Current Research

Nonhydrogenated Cottonseed Oil Can Be Used as a Deep Fat Frying Medium to Reduce *Trans*-Fatty Acid Content in French Fries

DARLA R. DANIEL, PhD, RD; LESLIE D. THOMPSON, PhD; BRENT J. SHRIVER, PhD; CHIH-KANG WU, PhD; LINDA C. HOOVER, PhD, RD

ABSTRACT

Objective The purpose of this research study was to evaluate the fatty acid profile, in particular *trans*-fatty acids, of french fries fried in nonhydrogenated cottonseed oil as compared with french fries fried in partially hydrogenated canola oil and french fries fried in partially hydrogenated soybean oil.

Design Cottonseed oil, partially hydrogenated canola oil, and partially hydrogenated soybean oil were subjected to a temperature of 177°C for 8 hours per day, and six batches of french fries were fried per day for 5 consecutive days. French fries were weighed before frying, cooked for 5 minutes, allowed to drain, and reweighed. Oil was not replenished and was filtered once per day. Both the oil and the french fries were evaluated to determine fatty acid profiles, *trans*-fatty acids, and crude fat.

Statistical analysis A randomized block design with split plot was used to analyze the data collected. Least-squares difference was used as the means separation test.

Results No significant differences were found between fries prepared in the three oil types for crude fat. Fatty acid profiles for the french fries remained stable. The french fries prepared in cottonseed oil were significantly lower in *trans*-fatty acids. The combined total of the *trans*-fatty acid content and saturated fatty acid content were lower in french fries prepared in cottonseed oil.

Conclusions Because deep fat frying remains a popular cooking technique, health professionals should educate the public and the food service industry on the benefits of using nonhydrogenated cottonseed oil as an alternative to the commonly used hydrogenated oils.
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D. Daniel is an assistant professor, Department of Human Sciences, Stephen F. Austin State University, Nacogdoches, TX; at the time of the study, she was a doctoral student, Education, Nutrition, and Restaurant, Hotel, Institutional Management, Texas Tech University, Lubbock. L. Thompson is an associate professor/associate chairman, Animal and Food Sciences and International Center for Food Industry Excellence, Texas Tech University, Lubbock. B. Shriver is an assistant professor, C.-K. Wu is an assistant professor, and L. Hoover is an academic dean, Education, Nutrition, and Restaurant, Hotel, Institutional Management, Texas Tech University, Lubbock.

Address correspondence to Darla R. Daniel, PhD, RD, Department of Human Sciences, Stephen F. Austin State University, Box 13014–SFA Station, Nacogdoches, TX 75962. E-mail: ddaniel@sfasu.edu

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Despite the negative health effects, deep fat fried snack foods remain very popular among consumers. The unique sensory qualities found in foods that are deep fat fried cannot be duplicated by any other cooking method. In particular, french fries remain a very popular food item in the American diet. On average, each person in the United States consumes approximately 13.6 kg (30 lb) of french fries every year (1). Therefore, the food service industry has the difficult task of providing the popular french fry in the most healthful form possible.

During 1989 and 1990, many restaurants reduced their use of saturated fats and substituted hydrogenated vegetable oils because of consumer pressure for more healthful products (2). This decline in the use and consumption of animal fat and tropical oils was attributable to the relationship found between saturated fatty acid intake and heart disease. Oils high in saturated fat, such as lard, were replaced with vegetable oils such as canola oil and soybean oil. However, vegetable oils containing high concentrations of polyunsaturated fatty acids require hydrogenation to increase their chemical stability. *Trans*-fatty acids are a byproduct of hydrogenation. Partially hydrogenated vegetable oils contain approximately 30% *trans*-fatty acids, whereas animal fats contain approximately 3% *trans*-fatty acids (2).

Both clinical and epidemiological studies indicate that the risk for coronary heart disease increases with increasing dietary intake of *trans*-fatty acids (3). This is probably because *trans*-fatty acids are metabolized in the same manner as saturated fatty acids. A study by Mensink and Katan (4) found that increased consumption of *trans*-fatty acids increases blood cholesterol levels. Zock and colleagues (5) hypothesize that for every additional percentage of *trans*-fatty acid in the diet, low-density lipoprotein (LDL) cholesterol is increased by about 1.5 mg/dL and high-density lipoprotein (HDL) cholesterol is decreased by approximately 0.5 mg/dL.

