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Red meats: Time for a paradigm shift in dietary advice

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ABSTRACT

Recent evidence suggests dietary advice to limit red meat is unnecessarily restrictive and may have unintended health consequences. As nutrient-rich high quality protein foods, red meats can play an important role in helping people meet their essential nutrient needs. Yet dietary advice to limit red meat remains standard in many developed countries, even though red meat intakes appear to be within current guidelines. Meanwhile, energy intakes from processed foods have increased dramatically at the expense of nutrient-rich foods, such as red meat. Research suggests these food trends are associated with the growing burden of obesity and associated diseases in recent decades. It is time for dietary advice that emphasizes the value of unprocessed red meat as part of a healthy balanced diet.

1. Introduction

A growing body of research suggests dietary advice to limit red meat is unnecessarily restrictive and not supported by current evidence. Historically, studies that have explored associations between red meat consumption and health outcomes have reported conflicting results (Micha, Wallace, & Mozaffarian, 2010; Wyness et al., 2011). Recently, researchers have begun to recognize that it is important to distinguish between unprocessed red meats such as beef, veal, pork and lamb and processed meats such as bacon, bologna, sausages and salami.

Large population studies both in Europe and North America have recently reported no association between intakes of unprocessed red meat and any cause of death, including cardiovascular disease (CVD) or cancer (Kappeler, Eichholzer, & Rohrmann, 2013; Rohrmann et al., 2013). This is consistent with the findings of the largest meta-analyses of the worldwide evidence showing no association between unprocessed red meat and coronary heart disease (CHD) (Micha et al., 2010). Randomized controlled trials (RCT) have also demonstrated that, within the context of heart healthy diets, the effect of lean red meats on LDL-cholesterol is no different than white meats (Davidson, Hunninghake, Maki, Kwiterovich, & Kafonek, 1999; Maki et al., 2012; Roussell et al., 2012). These findings are in line with evidence that lean red meats have a relatively neutral fatty acid profile with respect to blood cholesterol levels (Wyness et al., 2011).

Recent advances in our understanding of human requirements for key essential nutrients such as high quality protein throughout the lifecycle also provide good reasons to emphasize the value of nutrient-rich foods such as lean red meats as part of a healthy diet (Elango, Ball, & Pencharz, 2012; Elango, Humayun, Ball, & Pencharz, 2010; FAO, 2013). Red meats contain an array of important micronutrients such as iron, zinc, selenium, potassium and a range of B-vitamins including niacin, riboflavin, thiamine and vitamin B_{12} (Wyness et al., 2011). These nutrients are all essential for optimal health throughout the lifecycle.

Recommendations to limit red meat intakes date back several decades and were originally intended to reduce saturated fat intakes. Recent meta-analyses have concluded that there is no clear evidence to support decades of dietary guidelines to cut saturated fat intake (Chowdhury et al., 2014; Siri-Tarino, Sun, Hu, & Krauss, 2010). Meanwhile such guidance may have inadvertently contributed to dietary changes associated with the rapid rise in the prevalence of obesity since the 1970s as well as other risk factors for heart disease (Danaei et al., 2009; Slater et al., 2009). A decline in energy from nutrient-rich foods such as beef, milk and eggs has been accompanied by an excessive increase in energy from fats (including *trans* fats) and refined carbohydrates found in many processed convenience foods (Slater et al., 2009). The resulting energy gap has likely contributed to obesity and chronic disease.

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This discussion highlights the need for a paradigm shift in dietary guidance regarding nutrient-rich foods such as lean red meats. It is critical to recognize that a focus on limiting red meat distracts from more effective strategies to improve dietary patterns. In an era when people in developed nations are increasingly overfed, but undernourished, emphasizing the value of eating a healthy balance of nutrient-rich minimally processed foods, including lean red meats, is likely to better serve public health.

2. Red meats and health outcomes

A growing body of evidence from epidemiological studies and randomized controlled trials calls into question recommendations to limit red meat intake. Based on this current evidence, unprocessed red meats eaten in amounts recommended by dietary guidelines do not appear to be associated with chronic disease.

