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Levels of *trans*-Fatty Acids Present in Processed Food Distributed in Indonesia

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The purpose of this study is to determine the levels of *trans*-fatty acids in processed foods. The results include inventories and identifications of processed food samples which contain *trans*-fatty acids as categorized in Indonesia's National Agency for Food and Drug Control (BPOM) registration numbers (2010-2015) as oil and fat products, baked products, specialty baked goods and special nutritional foods. Gas chromatography with a flame ionization detector was used to analyze *trans*-fatty acids. The samples contained the following types of *trans*-fatty acids: *trans*-9, *cis*-12-octadecadienoate acid, *cis*-9, *trans*-12-octadecadienoate acid and *trans*-9, *trans*-12-octadecadienoate acid. Elaidic acid was not found in any samples. The highest levels of *trans*-fatty acids to total fat was 0.07 g/100 g and the lowest was 0.01g/100 g. The results show that some processed foods have *trans*-fatty acids that are below the 0.1 g/100 g level which permits the use of *trans*-fatty acid claims.

Keywords: GC-FID, Processed foods in Indonesia, *trans*-Fatty acids.

INTRODUCTION

trans-Fatty acids are defined as unsaturated fatty acids that contain one or more double bonds in the *trans* arrangement. About 10-20 % of *trans*-fatty acids consumed are derived from ruminant animal products (milk, meat, fat and their processed product derivatives). Furthermore, 80-90 % of *trans*-fatty acids consumed are obtained from partially hydrogenated products, specifically 40 % of biscuits, cookies, breads, cakes and similar items, 20 % from margarine and the remainder is comprised of other processed foods [1].

The concentration of *trans*-fatty acids in processed foods varies depending on the source of fat and the hydrogenation process used. The highest concentration of *trans*-fatty acids can be found in margarine and shortening which both undergo a partial hydrogenation process [2]. The content of *trans*-fatty acids in margarine products distributed in Malaysia is at 0.17-0.53 % [3] and margarine distributed in Saudi Arabia is at 0.25-2.32 [4].

The concentration of *trans*-fatty acids found in baked products varies from country to country. For example, the average concentration of *trans*-fatty acids contained in unpackaged biscuits in Malaysia is 0.19 g/100 g, for packaged biscuits is 0.39 g/100 g and for imported biscuits is 1.08 g/100 g [5]. In India the concentration of *trans*-fatty acids found in biscuits is 0.02 g/100 g and in bread is 0.837 g/100 g [6]. In Turkey the average concentration of *trans*-fatty acids contained in cookies is 3.54 g/100 g and in crackers is 1.19 g/100 g [7].

trans-Fatty acids are atherogenic (tend to trigger the narrowing, thickening and hardening of the arteries) and they inhibit the activity of enzymes that metabolize lipids (unsaturated fatty acid elongase and lecithin cholesterol acyl transferase/LCAT). This enzyme in particular is involved in HDL metabolism especially with the return transport of cholesterol from tissues back to the liver [8,9]. Compared to saturated fatty acids, *trans*-fatty acids affect the ratio of LDL/HDL almost two-fold. Variations in the ratio of total cholesterol/HDL or LDL/HDL are indications of coronary heart disease (CHD). An absolute increase of 2 % of energy intake from *trans*-fats is commensurate with a 23 % increase in cardiovascular risk [10]. Similar to increased levels of LDL, consumption of *trans*-fatty acids produce the same negative effects as those of saturated fatty acids. Both *trans* and saturated fatty acids raise LDL levels. However, *trans*-fatty acids will also reduce HDL levels whereas saturated fatty acids have no affect on HDL levels [11]. Inflammation may connect the

relationship between *trans*-fatty acid intake and stroke since atherosclerosis is actually an inflammatory process and is the most common causes of stroke [12].

High consumption of either saturated or *trans*-fatty acids can increase the risk of dementia, whereas the high consumption of polyunsaturated or monounsaturated fatty acids can reduce the risk of dementia [13]. The fatty acids found in foods are an important factor in the blood-brain barrier function and the blood's cholesterol profile since apolipoprotein E-ε4 is needed for the body to transport cholesterol that is connected to Alzheimer's disease [14]. Consuming excessive amounts of *trans*-fatty acids is hazardous to one's health. Therefore the Word Health Organization (WHO) and the Food and Agriculture Organization (FAO) recommends limiting consumption of *trans*-fatty acids in foods to less than 1 % of a person's total energy intake [15].

