



## Consumer Confusion about Fat

A CCFN WATCHING BRIEF

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**D**ietary fat and its involvement in the etiology of chronic diseases, in particular cardiovascular disease (CVD), has been a topic of concern and debate among medical and nutritional scientists for 50 years. The conclusion of the seven countries study<sup>1</sup> of a relationship between dietary fat, blood cholesterol level and the incidence of mortality due to coronary heart disease focused this concern. Added concern with the amount of fat, in particular saturated (*viz.* animal) fat, in the diet came from metabolic studies that quantified the relationship between saturated fat and blood cholesterol.<sup>2,3</sup> However, it was the cholesterol consensus conferences of the 1980s in the United States<sup>4</sup> and Canada<sup>5</sup> that gave rise to consumer interest in the relationship of dietary fat to disease risk, in particular risk factors for CVD, and to the policies and programs that were launched to address this issue.

In spite of appreciable consumer interest in the relationship of dietary fat to chronic diseases, substantial confusion continues to surround dietary fat. The most recent CCFN tracking of nutrition knowledge, attitudes and behavior (TNT VI, 2006)<sup>6</sup> found that nearly three-quarters (72%) of individuals surveyed continue to believe that “the amount of cholesterol people eat is the major factor that affects their blood cholesterol”. Half (52%) of those surveyed agreed with the statement “non-hydrogenated or soft margarine contains less fat than butter” and one-fifth (19%) agreed that “hard, stick margarine is better for you than soft margarine”. On the other hand, 36 percent of those surveyed disagreed with the last statement and 80 percent agreed with the statement “omega-3 fatty acids are essential to health to a healthy diet”.

A significant portion of the confusion surrounding dietary fat unquestionably arises because of major changes in our understanding of the role fat plays in health, especially over the past 20 years. There have been major advances during this period in clarification of the relationship of dietary fat, especially type of fat, in the etiology of chronic diseases, in particular CVD. As a result there have been several important changes in the messages directed to consumers. Another contributing factor to consumer confusion is undoubtedly the complexity of the message related to the nutritional attributes and metabolic effects of fat.



## Dietary Fat

Fat plays an important role in the diet and the health of individuals. It is the source of essential fatty acids. In addition, it is an important source of energy, especially for infants and children; 45–50 percent of the energy in breast milk comes from fat. It also serves as a carrier of and aids in the absorption of the fat-soluble vitamins A, D, E and K. As well, fat plays an important role in the palatability of food. However, much of the interest in dietary fat over the past 20 years stems from its role in the etiology of chronic lifestyle diseases, such as CVD, hypertension, cancer, diabetes and obesity.

Fatty acids, in the form of triglycerides, are the main constituents of dietary fat. Fatty acids are classified as saturated or unsaturated depending on whether or not the carbon chain contains no double bonds (saturated fatty acid; SFA) or one or more double bond (unsaturated fatty acid). Unsaturated fatty acids are further subdivided into monounsaturated fatty acids (MUFA; one double bond) or polyunsaturated fatty acids (PUFA; 2 or more double bonds). A more detailed description of the main features of dietary fat is presented in the Appendix. A comprehensive classification of fatty acids on the basis of structure, together with a description of their biological actions and common food sources, is summarized in the ADA–DC position paper on dietary fatty acids.<sup>7</sup>



## Recommended Intakes of Dietary Fat and Fatty Acids

The cholesterol consensus conferences in the 1980s recommended a reduction in total fat to 30 percent or less of energy and saturated fat to 10 percent or less of energy. The consensus conferences also recommended that cholesterol intake be limited to 300 mg or less per day. Food manufacturers responded to the recommendations by labeling many products as cholesterol free and by developing a host of low-fat and fat-free foods. However, the major change made by food manufacturers was the substitution of partially hydrogenated vegetable oil (PHVO) for saturated fats in their formulations. PHVO also replaced saturated fat in deep frying applications (e.g. preparation of fast foods, such as French fries, and the production of snack foods, such as potato chips). PHVO quickly became the main source of *trans* fatty acids (TFA) in the diet. It should be noted, however, that the prevailing science at the time held that TFA, at least at the levels in the average diet, had little effect on blood cholesterol or lipoprotein levels.