2.1. Population studies on red meat and health

Two large population studies in Europe (Rohrmann et al., 2013) and the United States (Kappeler et al., 2013) found no association between unprocessed red meat and any cause of death, including CVD or cancer. Unlike many earlier studies, these more recent studies explored health outcomes associated with unprocessed and processed meats separately. The findings from these studies provide good support for recommending both unprocessed red and white meats as part of a healthy balanced diet.

The European Prospective Investigation into Cancer and Nutrition (EPIC) followed close to half a million people in 10 European countries for more than 12 years (Rohrmann et al., 2013). The EPIC study found no significant association between unprocessed red meat intakes and all-cause mortality or death due to CVD, cancer or other causes. A particular strength of this study was that it examined unprocessed red meat (such as beef, pork and lamb), unprocessed white meat (such as chicken, turkey and poultry) and processed meat (such as sausages, bacon and luncheon meats) separately. Although a moderate positive association between high intakes of processed meat (greater than 160 g/day) and mortality was noted, higher intakes of unprocessed red meat and unprocessed white meat did not increase risk. Researchers also reported that those who consumed the most processed meat generally ate fewer vegetables and fruit and were more likely to smoke. Furthermore, a higher risk of all-cause mortality was observed among participants with very low or no red meat consumption.

A recent analysis of data from the United States National Health and Nutrition Examination Survey (NHANES) concluded that meat consumption was not associated with mortality (Kappeler et al., 2013). Researchers reported no significant association between red meat intake including beef, pork, ham, and organ meats and total mortality or cause-specific mortality due to CVD or cancer. This analysis included 17,611 men and women (18 years and older) from NHANES (1986–2010) which is representative of the United States population.

This analysis, which also examined overall diet quality, found that adults who ate red meat more often also tended to eat vegetables more often compared to those who ate red meat less often. In addition, those who ate red meat more often tended to have lower body mass index and a smaller waist circumference. Furthermore, those who ate red meat more often were less likely to have hypertension than those who ate red meat less often. This is consistent with other research that indicates higher protein intakes may help promote satiety and body weight management (Westerterp-Plantenga, Lemmens, & Westerterp, 2012).

2.2. Large systematic reviews and meta-analyses

The largest systematic review and meta-analysis of worldwide evidence to date, examining unprocessed red meats and processed meats separately, concluded that consuming 100 g/day of unprocessed red meat was not associated with CVD risk (Micha et al., 2010). This analysis pooled data for over 1.2 million study participants spanning more than 20 countries. This finding calls into question reports from previous studies that did not distinguish between unprocessed red meats (such as beef, pork and lamb) and processed meats (such as hot dogs, bacon, salami, sausages, and luncheon meats).

Another systematic review categorized the causal evidence for various dietary exposures and their associations with primary and secondary coronary heart disease (CHD) outcomes as strong, modest or weak (Mente, de Koning, Shannon, & Anand, 2009). This analysis pooled prospective cohort data on meat intake and CHD outcomes for 236,414 individuals and concluded the evidence for an association between meat and CHD is weak. This study concluded that there is strong evidence to support valid associations of several protective factors for CHD, including intakes of vegetables and nuts, as well as, high-quality dietary patterns such as a "Mediterranean" diet. *Trans* fatty acids and foods with high glycemic index or high glycemic load were identified as the only harmful dietary factors with strong evidence to support associations with CHD.

2.3. Evidence from randomized controlled trials

Randomized controlled trials (RCT) provide further evidence that diets including lean red meats can be as effective for improving total and LDL cholesterol as diets with mostly lean white meat (poultry and/or fish). In a recent meta-analysis of eight RCTs ($n = 409$) the fasting cholesterol and triglycerides levels of adults with borderline hypercholesterolemia were not significantly different after consuming beef and poultry and/or fish (Maki et al., 2012). Total and LDL cholesterol were slightly reduced in subjects consuming beef and did not differ significantly from changes observed following similar intakes of poultry and/or fish.

In one long-term RCT, hypercholesterolemic adults ($n = 191$) were counselled to follow a cholesterol-lowering diet including 6 oz. (170 g) of lean meat per day, 5 to 7 days per week, for 9 months (Davidson et al., 1999). Based on random assignment, subjects were instructed to consume at least 80% of their meat in the form of either lean red meat (beef, veal, pork) or lean white meat (poultry and fish). There were no significant differences in the mean concentrations of total and LDL cholesterol between the lean red meat and the lean white meat groups during the 9 months. The authors of this study suggest that giving patients the permission to choose lean red and white meats may improve their acceptance of and long-term dietary adherence to a heart healthy cholesterol-lowering diet.