In Indonesia, including *trans*-fatty acids on the nutritional label is not yet required, but regulations are in place that permit the declaration of free from *trans*-fatty acids on non-liquid (solid) food products that contain no more than 0.1 g/100 g and for liquid foods of no more than 0.1 g/100 mL [16]. Data regarding the presence of *trans*-fatty acids contained in processed foods distributed in Indonesia is not yet widely available. This makes it difficult for consumers to identify foods that have *trans*-fatty acids and decide whether or not too included them in their diet, thus the need for this research. This study aims to identify processed foods that contain *trans*-fatty acids, analyze the levels of *trans*-fatty acids in the said processed foods, assess the feasibility of labeling for *trans*-fatty acids and calculate quantities per serving.

EXPERIMENTAL

The materials used for testing are chloroform, methanol, BF_3-methanol (14 %), methanolic solution of sodium hydroxide (NaOH 0.5 N), saturated aqueous NaCl 0.88 %, hexane, anhydrous Na_2SO_4, nitrogen gas, internal standard margaric acid (C17:0), the standard solution FAME mixture of C8–C22 (Supelco, Bellefonte, USA), a standard solution of C18: 2 *trans* (Sigma-Aldrich, St. Louis, USA) and samples (shortening, margarine, bread, biscuits, crackers, cookies, cakes and wafers). A gas chromatograph (Shimadzu GC-2010) with a capillary column of 60 m × 0.25 mm × 0.2 μm SP-2340 (Supelco, Bellefonte, USA) and a flame ionization detector.

Identification and sampling: Samples that were analyzed were selected from processed foods that were registered with BPOM. Data was sourced from the entries made on the BPOM website (www.pom.go.id) between February 17, 2010 until February 16, 2015. Processed foods are categorized based on foods and food types. A total of 50 product samples were randomly selected in proportion to the number of identified food categories. Samples were selected by random selection of the said processed products' registration numbers. After gathering the registration numbers, 3 batches were made by selecting 3 different registration numbers of products being sold in markets (minimarkets and supermarkets within Bogor, West Java, Indonesia).

Fat extraction [17]: The samples from the 3 batches were weighed into 50 g each then pulverized in a blender. The pulverized samples were then weighed into 3 g each and 20 mL of a chloroform-methanol (2:1) mixture was added. The mixture was homogenized using a stirrer for 1 h then vacuum filtered to isolate pulp and suspension. Samples are taken from the suspension whilst the pulp is discarded. Next, 4 mL of NaCl 0.88 % were added to the suspension with the vortex method. This separated the suspension into two layers. The upper layer was discarded. However the bottom layer was passed through a filter subjected to anhydrous Na_2SO_4. The resulting filtrate was concentrated by N_2 gas until it reached a constant weight and was used to calculate the total fat content. Any extracted oils obtained from this process were either used immediately or carefully stored in a dark bottle in the refrigerator for future use.

Derivatives of fatty acids [18]: Approximately 100 ± 2 mg of the extracted fat was placed in a test tube and then as much as 1 mL of internal standard solution (C17:0) was added. After that 2 mL of 0.5N methanolic NaOH was added to this solution and then the test tube was blown with N_2 gas for 15 seconds, sealed, shaken, heated and held to 80 °C for 5 min. Then the tube was cooled and 2 mL of BF_3-methanol (14 % w/v) was added and the test tube was blown again with N_2 gas. The tube was reheated and held to a temperature of 80 °C for 30 min, re-cooled under running water to room temperature, then 1.5 mL of hexane was added into a vortex. After this, 3 mL of saturated NaCl was added and the test tube was agitated immediately. The mixture was allowed to stand until it separated into two layers. The layer above was extracted with a pipette and put into a vial containing anhydrous Na_2SO_4. This method was repeated as many as seven times to prepare test solutions.

