

食物中鋁的含量

Aluminium in Food

風險評估研究

Risk Assessment Study

鋁的性質

About Aluminium (Al)

- 鋁是一種重量輕的銀白色金屬
- 可天然存在於部分食物中(一般含量為少於5毫克/公斤)
- 鋁金屬
 - 製造烹飪用具、食品包裝物料、建築物的構件等
- 鋁化合物
 - 食品加工、醫學用途等
- Aluminium is a silvery-white metal with light weight
- Naturally be present in some foods (typically at level <5 mg/kg)
- Aluminium metal
 - Cooking utensils, food packaging, structural material for construction, etc
- Aluminium compounds
 - Food processing and medicinal uses, etc



含鋁的食物添加劑

Aluminium-containing food additives

- 含鋁食物添加劑的食物是一般人攝入鋁的主要來源。
- 部分的含鋁食物添加劑可於不同國家應用於多種的食物中。
- Aluminium-containing food additives is the main dietary source of the general population.
- Some are permitted to be used in various foods in different countries.



含鋁的食物添加劑的用途

Uses of Aluminium-containing food additives

用途 Functions	例子 Examples	食品加工 Food processing
膨脹劑/ 膨鬆劑 Raising agent	酸性的磷酸鋁鈉 Sodium aluminium phosphate, acidic (INS 541(i))	泡打粉的常用原料，用於烘焙食品 和蒸包或蒸糕 Common ingredient in baking powder for use in bakery products and steamed bread/bun/cake
固化劑 Firming agent	硫酸鋁鉀 (俗稱明礬) Aluminium potassium sulphate (also known as alum) (INS 522)	加工海蜇和醃製食品 Use in jellyfish and pickles
抗結劑 Anticaking agent	矽酸鋁鈉 Sodium aluminosilicate (INS 554)	食物混合配料粉(如奶精) Use in powder mix (e.g. non-dairy creamer)
染色料 Colouring matter	鋁粉和鋁鹽(色澱) Aluminium powder and Aluminium salt (lake)	裝飾有糖衣的麩粉製甜點 把糖果和糖衣染色 Decoration of sugar-coated flour confectionery, and colouring of candy and coating

對健康的影響(1)

Health effects of Aluminium (1)

➤ 急性毒性

- 無報告顯示一般人經口服途徑攝入鋁，會引致急性中毒。

➤ 發育毒性

- 導致年幼的實驗動物的夭折率上升、發育遲緩、成熟期延遲、神經發育受損及腎臟功能受損。

➤ Acute toxicity

- No acute toxic effects by the oral exposure to Al in the general population have been reported.

➤ Developmental toxicity

- Increased mortality, decreased growth, delayed maturation, impaired neurodevelopment and renal damage in experimental pups.



對健康的影響(2)

Health effects of Aluminium (2)

➤ 神經毒性

- 暫時沒有一致性的資料顯示鋁與神經系統中毒的關係，亦沒有證據支持鋁與腦退化症的因果關係。

➤ 致癌性

- 沒有證據顯示，人類因攝入鋁而導致癌症。

➤ Neurotoxicity

- Information available remains inconsistent and does not support a causal association between aluminium and Alzheimer disease.

➤ Carcinogenicity

- No evidence of carcinogenic potential to humans.



健康參考值

Health-based Guidance Value

- 聯合國糧食及農業組織 / 世界衛生組織聯合食品添加劑專家委員會(JECFA)曾多次評估各種鋁化合物的安全性。
- 在2011年的評估中，JECFA 把鋁的暫定每周可容忍攝入量由每公斤體重1毫克修訂為每公斤體重2毫克。
- Joint FAO/WHO Expert Committee on Food Additives (JECFA) has evaluated the safety of Aluminium compounds for several times.
- In 2011, JECFA re-evaluated the safety of Aluminium.
 - Revised the Provisional Tolerable Weekly Intake (PTWI) of aluminium from 1 mg/kg bw/wk to 2 mg/kg bw/wk.