The BOLD RCT found that heart healthy diets that include lean beef as the primary protein are as effective in lowering total and LDL cholesterol as the DASH diet that emphasizes white meat and plant protein (Roussell et al., 2012). Participants following the BOLD and BOLD + diets (with 113 g and 153 g of beef per day, respectively) experienced a 10% decrease in LDL cholesterol. These reductions in LDL cholesterol were of the same magnitude as those observed with the DASH diet, recognized as a "gold standard" for heart health.

RCTs also suggest that Paleolithic (Old Stone Age) type diets based on lean meat, fish, eggs, nuts, fruit, vegetables and root vegetables, may benefit patients with heart disease and diabetes as well as obese patients with metabolic risk factors for these diseases (Jönsson et al., 2009, 2010, 2013; Lindeberg et al., 2007; Mellberg et al., 2014). In patients with type 2 diabetes, advice to follow a Paleolithic diet improved several CVD risk factors and glycemic control compared to a diabetes diet consumed over two consecutive 3-month periods (Jönsson et al., 2009). The Paleolithic diet was higher in fruits, vegetables, meat and eggs, and lower in cereals and dairy products compared to the diabetes diet. The Paleolithic diet resulted in lower HbA1c, triglycerides, blood pressure, weight, BMI and waist circumference and higher HDL cholesterol. A follow-up study found the Paleolithic diet was also more satiating per calorie than the diabetes diet designed according to dietary guidelines (Jönsson et al., 2013). Mellberg et al. (2014) concluded that a

Paleolithic-type diet has greater beneficial effects on abdominal obesity, fat mass and triglyceride levels in obese postmenopausal women compared to standard Nordic Nutrition Recommendations.

2.3.1. Fatty acid profile of red meat

Recent findings with respect to red meat and health outcomes make sense in light of the fatty acid profile of red meat. Lean red meats (such as beef, pork, lamb) contain similar proportions of monounsaturated fatty acids to saturated fatty acids, and small amounts of polyunsaturated fatty acids (Wyness et al., 2011). Moreover, stearic acid, one of the main saturated fatty acids found in red meats, does not raise LDL cholesterol levels (Kris-Etherton & Yu, 1997; Yu, Derr, Etherton, & Kris-Etherton, 1995). Palmitic acid, another main saturated fatty acid in red meats, raises HDL as well as LDL cholesterol, therefore having little effect on the total to HDL cholesterol ratio (Mensink, Zock, Kester, & Katan, 2003).

3. Protein and other essential nutrients — good reasons to recommend lean red meats

Lean red meats are among the best dietary sources of high quality protein. Evidence presented at the 2013 International Congress of Nutrition symposium on *Protein Requirements for optimal health throughout all life stages* outlined here reinforces the relevance of understanding protein quality and requirements for optimal human nutrition. Experts agree protein intakes much higher than current recommended dietary allowances (RDA) are needed for children's healthy growth and development and to help older adults age well, and that protein quality matters. Researchers recommend that at least two meals (ideally three) a day should contain 25 to 30 g of high quality protein from naturally nutrient-rich foods for optimal health. Recent advances in measuring protein needs indicate current RDA underestimate actual protein needs by as much as 50% (Elango et al., 2010, 2012).

3.1. A better measure of protein quality

An FAO expert working group convened in 2014 identified the urgent need to move forward with research protocols for more accurate protein quality evaluation (in press). This follows a previous FAO expert consultation that recommended a more accurate method to measure protein quality (FAO, 2013). The 2013 FAO report outlines recommendations relating to the new method known as the Dietary Indispensable Amino Acid Score (DIAAS) that will replace the Protein Digestibility Corrected Amino Acid Score (PDCAAS). As noted in this report although PDCASS is the method most commonly used to date, it is less than ideal on several counts and tends to overestimate protein quality, particularly in foods with lower protein quality. Specifically, PDCAAS overestimates the protein quality of plant proteins relative to animal proteins, with the result that it may appear that people consuming primarily plant proteins may be meeting their dietary requirement for protein and amino acids, when in fact they are not. With the improved measure DIASS, animal proteins score fairly consistently higher than plant proteins, including soy. Accurate protein quality measures are fundamental for many nutrition activities and more precise protein quality scores for various foods based on DIAAS are expected to be published.

