

風險評估研究

《預先和非預先包裝食物中的工業生產反式脂肪含量》

Risk Assessment Study on “Industrially-Produced Trans Fatty Acids Content in Prepackaged and Non-Prepackaged Food”

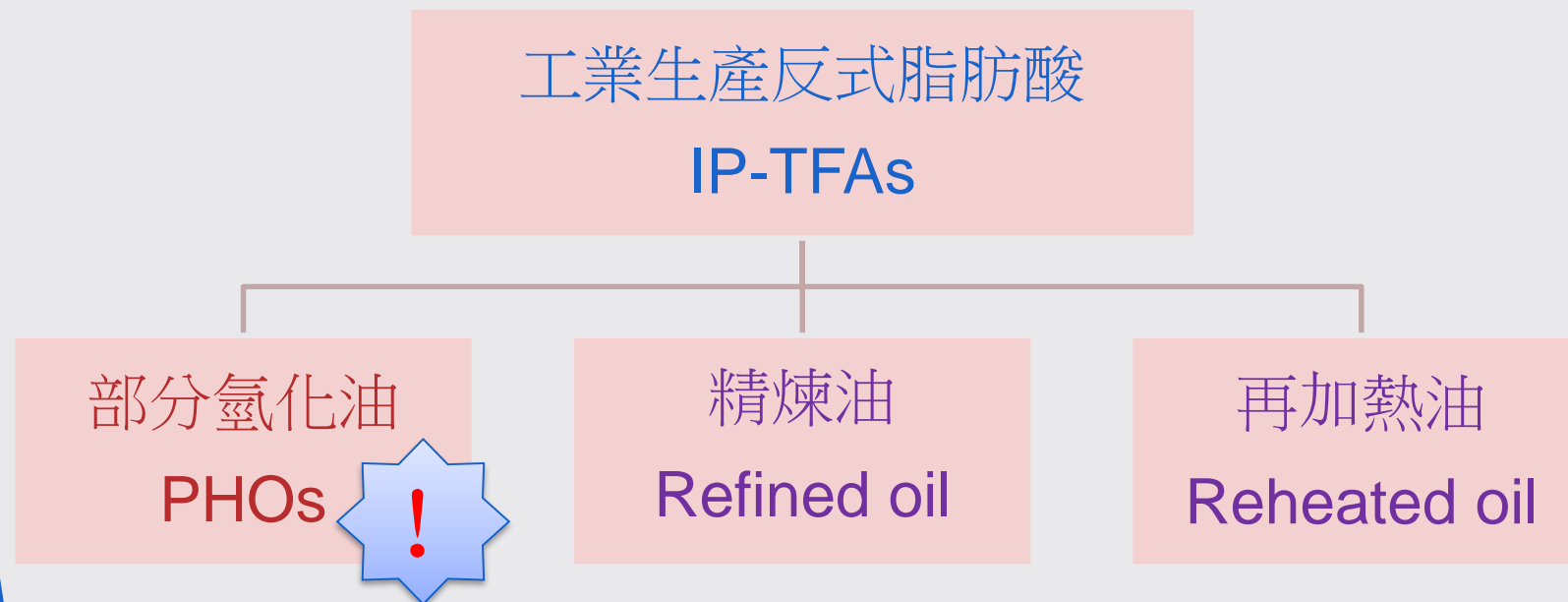


背景 Background



工業生產反式脂肪是什麼？

- 反式脂肪酸可分為兩大類：(i)天然存在來自反芻動物的反式脂肪酸和(ii)工業生產的反式脂肪酸。
- 反式脂肪酸天然存在於反芻動物製品如牛奶和牛油中，至於工業生產反式脂肪酸，**《部分氫化油》是主要來源**。



What is IP-TFA?