The majority of *trans*-fatty acids consumed today come from foods fried in partially hydrogenated vegetable oil, as well as margarine, snacks, and baked products (6). Restaurants typically use partially hydrogenated vegeta-

Table 1. Typical fatty acid profile of cottonseed oil, canola oil, and soybean oil[a]

Fatty acid composition (%)	Cottonseed oil	Canola oil	Soybean oil
Myristic (14:0)	0.5-2.5	0.1	<0.5
Palmitic (16:0)	17-29	3.5	7-12
Stearic (18:0)	1-4	1.5	2-5.5
Oleic (18:1)	13-44	60.1	20-50
Linoleic (18:2)	33-58	20.1	35-60
Linolenic (18:3)	0.1-2.1	9.6	2-13

[a]Source: reference 10.

ble oil for deep fat frying french fries. Soybean oil and canola oil rank first and third, respectively, among the oilseed crops (7) and are commonly used as a deep fat frying medium (8). The National Cottonseed Products Association has begun targeting casual dining restaurants in an advertising campaign to promote the health and taste benefits of cottonseed oil (8). Restaurant chefs, who are profit oriented but are also interested in health, may find cottonseed oil very appealing. The average price for cottonseed oil is just a fraction of a cent higher per pound than that of soybean oil (9). Table 1 shows the typical fatty acid profile of the unhydrogenated forms of cottonseed, canola, and soybean oils (10).

The objective of this study was to determine the fatty acid profile, in particular *trans*-fatty acids, of french fries fried in cottonseed oil as compared with french fries fried in partially hydrogenated canola oil and french fries fried in partially hydrogenated soybean oil.

METHODS

Fat Sources

Cottonseed oil was obtained from PYCO Industries, Lubbock, TX; both canola oil (Extend) and soybean oil (Mel Fry) were obtained from Ventura Foods LLC, City of Industry, CA. Cottonseed oil was not hydrogenated, whereas the canola and soybean oils were partially hydrogenated. All three oils contained tertiary butylhydroquinone and citric acid as antioxidants and dimethylpolysiloxane as an antifoam agent.

French Fries

This research was conducted using US Department of Agriculture grade A frozen, partially cooked, Russet Burbank potatoes produced by Payette Farms (J. R. Simplot Co, Boise, ID), straight cut ⅜×⅜ inches. The nutritional composition of an 86-g (3-oz) serving size is 120 calories, 4 g fat, 1 g saturated fat, 18 g carbohydrate, and 2 g protein. Other ingredients included beef tallow and/or vegetable shortening (partially hydrogenated soybean and/or canola oil), dextrose, and disodium dihydrogen pyrophosphate (to maintain natural color). The french fries were obtained from Watson Sysco Foodservice (Lubbock, TX).

Fryer

A stainless steel, gas-heated deep fat fryer with three 23- to 27-kg (50- to 60-lb) oil capacity tanks (Pitco Frialator with built-in filter, model AG14S, Pitco Frialator Inc, Concord, NH) was used. For statistical purposes, each tank was considered a block.

