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CURRENT DEVELOPMENTS IN NUTRITION

Nutritional Epidemiology and Public Health

Overcoming the *Trans* Fat Problem in Thailand

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ABSTRACT

Background: Owing to the clear impact of *trans* fatty acids (TFAs) on cardiovascular disease, Thailand urgently needs to evaluate the problem and formulate appropriate policies in order to protect the health of its own people and to benefit exportation. Since 9 January, 2019, Thailand's FDA has not allowed the use of partially hydrogenated oils (PHOs) in foods.

Objective: The aim of this study was to evaluate the situation and potential health risk from TFAs in foods available in Thailand, changes in fatty acid profiles upon replacement of PHOs, as well as to propose control measures for TFAs in the country.

Methods: A total of 176 food samples representing potential sources of TFAs were analyzed for fatty acid profiles, which were later used to evaluate potential health risk based on Thailand's Food Consumption Survey data and the FAO/WHO Guideline on Diet, Nutrition and the Prevention of Chronic Diseases (FAO/WHO guideline). Criteria for postmarketing monitoring of TFAs in food products were also proposed.

Results: TFAs were naturally highest in butter (5%) but lower than the limit in the FAO/WHO guideline regarding consumption pattern. TFAs in refined cooking oils were 0.4–0.8%, which was below the European Union (EU) legislative limit. Bakery products, i.e., puffs, pies, and deep-fried donuts, that used PHOs contained 3–5% TFAs and were the main sources of TFAs in Thailand. The postmarketing monitoring process should be based on the FAO/WHO guideline and EU legislative limit for TFAs. The PHOs in bakery products could be replaced with blended oils, although saturated fatty acids might increase.

Conclusions: Thailand's TFA problem was mainly due to the use of PHOs in bakery products. It is feasible to replace PHOs with blended oils. The international TFA limits should be used for the postmarketing monitoring of TFAs in foods on the market. *Curr Dev Nutr* 2019;3:nzz045.

Introduction

Trans fatty acids (TFAs) are unsaturated fatty acids that contain ≥1 double bond as the *trans* configuration. In nature, unsaturated fatty acids are normally found in the *cis* configuration, which can be changed into the *trans*-form via biological and physicochemical processes. In the biological process, the natural *cis*-form fatty acids transform into TFAs within the gastrointestinal tract of a ruminant during anaerobic fermentation at the rumen. Consequently, TFAs can be found in dairy products and ruminant meats (1–4). The physicochemical processes involve the application of severe physical conditions during oil treatment in order to achieve desirable physical and sensory characteristics.

However, the main source of TFAs in foods available in the market all over the world is from the physicochemical treatment called "partial hydrogenation," which is used to increase plasticity and the chemical stability of unsaturated oils. This process is used for developing vegetable oils that can replace animal fats, such as butter, lard, and beef tallow, as well as high-value vegetable fats such as cocoa butter. By applying severe physical conditions using hydrogen gas during the partial hydrogenation process, some parts of the unsaturated molecule become

Keywords: *trans* fatty acids, saturated fatty acids, Thailand, partially hydrogenated oils, bakery product

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Abbreviations used: EU, European Union; FAO/WHO guideline, FAO/WHO Guideline on Diet, Nutrition and the Prevention of Chronic Diseases; PHO, partially hydrogenated oil; TFA, *trans* fatty acid.

saturated, whereas other parts change their isomeric *cis*-form unsaturated molecule into the *trans*-form. Partially hydrogenated oils (PHOs) have been mainly introduced into countries around the world via Western-style cuisines (5, 6). In addition, another physicochemical treatment known as "deodorization" within the cooking oil refining process, which applies a high temperature of 260–280°C for hours, can also isomerize the natural *cis*-fatty acid into *trans*-fatty acid to some extent (7).