- Trans fatty acids (TFAs) can be divided into two main groups: (i) **naturally** occurring TFAs from ruminant animals and (ii) **Industrially-produced trans fatty acids (IP-TFAs)**
- Products from ruminants, such as milk and butter, TFAs are naturally present. **Partially hydrogenated oils (PHOs) are the main source of IP-TFAs.**

世衛呼籲全球在2023年前 消除工業生產反式脂肪酸

- 從食品供應鏈中消除工業生產反式脂肪酸是世界衛生組織(世衛)的優先目標之一
- 根據世衛，若消除工業生產反式脂肪酸，預計在未來 25 年內可挽救 1750 萬人的生命

WHO called for the Global elimination of IP-TFAs by 2023

- **Elimination of IP-TFAs from the food supply** is one of the priority targets of World Health Organisation (WHO)
- According to WHO, IP-TFAs elimination is predicted to save 17.5 million lives over the next 25 years

本港的情況

- 為回應世衛上述的呼籲和實現《邁向 2025：香港非傳染病防控策略及行動計劃》定下的其中一個目標
- 政府已立法**禁止本地食品供應或使用部分氫化油**，從源頭消除工業生產反式脂肪酸，以保護公眾健康。
- 相關規定將於**2023年12月1日**起實施



Local situation

- In response to the mentioned WHO's call and in line with a key target of "Towards 2025: Strategy and Action Plan to Prevent and Control Non-Communicable Disease in Hong Kong",
- The Government has taken legislative action to **ban PHOs in the local food supply** so as to eliminate IP-TFAs at source to protect public health
- The relevant provisions will come into force on **1st December 2023**

是次研究 The Study



目的

- 一. 為本港預先包裝和非預先包裝食品的工業生產反式脂肪酸含量訂立基線，以供日後作比對之用
- 二. 令公眾和業界關注工業生產反式脂肪酸，以及以較健康油脂取代部分氫化油的重要

Objectives

1. to establish a baseline of IP-TFAs content in prepackaged and non-prepackaged foods in Hong Kong for future comparison
2. to arouse public and trade attention on IP-TFAs and the importance of replacing PHOs with healthier fats/oils

五類食品

- 第一類 食用油脂
- 第二類 人造牛油和塗抹醬
- 第三類 預先包裝食品
- 第四類 即食食品
- 第五類 雜項



Five categories of food products

- I. Fats and oils
- II. Margarines and spreads
- III. Prepackaged foods
- IV. Ready-to-eat foods
- V. Miscellaneous

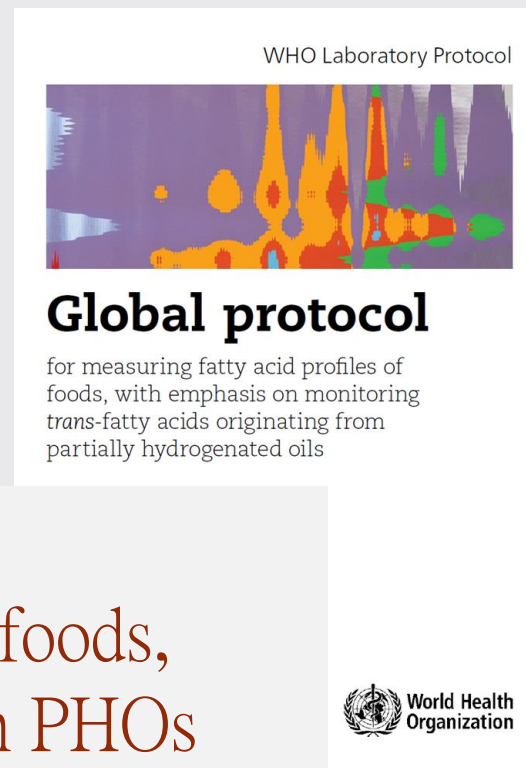


方法 Method



選擇樣本準則

- 參考《世衛全球協議》的採樣建議，選擇最有可能含有 IP-TFAs 的食品類別
- 根據先前的研究結果#和《營養資料查詢系統》，選擇含有較多 TFA 或 IP-TFA 的食品
- 根據《第二次全港性食物消費量調查》，選擇本地較高消費量的食品



