Saturated Fat and Cardiovascular Disease: Then and Now

A presentation by Dr. Andrew Samis.
Summary written by Colinda Hunter, RD

Key Messages

• In the late seventies and early eighties, public policy and eating guidelines recommending low-fat diets were created before scientific studies had shown that saturated fat (SFA) had a role in heart disease and stroke.

• A systematic review of randomized controlled trials in 2012 published in the Cochrane Collaboration showed there were “no clear health benefits” of reducing the total amount of fat we eat.

• The evidence for an association between SFA and cardiovascular disease (CVD) is unclear, with some studies showing an association, some showing no association and some studies showing an increase in CVD when SFA is replaced by unsaturated fat.

• Some recent research shows that consuming dairy products, including those that are higher in fat, does not increase the risk of cardiovascular disease and may in fact reduce risk.

• There is no increase in CVD from eating cholesterol-rich foods, including eggs and butter.

Introduction

In February, our annual Nutrition File® Seminar highlighted hot topics in nutrition recommended by past participants. We invited guest speakers to present on the microbiome, sports nutrition, emotional intelligence and dietary fats. While all presentations were well received, one in particular generated a lot of conversation. Dr. Samis traced the history of dietary guidelines that advised lowering total dietary fat and saturated fat (SFA), and then reviewed the most recent evidence.

Currently, there is a lot of confusion around the relationship between dietary fat and cardiovascular disease (CVD). Dr. Samis is well qualified to provide the facts. He is an assistant professor in the Department of Surgery at Queen’s University, a physician stroke champion at Quinte Health Care in Belleville, Ontario, an attending staff member at Kingston General Hospital and Belleville General Hospital and a speaker and expert panel member for the Heart & Stroke Foundation.

History of the vilification of fat

Dr. Samis reviewed the history of the dietary fat guidelines from 1904 - when the term atherosclerosis was first introduced - that advised lowering total dietary fat and SFA.¹

The lipid hypothesis

Starting in 1908 and continuing over 35 years, Russian scientists conducted research in animals fed full-fat milk, eggs and meat. They found “yellow cobblestoning,” which resembled atherosclerotic plaque, had developed in the aorta;² later it was identified as cholesterol.³,⁴ Initially, the research was done in rabbits and then replicated in sheep, cows and horses. Further research showed that if rabbits were fed purified cholesterol instead of meat and eggs, they developed even bigger plaques.³,⁴ This led to the conclusion that eating cholesterol causes heart disease. However, these animals are strict herbivores and not evolved to eat meat. Less well known parallel experiments on dogs and rats (natural meat eaters) failed to produce plaque.⁵ And the cholesterol levels in the blood of those original rabbits fed pure cholesterol were more than five times what is seen
in an average person today. It wasn’t a realistic comparison.  

Further conviction that cholesterol was the villain was described by a Norwegian physician, Dr. Carl Muller, in 1937. He discovered a condition called familial hypercholesterolemia. He associated the physical signs, high cholesterol levels and heredity traits which resulted in atherosclerotic disease at a very young age.

Then, American scientist Dr. John Goffman (the father of clinical lipidology) discovered HDL and LDL cholesterol in 1950-51. This cemented in people’s minds that cholesterol and CVD were linked. By 1951, dietary cholesterol as the cause of atherosclerosis was well accepted as fact by the majority of the scientific community.

Between 1950 and 1955, American scientist Dr. Pete Ahrens showed that the consumption of SFA raised serum cholesterol. However, as his research continued over the next two decades, Ahrens showed a varied response of serum cholesterol to SFA consumption. In fact, he was critical of those claiming a link between SFA and CVD, pointing out the lack of scientific evidence for benefits of a low-fat diet.

Research of Ancel Keys – the seven countries study
By the 1950s and ‘60s, heart disease had become an epidemic, and everyone was looking for the link between diet and coronary artery disease. Dr. Ancel Keys, a biologist and pathologist, formulated the diet-heart hypothesis and stated very persuasively that dietary fat was the cause of atherosclerotic disease and obesity. He also advocated for the Mediterranean diet. Looking back, his hypothesis was formulated without any evidence by today’s standards.

Keys is well known for the seven countries study (i.e. USA, Finland, Yugoslavia, Japan, Netherlands, Italy, Greece), in which the intake of dietary fat seemed to mirror rates of CVD. However, less well known is the criticism of the study that Keys was selective in the seven countries he chose to report on. With the analysis of the full dataset (21 countries), the relationship between fat intake and heart disease was less clear, and current analyses have shown the opposite effect. When Keys became a member of the American Heart Association nutrition committee in 1961, his diet-heart hypothesis was adopted by the association. Their nutrition guidelines for adults advised the public to eat less total fat and less SFA, while acknowledging that further study was needed before this could be accepted as fact.