Consumer interest in dietary fat and cholesterol was greatly heightened by these developments and by nutrition labeling which required that the percent of energy, per serving, of total fat and saturated fat and the amount (mg) of cholesterol appear in the Nutrition Facts table on packaged foods. Although total fat remains an integral part of nutrition labeling, recent nutrition recommendations<sup>7, 8</sup> have focused more attention on the type of fat than previous recommendations. An interesting development in the past decade is the recommendation by the Institute of Medicine, U.S. National Academy of Sciences, in 2002 (Dietary Reference Intakes [DRIs] for Macronutrients<sup>8</sup>) that the acceptable intake for



dietary fat is between 20 and 35 percent of the energy.<sup>i,ii</sup> The amount of fat may be an important consideration in maintaining an acceptable body weight whereas the type of fat is more significant in limiting CVD risk. It was found, for example, that reducing total fat without reducing saturated fat had little effect on blood cholesterol level.<sup>9</sup> This distinction between amount and type of dietary fat is important because consumers continue to believe that simply reducing fat intake can lower blood cholesterol; 86 percent of those surveyed in Tracking Nutrition Trends VI<sup>6</sup> agreed strongly or somewhat with the statement “reducing fat in the diet can lower cholesterol in the blood.”

Whereas the DRIs for Macronutrients<sup>8</sup> recommend a range for total fat intake (20–35% of energy), no specific intake was recommended for saturated and *trans* fats. Rather the IOM recommendation is that the intake of saturated and *trans* fats be as low as possible while ensuring a nutritionally adequate diet. In contrast, the World Health Organization (WHO) proposed that *trans* fat intake be limited to one percent or less of total energy intake and that saturated fat intake be limited to 10 percent or less of total energy intake.<sup>10</sup> Although the same scientific information was available to both expert panels, each panel interpreted the data differently. The rationale given by the WHO for its recommendation was the recognition that not all saturated fatty acids have similar physiological effects. Stearic acid, for example, which is a major constituent in the fat of beef and lamb (viz. tallow), has little effect on blood total and low-density lipoprotein (LDL) cholesterol levels.<sup>11</sup> For more detail on the nutritional effect of individual saturated fatty acids, readers are encouraged to consult the ADA–DC position paper on dietary fatty acids.<sup>7</sup>

Although saturated fat continues to be of concern, *trans* fat has been of particular interest recently because it is believed to have a more pronounced adverse effect on risk factors for CVD than saturated fat.<sup>12</sup> Like saturated fat, *trans* fat results in an increase in the level of blood LDL cholesterol, the so-called “bad cholesterol.” However, it also results in a decrease in the level of blood high-density lipoprotein (HDL) cholesterol, the so-called “good cholesterol.” As a result, *trans* fat results in an increase in the ratio of total-to-HDL cholesterol<sup>8</sup> and, in turn, an increase in CVD risk.<sup>13</sup>

Most of the *trans* fat in the Canadian diet comes from industrially produced PHVO which is used in the manufacture of margarines and shortenings. Thus the main sources of *trans* fat in the diet are foods made with PHVO, predominantly baked and fried foods such as crackers, cookies, doughnuts, cakes, pastries, muffins, croissants, commercial fried foods (e.g. French fries, potato chips) and breaded food products.<sup>14</sup> The *trans* fat content of some of these foods has been found to be as high as 45 percent of the total fat in the product. Hard margarines also contain a relatively high level of *trans* fatty acids, whereas soft, “non-hydrogenated” margarines are *trans* free. There are also small amounts of *trans*

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<sup>i</sup> The Government of Canada (Health Canada) participated with the Institute of Medicine, U.S. National Academy of Sciences, in the development of the Dietary Reference Intakes (DRIs) which provide the scientific basis for nutrition recommendations in Canada.

<sup>ii</sup> The Institute of Medicine panel responsible for developing the DRIs for Macronutrients defined a range of intakes (Acceptable Macronutrient Distribution Range – AMDR) for each source of energy (protein, fat and carbohydrate, expressed as a percentage of total energy in kcal) that is associated with reduced risk of chronic disease while providing adequate intakes of essential nutrients.



fatty acids in the milk and carcass fat of ruminants (cattle, sheep and goats; 2–5%) and in some vegetable oils (0.5–2.5%). However, the main concern with dairy products and the fat in beef and lamb is the relatively high level of saturated fat; the same concern applies for pork and lard.