測量食品脂肪酸譜的全球協議

Global Protocol for measuring fatty acid profiles of foods, with emphasis on monitoring TFAs originating from PHOs

註 Remarks:

參照“食品安全風險評估”自2007的相關研究報告。Refers to the related ‘Risk Assessment in Food Safety’ studies since 2007.

https://www.cfs.gov.hk/english/programme/programme_rafs/programme_rafs_n_01.html

Criteria of sample selection

- With reference to the “**WHO Global Protocol**” sampling plan to select categories of products most likely to contain IP-TFAs
- Food items with considerable amount of TFA or IP-TFAs according to **previous studies**# and the “**Nutrient Information Inquiry System**” (NIIS)
- High consumption level in local population according to “**The Second Hong Kong population-based food consumption survey**”

選擇採樣地點準則(1)

參考《世衛全球協議》的建議，第一(食用脂肪和油脂)，二(人造牛油和塗抹醬)，三(預先包裝食品)和五(雜項)類樣本是在《大型雜貨店》購買：

- 《大型雜貨店》指在香港的大型超市和便利店
- 每個類別的樣本盡可能是從兩家或多家不同的超市或便利店購買
- 同一家食肆不可採集超過兩款食品，供應有限的特定食品除外



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Criteria of selection of sampling location (1)

With reference to the “WHO Global Protocol”, Cat. I (Fats and oils), II (Margarines and spreads), III (Prepackaged foods) & V(Miscellaneous) food samples were collected from “Major Grocery Stores” :

- “Major Grocery stores” means major supermarket and convenience stores in HK
- Food samples per category were collected from two or more different supermarket and convenience stores if feasible.
- No more than two food items should be collected from the same food outlet, **except for** specific food items with limited supply

選擇採樣地點準則 (2)

參考《世衛全球協議》的建議，第四類(即食食品)樣本是在《受歡迎的食肆》購買：

- 《受歡迎的食肆》指在香港的**連鎖麵包店、快餐店和餐廳**
- 採樣及化驗樣本時間: 2021年11月至 2022年4月



Criteria of selection of sampling location (2)

With reference to the “WHO Global Protocol”, Cat. IV (Ready-to-eat) food samples were collected from **“Popular Food Outlets”**:

- “Popular Food Outlets” means **bakery chains, fast-food chains and restaurant chains** in Hong Kong
- Sampling and Testing Period: Nov 2021 to Jul 2022

食物樣本 (第一,二和三類)

Samples (Cat I, II & III)

類別 Category	子類別 Subcategory	樣本數目 No. of Samples
第一類 食用油脂 Category I Fats and Oils	酥油 Ghee	6
	起酥油 Shortenings	5
第二類 人造牛油及塗抹醬 Category II Margarines and spreads	人造牛油 Margarines	6
	塗抹醬 Other spreads	6
第三類 預先包裝食物 Category III Prepackaged foods	餅乾 Biscuits	6
	麵包 Breads	6
	曲奇餅 Cookies	6
	薯片 Potatoes chips /其他脆片 other chips	6
	片裝蛋糕 Sliced cake/迷你蛋糕 mini cake	6
	薄餅(急凍) Pizza (frozen)	6
	牛角包(急凍) Croissant (Frozen) /急凍酥皮 Puff pastry (Frozen)	6

食物樣本 (第四類)

Food Samples (Cat. IV)

類別 Category	子類別 Subcategory	樣本數目 No. of Samples
第四類 即食食品 Category IV Ready-to-eat foods	牛油蛋糕 Pound cake /瑞士卷 Swiss roll	6
	中式/甜酥餅 Chinese/Sweet Pastry	6
	蛋卷/鳳凰卷 Eggrolls/Phoenix rolls	6
	牛角包 Croissants/丹麥酥 Danish/酥皮卷 Puff	6
	雞尾包 Cocktail bun/ 奶油/忌廉包 cream-filled bun	6
	甜批/餡餅 Sweet pie/tart	6
	肉餡餅/批 Meat Pie	6
	酥皮湯的酥皮/ Puff pastry of soup	6
	薯條 French fries/薯餅 hash browns	6
	冬甩 Fried Doughnuts/牛脷酥 Ox-Tongue Pastry /油條 Chinese dough stick (deep-fried)	6
	咖喱角 Samosa /肉餡酥皮卷 meat stuffed pastry roll	6

