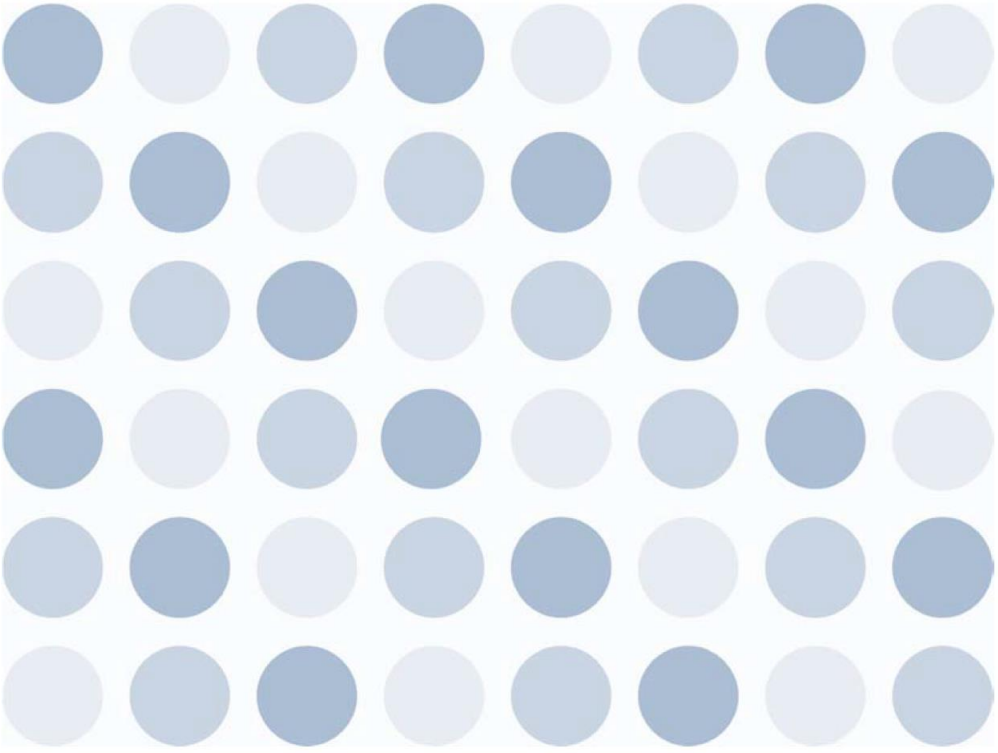
TRANS FATTY ACID CONTENT IN FOOD IN SPAIN 2015



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The NAOS Strategy, an acronym that stands for Nutrition, Physical Activity and Prevention of Obesity, is the response from the Ministry of Health, Social Services and Equality from the Government of Spain to the problem of obesity. Coordinated by the Spanish Agency for Consumer Affairs, Food Safety and Nutrition (AECOSAN), the NAOS Strategy aims to make the population aware of the problem that obesity represents for health, to promote health through healthy eating habits and physical exercise, and to bring together and promote those public or private initiatives that help to ensure that the public, in particular children and adolescents, adopt these healthy eating habits throughout their life.

For further information about the NAOS Strategy, the Observatory of Nutrition and of the Study of Obesity and AECOSAN activities, please visit our Web page:

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Trans fatty acid content in food in Spain.
2015

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CONTENTS

FOREWORD

The link between the consumption of *trans* fatty acids artificially added to food and cardiovascular diseases has been widely documented in numerous scientific studies.

Initially only a technological aspect, it has become a potential food-related health problem. International institutions and in particular some countries began to introduce measures to limit the *trans* fatty acid content in food. In Spain for example, the Food Safety and Nutrition Law of 2011 dedicated an article to *trans* fatty acids, with the aim of minimising their content. From the start, the food industry also adopted a responsible approach and, as can been seen in previous studies, made significant efforts to reduce the *trans* fatty acid content in their products.

The study conducted from the AECOSAN on a wide sample of foods in 2010 revealed that the *trans* fatty acid content of foods marketed in Spain had been significantly reduced with respect to previous information.

This situation is an excellent example of the results of policies for the reformulation of the composition of foods, one of the main pillars within the NAOS Strategy for improving the nutritional quality of food. Synergies between public administrations and the private sector are essential for maximising the efforts of all the parties concerned.

This new assessment study confirms the situation of *trans* fatty acids in food in Spain as highly favourable, and also corroborates the positive impact of the measures adopted in previous years, which must finally be reflected in the health of the population.

Teresa Robledo de Dios
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SUMMARY AND CONCLUSIONS

Trans fatty acids, mainly present in food for technological reasons, are associated with various health problems, including heart disease and diabetes.