TFA profiles of foods can be used to distinguish between TFAs obtained from biological and physicochemical processes. Specifically, whereas vaccenic acid is mainly found among the TFAs from the natural biological process, elaidic acid is predominantly found in the TFAs of the physicochemical process. Among all chemical configurations of fatty acid, TFAs can cause the most negative impact on heart health. TFAs not only increase the undesirable LDL; they also decrease the beneficial HDL. Moreover, the impact of TFA on blood cholesterol is worse than from SFA (8–10). Consumption of TFAs might also increase the risks of cancer and diabetes. According to the National Academy of Sciences (the United States and Canada), TFAs are nonessential and provide no known benefit to human health (11). Consequently, TFAs should be minimally consumed and no safe level of consumption has been established. Because small amounts of TFAs are unavoidably found in certain foods, both naturally and unnaturally, the FAO of the UN and the WHO suggested that daily consumption of TFAs should be limited to <2.2 g/d based on a daily energy intake of 2000 kcal (1% of total energy intake). SFAs are allowed ≤10% of daily energy intake or 22 g/d (12). The European Union (EU) legislative limit for TFAs in fats and oils is no more than 2%. The cardiovascular disease risks of TFAs from the biological and physicochemical processes are reported to be different. Studies by Field et al. (13) and Wang et al. (14) indicate that vaccenic acid causes less risk of cardiovascular disease than elaidic acid, or even no risk.

The uses of PHOs became common in most bakery products in Thailand beginning in 1977 (15), although these PHOs were seldom used as ingredients in local cuisines. Desirable characteristics in terms of oxidative and thermal stabilities can be found extensively in locally available animal and plant oils with no need for any modification, such as pork lard, coconut oil, and palm oil. Such locally available oils have been used in local deep-frying cuisines everywhere in the country from good restaurants to small food stalls or street food vendors. PHOs in Thailand, therefore, have been used mainly in Western-style cuisines prepared at bakery houses, franchise restaurants, and some food stalls. Because the consumption of dairy products among the Thai people is not high, PHOs that normally contain 25–45% TFAs should be the main source of TFAs in the country.

Awareness of the TFAs in foods available in Thailand became high in response to many states in the United States banning TFAs, as well as when the US FDA in 2015 announced banning TFAs in the entire country after 18 June, 2018 (16). In 2017, Thailand's FDA jointly with the Institute of Nutrition, Mahidol University, began a national survey on TFAs in food products as well as a potential health risk evaluation from TFAs in different food sources. Results showed that certain bakery products, i.e., fried donuts, puffs, and pastries, might qualitatively and quantitatively contain TFAs from PHOs. Fortunately, the information from food industries in this survey indicated that most PHOs used in the country were produced in only 3 large oil refineries where the partial hydrogenation facilities were available. Moreover, the PHOs used for many applications can potentially be replaced with naturally saturated tropical oils by using the blending technique with minimal technical problems (17). In June, 2018, the Thai FDA therefore decided to limit the TFAs in foods available in the market beginning on 9 January, 2019. In this notification from the Thai FDA, foods and ingredients that are produced from the partial hydrogenation process are not allowed to be distributed in the country (18).

In this article, the fatty acid profiles, including TFAs and SFAs, in foods that could potentially be sources of TFAs in Thailand are reported and evaluated for their potential risks in relation to cardiovascular disease. The fatty acid profiles of the products before and after PHO replacement are evaluated and criteria for postmarketing monitoring are proposed.

Methods

Food samples

Previous surveys performed in 2006, 2007, and 2014 by Chavasit et al. (19), Jongjaithed et al. (20), and Jingan et al. (21), respectively, indicated

TABLE 1 List of fatty acid standards used in the analysis

Trans fatty acid	Saturated fatty acid
1) *Trans*-9-hexadecenoic acid (16:1)-9	*1*) Butyric acid (4:0)
2) *Trans*-6-petroselaidic acid (18:1)-6	*2*) Caproic acid (6:0)
3) *Trans*-9-elaidic acid (18:1)-9	*3*) Caprylic acid (8:0)
4) *Trans*-11-vaccenic acid (18:1)-11	*4*) Capric acid (10:0)
5) *Trans*-octadecenoic acid (18:1)-unknown	*5*) Lauric acid (12:0)
6) *Trans*-9,12-octadecadienoic acid (18:2)-9,12	*6*) Tridecanoic acid (13:0)
7) *Trans*-octadecadienoic acid (18:2)-unknown	*7*) Myristic acid (14:0)
8) *Cis*-9, *trans*-12-octadecadienoic acid (18:2)-*cis*-9, *trans*-12	*8*) Pentadecanoic acid (15:0)
9) *Trans*-9, *cis*-12-octadecadienoic acid (18:2)-*trans*-9, cis-12	*9*) Palmitic acid (16:0)
10) *Trans*-11-eicosenoic acid (20:1)-11	*10*) Heptadecanoic acid (17:0)
11) *Trans*-13-docosenoic acid (22:1)-13	*11*) Stearic acid (18:0)
	12) Arachidic acid (20:0)
	13) Heneicosanoic acid (21:0)
	14) Behenic acid (22:0)
	15) Tricosanoic acid (23:0)
	16) Lignoceric acid (24:0)

