products	3 (48)	0.01 – 0.07
乳類製品 Dairy products	1 (20)	0.01 – 0.06
油脂類 Fats and oils	4(8)	0.17 – 0.22
其他 Others	1(16)	0.00 – 0.07

結果及討論
Results and discussion

魚類和海產及其製品非二噁英樣多氯聯苯的含量
(下限估量–上限估量)
Non-dioxin-like PCBs in Fish and seafood and their products
(Lower bound – Upper bound)

	平均值(微克/公斤) Mean (μg/kg)
歐洲數據# Data from European study#	14.23 – 14.82
目前的研究結果 Results of this study	0.89 - 0.93

#EFSA. Update of the monitoring of levels of dioxins and PCBs in food and feed. EFSA Journal 2012; 10(7):2832. Available from URL: http://www.efsa.europa.eu/fr/search/doc/2832.pdf

結果及討論
Results and discussion

含非二噁英樣多氯聯苯較高的食物
Food items with higher level of non-dioxin-like PCBs

	平均含量 (微克/公斤) Mean concentration (μg/kg)
三文魚 salmon fish	5.7
蠔 oyster	3.4
桂花魚 mandarin fish	3.1
黃花魚 yellow croaker fish	1.7
鯧魚 pomfret fish	1.2

膳食攝入量
Dietary Exposure

	每日膳食攝入量 (納克/每公斤體重) Dietary exposure (ng/kg bw/day)	
	一般人 Average	攝入量高的人 High consumer
本研究 Current study	0.68 – 1.38	3.08 – 3.84
健康參考值的百分比 % HBGV	6.8% – 13.8%	30.8% – 38.4%

- 健康參考值: 每日可容忍攝入為每公斤體重10納克
- 攝入量均低於健康參考值
- 一般市民的健康受到非二噁英樣多氯聯苯不 良影響的機會不大

- Health-base guidance value: 10 ng/kg bw/day
- exposures were below the health-based guidance value
- general population was unlikely to experience undesirable health effects of non-dioxin-like PCBs