GC analysis of fatty acid [19]: Using a syringe, a total of 1 μL of solution from the derivatization stage was injected into the gas chromatograph. The temperature of the injector and detector was 250 and 260 °C respectively. Flowing helium gas was used as the carrier gas. Flowing hydrogen gas and air were used as a gas burner and support. The column temperature was set to 120 °C (held for 6 min), then the temperature was incrementally raised at a rate of 3 °C until the column temperature reached 260 °C (held for 25 min). The analysis was performed with two iterations of linearly standard curve to 9t-C18:1 ($r^2 = 1$) in the working range between 0.0040 to 0.1000 mg/mL, at a precision (relative standard deviation (RSD)) of 0.24 %, LOD 0.0007 mg/mL and LOQ 0.0020 mg/mL. The linear standard curve used for isomer C18:2 (r^2) 0.9999 was in the working range of 0.0025 to 0.7500 mg/mL (mixed) with precision (RSD), LOD and LOQ set respectively as follows; (1) 9t,12t-C18:2: 1.40 %, 0.0033 mg/mL and 0.0100 mg/mL; (2) 9t,12c-C18:2: 1.89 %, 0.0015 mg/mL and 0.0045 mg/mL; (3) 9c,12t-C18:2: 2.39 %, 0.0015 mg/mL and 0.0044 mg/mL; (4) C18:2 *cis*: 3.39 %, 0.0006 mg/mL and 0.0019 mg/mL. Verification results for compounds 9t-C18:1 precision (RSD fatty acid content = 1.78 %; RSD percentage of fatty acid to total fatty acids = 0.72 %) and accuracy (percent recovery) 80.54-94.25 %.

Data analysis: Quantitative descriptive statistical analysis was used as the technique for Data analysis and applied to describe or depict and the data was collected.

RESULTS AND DISCUSSION

Identification and sampling: As many as 60,897 processed food items have been registered in BPOM (2010-2015) and 5,630 of them are believed to be processed foods which contain *trans*-fatty acids. Processed foods are grouped in four major groups of food categories according to the Decree of the Head of BPOM No. 1 of 2015. The 5,630 said products include as many as 487 in the fats and oils group, as many as 591 in the baked group, 4476 in the special baked goods group and as many as 76 for products in the special nutritional group. Specialty baked products claim a large amount, thus the need to be broken down into more specific sub-groups namely: as many as 2,360 biscuits, 257 cookies, as many as 1,565 wafers, as many as 97 cakes and as many as 197 sweet breads. Table-1 displays the 50 kinds of food and their details that were used for sample analysis.

Profile of fatty acids in processed food: Table-2 displays the range levels of saturated fatty acid (SFA), mono unsaturated fatty acid (MUFA), poly unsaturated fatty acids (PUFA) and *trans*-fatty acids (TFA) for each sample. Saturated fatty acid consists of caprylic acid (C8:0), capric acid (C10:0), lauric acid (C12:0), tridecanoate acid (C13:0), myristic acid (C14:0), pentadecanoic acid (C15:0), palmitic acid (16:0), margaric acid (C17:0), arachidonic acid (C20:0), behenic acid (C22:0). MUFA consists of myristoleic acid (C14:1), palmitoleic acid (C16:1), oleic acid (C18:1), eicosenoic acid (C20:1) and erucic acid (C22:1). Poly unsaturated fatty acids made up of linoleic acid (C18:2) and linolenic acid (C18:3). The progression of fatty acid elution starts from the saturated form, unsaturated with one double bond (monounsaturated), the form not saturated but with two double bonds (diunsaturated), with the first and the shortest chain of isomer forms [20]. Chromatogram standards and sample biscuits can be seen in Fig. 1.

In general the results of the analysis showed that the highest concentrations of fatty acids are saturated fatty aicd with a value between 40.19-56.89 g/100 g in fat and oil

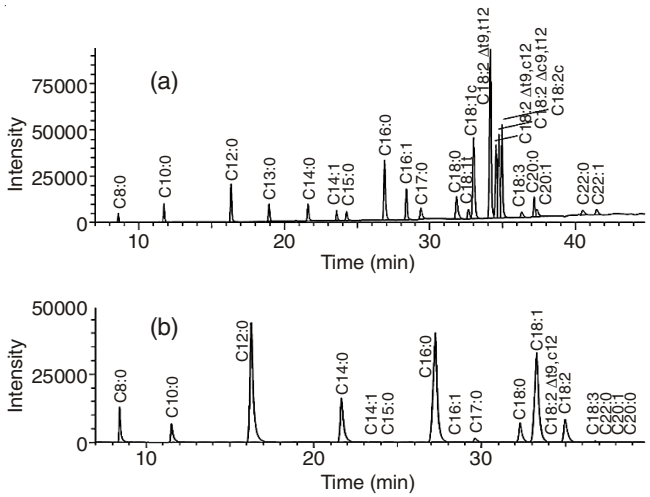

Fig. 1. Chromatogram GC-FID fatty acid methyl esters of standard (A), GC-FID chromatograms of biscuit samples (B)