Experimental Design

Using a block (tank) design with a split plot (time), each of the three tanks was filled to capacity with its designated fresh oil. The oil was placed into a container tared on a bench scale, and approximately 24 kg (measured to two decimal places) was weighed. After the oil was weighed, it was hand-poured back into the fryer. The oil residue left adhering to the walls of the container was scraped into the tank with a large rubber spatula. After 1 week, oils were rotated to a different tank to correct for any temperature differences among the tanks. Because there were three tanks, three repetitions were required to complete one trial. Three trials (one trial equaling three repetitions) were used to create a stronger statistical model. Oil was heated and used for 5 consecutive days without replenishing. The oil was heated for 8 hours every day for 5 days. After 5 days of heating and frying, the used oil was sampled and discarded and fresh oil was rotated to another tank until each oil had been in each tank during the 3-week repetition. A fresh sample of the oil was taken before the start of the study, and a sample was taken at the end of each day for analysis. The samples were flushed with nitrogen to help retard oxidation and stored frozen in brown Nalgene containers until further analysis could be performed. At the end of the day, the oil was filtered using the built-in filtering system within the Pitco Model AG14S. Before draining the oil for filtering, 1 cup of filtering powder (Homestyle Hol-N-One, Inc, Fordyce, AR) obtained from Lubbock Restaurant Supply (Lubbock, TX) was added to the oil. As the oil was draining, any food particles left around the sides or in the bottom of the fryer were scraped toward the drain. The oil in the last tank (farthest from the filtering system) was filtered first, the middle tank second, and the tank closest to the filter last. This minimized cross-contamination of the different types of oil. Fresh filter paper was used to filter each oil type. The filtering process was timed using a digital timer for exactly 2 minutes. The oil was pumped back into the same tank by the fryer's internal pump and allowed to bubble. This signified that the return lines had been cleared. This pumping process was timed for exactly 2 minutes. After the 5-day cycle, the fryer was cleaned first with Drano (SC Johnson, Racine, WI), rinsed with water, cleaned again with apple cider vinegar, rinsed, and dried.

Frozen french fries were taken from the freezer and immediately weighed to the nearest gram. Approximately 2 kg of french fries were added to the deep fat fryer basket and immersed in the hot oil at a temperature of 177°C for exactly 5 minutes. A digital timer was used to accurately record the time. Throughout the day, six batches of fries were cooked, yielding daily a total of 12 kg (26.4 lb) of french fries for each oil. Batches were fried every 30 minutes to 1 hour to allow the temperature of the oil to recover between batches. The fries were then removed from the oil and allowed to drain for 2 minutes. Once the fries were drained, batch 6 was vacuum-packaged and stored frozen for analysis.

FATTY ACID PROFILE OF THE OIL

Fatty acid profiles on the oil samples were analyzed by the Texas A&M Agricultural Research and Extension Center, Lubbock. The analytical procedure was as follows. The methylation mix consisted of 29.1 mL 14% borontrifluoride in methanol, 20.0 mL toluene, and 50.9 mL methanol. One drop of oil was added to a labeled Pierce Reactivial (Pierce Chemical Co, Rockford, IL). Approximately 1.5 mL methylation mixture was added. The vial was sealed with a lid and septum and block heated at 100°C for 30 minutes (vials were shaken at the 15-minute point). Vials were allowed to cool, and approximately 1.5 mL distilled water was added to the vials. This solution was decanted into large labeled test tubes. The solution was extracted twice with 1.5 mL hexane (each extraction was placed in a vortex and the top layer was removed with a pipette and placed into small labeled test tubes). The extractant was dried under nitrogen gas. Residue was dissolved with 1.0 mL chloroform and decanted into labeled vials. One microliter was injected into the Hewlet Packard Gas Chromatagraph (Hewlet Packard, Palo Alto, CA). Gas chromatography specifications are as follows: column, Supelco Supelcowax 10, 30×0.53 mm, 0.50-μm film; flow rates: helium, 22.4 mL/min, hydrogen, 22.36 mL/min, air, 448.6 mL/min; septum purge, 4.17 mL/min; split vent, 70.6 mL/min; split ratio, 4.17; injector temperature, 200°C; flame ionization detector temperature, 250°C; oven temperature program: initial, 210°C, final, 240°C, rate of increase, 4°C /min; auto sampler: rinse 3× hexanes, rinse 2× chloroform, rinse 2× sample, pump syringe 4× to remove bubbles, inject 1 mL solution.

Fatty Acid Profile of the French Fries and *Trans*-Fatty Acids

Fatty acid profiles and *trans*-fatty acid content of the french fries and oil were analyzed by Analytical Food Laboratories, Grand Prairie, TX. Oil from day 1, trial 1, week 1 was blended with oil from day 1, trial 1, weeks 2 and 3. Oil from day 5, trial 1, week 1 was blended with oil from day 1, trial 1, weeks 2 and 3. Oil from trials 2 and 3 were treated in this manner as well. French fries were blended following the same procedure.