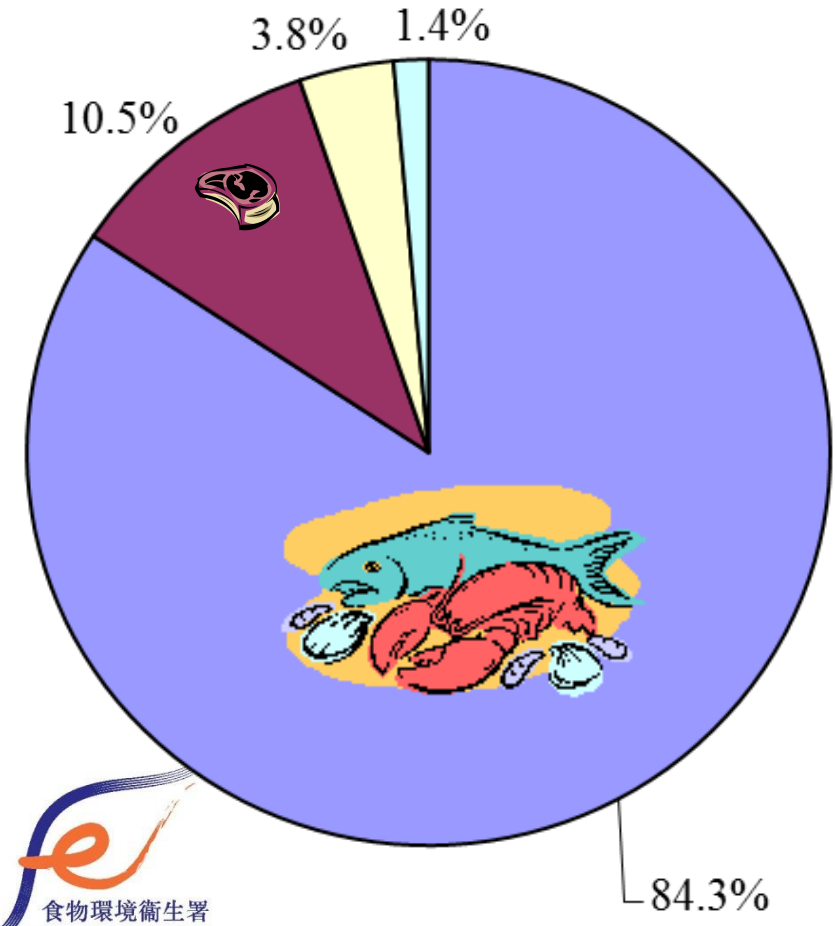
結果及討論
Results and discussion

跟其他地方研究比較
Comparison with other places

地方 Places	每日膳食攝入量 (納克/每公斤體重) Dietary exposure (ng/kg bw/day) (下限估量–上限估量) (Lower bound – Upper bound)	
	一般人 Average	攝入量高的人 High consumer
香港 Hong Kong (本研究) (Current study)	0.68 – 1.38	3.08 – 3.84
荷蘭 Netherlands	3.8 – 4.5	8.1 – 9.5
英國 UK	4.1 – 5.3	9.8 – 11.7
德國 Germany	4.3 – 5.3	14.4 – 15.9
比利時 Belgium	4.6 – 5.4	14.7 – 15.3
丹麥 Denmark	5.4 – 6.3	10.8 – 11.8
瑞典 Sweden	5.7 – 6.0	12.8 – 13.1

結果及討論
Results and discussion

主要的膳食來源
Major food contributors



結果及討論
Results and discussion

- 一般市民
  - 健康受到非二噁英樣多氯聯苯不良影響的機會不大
- 主要攝入來源:
  - 動物源性的食物
  - 特別是魚類

- General population
  - unlikely to experience major undesirable health effect
- Predominant route of exposure:
  - Food of animal origin
  - Particularly fish

結果及討論
Results and discussion

- 各國已致力減少市民從膳食攝入多氯聯苯的分量
- 源頭控制措施
  - 從70年代起，已禁止使用多氯聯苯
- 不同研究發現，多氯聯苯在主要食物類別內的含量有所降低

- international effort has been made to reduce the dietary exposure to PCBs of the population
- source control measures
  - banned for use since 1970s
- different studies have shown that PCB concentrations in major food groups have been decreasing

給市民的建議
Advice to public

- 保持均衡及多元化的飲食
  - 包括進食多種蔬果
  - 避免因偏食某幾類食物而攝入過量的污染物

- Have a balanced and varied diet
  - include a wide variety of fruit and vegetables
  - so as to avoid excessive exposure to contaminants from a small range of food items

給市民的建議
Advice to public

- 適量進食多種魚類
  - 魚類含有多種人體所需的營養素，例如奧米加-3脂肪酸、優質蛋白質等

- Recommend moderate consumption of a variety of fish
  - Fish contain many essential nutrients such as omega-3 fatty acids, and high quality proteins

謝謝

Thank you

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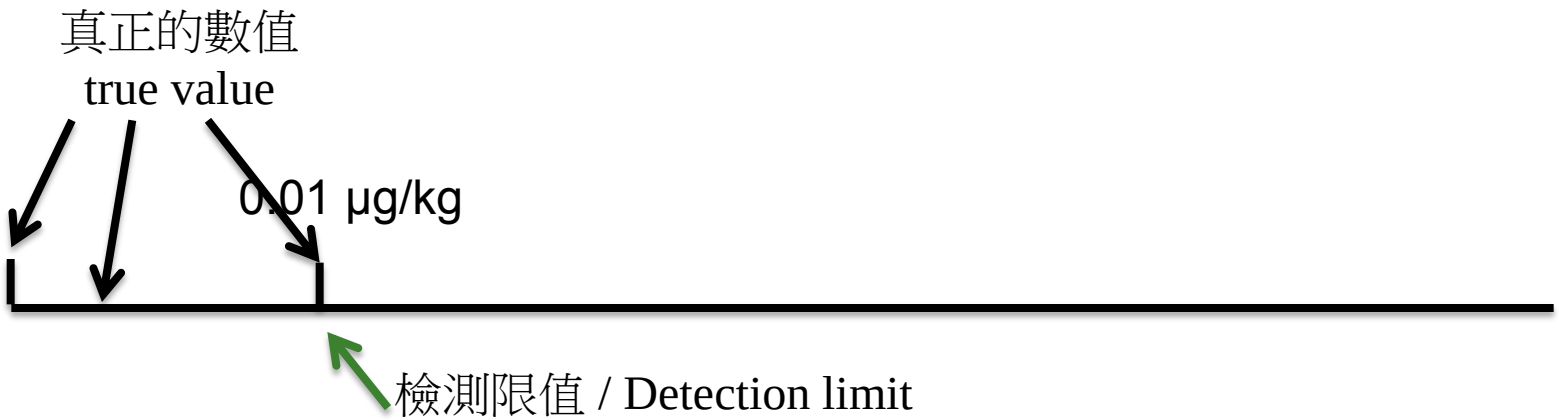
- 284個樣本中，225個未檢出含非二噁英樣多氯聯苯 (79%)
- 225 samples (out of 284) with no non-dioxin-like PCBs detected (79%)