食物樣本 (第五類)

Food Samples (Cat. V)

類別 Category		子類別 Subcategory	樣本數目 No. of Samples
第五類 雜項 Category V Miscellaneous	油炸食品 Fried Foods	炸豆腐 Fried bean curd / 炸枝竹 Fried bean curd stick / 響鈴卷(豆卷) Fried soybean roll	6
	含油食品 Oil-based foods	火鍋湯底(油性) Hotpot soup base (oil-based)	6
		醬汁(油性) Oil-based Sauce	6

測試項目

- 測試由食物安全中心食物研究化驗所進行
- 全部149個樣品均單獨測試
- 測試項目包括**總脂肪和反式脂肪酸**含量
- 食油加工或製作完全氫化油的過程中不免會產生少量工業生產反式脂肪酸，但通常不超過**世衛指引水平**，即**每100克總脂肪含2克或以下IP-TFA***。

Test items

- The Food Research Laboratory of the Centre for Food Safety was responsible for the analytical testing of this study
- All 149 samples were tested individually
- Test items included **total fat and trans fatty acids**
- **IP-TFAs can inevitably be produced during the manufacturing process of refined oils and fully hydrogenated oils, though the amount produced is usually lower than the WHO guidance level**, which is “no more than 2 g of IP-TFAs per 100 g of total fat in all foods” *.

* REPLACE TRANS FAT: AN ACTION PACKAGE TO ELIMINATE INDUSTRIALLY PRODUCED TRANS-FATTY ACIDS Module 3: Legislate or regulation How-to guide for trans fat policy action.



結果 Findings



結果概要

Results summary

在 149 個樣本中...

Among the 149 samples...

143 樣本不含 IP-TFA 或 每100 克脂肪含 < 2 克 IP-TFA
samples do not contain **IP-TFA** or **IP-TFAs < 2 g/100 g fat.**

6 樣本估算 每**100** 克脂肪含 > 2 克 **IP-TFA**。
samples estimated to contain **IP-TFAs >2 g/100 g fat.**

研究結果-

每個子類別的 IP-TFAs 平均值和數值範圍

Study Results-

IP-TFAs mean value and range of values per subcategory

類別 Category	子類別 Subcategory	Mean IP-TFA 平均值 [Range of values] [數值範圍] (g/100 g fat) (克/每100克總脂肪)
第一類 食用油脂 Category I Fats and Oils	酥油 Ghee	0.048 [0-0.19]
	起酥油 Shortenings	0.40 [0.057-0.63]
第二類 人造牛油及塗抹醬 Category II Margarines and spreads	人造牛油 Margarines	0.39 [0-0.68]
	塗抹醬 Other spreads	0.30 [0.070-1.1]
第三類 預先包裝食物 Category III Prepackaged foods	餅乾 Biscuits	0.31 [0-0.52]
	麵包 Breads	0.24 [0-0.61]
	曲奇餅 Cookies	0.26 [0-1.2]
	薯片 Potatoes chips /其他脆片 other chips	0.48 [0.30-0.74]
	片裝蛋糕 Sliced cake/迷你蛋糕 mini cake	0.37 [0-1.2]
	薄餅(急凍) Pizza (frozen)	0 [0]
	牛角包(急凍) Croissant (Frozen) /急凍酥皮 Puff pastry (Frozen)	0.068 [0-0.41]