that the TFA problem in Thailand was mainly found in some bakery and fried products. In this study, therefore, these foods were purposively sampled from different sources located in Bangkok, Samutprakan, and Nonthaburi provinces during March–October 2017. The foods entailed *1*) baked and fried bakery products obtained from local bakery houses, as well as local and multinational franchise restaurants; *2*) pizzas, hamburgers, French fries, fried chicken, and fried fish fillets obtained from multinational franchise restaurants and street food vendors; *3*) nondairy coffee creamers locally produced from local and multinational companies; *4*) margarine, shortening, and donut frying oils from local bakery ingredient suppliers; and *5*) vegetable oils produced from local edible oil refineries. In addition, milk of different grades, cream, butter, cheese, and beef were also sampled to represent natural sources of TFAs obtained from local supermarkets. A total of 176 samples were selected and analyzed for fatty acid profiles.

Fatty acid analysis

Fatty acid profiles were analyzed via GC with a flame ionization detector (Agilent Technologies) using a cyanopropyl column (Agilent Technologies) 100 m in length. Helium gas was used as the mobile phase. The analysis was performed at 250°C and 210 kPa (22). The standards (Sigma-Aldrich Corporation) used for analysis are shown in **Table 1**.

Potential health risk evaluation

The evaluation was performed based on the contents of TFAs and SFAs within the identified consumption amounts of each food item for average and high (97.5th percentile) consumers based on eating only, as reported in Thailand's National Food Consumption Survey (23). The cutoff criteria for potential health risk were based on the FAO/WHO Guideline on Diet, Nutrition and the Prevention of Chronic Diseases (FAO/WHO guideline), in which the intakes of TFAs and SFAs should not exceed 2.2 g/d and 22 g/d, respectively (12). Assuming that these fatty acids could be found in various dishes at every meal, they therefore were consumed 5 times/d (3 meals + 2 breaks). Further, the limit per 1 eating amount was 2.2/5 = 0.44 or ~0.5 g and 22/5 = 4.4 or ~5 g for TFAs and SFAs, respectively.

Development of criteria for postmarketing monitoring

Based on the cutoff criteria for potential health risk in the FAO/WHO guideline (12) and the EU legislative limit (24), criteria for postmarketing monitoring were proposed.

Statistical analysis

Significant differences in the fatty acid contents of foods in the same food category available on the market and that had been produced by using PHO and non-PHO ingredients were evaluated via *t* test with significance set at $P \leq 0.05$ using SPSS version 18 (SPSS Corporation).

Results

Butter produced from ruminants contained the highest amount of TFAs with a maximum concentration of ~5%. Regarding ruminant products, there were no cases of TFA intakes above the limit stated in the FAO/WHO guideline (12), although SFAs were problematic in some

TABLE 2 Fatty acid profiles in products from ruminants, intakes, and number of samples containing TFAs and SFAs in excess of the FAO/WHO guideline regarding eating amounts[1]

Food category (no. of sources of samples)	Fat content, %		Mean fat intake, g/meal[3]		No. of samples that do not contain or do contain excess TFA and/or SFA for eaters of different amounts[2]							
					Average consumption				High consumption			
	TFA	SFA	TFA	SFA	None	TFA	SFA	Both	None	TFA	SFA	Both
Pasteurized plain milk (3)	0.08–0.11	2.16–2.36	0.18–0.25	4.84–5.29	2	0	1	0	0	0	1	2
Rich/premium pasteurized plain milk (3)	0.09–0.14	2.35–2.80	0.20–0.31	5.26–6.27	0	0	3	0	0	0	1	2
Whole milk powder (1)	1.32	15.83	0.09	1.11	1	0	0	0	1	0	0	0
Butter (8)	2.04–4.64	44.24–52.41	0.18–0.42	3.98–4.72	8	0	0	0	0	0	1	7
Butter blend (3)	1.62–2.06	48.70–55.02	0.15–0.19	4.38–4.95	3	0	0	0	0	0	3	0
Dairy whipping cream (1)	1.88	27.87	—	—	—	—	—	—	—	—	—	—
Cheese (4)	0.68–1.08	12.39–22.93	0.12–0.19	2.23–4.13	4	0	0	0	1	0	3	0
Beef brisket (2)	0.15–0.64	7.10–12.46	0.04–0.18	3.49–1.99	2	0	0	0	1	0	1	0