數值是 “沒有檢出”
value is “not detected (ND)”

= 0



假設
(1) 計算下限值時，使用 “沒有檢出= 0”
(2) 計算上限值時，使用 “沒有檢出= 檢測限值”

Assumption
(1) “ND = 0” is used for lower bound (LB) figures
(2) “ND = LOD” is used for upper bound (UB) figures

魚類樣本非二噁英樣多氯聯苯的含量 (Non-dioxin-like PCB content in fish samples)	平均含量 (微克/千克) [範圍上限] Mean (μg/kg) [Range, UB]
三文魚 Salmon	5.7 [4.40 – 6.30]
桂花魚 Mandarin fish	3.1 [0.67 – 7.40]
黃花魚 Yellow croaker	1.7 [1.30 – 2.20]
鯧魚(鯰魚) Pomfret	1.2 [0.90 – 1.60]
海斑 Grouper	0.55 [0.41 – 0.75]
紅衫 Golden thread	0.34 [0.30 – 0.37]
馬頭 Horse head	0.29 [0.24 – 0.31]
大頭魚 Big head	0.23 [0.13 – 0.44]
烏頭 Grey mullet	0.23 [0.20 – 0.26]
絞鯪魚肉 Dace, minced	0.15 [0.13 – 0.16]
吞拿魚/金槍魚 Tuna	0.08 [0.06 – 0.15]
鯇魚 Grass carp	未檢出 not detected
龍脷/撻沙 Sole	未檢出 not detected
魚蛋/魚片 Fish ball/fish cake	未檢出 not detected

除了「魚類和海產及其製品」外，也在其他食物中檢出，但檢出的分量很低。

這些食物包括:
牛肉（平均含量為每公斤含零點十六微克(上限)）
雪糕（平均含量為每公斤含零點零八微克(上限)）
牛油（平均含量為每公斤含零點三八微克(上限)）
和巧克力（平均含量為每公斤含零點零八微克(上限)）

Low levels of NDL-PCBs were detected in

beef（mean: 0.16 μg/kg at the UB）
Ice-cream（mean: 0.08 μg/kg at the UB）
Butter（mean: 0.38 μg/kg at the UB）
chocolate（mean: 0.08 μg/kg at the UB）

歐盟訂定魚類內非二噁英樣多氯聯苯的最高水平（微克/千克）
EU maximum levels (μg/kg) for non-dioxin-like PCBs in fish

食物 Foodstuffs	六種非二噁英樣多氯聯苯之總和 Sum of 6 NDL-PCBs
魚類及其製品 fish and fishery products	75

含量最高的食物 Food items with highest levels	平均含量 (微克/千克) Mean concentration (μg/kg)
三文魚 salmon fish	5.7
桂花魚 mandarin fish	3.1
黃花魚 yellow croaker fish	1.7
鯧魚 pomfret fish	1.2

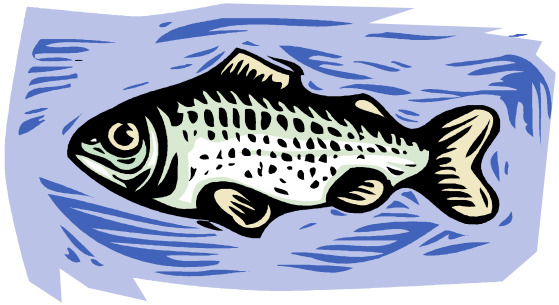
美國 (臨時容許量) (微克/公斤) US (temporary tolerance) (μg/kg)	內地(七種非二噁英樣PCBs之總和) (微克/公斤) Mainland (sum of 7 PCBs) (μg/kg)
2000	500 μg/kg (GB 2762-2012)

	六種非二噁英樣多氯聯苯之總和 平均含量 (微克/公斤) Sum of 6 NDL-PCBs Mean concentration (μg/kg)
三文魚 salmon fish	5.7
蠔 oyster	3.4
桂花魚 mandarin fish	3.1
黃花魚 yellow croaker fish	1.7
鯧魚 pomfret fish	1.2

結果及討論
Results and discussion

最主要的膳食來源

- 魚類和海產及其製品
  - 佔總攝入量的84.3%



Major food contributors

- Fish and seafood and their products
  - 84.3% of total exposure