In addition to *trans* fat, consumer interest in omega-3 fatty acids has increased appreciably over the past decade. As mentioned above, 80 percent of those surveyed in Tracking Nutrition Trends VI<sup>6</sup> agreed strongly or somewhat with the statement “omega-3 fatty acids are essential to a healthy diet.” The Institute of Medicine’s DRIs for Macronutrients<sup>8</sup> recommended intakes for PUFA (omega-6 and omega-3 fatty acids) based on an assessment of what was considered an adequate intake.<sup>iii</sup> An Adequate Intake (AI) for linoleic acid (omega-6) was given as 12 g/day for young women and 17 g/day for young men, while the AI for  $\alpha$ -linolenic acid (omega-3) was given as 1.1 g/day for women and 1.6 g/day for men. However, since the publication of the DRIs for Macronutrients, there has been an acknowledged need to consider health promotion rather than simply an adequate intake for PUFA, in particular for omega-3 fatty acids. In fact, the International Society for the Study of Fatty Acids and Lipids (ISSFAL) adopted a report in 2004 which recommended 2 percent of energy as an adequate intake of linoleic acid (i.e. an intake of 4.4 g/day on a 2000 kcal diet); and 0.7 percent of energy as a healthy intake of  $\alpha$ -linolenic acid (ALA; 1.6 g/day on a 2000 kcal diet).<sup>15</sup> In addition, ISSFAL recommended a minimum combined intake of 500 mg/day of eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) for cardiovascular health. It is interesting to note that consumer interest in omega-3 fatty acids appears to have kept pace with the scientific development in this area.



## Dietary Recommendations with Reference to Fat

One of the foremost challenges faced by nutrition educators, dietitians, clinicians and groups concerned with population health has been the translation of nutrition recommendations for fat into dietary recommendations. The difficulty of this task has been exacerbated by the marked change in the knowledge and understanding of the role of fat over the past 20 years, in particular its role in the etiology of chronic, multifactor diseases such as CVD. A similar challenge faces food processors and manufacturers in the development and promotion of healthy food products.

Nutrition recommendations that focused on dietary risk factors for chronic diseases were first introduced in Canada with the publication of the “Nutrition Recommendations for Canadians” in 1990. These recommendations acknowledged the reality that chronic diseases had replaced infectious and deficiency diseases as the main cause of mortality among Canadians. The recommendation for fat was that suggested by the Canadian

<sup>iii</sup> Adequate Intake (AI) is the “recommended average daily nutrient intake level based on observed or experimentally determined approximations or estimates of nutrient intake by a group (or groups) of apparently healthy people who are assumed to be maintaining an adequate nutritional state.”



Consensus Conference on Cholesterol,<sup>5</sup> namely, no more than 30 percent of energy from fat and no more than 10 percent of energy from saturated fat. The companion publications, “Canada’s Guidelines for Healthy Eating” and “Canada’s Food Guide to Healthy Eating,” which translated the nutrition recommendations into dietary recommendations, recommended that Canadians choose lower fat dairy products, lean meats, and foods prepared with little or no added fat. The revised Canada’s Food Guide “Eating Well with Canada’s Food Guide,”<sup>16</sup> which was released in 2007, continues to focus diet recommendations for fat on the prevention of chronic, lifestyle diseases such as CVD.

Canada’s new Food Guide, which is based on the DRIs for Macronutrients,<sup>8</sup> recommends that individuals choose lower fat foods, to reduce the total amount of fat and calories in their diets, and reduce their consumption of saturated and *trans* fat. Although the revised Food Guide continues to recommend a reduction in the intake of total fat, it places an equal emphasis on the type of fat, namely saturated and *trans* fat. The Food Guide<sup>16,17</sup> presents advice to help individuals and families in limiting the amount of saturated and *trans* fat they consume. This includes advice on foods to limit as well as suggested alternatives to foods that are sources of saturated and *trans* fats; for example, substitution of soft (non-hydrogenated) margarine for hard margarine and butter. The Food Guide also encourages individuals to consult the Nutrition Facts table on pre-packaged foods for information on the amount of total, saturated and *trans* fat in the food product and it describes how to use this information in making healthy food choices.

While the Food Guide recommends that individuals limit butter, hard margarine, lard and shortening, for the first time it also recommends that the diet include a small amount (30–45 ml) of unsaturated fat per day (e.g. canola oil, soybean oil, flax oil, olive oil or sunflower oil). In addition, the Food Guide recommends at least 2 servings (150 g) of fish (specifically, fish such as char, herring, mackerel, salmon and trout) each week. These recommendations recognize the need for some PUFA, in particular omega-3 fatty acids, in the diet. In addition to the importance of omega-3 fatty acids in reducing CVD risk, there is increasing understanding of their role in neurological function and importance in inflammatory and immune disorders.<sup>7</sup> The recommendation to include fish in the diet recognizes not only that the conversion of ALA to EPA and DHA (long chain omega-3 fatty acids) is low in humans but also that ALA, EPA and DHA vary in their metabolic and physiological functions.

