

Heart attack on a plate? The truth about saturated fat

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New Scientist #2980, 2 August 2014

After decades of health warnings, the idea that steak, cheese and lard are bad for your heart is melting away. The truth is more complex – and delicious.

THERE'S a famous scene in Woody Allen's film *Sleeper* in which two scientists in the year 2173 are discussing the dietary advice of the late 20th century.

"You mean there was no deep fat, no steak or cream pies or hot fudge?" asks one, incredulous. "Those were thought to be unhealthy," replies the other. "Precisely the opposite of what we now know to be true."

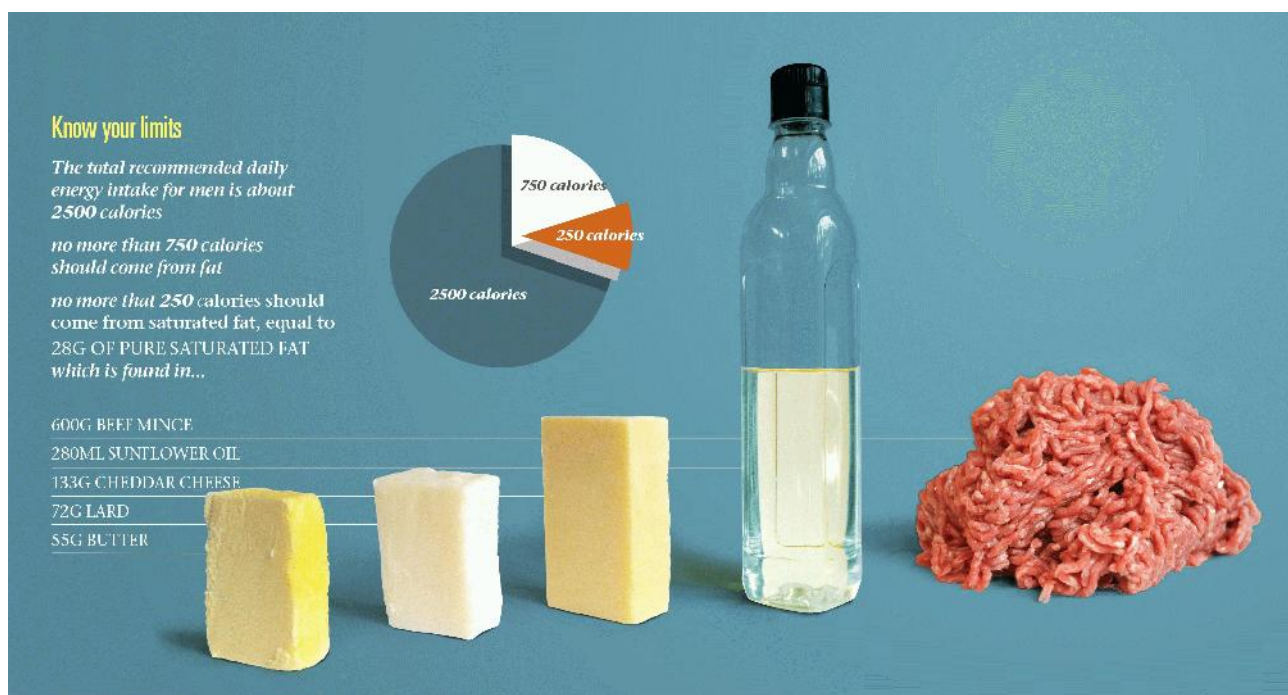
We're not quite in Woody Allen territory yet, but steak and cream pies are starting to look a lot less unhealthy than they once did. After 35 years as dietary gospel, the idea that saturated fat is bad for your heart appears to be melting away like a lump of butter in a hot pan.

So is it OK to eat more red meat and cheese? Will the current advice to limit saturated fat be overturned? If it is, how did we get it so wrong for so long?

The answers matter. According to the World Health Organization, cardiovascular disease is the world's leading cause of death, killing more than 17 million people annually, about a third of all deaths. It predicts that by 2030, 23 million will succumb each year. In the US, an estimated 81 million people are living with cardiovascular disease. The healthcare bill is a small fortune.

