ELSEVIER

Journal of Food Composition and Analysis 21 (2008) 320–325

JOURNAL OF FOOD COMPOSITION AND ANALYSIS

www.elsevier.com/locate/jfca

Original Article

Trans fatty acids in the New Zealand food supply

D. Saunders, S. Jones, G.J. Devane, P. Scholes, R.J. Lake*, S.M. Paulin

Food Safety Group, Institute of Environmental Science and Research, Christchurch Science Centre, PO Box 29-181, Christchurch, New Zealand

Received 21 February 2007; received in revised form 5 November 2007; accepted 12 December 2007

Abstract

Adverse health effects from the consumption of *trans* fatty acids (TFA) have led to efforts to decrease the consumption of these lipids. There is a need for up to date information on TFA levels in foods to support decision-making by regulators on labelling and health claims. This paper reports the results from a 2006 survey of New Zealand manufactured food items for fatty acid content, including TFA, determined using gas chromatography. The TFA levels in snack bars, margarines/table spreads, biscuits and cakes, pies and pastries were all below 10 g/100 g fatty acids (less than 3.5 g/100 g product). Also reported are results from a 1998 survey of margarines and table spreads which are compared with those from a previously published 1996 survey conducted by the same organisation. The conclusion is that the TFA content of foods in New Zealand has declined over the previous decade, with a likely decrease in consumption of these lipids by New Zealanders.

© 2008 Elsevier Inc. All rights reserved.

Keywords: *Trans* fatty acids; New Zealand foods; Food composition analysis; Regulation; Health claims; Partially hydrogenated vegetable oil; Margarine; Table spread; Shortening; Convenience foods; Snacks; Commercial baked goods

1. Introduction

Trans fatty acids (TFA) are produced from the naturally occurring "*cis*" unsaturated form by heating liquid vegetable oils in the presence of metal catalysts and hydrogen. Like hydrogenation (addition of hydrogen across a double bond to make it saturated), this process can also cause isomerisation of *cis* double bonds into the *trans* form. Such partially hydrogenated vegetable oils are attractive to the food industry because of their longer shelf life, oxidative stability, and semi-solidity at room temperature (Mozaffarian et al., 2006). TFA are commonly found in commercial baked goods, shortenings, some margarines and table spreads, and industrial cooking oils.

However, foods that are high in *trans* or saturated fatty acids are associated with an increased risk of cardiovascular disease and diabetes (Mozaffarian et al., 2006). TFA are also associated with markers of systemic inflammation in women, which may be involved in the pathogenesis of coronary artery disease (Mozaffarian et al., 2004).

Associations with adverse health effects have led to efforts to decrease the intake of TFA by consumers, including labelling of food products for TFA content, most recently in the United States and Canada (Department of Health, Canada, 2003; Food and Drug Administration, U.S.A., 2003). Food Standards Australia New Zealand (FSANZ) is currently considering the issue of dietary TFA in Australia and New Zealand. Previous studies in both New Zealand and Australia indicate that products with a high TFA content are not commonly found in processed foods within these countries (Noakes and Nestel, 1994; Lake et al., 1996). In order to estimate intakes and support decision-making regarding risk management, there is a need to continue to assess the content of *trans* fats in the food available in New Zealand. The purpose of the study reported here was to perform analyses, and thereby provide more up-to-date information on TFA levels currently found in New Zealand-manufactured foods. These data are compared with results from surveys in 1995 of a variety of foods (Lake et al., 1996), and in 1998 of margarines and table spreads (Lake et al., 1998), to determine how the level of *trans* fats in manufactured foods in New Zealand has changed over the past decade.

*Corresponding author. Tel.: +64 3 351 6019; fax: +64 3 351 0010.
E-mail address: rob.lake@esr.cri.nz (R.J. Lake).

0889-1575/$ - see front matter © 2008 Elsevier Inc. All rights reserved.
doi:10.1016/j.jfca.2007.12.004

2. Materials and methods

2.1. Sample selection

The focus of the current survey was predominantly on manufactured baked goods, including pastries, pies, biscuits, cakes, snack foods, chocolate (which may contain vegetable fats), and a few table spreads for which label data were not available. Specific sample selection was assisted by a number of supermarket visits to review product labels of potential samples, ensuring that these were selected to include the major manufacturers of each food group type and that they would be available throughout New Zealand. Certain food groups were excluded from the survey. These included products that had been recently examined, such as deep-frying fats (Morley-John et al., 2005) and margarines/table spreads for which a collation of label claims had been published (Consumer, 2005). The following samples were selected:

- *Biscuits and cakes*: Cakes (2 samples, including filled raspberry lamington and non-iced lollie cake); sweet biscuits (5, including plain and chocolate varieties); cracker biscuits (4).
- *Fats and oils*: Margarines and table spreads (6, including reduced fat and butter/vegetable oil blends).
- *Chocolate*: Milk and dark chocolate varieties (4, made from combinations of cocoa butter, vegetable fat, milk, cream, or milk powder).
- *Snack bars*: Muesli varieties, chocolate snack bar, and cookie bar (6).
- *Pies and pastry*: Sweet and savoury pastry types (7) and pies with both sweet and savoury fillings (3).
- *Partially cooked frozen potato chips/wedges*: (3, all of which claimed to be cooked in animal fat).

2.2. Analyses

Sample packages of up to 1 kg were purchased and samples homogenised in a blender before subsampling.

2.2.1. Moisture

Analysis of duplicate samples from a homogenised food sample was carried out by drying at 103 ± 2 °C for 2 h. Drying was repeated, at hourly intervals, until successive weighings differed by less than 0.1% (AOAC, 1995, Official Methods 920.39, 945.16, 948.22).

2.2.2. Fat extraction

Lipid extraction was performed using Soxhlet extraction (based on modified AOAC, 1995, Official Methods 920.39, 945.16, 948.22). Approximately 16 g of accurately weighed sample was placed in a cellulose extraction thimble (Whatman Catalogue No. 2800308) after homogenisation in a domestic food blender (Breville). The sample was dried overnight in a 102 °C moisture oven. The samples were mixed with sand (Merck 1.07711.5000) if the consistency of the matrix was such that it would form a tough crust upon drying. The thimbles were placed in a Soxhlet extraction apparatus and extracted with 200 mL of 1:1 diethyl ether/petroleum ether (40–60 °C bp) for approximately 8 h. The solvent was evaporated on a water bath and the samples were then stored in a desiccator.

For table spreads, the sample was acidified with dilute hydrochloric acid, partly dissolved in ethanol, and then heated in a water bath (70–80 °C) for 30 min. The mixture was cooled by the addition of ethanol and water and then extracted twice with a diethyl ether and petroleum ether (40–60 °C bp) mixture (1:1). Solvent extracts were combined and evaporated on a water bath, and then dried at 102 °C. The fat content was calculated by difference (AOAC, 1995, Official Methods 992.06). The fat was then placed in a 20 mL capacity vial, the air was replaced with nitrogen gas (BOC Nitrogen, Oxygen Free G152) and the vial sealed and stored at 5 °C in the dark until analysed.

2.2.3. Preparation of fatty acid methyl esters

The lipids were then esterified according to the method described by Bannon et al. (1982) and the British Standard Methods of Analysis of Fats and Fatty Oils, BS 684: section 2.35 1980. Fat extracts were melted on a water bath and approximately 400 mg transferred to a 50 mL volumetric flask, and 5 mL of freshly prepared 0.5 M methanolic potassium hydroxide added, followed by 5 mL of diethyl ether. The volumetric flask was then placed on a water bath and the solution refluxed for 2 min.

Iso-octane (4 mL) was added, followed by 20 mL of saturated sodium chloride solution and the mixture shaken for 15 s. Total 300 μL of the upper organic phase was then transferred to a crimp-top vial and further iso-octane (1 mL) added. The vial was then sealed and kept at 5 °C until analysis.

2.3. Gas chromatographic analysis

Analysis of fatty acid methyl ester was carried out on a Shimadzu QP2010 gas chromatograph mass spectrometer (GCMS) with a CTC CombiPAL automatic injector and a SP2560 capillary column (100 m × 0.25 mm I.D., 0.2 μM film thickness; Supelco, Bellefonte, PA). The injection volume was 1 μL with a split ratio of 50:1. The injector temperature was 225 °C. The carrier gas was high purity helium with a column flow rate of 0.5 mL/min. The column temperature was programmed from 150 to 200 °C at 1 °C/min, and then held at 200 °C for 40 min. The mass spectrometer was set to SCAN mode, 35–500 m/z. The total ion count was analysed.

Following analysis, chromatogram peaks were assigned manually, on the basis of comparison with reference standards and the integrated peak areas used to assign percentage composition. Analysis was performed according to the American Oil Chemists Society (AOCS, 1989, Official Methods Ce 1-62 and Ce 1f-96).

Download English Version:

https://daneshyari.com/en/article/1218711

Download Persian Version:

https://daneshyari.com/article/1218711

Daneshyari.com