3.2. Higher protein needs for optimal health

Current RDA for protein of 0.95 g/kg/day for children and 0.8 g/kg/day for adults were determined based on nitrogen balance studies which are known to be imprecise (Institute of Medicine, 2005). The much more precise Indicator Amino Acid Oxidation method indicates protein needs are much higher (Elango et al., 2010). For example, research shows that healthy 6 to 10 year old school aged children may require protein intakes of 1.3 to 1.55 g/kg/day for optimal growth and development (Elango, Ball, Humayun, & Pencharz, 2011). Experts also estimate that higher protein intakes in the range of 1.1 to 1.5 g/kg/day are required to support better muscle and bone maintenance to help adults age well (Gaffney-Stromberg, Insogna, Kerstetter, & Rodriguez, 2009; Paddon-Jones & Rasmussen, 2009; Paddon-Jones, Short, Campbell, Volpi, & Wolfe, 2008; Volpi et al., 2012). This in turn can improve strength and daily functioning, which is a critical consideration for reducing the risk of falls, fragility fractures and physical disability in aging populations.

A recent study by Levine et al. (2014) concluded that a low protein intake during middle age followed by moderate to high protein consumption in older adults (over 65 years of age) may optimize healthspan and longevity. This study reported that higher protein intakes were associated with a reduced risk of overall mortality and cancer death risk in respondents over 65, but an increased risk of overall mortality, and cancer death risk in adults 50 to 65, and an increased risk of diabetes mortality across all ages. Leading protein experts have expressed concern about the flawed methodology used to reach the conclusions in this study (Layman et al., 2014). Issues raised regarding the subdivision and analysis of the data include, the definitions used for the protein groups, small sample size for the low protein group, use of a single 24-h recall to derive dietary data to represent food intake over an 18-year period, and failure to report body weight and BMI for the groups. Furthermore, conclusions about diabetes are unwarranted given the limited data showing only 1% of diabetes related deaths in the whole study population. Layman et al. (2014) point out that the overall findings noted in the discussion by Levine et al. (2014) that protein intake was not associated with all-cause, cancer, or CVD mortality in adults 50 years and over are the most important.

3.3. Higher protein intakes and healthy weights

Given the growing burden of obesity and related chronic diseases, it is also worth recognizing the value of protein in promoting healthy weights. An analysis of macronutrient intakes in the United States supports an important role for higher protein intakes in addressing obesity (Austin, Ogden, & Hill, 2011). A higher percentage of energy from protein with a corresponding reduction in the percentage of energy from carbohydrates or fat was consistently associated with reduced energy intake according to an analysis of United States dietary intake data from NHANES (1971–1975 and 2005–2006). Since the 1970s, the percentage of energy consumed from fat has decreased and the percentage of energy from carbohydrates has increased in the United States. While these changes are in line with current dietary recommendations, the prevalence of obesity has increased dramatically along with energy intakes over the last several decades.

Based on NHANES (2005–2006) data, increasing protein from 15% to 25% of energy intake in an obese individual would be expected to be associated with a decrease in energy intake of (Austin et al., 2011):

- 438 cal/day if protein is substituted for carbohydrates
- 620 cal/day if protein is substituted for fat.

This population evidence is also consistent with findings from clinical trials examining the effects of higher dietary protein intakes on weight loss and weight maintenance. Weigle et al. (2005) reported that satiety was markedly increased on a higher protein diet (30% of energy from protein) compared to an isocaloric standard protein diet (15% of total energy from protein) over two weeks. In the second phase of this study, an ad libitum higher protein diet (30% of energy from protein, 20% fat and 50% carbohydrate) resulted in a spontaneous decrease in energy intake of 441 kcal per day over 12 weeks. This sustained decrease in ad libitum caloric intake was accompanied by mean weight and fat loss of 4.9 kg and 3.7 kg, respectively.