Polices aimed at reducing the consumption of TFA, based on legislative measures, information campaigns and the reformulation of food, have been in place for some years.

The fatty acid content in 277 foods purchased in Spain in 2015 was studied. The TFA content, total fats and the percentage of TFA with respect to total fats were calculated. The results were compared with those obtained in a similar study in 2010.

The majority of the food groups revealed a TFA percentage of less than 2 % with respect to the total fat. The few foods that exceeded this figure were from the group of dairy foods which naturally contain TFA.

Reductions were observed in the content and percentage of TFA in different food groups between 2010 and 2015. No statistically significant increases were found.

These results are even better than those obtained in 2010, such that TFA are undetectable in several of the groups of food analysed, have decreased in others or have remained at low levels.

Given that the TFA content in foods in Spain is very low, the mean intake of TFA in a balanced diet can also be expected to be low.

Policies to reduce the intake of TFA, and the commitment of the food industry in the reformulation of their products continue to be essential aspects in the elimination or reduction of the TFA content in food.

The TFA content in food does not currently pose a public health problem in Spain. Nevertheless, the situation may be conducive to establishing regulatory limits to guarantee its maintenance.

Evaluation measures should be maintained in order to regularly monitor the TFA content in food, via the Observatory of Nutrition and of the Study of Obesity.

INTRODUCTION

Trans fatty acids (TFA) are unsaturated fatty acids (MUFA or PUFA) with one or more double bonds in the *trans* configuration[1]. This configuration can be produced in two ways.

Some TFA are naturally present in ruminant meat and milk, and consequently they may be found in small quantities in the food derived from these animals, in particular meat and dairy products[2].

The second production mechanism is artificial, via the catalytic hydrogenation of vegetable oils carried out in the food industry[1]. Other processes, after the refining of vegetable or fish oils, or the heating and frying of oils at high temperatures also generate TFA[2].

TFA, in particular those obtained industrially from partially hydrogenated vegetable oils are associated with different effects on health, through different mechanisms. These include the alteration of the lipid metabolism, with an increase in triglycerides and blood levels of LDL and VLDL cholesterol and the reduction of blood HDL cholesterol, endothelial dysfunction, alterations in hepatocytes and adipocytes, the monocyte and macrophage level inflammatory response or the increase of C-reactive protein, interleukin-6 and an increase of the tumour necrosis factor receptor 2[1,5–7].

Based on these and other mechanisms of action, the FAO/WHO Committee of Experts has concluded that there is convincing evidence that these fatty acids are harmful to health, as they entail multiple factors of cardiovascular risk and significantly contribute to increasing the risk of coronary heart disease[8–10].

Numerous studies have described that the intake of TFA is linked to an increase in heart disease, sudden death from cardiac causes and total mortality, and with type 2 diabetes mellitus[1,5,6,11–16].

In addition to links to cardiovascular and metabolic disease, associations with other diseases have also been claimed, including certain types of cancer[17–19] or asthma[20].

Therefore, given the high risk of the above diseases associated with the intake of TFA, it is clear that it is necessary to reduce or eliminate the presence of TFA in food.

Certain countries have introduced strict regulatory measures aimed at the reduction of TFA in food, as is the case of Denmark[21]. In Spain, the Food Safety and Nutrition Law of 2011 introduced a specific article aimed at reducing the presence of artificial TFA in food[22].

As a result of the legislative measures and actions taken to promote health, together with voluntary initiatives from the food industry, in recent years

there has been a significant reduction in the content and in the intake of TFA in many countries[23,24], although in some further effort is still required[25,26].

In Spain, the AECOSAN, under the wing of the NAOS Strategy and the Observatory of Nutrition and of the Study of Obesity, published a study which showed that the average content of TFA in food in 2010 was low[27]. This report follows on from this work and the results observed at that time are confirmed here.

OBJECTIVES

The main goals of this study are to:

1. Ascertain the content of TFA in food products in Spain in 2015.
2. Determine the percentage of TFA with respect to the total fatty acids present in food products in Spain.
3. Assess trends in TFA content in food products in Spain with respect to the same in 2010.

METHODOLOGY

To assess the TFA content in Spain, food products, belonging to different groups, were acquired from countrywide stores (hypermarkets and supermarkets). The products assessed were selected based on the "Study of *trans* Fatty Acid Content in food in Spain. 2010", published by the Spanish Agency for Consumer Affairs, Food Safety and Nutrition (AECOSAN) in 2014[27], in order to compare the TFA content in the same food products between 2010 and 2015.