products, 22.99-46.88 g/100 g in baked products, 10.01-83.45 g/100 g in specialty baked goods and 35.02 g/100 g in special nutritional food products. Mono unsaturated fatty acids fat and oil products ranged between 26.25-43.57 g/100 g, baked products ranged between 0.44-34.25 g/100 g, special baked products ranged between 7.17-42.4 g/100 g and special nutritional food products ranged between 28.99 g/100 g. Poly unsaturated fatty acids oil and fat products ranged between 6.11-10.16 g/100 g, baked products ranged between 0.5-10.08 g/100 g, specialty baked products ranged between 1.67-20.56 g/100 g and special nutritional food products ranged between 9.63 g/100 g. *trans*-Fatty acid oil and fat products ranged between 0.02 to 0.06 g/100 g, baked products ranged between 0.03 to 0.07 g/100 g, specialty baked products ranged between 0.01 to 0.06 g/100 g, with nothing detected in the nutritional food product group. Fatty acid fat and oil products ranged between 88.92 to 98.07 g/100 g, baked products between 23.93 to 90.92, specialty baked goods between 52.86 to 98.48 g/100 g of food

TABLE-1
GROUP CATEGORIES OF FOODS, FOOD TYPES AND QUANTITIES SAMPLED FROM EACH CATEGORY

Categories of foods		Food types	Product registered (2010-2015)	Total sample
0.2.0	Fat, oil, oil emulsion		487	4
07.1	Fresh bakery products		591	5
07.2	Special bakery products	Biscuit	2360	21
		Cookies	257	2
		Wafer	1565	14
		Cake	97	1
		Bread	197	2
13.0	Special nutritional food products	Biscuit	76	1
Total			5630	50

TABLE-2
LEVELS OF TOTAL SFA, MUFA, PUFA, TFA AND FA EACH FOOD CATEGORY*

Sampel	ΣSFA (g/100 g)	ΣMUFA (g/100 g)	ΣPUFA (g/100 g)	ΣTFA (g/100 g)	ΣFA (g/100 g)
Fat and oil (n = 4)	40.19-56.89	26.25-43.57	6.11-10.16	0.02-0.06	88.92-98.07
Fresh bakery products (n = 5)	22.99-46.88	0.44-34.25	0.5-10.08	0.03-0.07	23.93-90.92
Special bakery products (n = 40)	10.01-83.45	7.17-42.4	1,67-20.56	0.01-0.06	52.86-98.48
Special nutritional food products (n = 1)	35.02	28.99	9.63	nd**	77.34

*The analysis was performed with two iterations and in duplicate; **not detected; ΣSFA = Total saturated fatty acid, ΣMUFA = Total mono unsaturated fatty acid, ΣPUFA = Total poly unsaturated fatty acid, ΣTFA = Total *trans*-fatty acid, ΣSFA = Total fatty acid

and special nutrition 77.34 g/100 g. The resulting data from testing SFA, MUFA and PUFA in processed foods indicate that palm and palm kernel oil were the most probable sources [21].

***trans*-Fatty acids:** Data on total *trans*-fatty acids and isomers are presented in Table-3. The *trans*-fatty acids analyzed in this study are geometric isomers of oleic acid, namely elaidic acid (C18:1 Δt9) and geometric isomers of linoleic fatty acids namely *trans*-9, *cis*-12-octadecadienoate acid (C18:2 Δt9, c12), *cis*-9, *trans*-12-octadecadienoate acid (C18:2 Δc9, t12), *trans*-9, *trans*-12-octadecadienoate acid (C18:2 Δt9, t12). It can be observed from Table-3 that totals of *trans*-fatty acids found in the category of fat and oil products ranged between 0.02-0.06 g/100 g, baked products ranged between 0.03-0.07 g/100 g, specialty baked products ranged between 0.01-0.06 g/100 g and no *trans*-fatty acids were detected in the nutritional food product group.