A meta-analysis of RCT comparing higher protein, low-fat diets to standard protein, low-fat diets showed that higher protein diets produced more favorable changes in weight loss, fat mass, and triglycerides over the short term (Wycherley, Moran, Clifton, Noakes, & Brinkworth, 2012). This analysis also showed that higher protein diets mitigated reductions in fat-free mass and resting energy expenditure. The benefits

of greater weight and fat loss observed with higher protein diets in short term studies appear to persist to a small degree in long term follow-up over 12 months based on another recent meta-analysis (Clifton, Condo, & Keogh, 2014).

The DIOGENES study reported that ad libitum diets higher in protein (25% of total energy) were more effective than lower protein diets (13% of total energy) in helping overweight and obese adults maintain weight loss over 12 months (Aller et al., 2014). Fewer participants in the high-protein and the low-glycemic-index groups than in the low-protein–high-glycemic-index group dropped out of the study over 26 weeks following the initial weight loss phase of the DIOGENES study (Larsen et al., 2010).

RCT also show that replacing some carbohydrates with protein may improve a number of cardiovascular risk factors, for example by lowering blood pressure (Hodgson, Burke, Beilin, & Puddey, 2006) and improving glycemic control and blood triglyceride levels (Layman, Clifton, Gannon, Krauss, & Nuttall, 2008; Nuttall, Schweim, Hoover, & Gannon, 2008). The DIOGENES study reported that ad libitum diets higher in protein improved cardiovascular risk markers in children of overweight parents from eight European countries (Damsgaard et al., 2013). The higher protein diets resulted in smaller waist circumference and lower LDL cholesterol levels compared to the lower protein diets at 6 months. In centers where families were provided with free foods, the higher protein diets also reduced blood pressure and serum insulin compared to lower protein diets in this study.

3.4. Contributions to essential nutrient intakes

In addition to high quality protein, red meat contains important essential micronutrients including, iron, zinc, selenium, potassium and a range of B-vitamins including niacin, riboflavin, thiamin and vitamins B_6 and B_{12}. Meat can also make a useful contribution to intakes of long-chain omega-3 polyunsaturated fatty acids for those who consume little or no oily fish (Wyness et al., 2011).

The iron and zinc found in red meats is more bioavailable than in alternative food sources, and red meat can enhance the absorption of these important minerals. Iron plays vital roles in children's early cognitive development, normal energy metabolism and the immune system. The importance of iron-rich foods, such as red meats, for early development has recently been recognized in nutrition guidelines for infants and young children (Australian Government, National Health and Medical Research Council, Department of Health and Aging, 2012; Health Canada, 2012 & 2014). Zinc is essential for a healthy immune system, wound healing and for children's normal growth and reproductive development. Inadequate intakes of iron and zinc remain a concern for some population subgroups even in developed countries. In particular, infants, children and adolescents (particularly young females), women of childbearing age and older adults are more at risk of low iron and zinc intakes (Wyness et al., 2011).

Red meats also contain useful amounts of the minerals selenium and potassium. Selenium acts as an antioxidant and is necessary for immune system function. Potassium plays an important role in blood pressure regulation.

Red meats also provide a range of B-vitamins including thiamin, niacin, riboflavin, pantothenic acid, and vitamins B_6 and B_{12}. B-vitamins play important roles in the functioning of the nervous system and in releasing energy from foods.

4. A closer look at current dietary patterns

4.1. Current red meat consumption is moderate

Contrary to popular perception, average red meat intakes appear to be moderate and in line with current recommendations in developed countries (McNeill & Van Elswyk, 2012; Wyness et al., 2011).

According to a recent review by McNeill and Van Elswyk (2012) an average of 110 g of red meat (pork, beef, veal and sheep) is available for daily consumption in developed countries, based on national food availability data published by the FAO (2009). It is worth noting that the amount of meat actually consumed is likely less than this due to factors such as plate waste, trimming practices, and weight loss in cooking. Nonetheless, the review by McNeill and Van Elswyk (2012) notes that the 110 g of red meat available for consumption is within the 142 g per day average recommended meat and meat alternatives across developed countries.