STATISTICAL ANALYSES

The data analyses were performed using SAS software (Statistical Analysis Systems Institute, Inc, Cary, NC). A randomized block design with a split plot was used to analyze the data collected. The tank effect was blocked out in the statistical design. The split plot was time in days (days 1 through 5). The dependent variables were weight of the french fries, oil loss, color of the oil, color of the french fries, and results of the laboratory analyses. Least-squares difference was used as the means separation test. Least-squares means were used instead of sample means to account for missing data in the data set. Standard error was used to show sampling distribution, which is the standard deviation of the population being sampled.

RESULTS

There were no significant differences in percent fat content of the french fries fried in cottonseed, canola, and soybean oil at any day of the frying process. The initial fat content of raw french fries was 4.1%. The average fat content of the cooked french fries was 11.4%. This confirms the results found by Filary (11). Oil absorption is affected by many factors. As reported by Blumenthal, as oil deteriorates, oil absorption increases (12). In this study, the oil did not reach high enough levels of degradation for this to be seen. Frozen french fries absorb less oil than thawed french fries. This factor was carefully controlled. The french fries were immediately immersed in the oil after being removed from the freezer and were not allowed to thaw. Variation in the french fries can affect oil absorption. Attempts were made to minimize this effect by analyzing blended, random samples of the french fries. In foodservice establishments, french fry shaking and drain time can account for a large percentage of the variation seen in oil absorption. In this study, french fries were not shaken, and were allowed to drain for exactly 2 minutes.

Fatty Acid Composition of the Frying Oils

The fatty acids analyzed in this study were palmitic, stearic, oleic, linoleic, and linolenic (Table 2). The fatty acid composition of frying oils continually changes as days of frying progress. These changes result from cyclization and polymerization and from pyrolytic, hydrolytic, oxidative, and other chemical reactions promoted by frying conditions (13). In addition, the oil from the french fries will leach into the frying oil, which affects the fatty acid profile as well.

It can be predicted from the initial fatty acid profile how oil will perform when subjected to deep fat frying conditions. Oil that has the highest linolenic acid content is more susceptible to degradation. Reducing the linolenic acid content will increase the oxidative stability of the frying oil (14).

Based on the mean of the combined trials, the linolenic acid content of the three fresh oils was very low. Cottonseed oil naturally has very low levels of linolenic acid, whereas the linolenic acid is reduced in canola oil and soybean oil by hydrogenation.

As expected, linoleic acid was the predominate polyunsaturated fatty acid in all of the oils, with cottonseed oil having the highest concentration (47%). In the literature, linoleic acid in cottonseed oil ranges from 33% to 58%. Hydrogenated canola oil and hydrogenated soybean oil contained 6% and 10% linoleic acid, respectively. Linoleic acid level in deep fat frying oil does not seem to be a noticeably negative factor in oil stability and sensory scores of the fried food (15). In fact, the presence of some degradation products from linoleic acid enhances the deep fat fried flavor of foods.

Oleic acid content was more stable in the three oils than was linoleic acid. Oleic acid is a monounsaturated fatty acid. As the level of unsaturation increases, breakdown increases at a faster rate. This can be attributed to the destruction of double bonds by oxidation, scission, and polymerization (15).

Palmitic acid was the predominant saturated fatty acid

Table 2. Fatty acid composition (wt/%)[a] of cottonseed oil, canola oil, and soybean oil on trial days 0, 1, and 5

Fatty acids[b]	Cottonseed Oil (Days)			Canola Oil (Days)			Soybean Oil (Days)		
	0	1	5	0	1	5	0	1	5
16:0	18.35	12.98	9.55	2.43	2.58	2.66	4.34	4.38	6.75
18:0	1.47	1.10	1.23	1.86	1.68	1.43	1.54	1.49	1.47
18:1	16.65	13.05	13.64	35.27	35.31	28.48	24.51	25.44	24.05
18:2	46.75	33.17	22.52	5.80	6.44	5.37	9.56	10.53	16.32
18:3	0	0	0	0.20	0.13	0.07	0.64	0.60	0.22
SFA[c]	24.36	24.07	23.50	9.35	9.23	10.73	14.48	13.68	16.31
MUFA[d]	19.68	21.57	29.36	78.03	77.15	75.18	60.43	60.85	52.78
PUFA[e]	55.96	54.36	47.15	12.62	13.62	14.10	25.09	25.47	30.90
Trans[f]	0.10	1.20[y]	4.97[y]	30.1	21.30[z]	21.17[z]	19.1	20.00[z]	20.10[z]