From the total of 50 analyzed samples 32 *i.e.*, 64 % contained *trans*-fatty acids, whereas 18 or 36 % samples did not contain *trans*-fatty acids. In the category of fat and oil products, 3 of the 4 analyzed samples contained *trans*-fatty acids. Shortenings and margarines contain *trans*-fatty acids since their products are derived from hydrogenated vegetable oils [2]. In the category of baked products, 4 of the 5 analyzed samples contained *trans*-fats and specialty baked products had 25 samples that contained *trans*-fatty acids. Baked products (breads, crackers and breadcrumbs) and specialty baked products (biscuits, wafers, cookies, cake and sweet breads) contain *trans*-fatty acids because they use shortening or margarine that comes from hydrogenated vegetable fats [5].

The breakdown of the *trans*-fatty acid's geometric isomers are: *trans*-fatty acid C18.2 Δt9, c12 about 40 %, *trans*-fatty acid C18.2 Δc9, t12 about 20 %, *trans*-fatty acid C18.2 t9, t12 around 2 % and *trans*-fatty acid C18.2 Δt9, c12 and C18.2 Δt9, t12 about 2 %. *trans*-fatty acids C18.2 Δt9, c12 are found in fat and oil products as well as baked products and specialty baked products, *trans*-fatty acid C18.2 Δc9, t12 and *trans*-fatty acid C18.2 Δt9, t12 exists in specialty baked products. Elaidic acid (C18.1 Δt9) was not found in any samples. *trans*-fatty acids are primarily formed by the partial hydrogenation of vegetable oil, which is derived from oleic acid as elaidic acid (C18:1 Δt9), *trans*-isomers of linoleic acid (C18:2 Δt9, t12, C18:2 Δc9, t12 and C18:2 Δt9, c12) and linolenic acid [22]. The data derived from *trans*-fatty acids in processed food indicate their probable source comes from vegetable oils that underwent a partial hydrogenation process.

***trans*-Fatty acid levels in processed food and compliance with labeling requirements:** Table-4 displays results data of the saturated and *trans*-fatty acid concentrations analysis regarding the serving size, total fats, total saturated fatty acids and total *trans*-fatty acids stated on nutritional value information labels. All analyzed samples (other than shortening and oil which have no nutritional label and thus could not be analyzed for label compliance), were labeled with nutritional value information and registered with BPOM. The following 8 products that were sampled which had total fat amounts in accord with their label are: 1 product from the fats and oils category, 1 from the baked category and 6 from the specialty baked goods. The following 12 sampled products had total fat amounts above what was specified on their label, namely: 1 product from the baked goods category and 11 from the specialty baked goods category. The following 29 products that were sampled which had total fat amounts below what was specified on their label are: 2 products from fats and oils category, 3 from the baked goods category, 23 from the specialty baked goods category and 1 special nutritional food samples. The discrepancies of actual and labeled total fat content may be a result of the different analytical methods used with this study and the methods used by the industry.

The research analysis results show that out of 32 samples which contain *trans*-fatty acids only 17 samples displayed "0 g" of total *trans*-fatty acids. The Control Head BPOM regulations states that labels and advertising of processed food may claim to be free of *trans*-fat (0 g), only when the *trans*-fat content in the processed food is no more than 0.1 g/100 g. There were no analyzed samples that contained more than 0.1 g/100 g of *trans*-fat.

Although our analysis discovered that all 50 of the samples contained saturated fatty acids, only 24 samples listed saturated fat on their nutritional value information label. Of the 24 samples that included saturated fats in the nutritional value information label, 13 samples had actual saturated fat amounts within the amount displayed on the nutritional value information label while 11 samples exceeded the amount of saturated fat amounts listed on the nutritional value information label. Product samples from the fat and oil category revealed amounts between 1.2-1.4 g higher than specified on the label, baked products were 0.3 g above their label, specialty baked products showed amounts between 0.3-1.6 g higher than what was specified on the label. If processed food claimed to be low or free of saturated fat, the food should not contain more saturated fat than 1.5 g/100 g or 4 g per serving. The requirements that saturated fats may not exceed 1.5 g/100 g or 4 g per serving did not apply to any sampled products since none of them had labels with the statement "low" or "free" of saturated fats. The discrepancies of actual and labeled total fat content may be a result of the different analytical methods used with this study and the methods used by the industry.