Another comprehensive review on red meat in the diet also concluded that intakes of red meats across 14 developed countries, are variable, but consistently moderate (Wyness et al., 2011). This review shows that intakes in these countries range from the lowest consumption in Greece at 31 g per day for women and 55 g per day for men to the highest consumption in The Netherlands at 79 g per day for women and 136 g per day for men. It is interesting to note that average red meat intakes in countries such as Australia, Canada and the United Kingdom (UK) fall well within the range of current recommendations and intakes observed in Mediterranean countries such as Spain, Italy and Greece (see Table 1).

This British Nutrition Foundation review concluded that most people in the UK eat moderate amounts of red meat, with an average intake of 47 g per day for women and 78 g per day for men (Wyness et al., 2011). In Canada, adults eat an average of 74 g of red meat per day (calculations based on data from Statistics Canada, 2004). This amount is well within the two to three daily servings of meat (75 g each) and alternatives recommended by *Canada's Food Guide* (Health Canada, 2007), respectively, for women and men (i.e., a daily total of 150 g for women and 225 g for men). On average, according this food guidance, Canadian women eat less than one serving of red meat a day (55 g), and men eat about 1 and a third servings a day (101 g).

4.2. New evidence challenges heart health guidance

Recent evidence also challenges decades of advice to limit naturally nutrient-rich foods such as red meats in efforts to reduce saturated fat intake. According to a 2014 review and meta-analysis, current evidence does not support decades of dietary guidelines that encourage low consumption of saturated fat to promote heart health (Chowdhury et al., 2014).This review takes into account evidence from 45 observational studies and 27 RCT on CHD risks based on dietary data from more than 600,000 people in Europe, North America and Asia. Despite a focus on reducing saturated fat in the diet dating back to the 1970s, saturated fat by itself did not help predict heart disease risk. This is consistent with an earlier Cochrane Review that reported no cardiovascular benefit of replacing saturated fat with carbohydrate (Hooper et al., 2012).

An earlier meta-analysis of prospective cohort studies also concluded that saturated fat was not associated with an increased risk of CHD (Siri-Tarino et al., 2010). In another review of evidence-based dietary

Table 1
Mean daily intake (g/day) of total red meat in selected countries.Source: Adapted from data in Table 3 on page 39 in Wyness et al. (2011) Red Meat in the Diet: An Update. *British Nutrition Foundation Nutrition Bulletin*, 36, 34–77.

Countries	Women	Men
Spain	67	127
Australia	55	110
Canada	55	101
Italy	60	91
United Kingdom	47	78
Greece	31	55

Note: Intakes in this chart include fresh and processed red meat.

guidance on saturated fat and CVD, the authors concluded that dietary recommendations did not reflect the evidence (Hoenselaar, 2012).

Researchers participating in the "Great Fat Debate" also raised the issue of dietary guidance leading to unintentional negative consequences (Zelman, 2011). In retrospect, it appears that efforts to reduce saturated fat intakes may have resulted in increased intakes of refined carbohydrates. Furthermore, when compared with other modifiable dietary risk factors for cardiovascular disease, saturated fat intake has been deemed less of a risk than diets high in salt and industrially produced *trans* fats (Danaei et al., 2009).

4.3. Rethinking priorities based on dietary trends

An evaluation of food availability data in Canada indicates that while the estimated amount of energy available per capita from naturally nutrient-rich foods such as beef, milk and eggs declined since the 1970s, this has not led to healthier food choices (Slater et al., 2009). Over the same period, a net increase of 18% in energy available per capita was largely driven by increases in calories from a few key ingredients in energy-dense convenience foods, including oils and shortenings and refined wheat flour, as well as soft drinks (see Fig. 1). According to this study, these dietary trends were the major contributor to the growing energy gap between energy intake and expenditure. Furthermore, the authors concluded that the rising prevalence of obesity was significantly correlated with this energy gap during this period (see Fig. 2). Slater et al. (2009) note that between 1985 and 2003, the prevalence of obesity in Canadian adults increased almost threefold according to Katzmarzyk (2002) and Tjepkema (2005).