[a]wt/%=percentage of specific fatty acids based on total weight.
[b]16:0=palmitic acid, 18:0=stearic acid, 18:1=oleic acid, 18:2=linoleic acid, 18:3=linolenic acid.
[c]SFA=saturated fatty acid.
[d]MUFA=monounsaturated fatty acid.
[e]PUFA=polyunsaturated fatty acid.
[f]*Trans*=*trans*-fatty acid.
[yz]Means within a column with different superscripts are significantly different ($P<.01$); n=18.

in the three oils. Studies have shown that as frying time increases, the saturated fat content of oil will increase. Contrary to what was expected, the saturated fat content of cottonseed oil actually decreased. There were only minor changes in the palmitic acid content of canola oil. Soybean oil followed typical patterns of frying oil in relation to the saturated fat content.

Stearic acid concentration was less than 2% in all three fresh oils and remained that way through day 5. Overall, the fatty acid profile of the three oils did not follow the expected results documented in the literature. As oil degrades, there is an increase in saturated fatty acids and a decrease in unsaturated fatty acids, which is attributed to the breakdown of monounsaturated and polyunsaturated fatty acids. To produce these results in the current study, the oils would have needed to be subjected to more stress.

The french fries used in this study were par-fried in beef tallow and/or vegetable oil (partially hydrogenated soybean and/or canola oil). The choice of fat is based on availability and price, and it was not determined which fat was selected for the batches of french fries used in this study. To account for this variability, french fries were randomly chosen to be fried in each oil type. To clearly show changes within the oil itself, the french fry would have needed to be par-fried (or precooked) in water. This would eliminate oil contamination from the french fries. Par-frying is a common practice of frozen potato producers for three reasons. First, it decreases final french fry cooking time. Secondly, the french fry will cook evenly, without excessive browning on the outside and undercooking on the inside. Lastly, there will be less splattering of oil during the final cooking of the french fry.

Fatty Acid Composition of the French Fries

Fat absorption by the french fries remained constant as days of frying increased. The fat content of the raw french fry was 4.1%, whereas the cooked french fries averaged 11.4%. Some of the oil in the french fries may have leached out into the frying oil during the deep fat frying process, in addition to frying oil being absorbed.

The fatty acid profiles of the raw and cooked french fries are shown in Table 3. Palmitic acid was the most abundant saturated fatty acid found in the three oils, and this was also the case for the french fries. Palmitic acid increased in the french fries fried in cottonseed oil. This may be attributable to absorption of palmitic acid from the frying oil because this acid actually decreased in the cottonseed oil. French fries fried in canola oil showed a decrease in palmitic acid. However, the frying oil did not show this large an increase. Palmitic acid also decreased in french fries fried in soybean oil on days 1 and 5 combined. This may have been attributable to leaching of the fatty acid from the french fries into the frying oil because palmitic acid actually increased in the soybean oil.

The largest change in stearic acid, oleic acid, and linoleic acid occurred on the first day of frying. For the remainder of the frying time, the profile remained fairly stable.

Trans-Fatty Acid Content of the Oil and French Fries

The *trans*-fatty acid content of the cottonseed oil on days 1 and 5 was significantly lower ($P<.01$) than that of the other two oils (Figure 1). There was no significant effect of days of frying on *trans*-fatty acid content; therefore, data from days 1 and 5 were pooled together. The initial *trans*-fatty acid content of fresh cottonseed oil, canola oil, and soybean oil was 0.1%, 30.1%, and 19.1%, respectively (Table 2).