以往的本地研究

Previous local studies

➤ 首個《食物中鋁的含量》的風險評估研究（2009）

- 含鋁食物添加劑普遍使用於蒸包或蒸糕、部分烘焙食品（例如：鬆餅、班戟／窩夫、椰撻和蛋糕）及海蜇（可供即食）。
- 一般市民健康受鋁嚴重影響的機會不大。
- 一些經常食用加入含鋁食物添加劑的食品（例如烘焙食品和海蜇）的市民，則不能排除健康會受鋁影響的可能性。

➤ 香港首個《總膳食研究》（2013）

- 研究結果亦顯示一般市民從膳食攝入的鋁令健康受鋁嚴重影響的機會不大。

➤ **First Risk Assessment Study on “Aluminium in Food” (2009)**

- Aluminium-containing food additives were widely used in the production of steamed bread/bun/cake, some bakery products such as muffin, pancake/waffle, coconut tart and cake and jellyfish (ready-to-eat-form).
- General population was unlikely to experience major undesirable effects due to aluminium in food.
- The adverse health effect of aluminum for some population who regularly consume large amount of foods such as bakery products and jellyfish added with aluminum-containing food additives could not be ruled out.

➤ **First Hong Kong “Total Diet Study” (2013)**

- The results also supported that the general population was unlikely to experience major undesirable health effects of aluminium.



業界指引

Trade Guidelines

➤ 中心制定《含鋁食物添加劑使用指引》

- 訂明在食品製造過程中使用含鋁食物添加劑的原則。
- 就如何減少食品中鋁含量，向業界提出建議。

➤ “Guidelines on the Use of Aluminium-containing Food Additives” prepared by CFS

- Set out principles for the use of aluminium-containing food additives in food production.
- Provide recommendations to the trade for reducing aluminium content in food products.

含鋁食物添加劑 使用指引



Guidelines on the Use of Aluminium- containing Food Additives



是次研究背景

Current Study Background

目的

Objectives

- 檢測在前次研究中發現鋁含量屬中等至偏高水平食品的鋁含量並探討其鋁含量與使用含鋁食物添加劑的關係；
 - 比較有關食品在兩次研究測得的鋁含量；
 - 評估香港市民從膳食攝入鋁的情況及其相關健康風險。
-
- Examine the levels of aluminium in certain foods with moderate to high levels in the previous risk assessment study on aluminium, and their relation to the use of aluminium-containing food additives;
 - Compare the levels of aluminium in foods between the current study and the previous study;
 - Estimate the dietary exposure to aluminium and its associated health risk.



研究範圍

Scope

- 涵蓋7個食物類別
- 前次風險評估研究中鋁含量屬中等至偏高
 - 蒸包或蒸糕
 - 烘焙食品
 - 小食(包括油炸小食)
 - 海蜇(可供即食)
 - 有糖衣的甜點
 - 醃製食品
 - 食物混合配料粉
- Cover 7 food groups
- Levels of aluminium of moderate to high levels in the previous risk assessment study on aluminium
 - **Steamed bread/bun/cake**
 - **Bakery products**
 - **Snacks including fried snack products**
 - **Jellyfish (ready-to-eat-form)**
 - **Confectionery with coating**
 - **Pickles**
 - **Powder mix**



採樣

Sampling

- 2015年5月至7月
 - 從本港市面共抽取了309個樣本 (27個預先包裝食品 and 282個非預先包裝食品)
 - 36種食品
- Sampling work was conducted from May to July 2015
 - 309 food samples (27 prepackaged and 282 non-prepackaged food)
 - 36 types of food items



採樣數目

Number of samples

食物類別 Food groups	樣本數目 Number of samples
蒸包或蒸糕 Steamed bread/bun/cake	108
烘焙食品 Bakery products	117
小食包括油炸小食 Snack (including fried snack products)	54
海蜇(可供即食) Jellyfish (ready-to-eat form)	10
有糖衣的甜點 Confectionery with coating	5
醃製食品 Pickles	5
食物混合配料粉 Powder mix	10