The idea that eating saturated fat – found in high levels in animal products such as meat and dairy – directly raises the risk of a heart attack has been a mainstay of nutrition science since the 1970s. Instead, we are urged to favour the "healthy" fats found in vegetable oils and foods such as fish, nuts and seeds.

In the US the official guidance for adults is that no more than 30 per cent of total calories should come from fat, and no more than 10 per cent from saturated fat (see diagram below). UK advice is roughly the same. That is by no means an unattainable target: an average man could eat a whole 12-inch pepperoni pizza and still have room for an ice cream before busting the limit. Nonetheless, adults in the UK and US manage to eat more saturated fat than recommended.



We used to eat even more. From the 1950s to the late 1970s, fat accounted for more than 40 per cent of dietary calories in the UK. It was a similar story in the US. But as warnings began to circulate, people trimmed back on foods such as butter and beef. The food industry responded, filling the shelves with low-fat cookies, cakes and spreads.

So the message got through, at least partially. Deaths from heart disease have gone down in Western nations. In the UK in 1961 more than half of all deaths were from coronary heart disease; in 2009 less than a third were. But medical treatment and prevention have improved so dramatically it's impossible to tell what role, if any, changes in diet played. And even though fat consumption has gone down, obesity and its associated diseases have not.

To appreciate how saturated fat in food affects our health we need to understand how it is handled by the body, and how it differs from other types of fat.

When you eat fat, it travels to the small intestine where it is broken down into its constituent parts – fatty acids and glycerol – and absorbed into cells lining the gut. There they are packaged up with cholesterol and proteins and posted into the bloodstream. These small, spherical packages are called lipoproteins, and they are what allow water-insoluble fats and cholesterol (together known as lipids) to get to where they are needed.

The more fat you eat, the higher the levels of lipoprotein in your blood. And that, according to conventional wisdom, is where the health problems begin.

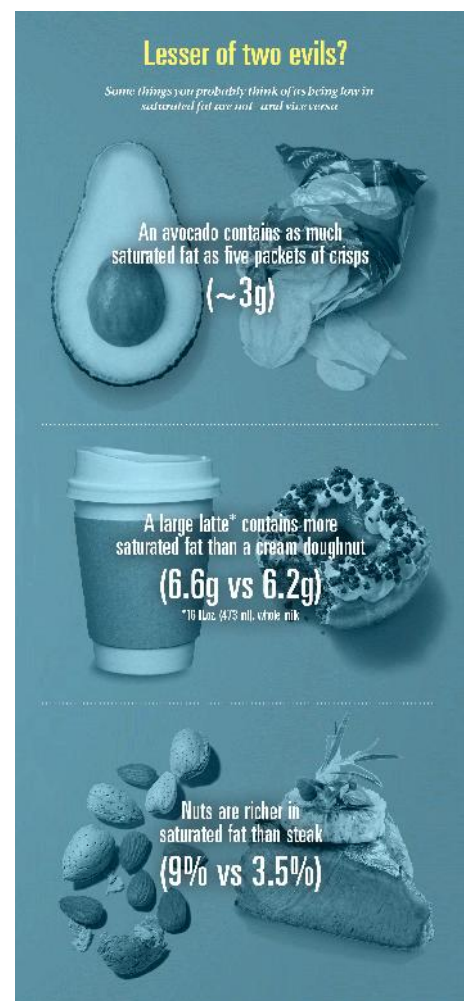
Good and bad cholesterol

Lipoproteins come in two main types, high density and low density. Low-density lipoproteins (LDLs) are often simply known as "bad cholesterol" despite the fact that they contain more than just cholesterol. LDLs are bad because they can stick to the insides of artery walls, resulting in deposits called plaques that narrow and harden the vessels, raising the risk that a blood clot could cause a blockage. Of all types of fat in the diet, saturated fats have been shown to raise bad cholesterol levels the most. (Consuming cholesterol has surprisingly little influence: the reason it has a bad name is that it is found in animal foods that also tend to be high in saturated fat.)

