Bruce E. McDonald, PhD

Diet and Coronary Heart Disease: Does Beef Fit in?

SUMMARY

Changes in the fat and cholesterol content of retail cuts of Canadian beef over the past 16 years indicate that it is not necessary to limit beef in diets designed to meet the guidelines recommended at the recent Canadian Consensus Conference on Cholesterol. Recent studies have shown that the retail cuts of beef available in Canada today contain 20% to 60% less fat than previously reported in the Canadian nutrient data file. Cuts from the loin and hip region of the carcass (e.g., sirloin steak, round steak, and rump roast) that are trimmed of all visible fat are similar in fat, energy, and cholesterol content to chicken and fish. (*Can Fam Physician* 1989; 35:1179–1182.)

RÉSUMÉ

Au cours des 16 dernières années, les changements dans les taux de gras et de cholestérol contenus dans les coupes de boeuf canadien vendues au détail indiquent qu'il n'est pas nécessaire de restreindre la consommation du boeuf dans les diètes conçues pour répondre aux récentes recommandations nutritionnelles de la Canadian Consensus Conference on Cholesterol. Des études récentes ont démontré que les coupes de boeuf vendues au détail sur le marché canadien contiennent 20 à 60% moins de gras que les valeurs nutritives antérieures publiées par Santé et Bien-être social Canada. La teneur en matières grasses, calories et cholestérol des coupes provenant de l'aloyau et de la cuisse (e.g. surlonge, ronde et croupe) qui sont parées de tout gras visible est semblable à celle du poulet et du poisson.

Key words: dietary guidelines, coronary disease, Canadian beef

Bruce McDonald is a professor in the Department of Foods and Nutrition at the University of Manitoba, Winnipeg, Manitoba. Request for reprints to: Dr. Bruce E. McDonald, Department of Foods and Nutrition, University of Manitoba, Winnipeg, Man. R3T 2N2

THE RECOMMENDATIONS of the recent Canadian Consensus Conference on Cholesterol[1] emphasize the importance of elevated serum cholesterol, when composed of high LDL cholesterol and low HDL cholesterol levels, on the development of atherosclerosis in humans. Furthermore, the Consensus Panel of the conference affirmed that "dietary modification remains the principal intervention for individuals with elevated blood lipids." The panel recommended that individuals with elevated blood cholesterol levels (Table 1) adopt diets in which total fat does not exceed 30% of energy intake and saturated fat does not exceed 10% of energy intake. Of particular significance is the panel's recommendation that dietary intervention be considered at appreciably lower blood cholesterol levels for individuals between the ages of 18 and 29 than for those age 30 years and older, thus emphasizing the importance of early intervention in the prevention of cardiovascular disease.

Although the panel also recommended that proteins supply 10% to 15% of the energy and that there be an emphasis on polysaccharides and sources of fibre in the diet, the dietary guidelines underscore the strong relationship between dietary fat and serum cholesterol level. In addition to diet modification, the panel recommended that physical activity be sufficient to achieve and maintain cardiovascular fitness and that the balance between energy intake and energy expenditure of individuals at risk be adjusted to maintain body weight in an appropriate range.

Dietary Implications

It should be noted that the recommendations of the Consensus Conference are directed at individuals who have coronary heart disease (CHD) or who are at risk of developing CHD. The second group is identified as individuals with a family history of hyperlipidemia or CHD occurring at an early age (i.e., parent, grandparent, brother, or sister with heart attack while younger than 60), and individu-

als with hypertension, diabetes, or renal failure. Some delegates attending the Consensus Conference, however, argued that the recommendations are prudent guidelines for the general public.

The focus of the Conference's dietary guidelines on total and saturated fat will undoubtedly raise questions about certain foods in our diets. Traditionally, concern about saturated fat has tended to focus on animal products, in particular red meats, even though red meats contribute only 12% of the total fat and 13% of the saturated fat in the average Canadian diet.

Developments over the past few years suggest that these generalizations about red meat consumption should be reviewed. Not only has there been an appreciable decrease in the portion sizes of red meats over the past decade, but there also has been a major change in the composition of Canadian beef, especially in total fat and cholesterol content. Recent studies[2,3] indicate that the beef produced in Canada today contains 20% to 60% less fat and 4% to 29% less cholesterol than reported previously by Health and Welfare Canada.[4] In fact, Health and Welfare Canada has recently revised the "Canadian nutrient data file"[5] on the basis of these studies. The lower fat content of the beef produced in Canada today is particularly striking for the more tender cuts (Table 2). The reduction in fat content has resulted in a concomitant increase in lean and, in turn, protein content of these cuts (Table 2).