結果

Results



平均鋁含量(一)

Mean aluminium concentration (1)

蒸包或蒸糕 Steamed bread/bun/cake	平均值 Mean 毫克/公斤 mg/kg (範圍 range)
馬拉糕 “Mai Lai” cake	280 (0.9 – 410)
千層糕 Thousand layer steamed cake	270 (130 – 470)
雞包仔 Chicken bun	230 (110 – 430)
叉燒包 Barbecue pork bun	180 (1.1 – 260)
蓮蓉包 Lotus seed bun	180 (87 – 360)
麻蓉包 Sesame paste bun	160 (0.84 – 280)
壽包 Longevity bun	150 (1.7 – 300)
花卷 Twisted rolls	140 (ND – 360)
饅頭 Steamed bread	140 (0.9 – 260)
燒腩卷 Roasted pork bun	130 (82 – 240)
奶黃包 Egg custard bun	130 (0.72 – 250)
菜肉包 Pork and vegetable bun	65 (0.51 – 190)

ND: 沒有檢出 Not detected

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馬拉糕的平均鋁含量(平均值: 280毫克/公斤)為蒸糕中最高; 而雞包仔的平均鋁含量(平均值: 230毫克/公斤)為蒸包中最高。

“Mai Lai” cake contains the highest mean concentration of aluminium (mean: 280 mg/kg) among the “steamed cake” and chicken bun contains the highest mean concentrations of aluminium (mean: 230 mg/kg) among the “steamed bread/bun”).

平均鋁含量(二)

Mean aluminium concentration (2)

烘焙食品 Bakery products	平均值 Mean 毫克/公斤 mg/kg (範圍 range)
雞蛋仔 Egg waffle	270 (56 – 400)
窩夫 Waffle	270 (ND – 570)
椰撻 Coconut tart	150 (3.1 – 230)
鬆餅 Muffin	130 (1.3 – 270)
牛油蛋糕 Butter cake	91 (0.75 – 210)
班戟 Pancake	55 (ND – 490)
軟蛋糕 Soft cake	37 (ND – 290)
合桃酥 Chinese walnut cookies	12 (1 – 85)
冬甩 Doughnut	12 (1.1 – 81)
菠蘿包 “Pineapple” bun	9.8 (0.8 – 28)
瑞士卷 Swiss cake	8.1 (0.55 – 61)
曲奇/餅乾 Cookies/biscuits	3.6 (0.64 – 7.5)
果撻 Fruit tart	2.6 (0.65 – 7.6)

ND: 沒有檢出 Not detected

平均鋁含量(二)

Mean aluminium concentration (2)

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曲奇/餅乾 Cookies/biscuits	3.6 (0.64 – 7.5)
果撻 Fruit tart	2.6 (0.65 – 7.6)

雞蛋仔及窩夫的鋁平均含量(平均值: 270毫克/公斤)為烘焙食品類別中最高。

Egg waffle and waffle contain the highest mean concentrations of aluminium (mean: 270 mg/kg) in the food group “bakery products”.

ND: 沒有檢出 Not detected

平均鋁含量(三)

Mean aluminium concentration (3)

小食(包括油炸小食) Snack including fried snack products	平均值 Mean 毫克/公斤 mg/kg (範圍 range)
鹹煎餅 Deep fried dough cake	58 (0.78 – 360)
牛蒠酥 Deep fried sweet cruller	21 (0.72 – 170)
煎堆 Sesame ball	19 (0.73 – 160)
膨化食品 Leavening product	15 (0.66 – 64)
蝦片 Prawn cracker	14 (6.6 – 23)
油條 Fried fritters	2.2 (1.2 – 4)

油條的平均鋁含量(平均值: 2.2毫克/公斤)為是次研究中全部36種食品中最低。

Fried fritter has the lowest mean aluminum concentration of 2.2 mg/kg among all 36 food items in the current study.