It is important to note that the emphasis on *trans* fat has amplified since the release of the new Food Guide. Furthermore, this emphasis is likely to continue to mount as the food industry strives to meet the recommendations of the Trans Fat Task Force.<sup>iv</sup> While some companies are making satisfactory progress towards reducing or eliminating *trans* fat from

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<sup>iv</sup> The Honourable Tony Clement, Minister of Health, accepted the Trans Fat Task Force report in a news conference on June 20, 2007, but did not implement its recommendation because the level of *trans* fat in the Canadian diet had decreased appreciably over the previous decade. However, the Minister put the food industry on alert that the Government would implement the recommendations of the Task Force<sup>14</sup> if the limits recommended by it were not met by 2009. The Minister also stated that Health Canada would monitor the progress made in reducing *trans* fat in the Canadian food supply and that the results would be made public.



their products, other companies have made little progress.<sup>v, 18, 19</sup> Equally disconcerting is the finding that some companies have made progress in reducing or eliminating *trans* fat in their products by replacing *trans* fat with saturated fat.



## Issues Related to Nutrition and Dietary Recommendations for Fat

### Implications for consumers

Several issues pertaining to dietary fat have important implications for consumers. The replacement of *trans* fat by saturated fat in some foods, in light of recent developments,<sup>iv, v</sup> points out how important it is for consumers to consult the Nutrition Facts table on foods. This development is of particular concern because it is not clear from TNT VI<sup>6</sup> whether Canadians view *trans* and saturated fats as equal health concerns or whether they regard one as more deleterious than the other.<sup>vi</sup> Although there appears to be a strong awareness of the importance of omega-3 fatty acids to a healthy diet,<sup>6</sup> the low level of DHA in breast milk in Canada<sup>20</sup> indicates a low intake of long-chain omega-3 fatty acid sources, namely fish. In addition to these specific implications, marked changes in the understanding of the role of fat over the past 20 years coupled with the general complexity of fat nutrition create a major conundrum for consumers.

### Implications for government

Health Canada faces several challenges in conveying dietary recommendations for fat to consumers. Extensive consultation with stakeholders in the development of the recently released “Eating Well with Canada’s Food Guide” produced an excellent transcription of current nutrition recommendations. However, the guidelines for dietary fat are more extensive than in the previous version of the Food Guide. Hence, it is imperative that Health Canada carefully monitor consumer adoption of the dietary recommendations in the new Food Guide. Likewise, Health Canada needs to monitor the intake of saturated fat in the aftermath of the recommendation to limit the level of *trans* fat in the Canadian food supply<sup>14</sup> and the resulting move by some food manufacturers to replace *trans* fat by saturated fat.<sup>18, 19</sup> There is a need to reinforce the recommendation that consumers reduce their intake of both saturated and *trans* fat. Likewise, there is a need to continue to promote the use of the information related to fat on packaged foods (viz. Nutrition Facts table) and to monitor the extent to which consumers use this information. Similarly, there is a need for Health Canada to follow up on the recommendation that consumers include a source of PUFA in their diet. This recommendation, in particular the inclusion of a source of omega-3 fatty acids and the proposal that consumers include at least 2 servings of fish per week, is especially significant during pregnancy and lactation; the mean level of long-chain omega-3 fatty acids (viz. DHA) in the breast milk of Canadian women is one of the lowest worldwide.<sup>20</sup>

<sup>v</sup> The first summary of Health Canada’s assessment of retail and restaurant foods was released by the Minister of Health at a press conference on December 20, 2007.<sup>18, 19</sup>

<sup>vi</sup> Equal numbers agreed (34%) and disagreed (33%) with the statement “Trans fatty acids have the same effect as saturated fat.”



### Implications for industry

The food industry is expected to reduce the *trans* fat content of retail and restaurant foods to the levels recommended by the Trans Fat Task Force<sup>14</sup> by 2009.<sup>iv</sup> However, reverting to the use of saturated fat to meet this goal is not a fitting option. It is essential that industry develop acceptable alternatives to PHVO margarine and shortening and to saturated fat sources used in the preparation and manufacture of certain foods. Development of acceptable substitutes (e.g. high stearic acid and/or interesterified shortenings) will take time and appreciable resources, some of which need to be directed to clinical testing of these alternative fat sources. Industry also needs to strengthen its efforts to promote sound dietary guidelines, consistent with Canada's Food Guide, and to bolster efforts to develop and provide educational materials for health professionals and consumers.