Conclusion

Processed foods listed in BPOM contain *trans*-fatty acids. The *trans*-fatty acids analyzed are: *trans*-9, *cis*-12-octadecadienoate acid (C18:2 Δt9, c12), *cis*-9, *trans*-12-octadecadienoate acid (C18:2 Δc9, t12) and *trans*-9, *trans*-12-octadecadienoate acid (C18:2 Δt9, T12). All of the processed food samples contained less than 0.1 g/100 g and thus were in accordance with the labeling regulations.

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TABLE-3
trans-FATTY ACID FROM ISOMERS OF OLEIC ACID AND LINOLEIC ACID AND TOTAL *trans*-FATTY ACIDS FOUND IN PROCESSED FOODS DISTRIBUTED IN INDONESIA

Sample	*trans*-Fatty acid (g/100 g)*				ΣTFA
	C18:1 t9	C18:2 t9, t12	C18:2 t9, c12	C18:2 c9, t12	
Fat and oil (n = 4)					
Shortening	nd	nd	0.06	nd	0.06
Margarine 1	nd	nd	0.03	nd	0.03
Margarine 2	nd	nd	nd	nd	nd
Cream margarine	nd	nd	0.02	nd	0.02
Fresh bakery products (n = 5)					
White bread	nd	nd	0.07	nd	0.07
Creckers	nd	nd	0.04	nd	0.04
Cream creckers	nd	nd	0.04	nd	0.04
Malkist	nd	nd	0.03	nd	0.03
Bread crumbs	nd	nd	nd	nd	nd
Special bakery products (n = 40)					
Biscuit 1	nd	nd	nd	nd	nd
Biscuit 2	nd	nd	nd	nd	nd
Biscuit 3	nd	nd	nd	nd	nd
Biscuit 4	nd	nd	nd	nd	nd
Biscuit 5	nd	nd	0.01	nd	0.01
Biscuit 6	nd	nd	0.05	nd	0.05
Biscuit 7	nd	nd	nd	nd	nd
Biscuit 8	nd	nd	nd	nd	nd
Biscuit 9	nd	nd	nd	nd	nd
Biscuit 10	nd	0.03	nd	nd	0.03
Biscuit 11	nd	nd	0.02	nd	0.02
Biscuit 12	nd	nd	nd	0.04	0.04
Biscuit 13	nd	nd	0.02	nd	0.02
Biscuit 14	nd	nd	nd	nd	nd
Biscuit 15	nd	nd	0.02	nd	0.02
Biscuit 16	nd	nd	0.04	nd	0.04
Biscuit 17	nd	nd	nd	0.02	0.02
Biscuit 18	nd	nd	nd	0.02	0.02
Biscuit 19	nd	nd	nd	0.02	0.02
Biscuit 20	nd	nd	0.03	nd	0.03
Biscuit 21	nd	nd	nd	0.03	0.03
Wafer 1	nd	nd	0.03	nd	0.03
Wafer 2	nd	nd	0.01	nd	0.01
Wafer 3	nd	nd	nd	nd	nd
Wafer 4	nd	nd	nd	0.02	0.02
Wafer 5	nd	nd	nd	nd	nd
Wafer 6	nd	nd	nd	nd	nd
Wafer 7	nd	nd	0.02	nd	0.02
Wafer 8	nd	nd	nd	nd	nd
Wafer 9	nd	nd	0.03	nd	0.03
Wafer 10	nd	nd	nd	nd	nd
Wafer 11	nd	nd	nd	0.03	0.03
Wafer 12	nd	nd	0.05	nd	0.05
Wafer 13	nd	nd	nd	nd	nd
Wafer 14	nd	nd	nd	nd	nd
Cake	nd	nd	nd	0.03	0.03
Cookies 1	nd	nd	0.02	nd	0.02
Cookies 2	nd	0.05	0.01	nd	0.06
Bread 1	nd	nd	nd	0.03	0.03
Bread 2	nd	nd	nd	0.03	0.03
Special nutritional food (n = 1)					
Biscuit	nd	nd	nd	nd	nd