平均鋁含量(四)

Mean aluminium concentration (4)

Food groups with food items 食物類別及種類	平均值 Mean 毫克/公斤 mg/kg (範圍 range)
海蜆(可供即食) Jellyfish (ready-to-eat-form)	800 (440 – 1100)
有糖衣的甜點 Confectionery with coating	54 (ND – 180)
醃製食品 Pickles	16 (ND – 76)
食物混合配料粉 Powder mix	
• 烘焙/油炸食物混合配料粉 Cake mix/ Pancake mix/ Powder mix for bakery/ Powder mix for fried food	290 (0.59 – 1100)
• 奶精和飲品混合配料粉 Beverage with non-dairy creamer	76 (2.4 – 260)

ND: 沒有檢出 Not detected



平均鋁含量(四)

Mean aluminium concentration (4)

Food groups with food items 食物類別及種類	平均值 Mean 毫克/公斤 mg/kg (範圍 range)
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有糖衣的甜 coating	54 (ND – 180)
醃製食品 I 食物混合酉	16 (ND – 76)
• 烘焙/油 Cake mix/ Pancake mix/ Powder mix for bakery/ Powder mix for fried food	90 (0.59 – 1100)
• 奶精和飲品混合配料粉 Beverage with non-dairy creamer	76 (2.4 – 260)

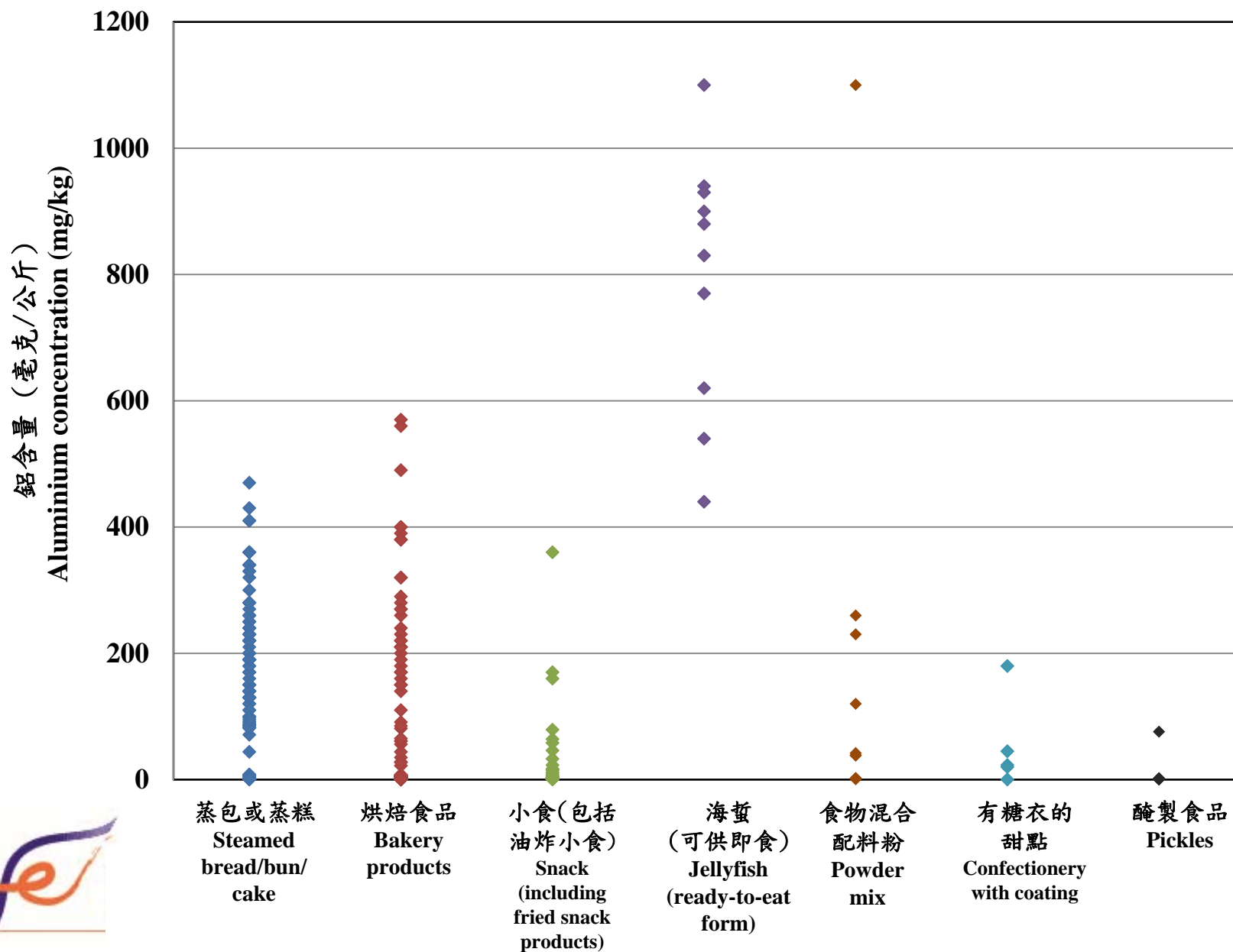
海蜆(可供即食)的平均鋁含量(平均值: 800 毫克/公斤)為是次研究中全部36種食品中最高。
Jellyfish (ready-to-eat form) has the highest mean aluminum concentration of 800 mg/kg among all 36 food items in the current study.