High-density lipoproteins (HDLs), or "good cholesterol", on the other hand, help guard against arterial plaques. Conventional wisdom has it that HDL is raised by eating foods rich in unsaturated fats or soluble fibre such as whole grains, fruits and vegetables. This, in a nutshell, is the lipid hypothesis, possibly the most influential idea in the history of human nutrition.

The hypothesis traces its origins back to the 1940s when a rising tide of heart attacks among middle-aged men was spreading alarm in the US. At the time this was explained as a consequence of ageing. But Ancel Keys, a physiologist at the University of Minnesota, had other ideas.

Keys noted that heart attacks were rare in some Mediterranean countries and in Japan, where people ate a diet lower in fat. Convinced that there was a causal link, he launched the pioneering Seven Countries Study in 1958. In all, he recruited 12,763 men aged 40 to 59 in the US, Finland, The Netherlands, Italy, Yugoslavia, Greece and Japan. The participants' diet and heart health were checked five and 10 years after enrolling.



Keys concluded that there was a correlation between saturated fat in food, raised levels of blood lipids and the risk of heart attacks and strokes. The lipid hypothesis was born.

The finding was supported by other research, notably the Framingham Heart Study, which tracked diet and heart health in a town in Massachusetts. In light of this research and the rising toll – by the 1980s nearly a million Americans a year were dying from heart attacks – health authorities decided to officially push for a reduction in fat, and saturated fat in particular. Official guidelines first appeared in 1980 in the US and 1991 in the UK, and have stood firm ever since.

Yet the voices of doubt have been growing for some time. In 2010, scientists pooled the results of 21 studies that had followed 348,000 people for many years. This meta-analysis found "no significant evidence" in support of the idea that saturated fat raises the risk of heart disease (American Journal of Clinical Nutrition, vol 91, p 535).

The doubters were given a further boost by another meta-analysis published in March (Annals of Internal Medicine, vol 160, p 398). It revisited the results of 72 studies involving 640,000 people in 18 countries.

To the surprise of many, it did not find backing for the existing dietary advice. "Current evidence does not clearly support guidelines that encourage high consumption of polyunsaturated fatty acids and low consumption of total saturated fats," it concluded. "Nutritional guidelines... may require reappraisal."

In essence, the study found that people at the extreme ends of the spectrum – that is, those who ate the most or least saturated fat – had the same chance of developing heart disease. High consumption of unsaturated fat seemed to offer no protection.

The analysis has been strongly criticised for containing methodological errors and omitting studies that should have been included. But the authors stand by their general conclusions and say the paper has already had the intended effect of breaking the taboo around saturated fat.

Green light

Outside of academia, its conclusion was greeted with gusto. Many commentators interpreted it as a green light to resume eating saturated fat. But is it? Did Keys really get it wrong? Or is there some other explanation for the conflict between his work and the many studies that supported it, and the two recent meta-analyses?

Even as Keys's research was starting to influence health advice, critics were pointing out flaws in it. One common complaint was that he cherry-picked data to support his hypothesis, ignoring countries such as France which had high-fat diets but low rates of heart disease. The strongest evidence in favour of a low-fat diet came from Crete, but it transpired that Keys had recorded some food intake data there during Lent, a time when Greek people traditionally avoid meat and cheese, so he may have underestimated their normal fat intake.

The Framingham research, too, has its detractors. Critics say that it followed an unrepresentative group of predominantly white men and women who were at high risk for heart disease for non-dietary reasons such as smoking.

More recently, it has also become clear that the impact of saturated fat is more complex than was understood back then.

Ronald Krauss of the University of California, San Francisco, has long researched the links between lipoprotein and heart disease. He was involved in the 2010 meta-analysis and is convinced there is room for at least a partial rethink of the lipid hypothesis.

He points to studies suggesting that not all LDL is the same, and that casting it all as bad was wrong. It is now widely accepted that LDL comes in two types – big, fluffy particles and smaller, compact ones. It is the latter, Krauss says, that are strongly linked to heart-disease risk, while the fluffy ones appear a lot less risky. Crucially, Krauss says, eating saturated fat boosts fluffy LDL. What's more, there is some research suggesting small LDL gets a boost from a low-fat, high-carbohydrate diet, especially one rich in sugars.