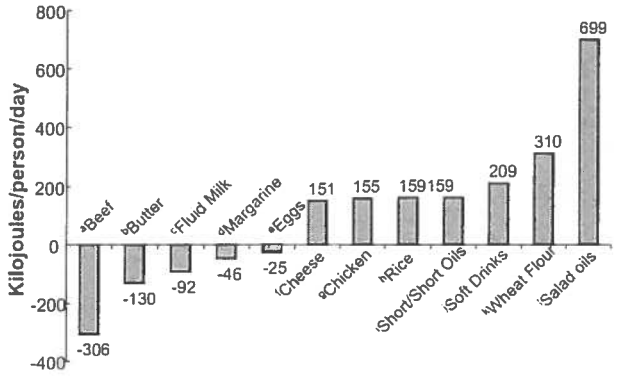
An analysis of food consumption trends in Canada by Moubarac et al. (2014) also concluded that the most important factor that has driven changes in Canadian dietary patterns between 1938 and 2011 is the replacement of unprocessed or minimally processed foods (such as meat, milk, eggs, vegetables, fruit, nuts and seeds) with ultra-processed ready-to-consume food products. While the availability of dietary energy from unprocessed or minimally processed foods fell during the study period, the caloric share of ready-to-consume products rose from 29% to 62%. The authors note that these changes in food consumption patterns and trends in obesity during the same period raise important concerns about the prevention of obesity and chronic diseases.

The increased industrialization of the food system since the 1950s has resulted in an abundant supply of relatively low cost convenience foods (Winson, 2013). With highly palatable tastes, dominated by fat, sugar and sodium, these processed foods have increasingly replaced unprocessed nutrient-rich home-prepared foods in the diet (Garriguet, 2007). This has no doubt contributed to the erosion of food-preparation and cooking skills in younger generations, as well as poorer eating habits and the growing burden of obesity and chronic diseases (Desjardins et al., 2013; Garriguet, 2009; Moubarac et al., 2014).

Consequently, experts are increasingly calling for a new approach to dietary guidance that places far greater emphasis on healthier dietary patterns, consisting primarily of naturally nutrient-rich foods (Miller et al., 2009; Mozaffarian & Ludwig, 2010). Such diets emphasize minimally processed foods such as vegetables and fruit, whole grains, milk products, lean meats, poultry, fish, eggs, legumes and nuts and seeds. In essence, this approach to dietary guidance gets back to the basics of encouraging a more traditional, balanced and healthy way of eating. This type of approach to dietary guidance results in diets naturally lower in salt, trans fat, saturated fat, added sugar and refined carbohydrates and higher in fibre, unsaturated fats, minerals, antioxidants and phytochemicals (Mozaffarian & Ludwig, 2010). This type of positive guidance can also lead to diets that are naturally more satiating and lower in energy (Miller et al., 2009). Ultimately, this type of approach is likely to prove much more effective for promoting weight management and reducing risk factors that contribute to the burden of chronic diseases such as heart disease, stroke, diabetes and cancer.

Such an approach is supported by the findings of the Global Burden of Disease Study (Lim et al., 2012), the largest systematic review to estimate the contribution of risk factors to disease and disability to date. According to this study the three leading risk factors for disease are high blood pressure, tobacco smoke and alcohol use. The study also identified diets high in sodium and low in fruit, nuts and seeds, whole grains, and vegetables as the most prominent dietary risk factors for disease. Nutrient issues of concern included iron deficiency and low omega-3 intakes. Diet and lifestyle-related contributors to the global burden of disease also included high body mass index, high fasting blood glucose, childhood underweight, physical inactivity, suboptimal breastfeeding and drug use. Conversely, a diet high in red meat ranked the lowest in a list of 43 factors contributing to the global burden of disease. This study provides valuable insight to inform priorities for dietary guidance and disease prevention in an evidence-based manner.