研究結果-

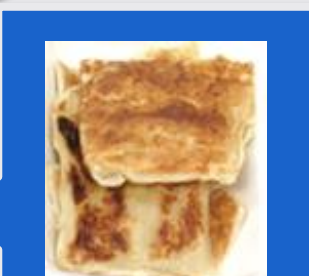
每個子類別的 IP-TFAs 平均值和數值範圍

Study Results-

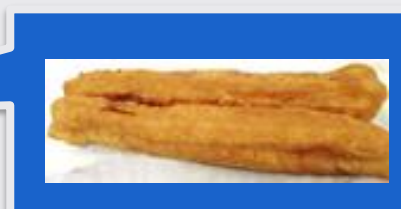
IP-TFAs mean value and range of values per subcategory

類別 Category	子類別 Subcategory	Mean IP-TFA 平均值 [Range of values] [數值範圍] (g/100 g fat) (克/每100克總脂肪)	
第四類 即食食品 Category IV Ready- to-eat foods	牛油蛋糕 Pound cake /瑞士卷 Swiss roll	0.22 [0-0.64]	
	中式/甜酥餅 Chinese/Sweet Pastry	0.23 [0-0.48]	
	蛋卷/鳳凰卷 Eggrolls/Phoenix rolls	0.10 [0-0.32]	
	牛角包 Croissants/丹麥酥 Danish/酥皮卷 Puff	0.17 [0-0.39]	
	雞尾包 Cocktail bun/ 奶油/忌廉包 cream-filled bun	0 [0]	
	甜批/餡餅 Sweet pie/tart	0.67 [0-2.2]	
	肉餡餅/批 Meat Pie	0.82 [0-2.0]	
	酥皮湯的酥皮/ Puff pastry of soup	2.4 [0.14-6.7]	
	油炸食品 Fried Foods	薯條 French fries/薯餅 hash browns	0.78 [0.32-1.2]
		冬甩 Fried Doughnuts/牛脷酥 Ox-Tongue Pastry /油條 Chinese dough stick (deep-fried)	0.91 [0.10-2.6]
烘焙/油炸食品 Baked/Fried foods	咖喱角 Samosa /肉餡酥皮卷 meat stuffed pastry roll	0.27 [0-0.53]	

蛋撻 Egg Tart



酥皮湯酥皮
Puff pastry of soup



油條
Chinese Dough Sticks

研究結果-

每個子類別的 IP-TFAs 平均值和數值範圍

Study Results-

IP-TFAs mean value and range of values per subcategory

類別 Category		子類別 Subcategory	Mean IP-TFA 平均值 [Range of values] [數值範圍] (g/100 g fat) (克/每100克總脂肪)
第五類 雜項 Category V Miscellaneous	油炸食品 Fried Foods	炸豆腐 Fried bean curd / 炸枝竹 Fried bean curd stick / 響鈴卷(豆卷) Fried soybean roll	1.5 [0.81-3.1]
	含油食品 Oil-based foods	火鍋湯底(油性) Hotpot soup base (oil-based)	0.64 [0-2.2]
		醬汁(油性) Oil-based Sauce	0.70 [0.25-1.5]

響鈴卷 Fried soybean roll



湯底調味料包
Seasoning Pack of soup base



IP-TFAs 從何來？

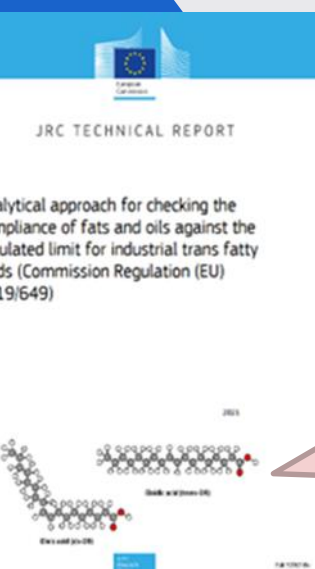
Source of IP-TFAs?



精煉油/再加熱油
Refined/Reheated oil
t18:2&3 > t18:1

PHOs 主要含有反式異構體油酸 (t18:1)，而物理精製植物油主要含有反式異構體亞油酸 (t18:2) 和亞麻酸 (t18:3)。

PHOs contain mostly trans isomer of oleic acid (t18:1), while physically refined vegetable oils contain mostly trans isomers of linoleic (t18:2) and linolenic acid (t18:3).