[1]SFA, saturated fatty acid; TFA, *trans* fatty acid; —, no consumption data.
[2]Average and high levels of consumption are the mean and 97.5th percentile amounts of a food category for the real consumers (eating only) from the National Food Consumption Survey (23). Both, TFA > 0.5 and SFA > 5 g/eating amount; none, TFA ≤ 0.5 and SFA ≤ 5 g/eating amount; SFA, SFA > 5 g/eating amount; TFA, TFA > 0.5 g/eating amount.
[3]Calculated from the mean consumption amount from the National Food Consumption Survey (23).

food categories. High consumption of milk and butter was associated with high intakes of both TFAs and SFAs (**Table 2**). For cooking oils (i.e., rice bran, palm, and soya), there were no instances of high intakes of TFAs or SFAs in average consumption (**Table 3**). Even in cases of high consumption, the TFA intake still did not exceed the limit. The problem of over-intake of SFAs was found in the high consumption of oils naturally high in saturated fat, such as palm oil, although the TFAs from these cooking oils did not exceed the limit in the FAO/WHO guideline.

Consumption exceeding the guideline's limit was found for certain bakery products as shown in **Table 4**. The TFAs in these bakery products, even within the same type, were quite varied, which may be due to both PHO and non-PHO ingredients being used in production. By consuming bakery products using PHO ingredients, TFA intake could be over the limit in the FAO/WHO guideline among consumers of both consumption patterns. For a product that exceeded the TFA limit, such as donut frying oil, shortening was used as an ingredient; thus the prepared foods (i.e., donuts, puffs, and pastries) consequently contained excessive TFAs (Tables 2 and 4). Moreover, certain fast foods, such as deep-fried chicken, fish patties, French fries, burgers, pizza, and popcorn, did not contain significant amounts of TFAs. It was found that a brand of nondairy creamer also contained high TFAs, but owing to its small serving size, it did not provide TFAs in excess of the FAO/WHO limit. A low potential health risk from TFAs was also found in premixed forms containing coffee/tea and sugar (3in1). With the nonuse of PHOs in Thailand, concern regarding TFAs in most food categories should only arise from high, not average, consumption. Considering the fatty acid profiles of most products, TFAs in Thailand might not be the primary concern for heart health compared with SFAs, intake of which was over the limit in many food categories. Based on the TFA contents, the food categories in Table 4 could be classified into 2 groups, i.e., *1*) PHOs were potentially used as an ingredient (with PHOs) and *2*) no PHOs were used as an ingredient (without PHOs). Differences in fatty acid profiles of the same food item, with and without PHOs, were found to be significant. Even a food item without PHOs and containing only a trace amount of TFAs typically contained a much higher amount of SFAs than those with PHOs. The amounts of TFAs + SFAs were not different by so much, except for in donut frying oil and shortening where they tended to be higher in those with PHOs (**Figure 1**). The proposed process for postmarketing monitoring is a combination of the limit in the FAO/WHO guideline (12) and the EU legislative limit (24). The concern about SFAs should also be included as a dual criterion for the TFA-free claim.