The marked reduction in the fat content of Canadian beef came about because of a change in 1972 to Canada's beef grading system that rewarded leanness rather than fat. As a result, leaner breeds of cattle were introduced from Europe, and cattle were fed grain for a shorter period. The efforts to decrease the fat content of Canadian beef were in keeping with dietary recommendations[6] for the prevention of coronary heart disease, namely that energy from fat be reduced from 40% to no more than 35% of total calories and that saturated fat be reduced to less than 10% of dietary energy.

Nutritive Value of Beef

It is widely accepted that red meats are an excellent source of protein; of minerals, such as iron and zinc; and of vitamins, such as vitamin B_6 and vitamin B_{12}. A single serving of beef, for example, provides approximately twice as much iron or vitamin B_{12} and four to five times as much zinc as a single serving of chicken or fish. Red meats are not only a rich source of some nutrients, but the relatively high bioavailability of these nutrients makes meat especially important in the diets of growing children, adolescents, pregnant and lactating women, and athletes, especially those involved in sports in which weight control is an important consideration. In addition to the direct contribution that meat makes to our nutrient intake, it also plays an important role in the absorption of nutrients, such as non-heme iron, from other food sources. A marked reduction in the intake of meat can result in iron deficiency, particularly in vulnerable groups such as pre-menopausal women and the elderly. Hence, dietitians and nutritionists have expressed concern about the blanket recommendation that red meats be restricted in diets aimed at reducing fat intake.

Fat Content of Canadian Beef

The reduction in fat content of Canadian beef is particularly great for the tender cuts, such as sirloin, T-bone, and wing steaks. The fat content for a single serving of specific retail cuts of beef is presented in Table

Table 1
Individuals Judged at Risk by the Consensus Panel of the Canadian Consensus Conference on Cholesterol

Intervention to lower blood cholesterol levels is recommended for men and women:

age 30 years and older when blood cholesterol level
1) exceeds 6.2 mmol/L (240 mg/dL), or
2) is between 5.2 and 6.2 mmol/L (200-240 mg/dL) but the LDL-cholesterol level is greater than 3.4 mmol/L (130 mg/dL), or the HDL-cholesterol level is less than 0.9 mmol/L (35 mg/dL), or the triglyceride level is greater than 2.3 mmol/L (200 mg/dL);

age 18 to 29 years when blood cholesterol level
1 exceeds 5.7 mmol/L (220 mg/dL), or
2) is between 4.6 and 5.7 mmol/L (180-220 mg/dL) but the LDL-cholesterol level is greater than 3.0 mmol/L (115 mg/dL), or the HDL-cholesterol level is less than 0.9 mmol/L (35 mg/dL), or the triglyceride level is greater than 2.3 mmol/L (200 mg/dL).

Table 2
Comparison of the Lipid and Protein Content from the H&W Values for Selected Cuts of Cooked Beef

Cut of Meat	Nutrient Content (%) of Edible Portion[a] 1979	1987	Difference between 1987 and 1979 (%)
Lipid			
Sirloin steak	27.8	10.2	−63.3
Round steak	15.6	5.7	−63.5
Rib roast	36.7	20.2	−45.0
Rump roast	23.3	11.2	−51.9
Protein			
Sirloin steak	24.4	27.3	+11.9
Round steak	28.9	29.5	+2.1
Rib roast	21.1	24.7	+17.1
Rump roast	24.4	29.2	+19.7

Source: Adapted, see references 4 and 5.
a. Includes lean and fat.

3. The fat content of the lean meat only is probably the more appropriate value from a nutritional standpoint because a recent survey has shown that over 75% of consumers trim away all visible fat before cooking or eating meat (personal communication: Beef Information Centre, Toronto). Cuts from the hind quarter of the animal, that is, from the loin and hip regions of the carcass (e.g., sirloin steak, round steak, and rump roasts), that are carefully trimmed of all visible fat, are similar in fat, energy, and cholesterol content to chicken and fish (Table 4). There is no apparent advantage, on the basis of proximate composition, to recommend that individuals substitute chicken or fish for beef. If one is concerned about the fat content of beef, the best recommendation is to trim off all visible fat. The data in Table 4 also illustrate the importance of method of preparation; chicken or fish that is battered and fried contains as much fat as beef that is not trimmed of visible fat (i.e., total edible portion in Table 3 including both fat and lean).