A lipid profile was defined for the selected food products. This included the total fat content and the TFA content, all measured in g / 100 g of product. The analytical test on food samples were performed by an independent laboratory, accredited by the ENAC, using a gas chromatography with a flame ionisation detector for.

Central tendency (mean and median) and dispersion (standard deviation, minimum and maximum) estimators were calculated for the content of TFA, measured in g of TFA / 100 g of product, and total fat, in each food group. The TFA/total fat ratio was calculated for each food product. All the calculations were also carried out for the different groups or families of food products.

To assess the difference between 2010 and 2015, the mean TFA values (g / 100 g of product) and TFA/total fat percentage ratios for those years were compared, using the U Mann-Whitney test.

Products that were not exactly the same in 2010 and in 2015 were excluded from the analysis in order to ensure the comparability of all the food products included.

RESULTS

After excluding food products whose references were not identical in 2010 and in 2015, results were obtained for 277 products which were grouped as shown in Table 1.

Table 1. Products analysed. 2015.

Type of food product	N
Salty snacks	16
Confectionary and pastries	21
Processed meats	29
Breakfast cereals and cereal bars	7
Chocolate and cocoa-based products	24
Biscuits	24
Ice-cream	19
Butter	7
Margarine	10
Industrial bread	11
Chips	16
Ready meals	23
Products served in fast food restaurants	13
Spreadable cheeses and other cheeses	12
Tomato sauce	13
Yoghurts and dairy products	32
Total	277

The mean content of TFA in all groups was less than 0.6 g / 100 g product, with the only exception of butter, in which a mean content of 2.0 g / 100 g was observed. The results were found to be similar based on the medians, with an undetectable content (<0.001) in the majority of groups (Table 2).

Table 2. Quantity of TFA (g/100 g of product) in food. 2015.

Type of food product	N	Mean	SD	Median	Minimum	Maximum
Salty snacks	16	0.003	0.007	<0.001	<0.001	0.030
Confectionary and pastries	21	0.008	0.014	<0.001	<0.001	0.040
Processed meats	29	0.051	0.029	0.050	<0.001	0.120
Breakfast cereals and cereal bars	7	<0.001	0.000	<0.001	<0.001	<0.001
Chocolate and cocoa-based products	24	0.038	0.056	0.016	<0.001	0.210
Biscuits	24	<0.001	0.000	<0.001	<0.001	<0.001
Ice-cream	19	0.025	0.058	<0.001	<0.001	0.250
Butter	7	2.011	0.209	2.030	1.620	2.230
Margarine	10	0.136	0.205	0.045	<0.001	0.590
Industrial bread	11	<0.001	0.000	<0.001	<0.001	<0.001
Chips	16	0.030	0.089	<0.001	<0.001	0.360
Ready meals	23	0.023	0.043	<0.001	<0.001	0.130
Products served in fast food restaurants	13	0.127	0.220	0.040	<0.001	0.800
Spreadable cheeses and other cheeses	12	0.536	0.181	0.590	0.090	0.740
Tomato sauce	13	<0.001	0.000	<0.001	<0.001	<0.001
Yoghurts and dairy products	32	0.073	0.039	0.065	<0.001	0.190

TFA, Trans fatty acids

SD = Standard Deviation

The proportion of TFA with respect to total fatty acids in each food group was less than 2 % in all food groups, except in the yoghurt and dairy products group (2.30 %), butters (2.45 %) and spreadable cheeses and other cheeses (2.52 %) (Table 3).

Table 3.Mean ratio TFA/Total fats. 2015.

Type of food product	N	Percentage
Salty snacks	16	0.011
Confectionary and pastries	21	0.034
Processed meats	29	0.248
Breakfast cereals and cereal bars	7	0.037
Chocolate and cocoa-based products	24	0.140
Biscuits	24	0.008
Ice-cream	19	0.271
Butter	7	2.452
Margarine	10	0.274
Industrial bread	11	0.035
Chips	16	0.088
Ready meals	23	0.307
Products served in fast food restaurants	13	1.959
Spreadable cheeses and other cheeses	12	2.524
Tomato sauce	13	0.028
Yoghurts and dairy products	32	2.297

TFA, Trans fatty acids

When comparing the TFA content between 2010 and 2015, the differences found were minor, and the majority of them were reductions, some of which were statistically significant (Table 4).

Table 4. Mean TFA content (g/100 g of product). Comparison between 2010 and 2015.