Why might smaller LDL particles be riskier? In their journey around the bloodstream, LDL particles bind to cells and are pulled out of circulation. Krauss says smaller LDLs don't bind as easily, so remain in the blood for longer – and the longer they are there, the greater their chance of causing damage. They are also more easily converted into an oxidised form that is considered more damaging. Finally, there are simply more of them for the same overall cholesterol level. And more LDLs equate to greater risk of arterial damage, Krauss says. He thinks that the evidence is strong enough for the health advice to change.

But Susan Jebb, professor of diet and population health at the University of Oxford, says it is too early to buy into this alternative model of LDLs and health. "The jury has to be out because relatively few of the studies have subdivided LDL. It may well be worth exploring, but right now I am not persuaded."

Jeremy Pearson, a vascular biologist and associate medical director at the British Heart Foundation, which part-funded the 2014 meta-analysis, agrees. He says the original idea that a diet high in saturated fat raises the risk of heart disease remains persuasive, and that there are other meta-analyses that support this. He also points to hard evidence from studies in animals, where dietary control is possible to a degree that it is not in people. They repeatedly show high saturated fat leads to high LDL and hardened arteries, he says.

So how does he explain the meta-analyses that cast doubt on the orthodoxy? "I guess what that means is that in free living humans there are other things that are usually more important regarding whether you have a heart attack or not than the balance of saturated and unsaturated fat in your diet," Pearson says. Factors such as lack of exercise, alcohol intake and body weight may simply overshadow the impact of fat.

Certainly, the debate cannot be divorced from the issue of overall calorie intake, which rose in the three decades from the 1970s in the US and many other countries. The result was rising numbers of overweight people. And being overweight or obese raises the risk of heart disease.

Another key factor might be what people now eat instead of saturated fat. "The effect of reducing saturated fat depends on what replaces it," says Walter Willett of the Harvard School of Public Health. "We consciously or unconsciously replace a large reduction in calories with something else."

The problem, as some see it, is that the something else is usually refined carbohydrates, especially sugars, added to foods to take the place of fat. A review in 2009 showed that if carbohydrates were raised while saturated fat cut, the outcome was a raised heart-disease risk. This plays to the emerging idea that sugar is the real villain.

Then there are trans fats. Created by food chemists to replace animal fats such as lard, they are made by chemically modifying vegetable oils to make them solid. Because they are unsaturated, and so "healthy" the food industry piled them into products such as cakes and spreads. But it later turned out that trans fats cause heart disease. All told, it is possible that the meta-analyses simply show that the benefits of switching away from saturated fat were cancelled out by replacing them with sugar and trans fats.

Meanwhile, science continues to unravel some intricacies of fat metabolism which could also help to account for the confusing results. One promising avenue is that not all types of saturated fat are the same. The 2014 meta-analysis, for example, found clear indications that different saturated fatty acids in blood are associated with different coronary risk. Some saturated fats appear to lower the risk; some unsaturated ones increase it.

Meat vs dairy

Although further big studies are needed to confirm these findings, lead author Rajiv Chowdhury, an epidemiologist at the University of Cambridge, says this is an avenue that might be worth exploring.

There is other evidence that not all saturated fats are the same. A study from 2012 found that while eating lots of saturated fat from meat increased the risk of heart disease, equivalent amounts from dairy actually reduced it. The researchers calculated that cutting calories from meaty saturated fat by just 2 per cent and replacing them with saturated fat from dairy reduces the risk of a heart attack or stroke by 25 per cent.

Krauss also cites studies showing that eating cheese does not raise bad cholesterol as much as eating butter, even when both have identical levels of saturated fat.

So could future advice say that saturated fat from dairy sources is less risky than that from meat, for example? Or urge us to favour cheese over butter? It's too early to say. Jebb is aware that the idea that some saturated fatty acids may be worse than others is gaining credence, but says it is far from being ready to guide eating habits.