ND: 沒有檢出 Not detected



食物中的鋁含量

Aluminium Content in Food



平均鋁含量的比較(一)

Comparison of mean aluminium concentration (1)

- 於是次研究的36種食物中，其中32種亦於前次研究所涵蓋。此32種食品的平均鋁含量作比較。
- 32 out of 36 food items were tested in both the current and previous study. Their mean aluminium concentrations were compared.
- 與前次研究比較，平均鋁含量下降的食品較之有所上升的食品為多。
- Generally speaking, more food items showed a decrease in the mean aluminium concentration.
- **59%** (19種食品)的平均鋁含量**下降** ↓
- 59% (19 food items) decreased
- **38%** (12種食品)的平均鋁含量**上升** ↑
- 38% (12 food items) increased
- **3%** (1種食品)的平均鋁含量**不變** ↔
- 3% (1 food item) unchanged



平均鋁含量的比較(二)

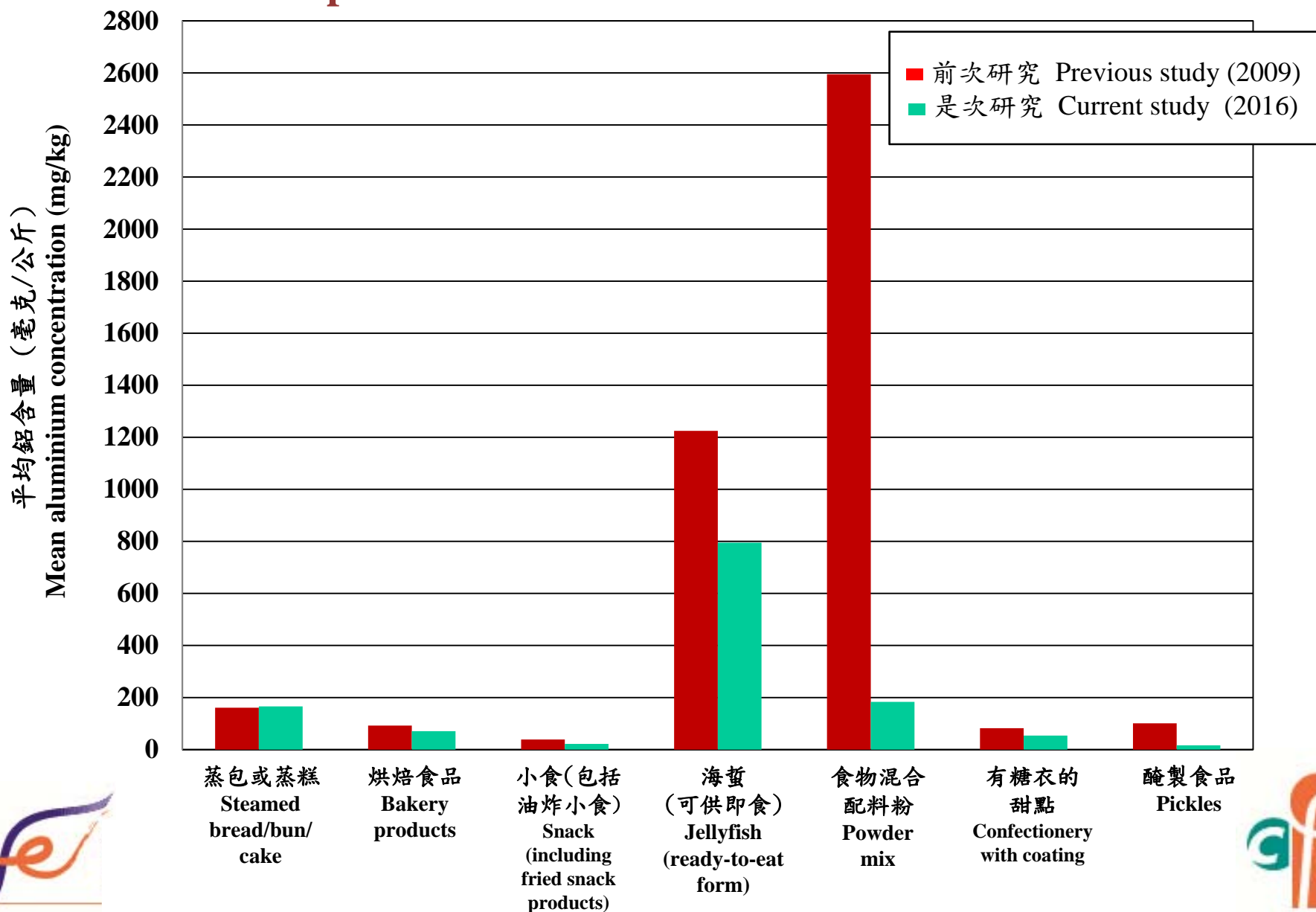
Comparison of mean aluminium concentration (2)

- 以下4個類別的食物，所有食品的平均鋁含量皆下降。
 - 海蜇(可供即食)
 - 有糖衣的甜點
 - 醃製食品
 - 食物混合配料粉
- 蒸包或蒸糕類別
 - 73% 的食品的鋁的平均含量上升，升幅為 4% 至75%。
- The mean concentrations of aluminium in all food items covered in the following four food groups were found to decrease.
 - **Jellyfish (ready-to-eat form)**
 - **Confectionery with coating**
 - **Pickles**
 - **Powder mix**
- In food group “**steamed bread/bun/cake**”, 73% of food items showed an increase in the mean aluminium concentration, ranging from 4% to 75%.



平均鋁含量的比較

Comparison of Mean Aluminium Concentration



從食物攝入鋁的情況(一)

Dietary exposure to aluminium (1)

- 攝入量一般的市民
 - 每周攝入鋁的分量為每公斤體重**0.49**毫克(佔暫定每周可容忍攝入量的25%)
 - 攝入量偏高的市民
 - 每周攝入鋁的分量為每公斤體重**1.80**毫克(佔暫定每周可容忍攝入量的90%)
 - 攝入量一般及偏高的市民健康受鋁嚴重影響的機會不大。
- Average consumers
 - Exposure to aluminium is **0.49** mg/kg bw/week (25% of PTWI)
 - High consumers
 - Exposure to aluminium is **1.80** mg/kg bw/week (90% of PTWI)
 - Average and high consumers are unlikely to experience major undesirable health effects of aluminium.