The much lower fat content of the total edible portion (both lean and fat) of today's beef results in appreciably less waste when the meat is trimmed of all visible fat than the same trimming of beef available 10 to 15 years ago (Table 2). The fat content of the lean meat only is believed to also have decreased during the past 16 years. Dr. Ron Usborne estimates that the degree of marbling, that is the fat deposited between the muscle fibers of the meat, has decreased by over 30% since the current beef grading system was introduced in Canada (personal communication: Usborne WR, Department of Food Science, University of Guelph, Ontario).

Table 3
Fat Content of a Single 9-0g Serving[a] of Retail Cuts of Cooked Beef

Cut of Meat	Fat Content (g) Edible Portion[b]	Fat Content (g) Lean only
Sirloin steak	9.2	6.1
T-bone steak	15.5	9.5
Inside round steak	5.1	3.1
Eye of round steak	7.0	7.0
Cross rib roast	15.0	10.2
Sirloin tip roast	11.2	7.8
Inside round roast	9.9	6.3
Blade roast	16.4	11.3

Source: Adapted, see references 2 and 5.
a. Approximately 3 oz.
b. Includes lean and fat.

Table 4
Fat, Energy, and Cholesterol Content of Representative Servings of Beef, Chicken, and Fish

Cut of Meat	Fat Content (%)	Energy (kcal/ 100 g)	Cholesterol (mg/ 100 g)
Beef, lean only			
Inside top round steak	3.4	164	65
Sirloin broiled steak	6.8	185	73
Rump roast	7.9	199	74
Rib roast	11.2	220	67
Chicken			
Broiler/fryer, breast, meat only	3.5	165	85
Roasted, flesh only	6.5	167	75
Breast, meat plus skin, battered	12.8	260	85
Fish			
Bluefish, baked or broiled	5.4	159	70
Fresh broiled cod	5.7	170	81
Fresh broiled salmon	7.6	182	47
Breaded fish sticks	8.9	176	47

Source: Adapted, see reference 5.

Response of Plasma Lipids to Beef Fat

Beef fat or tallow is a saturated fat. As a consequence, it is generally regarded as being hypercholesterolemic. Beef fat, however, is characterized by a relatively high level of stearic acid, an 18-carbon saturated fatty acid that has recently been reported to be hypocholesterolemic for humans.[7] Bonanome and Grundy[7] found that total plasma cholesterol levels of subjects were 14% lower and LDL cholesterol levels 21% lower on a diet high in stearic acid than when these subjects were fed a diet high in palmitic acid. Earlier work by Keys and colleagues[8] had indicated that stearic acid and saturated fatty acids with less than 10 carbon atoms have little effect on serum cholesterol levels in humans. By the use of regression analysis, Keys and colleagues[8] developed predication equations which indicated that only lauric (Cl2:0), myristic (Cl4:0), and palmitic (Cl6:0) acids are hypercholesterolemic. Studies in our laboratory[9] and by Reiser and colleagues[10] confirmed that beef fat does not elevate plasma total cholesterol or LDL-cholesterol. In fact Losier[9] found that total serum cholesterol decreased 10% when male subjects were fed a diet in which beef tallow provided 35% of the total energy. Reiser and colleagues[10] observed no change in plasma total, LDL cholesterol or HDL cholesterol levels of normolipidemic men fed a diet for four weeks in which beef tallow provided 60% of the total fat (21% of total energy).

Cholesterol

In addition to the marked reduction in fat content of Canadian beef, the new grading system has resulted in an appreciable decrease in cholesterol content (Table 4). For example, there was a 29% reduction in the cholesterol content of rib roast (94 mg/

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100 g vs. 67 mg/100 g) and a 19% reduction in rump roast (91 mg vs. 74 mg per 100 g) between the 1979[4] and the 1987 values.[5] Similar decreases have occurred for other cuts of beef. The decrease in cholesterol content probably reflects, to a large degree, the decrease in total fat content of today's beef.

Conclusions

Changes in beef production practices in Canada over the past 16 years have resulted in an appreciable reduction in the fat content of retail cuts of Canadian beef. On the basis of recent studies, there is no apparent need to restrict beef in the diets of individuals at risk for coronary heart disease. Even though beef fat is not hypercholesterolemic, most consumers trim all visible fat from meat before consumption. ■

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