The McGovern report
In 1977, the low-fat diet hypothesis became political when Senator George McGovern and the Select Committee on Nutrition and Human Needs published the Dietary Goals for the United States. The McGovern Report urged the public to cut SFA. Scientists challenged the report in congressional hearings stating the findings were not based on sufficient evidence. However, the recommendations stuck. Senator McGovern replied to the criticism: “Senators don’t have the luxury that the research scientist does of waiting until every last shred of evidence is in.”
**Dietary Guidelines for Americans/Canadians**

The Dietary Guidelines for Americans from 1980 to 2015, which were reviewed and updated every five years, consistently advised the public to reduce fat, especially SFA, and cholesterol. In 2015, based on lack of scientific evidence, the US Dietary Guidelines Advisory Committee acknowledged that dietary cholesterol was not a nutrient of concern for overconsumption. The recommendation from previous dietary guidelines to cap dietary cholesterol at 300 mg/day was removed. The current guidelines still recommend a reduction in total fat and SFA despite no evidence for this.

Canada’s Food Guide, starting in 1977 and continuing up to, and including, the latest edition in 2007, encourages people to choose lower fat options to reduce the total amount of fat in their diet including SFA and trans fat. No evidence has been provided to explain this recommendation.

**Low-fat products**

Despite a lack of scientific evidence, the recommendation to reduce dietary fat led to a proliferation of processed foods labelled “low fat.” From 1970 – 2000, the production of low-fat products became big business. Although these types of products are lower in fat, they aren’t necessarily healthy; often they are highly processed and high in calories, sodium and sugar.

**Research of Zoe Harcombe**

In 2015, Dr. Zoe Harcombe published a meta-analysis of published randomized controlled trials from 1977, the time of the McGovern Report, and 1983, when the United Kingdom National Advisory Committee on Nutritional Education published dietary recommendations for the British public.

Harcombe examined seven randomized controlled trials from those times and found no supporting evidence that dietary interventions, such as lowering total fat and SFA, decreased mortality from all causes or causes related to heart disease. In other words, using the modern scientific technique of systematic review, Dr. Harcombe showed the US and UK guidelines of the late 1970s and early 1980s were made without any scientific evidence.

**Evolving evidence**

Because it was initially thought that SFA may have a negative impact on heart disease and stroke, public policy and guidelines were created before evidence-based science was clear. The evidence has evolved as more specific, better quality research has been done. As of 2017, evidence regarding the relationship between dietary fat and CVD indicates the following:

- The consumption of industrial trans fats increases CVD. \(^\text{12}\)
- There is no reduction in CVD by reducing overall fat. \(^\text{13}\)
- The literature is unclear whether reducing SFA has an impact on CVD (Table 1). Replacing SFA with refined carbohydrates does not reduce CVD and may in fact increase risk.
- Replacing SFA with unsaturated fat may: reduce CVD, have no effect on, or increase CVD (Table 1).
- Eating dairy saturated fat may decrease, or have a neutral association with, CVD \(^\text{14}\) (Table 2). The dairy paradox is that consumption of higher fat dairy decreases the risk of obesity.

*Source: istock.com/Romolo Tavani*
and possibly decreases cardiovascular risk. The reasons have not been determined.

- There is no increase in CVD from eating cholesterol-rich foods, including eggs and butter.15-17