Nonetheless, there is a growing feeling that we need to reappraise our thinking on fat.

Marion Nestle, professor of nutrition at New York University, says that studies of single nutrients have a fundamental flaw. "People do not eat saturated fat," she says. "They eat foods containing fats and oils that are mixtures of saturated, unsaturated and polyunsaturated fats, and many other nutrients that affect health and also vary in calories. So teasing saturated fat out of all that is not simple."

The only way to rigorously test the various hypotheses would be to put some people on one kind of diet and others on another for 20 years or more. "Doable? Fundable? I don't think so," says Nestle.

So where does that leave us? Is it time to reverse 35 years of dietary advice and stop worrying about fuzzing up our arteries?

Some nutritionists say yes. Krauss advocates a rethink of guidelines on saturated fat when a new version of the Dietary Guidelines for Americans is put together next year. He certainly believes that the even stricter limit on saturated fat recommended by the American Heart Association – that it constitute no more than 7 per cent of daily calorie intake – should be relaxed.

Others, though, strike a note of caution. Nestle says that the answer depends on context. "If calories are balanced and diets contain plenty of vegetables, foods richer in saturated fat should not be a problem. But that's not how most people eat," she says.

Jebb and Pearson see no reason to shift the guidance just yet, although Jebb says it may be time for a review of fat by the UK's Scientific Advisory Committee on Nutrition, which last visited the issue in 1991.

So while dietary libertarians may be gleefully slapping a big fat steak on the griddle and lining up a cream pie with hot fudge for dessert, the dietary advice of the 1970s still stands – for now. In other words, steak and butter can be part of a healthy diet. Just don't overdo them.

The skinny on saturated fat

What is a fat?

Fats are complex biomolecules that play various roles in the body, including energy storage and as components of cell membranes. A fat molecule is made up of three fatty acids bound to a molecule of glycerol. This unit is known as a triglyceride. There are dozens of different types of fatty acid, all with different properties, including whether they are saturated or unsaturated.

What does saturated/unsaturated mean?

The bulk of a fatty acid is a long string of carbon atoms with hydrogen atoms attached. In a saturated fatty acid, this chain does not have any carbon-carbon double bonds, meaning it has the maximum possible number of hydrogens: it is "saturated". Unsaturated fatty acids have at least one double bond.

Triglycerides containing only saturated fatty acids are also called saturated; those with one or more double-bonded acids are unsaturated. As a rule, the more unsaturated a fat, the better it is for you – though this orthodoxy is being challenged.

What about animal and vegetable fats?

Fats from animals tend to be saturated while those from vegetables are usually unsaturated. But this is only a rough guide. Meat, eggs and dairy contain unsaturated fats, while vegetables also contain saturated fats. Some vegetable fats – notably palm oil, coconut oil and the cocoa butter used in chocolate – are higher in saturated fat than beef dripping or lard. In short, both animals and plants contain saturated and unsaturated fat.

Is cholesterol a fat?

Strictly speaking, no. But it is a vital link between dietary fat and heart disease. Unlike saturated fat, cholesterol is almost exclusively found in animal products: meat, fish, seafood, milk and eggs. Cutting the cholesterol in your diet doesn't have much direct effect on blood cholesterol levels but can help indirectly because cutting down on cholesterol-rich foods will usually reduce your saturated fat intake.

Are some fats more fattening than others?

No. A gram of unsaturated fat contains just as much energy as a gram of saturated fat (about 9 calories, compared with about 4 in a gram of sugar). So in terms of calories, there are no "good" and "bad" fats.

Surprise fats

The bad news

- The oil highest in saturated fat is actually a vegetable oil – coconut oil. It's 87% saturated fat
- 150 g of milk chocolate contains more saturated fat than you should eat in a day (28g)
- Coconut has more saturated fat in it than minced lamb (30% vs 10%)
- Olive oil contains almost as much saturated fat as margarine (14% vs 17%)

The good news

- Beef dripping is just 50 per cent saturated fat
- Lard contains more unsaturated fat than saturated (56% vs 39%)
- Eggs are only about 3% saturated fat