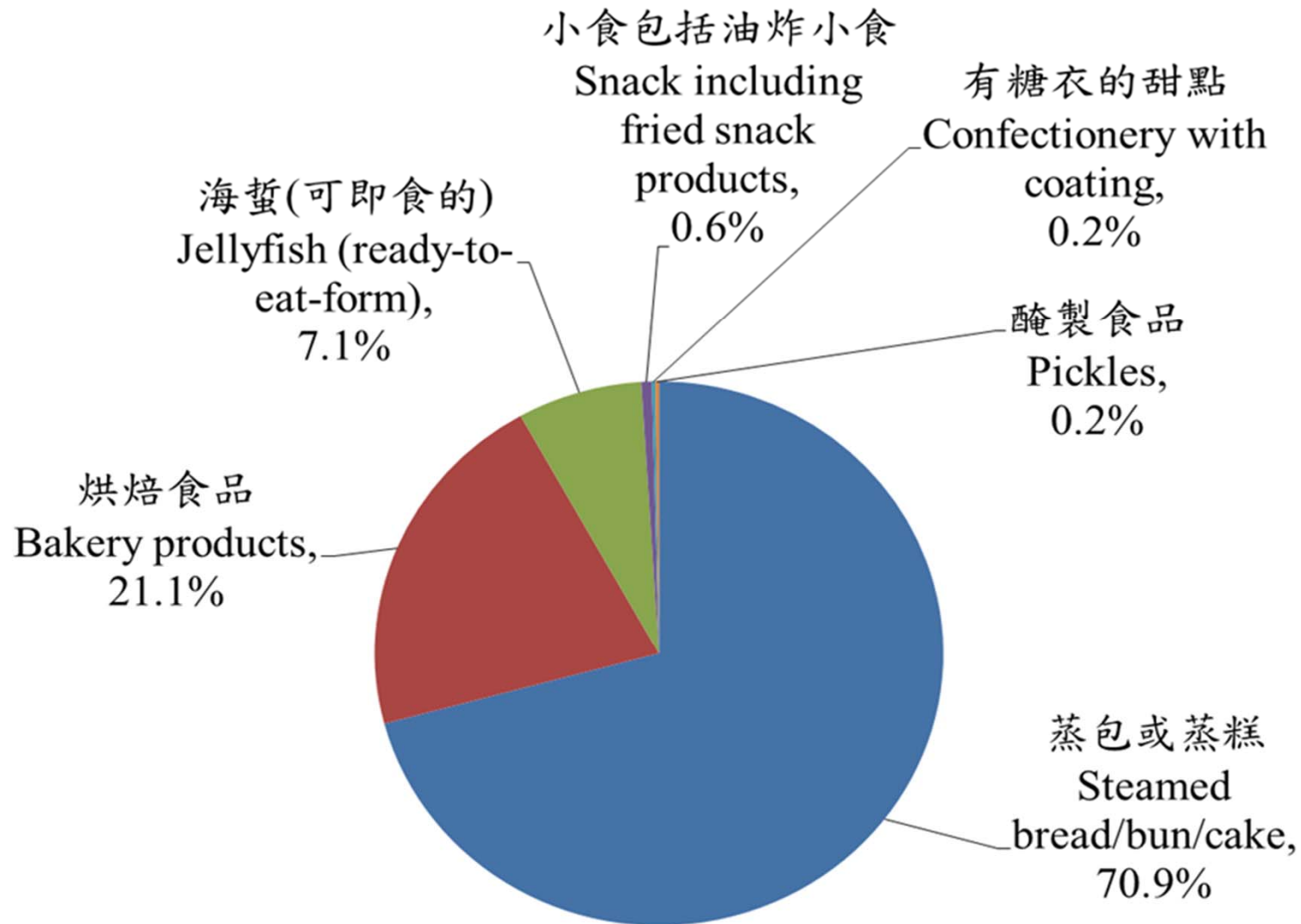
從食物攝入鋁的情況(二)

Dietary exposure to aluminium (2)

- 如市民經常食用同一牌子鋁含量高的食品，則不能排除健康會受鋁影響的可能性。
- For consumers with brand loyalty to products with high aluminium concentrations, adverse health effect of aluminium cannot rule out.