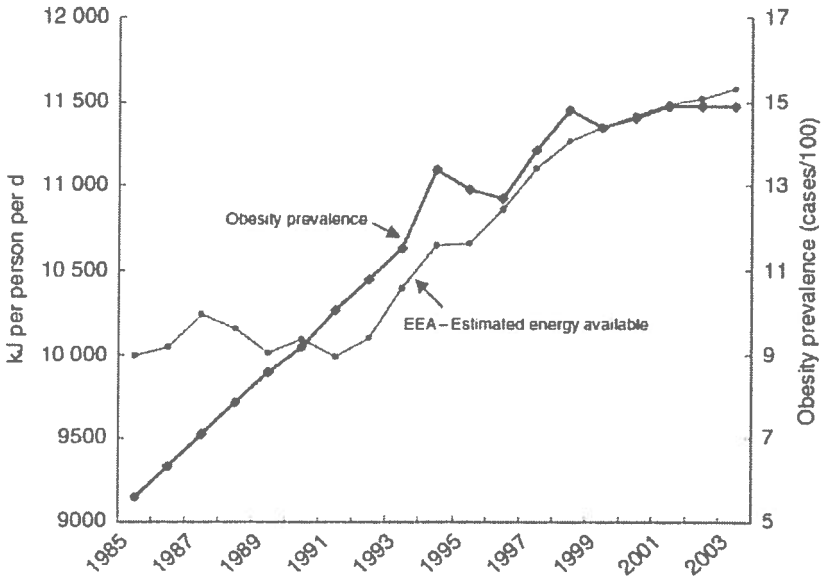
Some governments and health authorities are recognizing the need to shift their dietary guidance away from a focus on nutrients and individual foods back to the basics of encouraging people to prepare and eat wholesome, minimally processed foods. In Canada for example, the federal government agency, Health Canada, is engaging partnerships that promote cooking skills as a new approach to address obesity and type 2 diabetes. Dietitians of Canada have promoted food preparation skills through their National Nutrition Month campaigns for three consecutive years. At a provincial level, the Ontario Federation of Agriculture set a goal to ensure every 16-year-old in Ontario is equipped with the knowledge and skill to plan and prepare at least six nutritious meals to give them a healthy start to adulthood. New national dietary guidelines in Brazil also recommend making fresh and minimally processed foods the basis of a healthy diet and further promote the enjoyment of meals as a central part of family, social and workplace life.



[a]Beef: all beef for human consumption including veal
[b]Butter: butter only
[c]Fluid milk: standard milk (3.25%), buttermilk, partly skimmed 1% and 2% milk, skim milk, chocolate drink.
[d]Margarine: margarine only
[e]Eggs: chicken eggs
[f]Cheese: cheddar, variety cheeses, processed cheese (excludes cottage cheese)
[g]Chicken: all chicken for human consumption including stewing hens
[h]Rice: all human food types of rice and wild rice
[i]Shortening and shortening oils: shortening and oils used to produce solid shortening products
[j]Soft drinks: carbonated soft drinks, mineral waters and aerated waters containing sugar or sweetener, or flavoured.
[k]Wheat flour: all wheat flour for human consumption
[l]Salad oils: liquid vegetable oils

Source: Slater, J et al. (2009) The growing Canadian energy gap: more the can than the couch? *Public Health Nutrition, 12,* 2216–2224

Fig. 1. Major foods contributing to net per capita energy availability (1976–2003) Statistics Canada, Agriculture Division (2004).



Source: Slater, J et al. (2009) The growing Canadian energy gap: more the can than the couch? *Public Health Nutrition, 12*, 2216–2224

Fig. 2. Per capita daily estimated energy availability (EEA) and adult obesity (BMI ≥ 30 kg/m^2) prevalence (1985–2003).

5. Conclusion — time for a paradigm shift in dietary advice

A growing body of evidence indicates it is time for a paradigm shift in dietary advice about red meat. There is a need to address the fact that advice to limit red meat remains standard even though red meat intakes in developed countries appear to be well within dietary guidelines. It is important to recognize that recommendations to reduce the consumption of unprocessed red meats are unnecessarily restrictive based on recent studies. Moreover, an overzealous focus on limiting nutrient and protein-rich unprocessed red meat may have distracted from effective nutrition strategies to address chronic diseases associated with the growing burden of obesity and aging populations. In an era of increasing intakes of highly processed ready-to-consume foods it is important to reconsider nutrition priorities. Public health can clearly benefit from practical advice on how to choose, cook and enjoy wholesome, minimally processed foods more often. Unprocessed red meats are one of the best sources of high quality protein and make important contributions to nutrient intakes. Current evidence strongly supports a new approach that emphasizes the value of naturally nutrient-rich foods, such as lean unprocessed red meats, as part of a healthy balanced diet.

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