Discussion

Because consumption of dairy products and ruminant meats is quite low in Thailand (23), TFAs from these sources should not be a significant risk factor for cardiovascular disease among the Thai people. In terms of content, the major TFA found in these natural sources is vaccenic acid, which some studies have indicated does not have a significant negative impact on heart health (25, 26). The cooking oil refining process also

TABLE 3 Fatty acid profiles in refined cooking oils, intakes, and number of samples containing TFAs and SFAs in excess of the FAO/WHO guideline regarding eating amounts[1]

Food category (no. of sources of samples)	Fat content, %		Mean fat intake, g/meal[3]		No. of samples that do not contain or do contain excess TFA and/or SFA for eaters of different amounts[2]							
					Average consumption				High consumption			
	TFA	SFA	TFA	SFA	None	TFA	SFA	Both	None	TFA	SFA	Both
Rice bran oil (1)	0.63	24.50	0.005	0.19	1	0	0	0	0	0	1	0
Palm oil (1)	0.38	43.35	0.005	0.56	1	0	0	0	0	0	1	0
Soybean oil (1)	0.81	16.68	0.011	0.22	1	0	0	0	0	0	1	0

[1] SFA, saturated fatty acid; TFA, *trans* fatty acid.
[2] Average and high levels of consumption are the mean and 97.5th percentile amounts of a food category for the real consumers (eating only) from the National Food Consumption Survey (23). Both, TFA > 0.5 and SFA > 5 g/eating amount; none, TFA ≤ 0.5 and SFA ≤ 5 g/eating amount; SFA, SFA > 5 g/eating amount; TFA, TFA > 0.5 g/eating amount.
[3] Calculated from the mean consumption amount from the National Food Consumption Survey (23).

TABLE 4 Fatty acid profiles in food products, intakes, and number of samples containing TFAs and SFAs in excess of the FAO/WHO guideline regarding eating amounts[1]

Food category (no. of sources of samples)		Fat content, %		Mean fat intake, g/meal[3]		No. of samples that do not contain or do contain excess TFA and/or SFA for eaters of different amounts[2]							
						Average consumption				High consumption			
		TFA	SFA	TFA	SFA	None	TFA	SFA	Both	None	TFA	SFA	Both
Bakery ingredient	Donut frying fat (4)	0.61–46.54	22.92–32.08	0.08–6.03	2.07–5.88	1	2	1	0	0	0	2	2
	Margarine (15)	0.08–15.32	32.71–54.82	0.01–2.16	4.61–7.73	0	1	14	0	0	0	13	2
	Shortening (15)	0.02–43.38	22.18–60.24	0.003–6.07	3.14–8.43	3	2	9	1	0	1	13	1
	Cake oil (1)	0.59	28.46	0.05	2.56	1	0	0	0	1	0	0	0
	Chocolate (7)	0.01–0.26	0.27–33.30	0.003–0.07	0.07–8.33	4	0	3	0	1	0	6	0
	Nondairy whipping cream (2)	0.07–0.14	32.31–38.08	—	—	—	—	—	—	—	—	—	—
Bakery product	Fried donuts (22)	0.02–5.14	3.76–20.45	0.01–2.78	2.03–11.04	7	3	9	3	0	1	16	5
	Pies (17)	0.03–4.39	5.62–24.26	0.01–2.06	2.64–11.40	6	2	9	0	0	0	9	8
	Puff and pastry (11)	0.01–2.46	8.69—16.77	0.05–1.16	4.08–7.88	1	1	7	2	0	0	3	8
	Wafer chocolate (8)	0.03–6.24	6.96–23.32	0.01–1.12	1.46–4.20	7	1	0	0	4	1	3	0
	Cookies (11)	0.06–1.16	9.66–19.54	0.03–0.49	4.06–8.21	3	0	7	1	0	0	9	2
Fast food	Burger (2)	0.14–0.36	4.51–4.58	0.17–0.45	5.59–5.68	0	0	2	0	0	0	1	1
	Deep fried chicken (6)	0.03–0.10	4.67–6.63	0.01–0.04	1.96–2.78	6	0	0	0	1	0	5	0
	Deep fried fish patty (2)	0.05–0.05	5.43–5.93	0.02	2.28–2.49	2	0	0	0	0	0	2	0
	French fries (5)	0.04–0.08	4.64–8.02	0.02–0.05	2.74–4.73	5	0	0	0	0	0	5	0
	Pizza (4)	0.24–0.30	3.28–6.31	0.25–0.32	3.48–6.69	2	0	2	0	0	0	0	4
	Salad dressing (2)	0.22–0.38	4.92–6.31	0.07–0.12	1.57–2.02	2	0	0	0	2	0	0	0
	Popcorn (2)	0.11–0.16	10.38–27.77	—	—	—	—	—	—	—	—	—	—
Beverage	Nondairy creamer (4)	0.23–15.43	9.17–30.88	0.01–0.77	0.46–1.54	3	1	0	0	3	1	0	0
	Powdered chocolate beverage mix (2)	0.01–0.04	1.61–4.62	0.001–0.003	0.11–0.32	2	0	0	0	2	0	0	0
	3in1 instant tea and coffee (4)	0.04–0.11	7.19–13.55	0.002–0.005	0.29–0.62	4	0	0	0	4	0	0	0
	3in1 instant chocolate drink (2)	0.02–0.03	2.35–5.14	0.01	0.80–1.75	2	0	0	0	2	0	0	0