The *trans*-fatty acid content of the prefried, raw french fries ranged from 8% to 59% (average, 30.3%). This is a very large variation, and according to the laboratory that analyzed these samples, it was very difficult to extract enough fat to perform the test to detect *trans*-fatty acids. Filary (11) found a *trans*-fatty acid content of 1.3%, but only one sample was analyzed. The *trans*-fatty acid con-

Table 3. Fatty acid composition (wt/%)[a] of french fries fried in cottonseed oil, canola oil, and soybean oil on trial days 0, 1, and 5

	Raw French Fries[c] (Day)	Cottonseed Oil (Days)		Canola Oil (Days)		Soybean Oil (Days)	
Fatty acids[b]	**0**	**1**	**5**	**1**	**5**	**1**	**5**
16:0	14.89	19.4	17.66	9.02	6.03	11.40	10.86
18:0	12.39	4.13	3.97	5.77	6.07	6.00	5.63
18:1	19.31	20.27	20.89	45.98	45.27	31.12	30.02
18:2	2.63	45.78	41.89	8.57	5.30	15.00	13.99
18:3	0.334	0.30	0.29	0.35	0.41	0.93	0.74
SFA[d]	32.39	25.68	23.56	17.49	14.23	19.93	18.53
MUFA[e]	50.86	22.82	27.35	62.33	63.46	47.61	49.01
PUFA[f]	5.81	46.95	43.42	13.31	10.02	19.90	18.51
Trans[g]	33.11	2.62	6.77	19.69	21.94	20.11	22.64
Trans+SFA	65.50	28.30	30.33	37.18	36.17	40.04	41.17
Percent *trans*	51	9[y]	22[y]	53[z]	61[z]	50[z]	55[z]

[a]wt/%=percentage of specific fatty acids based on total weight.
[b]16:0=palmitic acid, 18:0=stearic acid, 18:1=oleic acid, 18:2=linoleic acid, 18:3=linolenic acid.
[c]Raw french fries=par-fried before study.
[d]SFA=saturated fatty acid.
[e]MUFA=monounsaturated fatty acid.
[f]PUFA=polyunsaturated fatty acid.
[g]*Trans*=*trans*-fatty acid.
[yz]Means within a column with different superscripts are significantly different ($P<.001$); n=18.

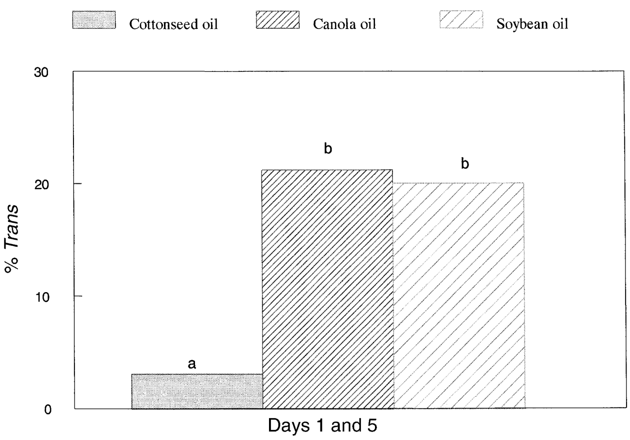

Figure 1. *Trans*-fatty acid content of cottonseed oil, canola oil, and soybean oil on trial days 1 and 5 (combined). [ab]Means within a column with different superscripts are significantly different ($P<.01$); n=18.

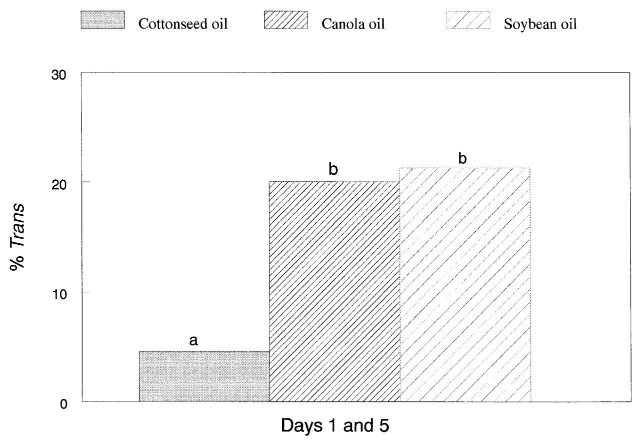

Figure 2. *Trans*-fatty acid content of french fries fried in cottonseed oil, canola oil, and soybean oil on trial days 1 and 5 (combined). [ab]Means within a column with different superscripts are significantly different ($P<.001$); n=18.

tent of the french fries cooked in cottonseed oil was significantly lower ($P<.001$) than for those prepared in canola oil and soybean oil (Figure 2, Table 2). There was no significant effect of days of frying on *trans*-fatty acid content of the french fries; therefore, data from days 1 and 5 were pooled together. These means were very similar to the values for *trans*-fatty acid content found for the frying oil.