Type of food product	N	2010	2015	Difference
Salty snacks*	16	0.057	0.003	-0.054
Confectionary and pastries*	21	0.210	0.008	-0.201
Processed meats	29	0.056	0.051	-0.005
Breakfast cereals and cereal bars	7	<0.001	<0.001	0.000
Chocolate and cocoa-based products*	24	0.099	0.038	-0.061
Biscuits*	24	0.049	0.001	-0.048
Ice-cream*	19	<0.001	0.025	0.024
Butter	7	1.927	2.011	0.084
Margarine	10	0.254	0.136	-0.118
Industrial bread	11	<0.001	<0.001	0.000
Chips*	16	0.071	0.030	-0.041
Ready meals	23	0.013	0.023	0.010
Products served in fast food restaurants	13	0.196	0.127	-0.069
Spreadable cheeses and other cheeses	12	0.522	0.536	0.014
Tomato sauce	13	<0.001	<0.001	0.000
Yoghurts and dairy products	32	0.055	0.073	0.018

TFA, Trans fatty acids

* $p<0.05$ for the difference between means

The comparison between the mean ratio of TFA with respect to total fats between 2010 and in 2015 produced similar results. Minor variations were observed, overall decreases, and some of these were statistically significant. The main increase was observed in the yoghurt and dairy products, from 1.66 to 2.30 %, although the increase was not statistically significant (Table 5).

Table 5. Mean TFA/Total fat ratio. Comparison between 2010 and 2015.

Type of food product	N	2010	2015	Difference
Salty snacks*	16	0.231	0.011	-0.220
Confectionary and pastries*	21	0.657	0.034	-0.624
Processed meats	29	0.248	0.248	0.000
Breakfast cereals and cereal bars	7	0.034	0.037	0.004
Chocolate and cocoa-based products*	24	0.721	0.140	-0.581
Biscuits*	24	0.311	0.008	-0.303
Ice-cream*	19	0.010	0.271	0.261
Butter	7	2.356	2.452	0.096
Margarine	10	0.413	0.274	-0.139
Industrial bread	11	0.031	0.035	0.004
Chips*	16	0.210	0.088	-0.122
Ready meals	23	0.131	0.307	0.175
Products served in fast food restaurants	13	1.609	1.959	0.351
Spreadable cheeses and other cheeses	12	2.646	2.524	-0.123
Tomato sauce	13	0.029	0.028	-0.001
Yoghurts and dairy products	32	1.656	2.297	0.641

TFA, Trans fatty acids

* $p<0.05$ for the difference between means

Table 6. Mean quantity of total fats (g/100 g of product) in food products. 2010 and 2015.

Type of food product	N	2010	2015	Difference
Salty snacks	16	22.2	22.5	0.3
Confectionary and pastries	21	27.6	24.3	-3.4
Processed meats	29	21.6	20.5	-1.1
Breakfast cereals and cereal bars	7	3.2	2.9	-0.3
Chocolate and cocoa-based products	24	21.7	22.4	0.6
Biscuits*	24	15.3	14.0	-1.3
Ice-cream	19	11.9	12.3	0.4
Butter	7	81.8	82.0	0.2
Margarine	10	59.6	59.5	-0.2
Industrial bread	11	3.5	3.0	-0.5
Chips	16	34.0	34.5	0.6
Ready meals	23	8.4	7.8	-0.6
Products served in fast food restaurants	13	10.5	7.9	-2.7
Spreadable cheeses and other cheeses	12	20.4	21.4	0.9
Tomato sauce	13	3.5	3.7	0.2
Yoghurts and dairy products*	32	3.5	3.2	-0.4

* $p<0.05$ for the difference between means

The quantities of total fats found in the different groups of products in 2010 and 2015 can be seen in Table 6. Significant reductions were only observed in the Biscuits and the Yoghurt and dairy products.

DISCUSSION

There is sufficiently solid scientific evidence to justify the measures aimed at reducing the TFA content in food, and the reduction of its consumption by the population, in light of its association with health problems, principally heart disease. This was of particular relevance when different studies indicated that the TFA content in food, especially in some groups, might be high[2,28].

Nevertheless, in 2010, the results obtained by the National Food Centre[29], in particular from the study carried out by the AECOSAN[23], already demonstrated that a significant reduction had been achieved in the majority of food groups analysed, such that the TFA levels in foods in Spain were, on average, very low. These results were coherent with other analyses carried out on certain food groups and in certain Regional Communities[30,31].

The results obtained in this study confirm what was already visible five years ago. On analysing the same products, it was found that in the majority of food groups there were no significant variations. In some groups, for example breakfast cereals, industrial bread or tomato sauce, the TFA were already undetectable in laboratory tests, and this continues to be the case. In other groups, statistically significant reductions from values that were already very low in 2010 were observed; this is the case of Salty snacks, Confectionary and pastries, Chocolates and cocoa-based products, Biscuits, Chips, or ready-to-make desserts. Minor increases were observed in some groups of food, but the magnitudes of these increases were so small that they should not be of concern. Moreover, these increases were not statistically significant.