[1] SFA, saturated fatty acid; TFA, *trans* fatty acid; —, no consumption data.
[2] Average and high levels of consumption are the mean and 97.5th percentile amounts of a food category for the real consumers (eating only) from the National Food Consumption Survey (23). Both, TFA > 0.5 and SFA > 5 g/eating amount; none, TFA ≤ 0.5 and SFA ≤ 5 g/eating amount; SFA, SFA > 5 g/eating amount; TFA, TFA > 0.5 g/eating amount.
[3] Calculated from the mean consumption amount from the National Food Consumption Survey (23).

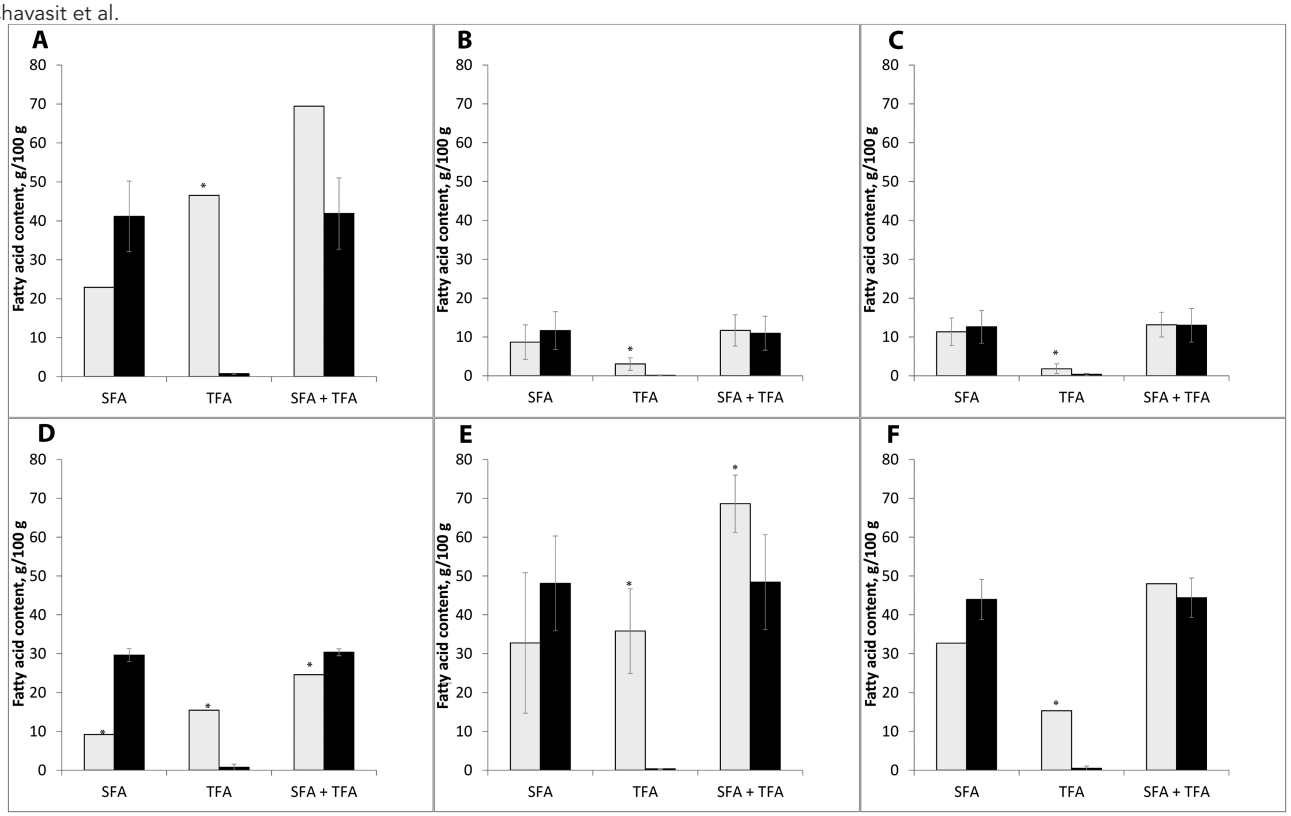

FIGURE 1 Profiles of TFAs and SFAs in donut frying fat (A), donuts (B), puffs and pastries (C), nondairy creamers (D), shortening (E), and margarine (F) that were produced with and without PHOs. Bar height represents mean and range represents standard deviation (SD). *Significantly different fatty acid content from that of the paired bar, $P < 0.05$. Black bars, without PHO; grey bars, with PHO; SFA, saturated fatty acid; TFA, *trans* fatty acid.

does not result in high enough TFAs to exceed the FAO/WHO limit. The concern about refined cooking oils should be only in terms of their natural fatty acid profiles, especially regarding excessive SFAs. As recommended in the FAO/WHO guideline, the healthy ratio of saturated:monounsaturated:polyunsaturated fatty acids should be 1:1:1 (12).

The replacement of PHOs was feasible in the food categories of Table 4, which were the main sources of TFAs in the country. Because Thailand is located in the tropical zone, where naturally saturated tropical oils are widely available, it was quite feasible to replace traditionally used PHOs with these local oils. By using the oil blending technique, Thailand's food industries continuously developed PHO replacements by mixing highly saturated and/or fully hydrogenated oils with different types of less saturated oils at different ratios to achieve desirable physical properties for various food applications (19). Moreover, certain fried food items, such as burgers, fried chicken, fried breaded fish patties, and French fries, could also be prepared similarly to the local dishes by using natural saturated oils. These highly saturated tropical oils are locally available at affordable prices and have been used for deep-frying most of the local dishes in Thailand for decades (27). They are accepted and used among people of all socioeconomic classes in the country and their uses