Table 1: Summary of SFA and CVD Studies

<table>
<thead>
<tr>
<th>Study</th>
<th>Finding</th>
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<tbody>
<tr>
<td>Wang et al. 2016</td>
<td>SFA and trans fat associated with increased all cause mortality, and MUFA and PUFA associated with less all cause mortality.</td>
</tr>
<tr>
<td>Hooper et al. 2015</td>
<td>Replacing SFA with PUFA reduced CVD events by 17% in a large meta-analysis of RCT, but not overall or CVD mortality. No effect if SFA replaced with protein or carbs.</td>
</tr>
<tr>
<td>de Souza et al. 2015</td>
<td>SFA not associated with all cause mortality, CVD, CHD, stroke, or DM2. Trans fat associated with all cause mortality, total CHD and CHD mortality, probably because of increased industrial trans fat.</td>
</tr>
<tr>
<td>Harcombe et al. 2015</td>
<td>Meta-analysis of RCT available at the time the US and UK government issued their dietary fat guidelines (1977 and 1983) showed no evidence from RCT at the time of issuing guidelines.</td>
</tr>
<tr>
<td>Chowdhury et al. 2014</td>
<td>No evidence to support reducing dietary SFA in a very large meta-analysis, but heavily criticized.</td>
</tr>
<tr>
<td>Ramsden et al. 2013</td>
<td>Replacing SFA with a common PUFA increased death and CVD.</td>
</tr>
<tr>
<td>de Oliveira 2012</td>
<td>Higher intake of dairy SFA associated with lower CVD risk, a higher intake of meat SFA was associated with greater CVD risk.</td>
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<tr>
<td>Mozaffarian 2010</td>
<td>19% reduction in CHD events by replacing SFA with PUFA.</td>
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<tr>
<td>Siri-Tarino 2010</td>
<td>No significant evidence that dietary SFA associated with an increased risk of CHD or CVD.</td>
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<tr>
<td>Danaei 2009</td>
<td>Intervention studies replacing SFA with PUFA showed an insignificant relative risk (1.01-1.04) for IHD.</td>
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<tr>
<td>Mente 2009</td>
<td>Insignificant effect of replacing SFA with PUFA.</td>
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Legend:
- SFA – saturated fat
- MUFA – monounsaturated fat
- PUFA – polyunsaturated fat
- CVD – cardiovascular disease
- CHD – coronary heart disease
- DM2 – diabetes mellitus type 2
- RCT – randomized controlled trials
- IHD – ischemic heart disease

**Table 2: Summary of Dairy SFA and CVD Studies**

<table>
<thead>
<tr>
<th>Study</th>
<th>Finding</th>
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<tr>
<td>Alexander et al. 2016</td>
<td>Meta-analysis of dairy intake and CVD, CHD and stroke by using prospective cohort studies. Trend toward less CVD and CHD with increase in dairy consumption, not statistically significant, but significant for stroke (not focussed on SFA).</td>
</tr>
<tr>
<td>Qin et al. 2015</td>
<td>Dairy consumption reduced overall risk of CVD and stroke. No association with CHD. Stroke was reduced by low-fat dairy and cheese and CHD risk was significantly lowered by cheese consumption.</td>
</tr>
<tr>
<td>Hu et al. 2015</td>
<td>Meta-analysis of prospective cohort studies of dairy foods ad risk of stroke finding that dairy consumption reduces risk of stroke (not focussed on SFA).</td>
</tr>
<tr>
<td>de Oliveira 2012</td>
<td>Higher intake of dairy saturated fat was associated with lower CVD risk, a higher intake of meat SFA was associated with greater CVD risk.</td>
</tr>
<tr>
<td>Kratz et al. 2012</td>
<td>Review of observational studies. High-fat dairy consumption associated with a decrease in obesity, and did not show an effect on CVD or diabetes.</td>
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<tr>
<td>Rosell et al. 2006</td>
<td>Intakes of whole milk and cheese were inversely associated with weight gain as measured by BMI.</td>
</tr>
<tr>
<td>Drouin-Chartier JP et al. 2016</td>
<td>A systematic review of dairy intake and CVD found dairy consumption had either a neutral or favourable assoc. on cardiometabolic-related outcomes.</td>
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Legend:
- BMI – body mass index

Table 1 and 2 are adapted from Dr. Samis’s presentation Saturated Fat and Cardiovascular Disease: Then and Now, Nutrition File® Seminar. January 30, 2017. Edmonton, AB.

**Overall diet quality matters most**

While Dr. Samis concludes the approach to promoting a cardiovascular-healthy diet be evidenced-based, he acknowledges the literature is still in a state of flux.

His key message is that overall diet quality has more impact on heart health than any single nutrient, and this is supported by the Heart & Stroke Foundation that offers this position statement: Saturated Fat, Heart Disease and Stroke.
Furthermore, a healthy, balanced eating plan consists of the following:  

- vegetables and fruit - Dr. Samis believes this is the key component  
- whole grains (e.g. wheat, barley, oats, brown rice, quinoa, millet, wild rice)  
- proteins from a variety of sources:  
  - beans and lentils  
  - nuts and seeds  
  - lower fat dairy products or alternatives – Dr. Samis does not believe in specifying lower fat dairy, but rather all dairy, as high-fat dairy foods are neutral or favourably associated with CVD  
  - lean meats, poultry and fish  

The one unifying message relating diet to CVD that is now supported by science is to avoid highly processed or refined food (Figure 1). Dr. Samis and many dietitians encourage people to eat a diet based on whole, unprocessed foods, in appropriate portion sizes, which can decrease the risk for heart disease and stroke. 

This issue of Nutrition File® for Health Educators was reviewed by Dr. Andrew Samis, MD, PhD, FRCSC, FACS.

View the complete list of references or read past issues.

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