### Implications for schools

Although adding to school curricula is a concern among school administrators, schools provide a unique environment for reaching adolescents with sound dietary guidelines pertaining to amount and type of fat, in particular saturated and *trans* fat. Major changes in the fatty acid profile of foods popular with this group (e.g. fries, snack foods) offer a superb opportunity to influence the development of future dietary patterns. Schools that provide a lunch program or operate a cafeteria should be encouraged to adopt margarines and oils for use in cooking that contain a maximum of 2 percent *trans* fat and pre-packaged foods containing low levels of *trans* and saturated fats.

### Implications for consumer research

As reflected by TNT VI,<sup>6</sup> there was appreciable confusion among consumers concerning dietary fat in 2006. In all probability, this confusion has amplified with the focus on *trans* fat over the past year,<sup>iv,v,vii</sup> Thus, there is a need to assess consumers' awareness of the new Canada's Food Guide<sup>16,17</sup> and their knowledge and understanding of current dietary recommendations for fat. There also is a need to assess the degree to which consumers understand and use the nutrition information contained in the Nutrition Facts table on foods, in particular the information on the amount and type of fat. This information is vital to the development of nutrition education materials and programs. It is equally important to the development of initiatives designed to change dietary behaviour.

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<sup>vii</sup> Calgary Health Region moved to restrict the use of *trans* fat effective January 1, 2008, by requiring restaurants under its jurisdiction to restrict all margarines and oils used for cooking to a maximum of 2% *trans* fat ([www.cbc.ca/canada/story/2007/12/29/calgary-fats.html](http://www.cbc.ca/canada/story/2007/12/29/calgary-fats.html)), making Calgary the first city in Canada to regulate the level of *trans* fat in restaurant foods.



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## Brief Description of the Main Features of Dietary Fat

Fatty acids, usually in the form of triglycerides, are the main constituents of dietary fat. Dietary fat also contains a variety of minor constituents, such as cholesterol in animal fats and phytosterols in vegetable oils. Fatty acids are classified as either saturated or unsaturated depending on whether or not the carbon chain contains no double bonds (saturated fatty acid; SFA), one double bond (monounsaturated fatty acid; MUFA) or two or more double bonds (polyunsaturated fatty acid; PUFA).

Unsaturated fatty acids can be further subdivided on the basis of the geometric configuration of the double bond (*cis* or *trans*) in the carbon chain. Most of the double bonds in naturally occurring unsaturated fatty acids are in the *cis* configuration although small amounts of *trans* fatty acids are present in dairy products, beef and lamb. PUFA can be further classified based on the position of the first double bond from the methyl end of the carbon chain: namely, n-6 (or omega-6) fatty acids where the first double bond is 6 carbons from the last (n<sup>th</sup>) carbon; or n-3 (or omega-3) fatty acids where the first double bond is 3 carbons from the methyl end (n<sup>th</sup> carbon). The omega-6 and omega-3 fatty acids are families of fatty acids, the individual members of which vary in the number of carbons making up the fatty acid chain and the number of double bonds in the chain. For example,  $\alpha$ -linolenic acid (ALA), which is present in flax, canola and soybean oils, is an 18-carbon omega-3 fatty acid that contains 3 double bonds, while eicosapentaenoic acid (EPA), which is present in fish and fish oils, is a 20-carbon omega-3 fatty acid that contains 5 double bonds. The first members of these families of fatty acids, namely linoleic acid (18:2n-6; an omega-6 fatty acid) and ALA (18:3n-3; an omega-3 fatty acid) are essential fatty acids. It also is argued that docosahexaenoic acid (DHA; 24:6n-3) should be considered an essential fatty acid (i.e. must be supplied by the diet) because of the limited conversion of ALA to DHA by humans.

A detailed classification of fatty acids on the basis of structure together with a description of their biological actions and common food sources is summarized in the ADA–DC position paper on dietary fatty acids.<sup>a</sup> This paper provides a summary of the nutritional properties of individual saturated fatty acids, monounsaturated fatty acids (MUFA; viz. oleic acid) and polyunsaturated fatty acids (PUFA); in fact, discussion of the nutritional properties of omega-6 and omega-3 fatty acids is relatively extensive.

<sup>a</sup>ADA Reports. Position of the American Dietetic Association and Dietitians of Canada: Dietary Fatty Acids. *J Am Diet Assoc* 2007;107:1599-1611.  
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