從食物攝入鋁的來源

Contribution to dietary exposure of aluminium



結論(一)

Conclusion (1)

- 含鋁食物添加劑普遍使用於蒸包或蒸糕、部分烘焙食品(如雞蛋仔及窩夫)及海蜇(可供即食)。
- Aluminium-containing food additives were widely used in the production of steamed bread/bun/cake, some bakery products such waffle and egg waffle and jellyfish (ready-to-eat form).



結論(二)

Conclusion (2)

- 鋁含量於同一種食品的不同樣本差異很大，反映食物製作過程中可減少使用含鋁食物添加劑。
- The wide variation of aluminium concentrations in the samples within the same type of food item suggests that reducing the use of aluminium-containing food additives in the production of food products is possible.

結論(三)

Conclusion (3)

- 攝入量一般及偏高的市民健康受鋁嚴重影響的機會不大。
- 如市民經常食用同一牌子鋁含量高的食品，則不能排除健康會受鋁影響的可能性。
- The average and high consumers of the general population are unlikely to experience undesirable health effects of aluminium.
- For consumers with brand loyalty to food products with high aluminium concentrations, adverse health effect of aluminium cannot rule out.



給公眾的建議

Advice to public

- 市民應保持均衡的飲食，以免因偏食某幾類食物而攝入過量的鋁。
- 消費者在購買預先包裝食品時，可參考標籤上表列的食物配料資料，以得知該食物是否加入了含鋁的食物添加劑。
- Maintain a balanced diet so as to avoid excessive exposure of aluminium from a small range of food items.
- When purchasing prepackaged food products, refer to the ingredient lists on the food label for information on whether aluminium-containing food additives have been used.



Labelling of Al-containing Food Additives

含鋁的食物添加劑的標示

- 市民可查看標籤上的配料表，是否標示含鋁食物添加劑的名稱或識別編號以及其作用類別。
- Consumers can read the information on the ingredient list and see if it contains Al-containing food additive by checking for its **name** or **identification number** and its functional class.



523為含鋁食物添加劑(硫酸鋁銨)於食品法典委員會採用的國際編碼系統的編號。

523 is the number of aluminium ammonium sulphate in the International Numbering System (INS) adopted by the Codex Alimentarius Committee.

Examples of Al-containing Food Additives

含鋁的食物添加劑的例子

國際編碼系統編號 International Numbering System (INS) Number	食物添加劑名稱 Name of Food Additive
173	鋁粉 Aluminium powder
520	硫酸鋁 Aluminium sulphate
521	硫酸鋁鈉 Aluminium sodium sulphate
522	硫酸鋁鉀 Aluminium potassium sulphate
523	硫酸鋁銨 Aluminium ammonium sulphate
541	磷酸鋁鈉 Sodium aluminium phosphates
541(i)	酸性的磷酸鋁鈉 Sodium aluminium phosphate, acidic
541(ii)	鹼性的磷酸鋁鈉 Sodium aluminium phosphate, basic
554	矽鋁酸鈉 Sodium aluminosilicate
555	矽酸鋁鉀 Potassium aluminium silicate
556	矽酸鋁鈣 Calcium aluminium silicate
559	矽酸鋁 Aluminium silicate
1452	辛烯基琥珀酸鋁澱粉 Starch aluminium octenyl succinate

給業界的建議

Advice to trade

- 業界參考《含鋁食物添加劑使用指引》，並採納該指引的相關內容，以減少食品的鋁含量。
- Make reference to the “Guidelines on the Use of Aluminium-containing Food Additives” and adopt where appropriate to reduce the aluminium content of their products.



謝謝
Thank you