have never been replaced by PHOs. The TFA problem in the country, therefore, was not difficult to solve, but it could remain unresolved without suitable law enforcement. In 2017, the Ministry of Public Health issued a notification which prohibited the use of PHOs in food and food ingredients that are imported and produced for local consumption and exportation beginning in January, 2019 (18).

Under the notification, control applies to the raw material used for production, which can be checked only via the certificate of analysis. The data indicated in this study can then be supportive to the government's controlling measure. Most of the PHOs, as well as margarine and shortening, contained >15% of TFAs (Figure 1), far higher than the EU legislative limit that allowed TFAs in the fat/oil to be ≤2% (24). This EU legislative limit could be potentially used as a cutoff value of TFAs for all types of fats and oils. This limit, however, could not be applied for the TFAs naturally occurring in fats of the biological process which were ≤5% for butter and 6% for butter fat (from our calculations) (**Table 5**). The values proposed in Table 5 could allow for certain amounts of TFAs from nature and the necessary deodorization process in food products. Moreover, a claim that includes both TFAs and SFAs as the criterion could reflect the real nutrition situation which arises from the nature of foods and technical limitations.

After enforcement of the Thai FDA notification on banning uses of PHO in foods, the *trans* fat problem in Thailand should be shortly overcome with minimal effects on food businesses and consumers. However, the postmarketing monitoring should still be performed not only on TFA but also on SFA contents in order to guarantee that the health risk from TFA has already been controlled and to control the potential emerging risk from SFA.

TABLE 5 Potential criteria for the Thai FDA to use for postmarketing monitoring[1]

Food category		*Trans fat* limit	*Trans* fat–free claim
Food products other than mentioned below	All kinds	Not more than 0.5 g/serving	TFA ≤ 0.5 g/serving and SFA ≤ 5 g/serving
Ruminant products	Butter/butter oil	<6%	
	Blended fat/oil product (e.g., butter blend)	<2%	
	Others	Not more than 0.5 g/serving	
Fat and oils other than ruminant products	Refined cooking oils	<2%	
	Margarine/shortening	<2%	

[1]TFA, *trans* fatty acid.

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