Analytical tests indicated that cottonseed oil, canola oil, and soybean oil were comparable in terms of their stability characteristics under the conditions used in this study. Please refer to the unpublished dissertation for further information (16).

DISCUSSION

According to research on *trans*-fatty acids and their effect on health, gram for gram, *trans*-fatty acids may be associated with greater health risks than saturated fatty acids. *Trans*-fatty acids have been shown not only to increase LDL cholesterol levels, but also to decrease HDL cholesterol levels (17). Some saturated fatty acids have been shown to decrease LDL cholesterol levels, but they do not seem to decrease HDL cholesterol levels (18). *Trans*-fatty acids are considered more detrimental to blood lipid levels than saturated fatty acids. French fries fried in cottonseed oil were higher in saturated fatty acids and lower in *trans*-fatty acids compared with french fries fried in the other two oils. The US Food and Drug Administration will require the *trans*-fatty acid content to be included with the saturated fatty acid content on a food label by 2006. If *trans*- and saturated fatty acids are added together, french fries fried in cottonseed, canola, and soybean oil contained 30%, 36%, and 41% of the total, respectively, using data obtained on day 5 (Table 2). French fries fried in cottonseed oil had a lower combined total of saturated and *trans*-fatty acids and, more importantly, the percentage of the total contributed by *trans*-fatty acids was lower. The percentage of the total contributed by *trans*-fatty acids was 9%, 53%, and 55% for cottonseed, canola, and soybean oil, respectively. If *trans*-fatty acids, gram for gram, are more dyslipidemic than saturated fatty acids, it would be wise to choose an oil with a lower content of *trans*-fatty acids, even if it were higher in saturated fatty acids.

Studies have shown that monounsaturated fatty acids and polyunsaturated fatty acids elicit similar lowering effects of LDL cholesterol levels in parallel with total cholesterol; however, monounsaturated fatty acids did not lower HDL cholesterol levels whereas a slight decrease was seen with polyunsaturated fatty acids (4). French fries fried in both canola and soybean oil had higher monounsaturated fatty acid levels than those fried in cottonseed oil.

Because fried foods contribute a large proportion of *trans*-fatty acids consumed in the United States, it is advisable to reduce the content of *trans*-fatty acids in frying oils. Hydrogenation contributes 75% of the *trans*-fatty acids found in food products. Cottonseed oil can be used in its unhydrogenated state. This will become especially important when the *trans*-fatty acid content is required to be disclosed on a food label. Cottonseed oil fits this profile. Restaurants will find cottonseed oil to be economically feasible while appealing to customer desires for a healthful product. A limitation to this study was the high variability in the initial *trans*-fatty acid content of the par-fried french fry. Further studies should be conducted on french fries that have not been par-fried or that are par-fried in nonhydrogenated vegetable oil.

It is unknown how much saturated fatty acid it takes to offset the health benefits of using a product with a decreased amount of *trans*-fatty acids. Epidemiological studies would need to be performed to determine the health benefits of using oil with a higher saturated fat content but a lower *trans*-fat content. It is clear that more studies should be done on the effects of the fatty acid profile on health.

CONCLUSIONS

Trans-fatty acids are becoming a major health concern, and the public's awareness will continue to increase. It is important that dietetics practitioners understand where *trans*-fatty acids are found in foods and how to plan diets accordingly. If fried foods are going to be a part of a client's diet, *trans*-fatty acids can be minimized by the choice of fat used in the preparation of food. Foodservice establishments will be influenced by public health concerns, and dietetics professionals can provide these establishments with informed suggestions regarding the use of cottonseed oil as an alternative to hydrogenated oils to reduce *trans*-fatty acid consumption.

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