IP-TFAs 含量大於世衛指引水平的樣本

Samples with IP-TFAs >WHO guidance level

樣本 Samples	主要反式異構體 Major trans isomers	IP-TFA(克/每100克脂肪) IP-TFA (g/100 g fat)	使用油脂* Oil use*	IP-TFA 源自PHOs? IP-TFAs from PHOs?
蛋撻 Egg tart	C18:1	2.2	撻皮: 人造牛油 Tart pastry: Margarine	有可能 Possible
酥皮湯的酥皮 Puff pastry of soup	C18:1	6.5 (Puff pastry 1)^ 6.7 (Puff pastry 2)^	酥皮成分: 人造牛油 (菜油) Pastry ingredient: Margarine (vegetable oil)	
油條 Chinese dough sticks	C18:2&C18:3	2.6	炸油: 精煉大豆油 Frying oil: Refined soybean oil	可能性不大 Not-likely
響鈴卷 Fried soybean roll	C18:2&C18:3	3.1	成分: 由非氫化菜籽油、大豆油和橄欖油組成的調和油 Ingredients: A blend of non-hydrogenated rapeseed oil, soybean oil and olive oil	
酸菜魚湯底調料 Pickled Vegetables Sauce for fish soup	C18:2&C18:3	2.2	成分: (非氫化) 植物油、食用豬油、食用雞油 Ingredients: (non-hydrogenated) Vegetable oil, edible lard, edible chicken fat	

註 Remarks:

^酥皮 1 和酥皮2 來自同一來源。 Puff 1 and 2 were from the same source.

*信息由食品供應商提供。 Information given by food suppliers.

已改良配方樣本的 IP-TFAs 含量

- 該三個樣本的相關食店接納中心的建議，改良了食物配方。
- 跟進樣本結果顯示，食店已沒有使用部分氫化油作為配料，成功將上述樣本的IP-TFAs含量降至每100克脂肪低於2克。

樣本 Samples	主要反式異構體 Major trans isomers	IP-TFA(克/每100克脂肪) IP-TFA (g/100 g fat)
蛋撻 Egg tart	(TFA from ruminant fats/oils)	0
酥皮湯的酥皮 Puff pastry of soup	C18:2&C18:3	0.47

IP-TFAs content of reformulated samples

- Relevant food outlets of the three samples have adopted the recommendations from the CFS and reformulated their recipes
- The reformulated products were tested and found to contain IP-TFAs less than 2 g /100g of total fat, indicating that PHOs was not used as an ingredient.

與過往研究的比較

Compare with previous studies

IP-TFAs相關研究 IP-TFAs Related studies	No. of samples 樣本數目	年份 Year	IP-TFA含量超過2%的樣本百分比 Percentage of food items with IP-TFAs >2%/fat
本地食物中之工業生產的反式脂肪含量 Industrially-produced Trans Fatty Acids Content in Local Food	75	2019	25%
預先和非預先包裝食物中的工業生產反式脂肪含量 Industrially-Produced Trans Fatty Acids Content in Prepackaged and Non-Prepackaged Food	149	2023 (This study)	4%

IP-TFA含量超過2%的樣本百分比有下降趨勢
A downward trend observed for percentage of food items with IP-TFA>2% /fat

- 自2007年起，食安中心一直加強教育工作，讓公眾認識反式脂肪對健康的風險傳達教育及宣傳訊息。為配合立法，食安中心在2020年發出<取代工業生產的反式脂肪>的業界指引。
- Since 2007, the CFS has stepped up educational efforts in parallel to inform the public of the health risks related to TFAs. Further to amendment of regulation, trade guidelines on “Replacing IP-TFAs” was issued in 2020 to deliver education and publicity messages.

研究發現

Findings

96%

143 樣本符合世衛指引水平 (不含 IP-TFA 或 < 2 克 IP-TFA/100 g 脂肪)
143 Samples conformed to WHO guidance level of IP-TFA (do not contain IP-TFA or IP-TFAs < 2 g/100 g fat.)