*The results are valued at SD = 0.00; nd = not detected

TABLE-4
FATTY ACID AMOUNTS SHOWN ON PACKAGE LABELS, ANALYZED AMOUNTS AND SFA TFA PER SERVING

Registration number	Product	Nutrition facts (g)						
		Label packaging				Results of analysis (perserving)		
		Serving size	Total fat	TFA	SFA	Total fat	TFA	SFA
Fat and Oil (n = 4)								
MD	Shortening	–*	–	–	–	–	–	–
MD	Margarine 1	8	6	0	4	6.2	0.002	3.8
MD	Margarine 2	14	11.3	0	3.4	11.5	nd	4.8
MD	Cream margarine	15	10	0	4	10.3	0.003	5.2
Fresh bakery products (n = 5)								
MD	White bread	40	1.5	–	0.5	1.5	0.028	0.8
MD	Creckers	15	2	0	1	1.7	0.006	1.0
MD	Cream creckers	16	2.5	–	–	2.3	0.006	1.3
MD	Malkist	27	4	–	–	4.0	0.008	2.4
ML	Bread crumbs	50	1.5	–	–	1.6	nd	1.0
Special bakery products (n = 40)								
MD	Biscuit 1	22	4	–	–	4.0	nd	1.8
MD	Biscuit 2	39	11	–	–	11.1	nd	4.9
MD	Biscuit 3	24	2.5	0	1.5	2.7	nd	1.1
MD	Biscuit 4	22	3	–	2.5	3.1	nd	1.5
MD	Biscuit 5	30	8	0	5	8.0	0.003	4.7
MD	Biscuit 6	35	13	0	–	13.2	0.018	7.3
MD	Biscuit 7	30	8	–	5	8.1	nd	4.7
MD	Biscuit 8	20	2.5	–	–	2.6	nd	1.4
MD	Biscuit 9	24	3	–	2	3.1	nd	1.8
MD	Biscuit 10	25	2	–	–	2.4	0.008	0.6
MD	Biscuit 11	15	3.5	–	–	3.7	0.003	2.6
MD	Biscuit 12	29,2	6	0	2	6.0	0.012	3.2
MD	Biscuit 13	30	7	–	–	7.1	0,006	5.2
ML	Biscuit 14	100	16	0	7	15.4	nd	6.4
MD	Biscuit 15	28,5	5	0	2.5	5.1	0.006	3.1
ML	Biscuit 16	100	23.5	0	11	23.9	0.040	11.0
ML	Biscuit 17	37	9	–	4	9.0	0.007	5.6
MD	Biscuit 18	30	6	–	–	6.2	0.006	3.5
MD	Biscuit 19	25	4	–	–	4.0	0.005	3.4
MD	Biscuit 20	20	4	–	–	4.1	0.006	2.0
MD	Biscuit 21	30	7	0	–	7.1	0.009	4.0
MD	Wafer 1	25	4.5	–	–	4.3	0.008	2.2
MD	Wafer 2	100	25	0	20	22.2	0.010	20.4
ML	Wafer 3	6	2	–	–	1.9	nd	1.7
MD	Wafer 4	20	6	0	4.5	6.1	0.004	4.8
MD	Wafer 5	18	3	–	1.5	2.7	nd	1.5
MD	Wafer 6	30	9	–	–	9.4	nd	5.4
MD	Wafer 7	30	7	–	–	7.1	0.006	5.2
MD	Wafer 8	26	7	–	–	6.6	nd	3.5
MD	Wafer 9	20	4	0	2.5	4.1	0.006	1.8
MD	Wafer 10	30	6	–	–	6.0	nd	5.1
MD	Wafer 11	100	20	0	15	19.8	0.030	9.8
MD	Wafer 12	25	6	–	–	6.0	0.013	3.0
MD	Wafer 13	10,5	2	0	1	2.0	nd	0.6
ML	Wafer 14	38	11	–	–	11.4	nd	7.4
ML	Cake	28	5	–	–	5.3	0.008	3.7
MD	Cookies 1	20	5	–	–	5.2	0.004	2.7
MD	Cookies 2	30	7	–	5	7.4	0.018	5.3
MD	Bread 1	55	9	–	1.5	10.6	0.017	5.2
MD	Bread 2	72	10	–	5	10.2	0.022	5.4
Special nutritional food (n = 1)								
MD	Biscuit	21.8	1.5	–	–	1.5	nd	0.7

*Not listed on the label; nd = not detected

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