In addition to the absolute TFA content in the product, it is also interesting to calculate the TFA ratio with respect to total fats, as the majority of the legislative regulations established use these criteria for defining acceptable limits. In this respect, the results of this study show that only three groups of the foods assessed exceeded 2 % TFA. These groups are Butter, Spreadable cheeses and other cheeses, and Yoghurts and dairy products; however, none of these rises was statistically significant. In spite of these findings, certain factors must be considered. Firstly, the absolute quantities of TFA in Yoghurts and dairy products are very low (0.073 % of the total product), and they are therefore not of concern. Secondly, it is important to consider that the naturally-occurring TFA may be present in ruminant meat and milk, which are included in these categories. And thirdly, as it can be seen in Table 6, the total fat content in Yoghurts and dairy products has fallen significantly since 2010, which may partly explain the rise in the TFA ratio.

The question of naturally-occurring TFA is relevant, insofar as it has been suggested that these TFA are not associated with heart diseases in the same way as the artificially-occurring TFA. Some studies even consider the possibility that they may even have a beneficial effect on health[32–34]. Therefore, further more precise tests are required to establish whether the TFA contained in ruminant meat and milk are naturally occurring.

The results of our study reveal a favourable situation regarding the TFA content in food marketed in Spain. They confirm the findings of earlier studies and reflect the fact that measures have been successfully introduced in several areas.

The main conclusion of this study is that the mean TFA content in the foods analysed is low, and the situation of 2010 has improved. Consequently, the TFA exposure of the population in a balanced diet is minimal. It is difficult and expensive to obtain precise data regarding the consumption of TFA, but if the exposure is low because the levels of TFA are low, it can be assumed that the mean intake of TFA in Spain will also be low.

The tendency to reduce TFA content in food was backed up by the regulatory measures established in several countries. Different initiatives in Europe and America[24,26,35, 38] followed the example of Denmark[21],
including that carried out in Spain through the Food Safety and
Nutrition Law[22]. At present, the benefit of combining voluntary actions with regulated measures continues to be appraised as a means of eliminating TFA in food[39–41].

Furthermore, the social responsibility of food manufacturers in Spain warrants a special mention. This is reflected in the efforts made since the moment the links between the intake of TFA and heart disease were established. The manufacturers have adapted to the need to reduce TFA content and have addressed technological challenges, with excellent results, together with modifications in the nutritional labelling that make easier and inform consumers.

Moreover, it is essential to publicise these results so that, for the public and for all the sectors involved in the area of nutrition, true, accurate and up-to-date information is available. In this way, a potential social alarm resulting from the lack of information can be avoided.

The principal strength of this study is the methodological rigour with which it has been conducted, as in 2010, using a similar methodology in order to guarantee the comparability of the results. As in 2010, the food products analysed have been classified into groups or categories, in spite of the associated difficulties, in particular in those groups in which the products are more heterogeneous or have higher levels of variability. This difficulty also became a strength when the results were assessed. Although the sample analysed is sufficiently large to provide precise estimates, the fact that it is not larger means that the concept of statistical significance must be dealt with carefully, in the sense that it is necessary, as in any research, to consider not only the p value, but also the magnitudes of the content and the variations, which as can be seen in this study, are very small. It should also be noted that since the previous study in 2010, some references have disappeared from the market, and others have been changed. In these cases, the decision to exclude these products from the study strengthens the comparability when it comes

to assessing the tendency, and justifies the reduction of the sample size.

It is necessary to set out a limitation to the study. The products were selected according to market criteria in the 2010 study; this means that the selected food products had a high level of consumption, and were in general nationally distributed and sold brands, and therefore most likely to be the products with the greatest impact as a result of their consumption. However, it must be taken into account that there are many other products, locally distributed that have not been included in this study, and consequently their situation remains unknown. It is to be expected that these manufacturers have also followed the worldwide tendency to reduce TFA. Nevertheless, further studies would be required, possibly with a different sample, in order to confirm this.

The decrease in the TFA content, and its almost complete elimination from many groups of foods is positive. For all the sectors involved in nutrition and health, but in particular for the population, who, in this way, are able to see how the possibility of healthier options when preparing diets is increased. However, surveillance of the TFA content of food products should be dropped out. In particular in food groups that are still liable to being improved, efforts to reduce TFA content should be maintained or increased.

In addition, in spite of the favourable situation achieved, it is necessary to maintain continuous efforts to ensure that assessment activities offer the guarantee of up-to-date information while also serving as a monitoring system.

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