4%

有六個樣本被發現含有 IP-TFA >2 g/100 g 脂肪。它們屬於即食食品和雜項類別。
Six samples were found to contain IP-TFAs >2 g/100 g fat. They were under the ready-to-eat and miscellaneous categories.

2%

六個樣本當中有三個樣本懷疑使用 PHOs 作為成分，它們屬於即食食品類別，分別是一個蛋撻和兩個酥皮湯酥皮。
Three samples of the six samples were suspected to use PHOs as ingredients and they were under the ready-to-eat category, which were one egg tart and two puff pastry of soups

跟進樣本: 該三個樣本在改良了食物配方後，IP-TFA的化驗結果符合世衛指引水平
Follow-up samples: After reformulation, the three follow-up samples conformed to the WHO guidance level of IP-TFA.

與2019的研究比較，IP-TFA>2 g/100 g fat 的樣本百分比和同類食品中的IP-TFA含量呈下降趨勢。
Compare with the study in 2019, a downward trend is observed in terms of the percentage of sample with IP-TFAs>2 g/100 g fat and IP-TFAs content in the same types of food items.

建議 Advice



給業界的建議

- 業界須確保**所供應的食物不含 PHOs**。業界可要求供應商提供不含「部分氫化油」的配料，或按世界衛生組織所建議使用較健康的替代品，使用含大量單元不飽和脂肪酸(例如芥花籽油、橄欖油)或多元不飽和脂肪酸含量高(例如大豆油、粟米油)的油類。
- 如需改良食品配方，業界可按需要向供應商查詢產品的成分詳情。
- 還有，業界可參考食安中心發布的《取代食物中工業生產反式脂肪酸的指引》，以及《使用煎炸油業界指引》，以減少食物中的反式脂肪酸含量。

Advice to Trade

- The trade has to ensure **their food products do not contain PHOs**. To avoid manufacturing foods with PHO-containing ingredients, traders can ask suppliers to provide PHO-free ingredients or use the World Health Organization's recommended healthier replacers- using fats and oil that are high in monounsaturated fatty acids (e.g. canola oil and olive oil) or polyunsaturated fatty acids (e.g. soybean oil and corn oil).
- If product reformulation is required, traders can check with suppliers for the ingredient details of the products according to needs.
- The trades may attain more information on PHO and IP-TFAs from the CFS publications, such as "Guidance to Replace Industrially-produced Trans Fats in Food" "Trade Guidelines on the Use of Deep-frying Oil" to reduce the IP-TFAs content in foods.

給消費者的建議

- 市民在購買預先包裝食品時，應留意營養標籤上的反式脂肪酸含量。
- 世衛建議將反式脂肪酸攝取量限制在總能量的 1% 以下，相當於 2000 卡路里飲食中的每日攝取量少於 2.2 克。



Advice to consumers

- Members of the public shall pay attention to the TFAs content on nutrition labels when purchasing prepacked foods.
- **WHO recommends limiting TFAs intake to less than 1% of total energy, which equals to less than 2.2 g/day in a 2000-calorie diet.**

1. 《「部分氫化油」列為食物中的違禁物質於2023年12月1日生效》
"Partially Hydrogenated Oils Listed as a Prohibited Substance in Food Effective 1 December 2023"
https://www.cfs.gov.hk/english/whatsnew/whatsnew_fstr/files/Oil_Outline_Eng.pdf
2. 《取代食物中工業生產反式脂肪的指引》
"Guidance to Replace Industrially-produced Trans Fats in Food"
https://www.cfs.gov.hk/english/food_leg/food_leg_Guidance_to_REPLACE_Trans_Fats_in_Food.html
3. 《使用煎炸油業界指引》
"Trade Guidelines on the Use of Deep-frying Oil"
https://www.cfs.gov.hk/english/food_leg/files/guidelines_use_of_deep_frying_oil_e.pdf

謝謝

Thank you