

Monounsaturated Fat vs Saturated Fat: Effects on Cardio-Metabolic Health and Obesity

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The intake of foods higher in monounsaturated fats compared to foods higher in saturated fat may reduce body weight, body fat and insulin resistance when consumed on top of a diet moderate to high in carbohydrates.

Abstract

For over 40 years saturated fat, the fat found primarily in animal foods, was thought to be the main culprit for increasing cholesterol levels and causing heart disease. During this same time vegetable oils were promoted as being heart healthy because they could lower cholesterol. However, recently the evidence implicating saturated fat as being harmful to heart health has been challenged and more studies are beginning to show the harms from consuming industrially produced vegetable oils. Furthermore, monounsaturated fats, found in olives, olive oil, certain nuts and avocados have been promoted as being part of a healthy Mediterranean diet. This paper will provide a brief review comparing the effects of saturated fat to monounsaturated fat.

Introduction: Quick primer on fats

Dietary fats are generally categorized into three subsets, saturated, monounsaturated, and polyunsaturated. A saturated fat has zero double bonds in its carbon chain, whereas monounsaturated

fat (such as oleic acid found in olive oil) has one double-bond, and polyunsaturated fats have more than one double-bond. There are numerous types of saturated fats such as small, medium, and long-chain saturated fats and different types of polyunsaturated fats. Below we will review the studies comparing saturated fat to monounsaturated fat.

Saturated Fat versus Monounsaturated Fat: Science Clear as Mud

There is a fairly large body of evidence in the scientific literature comparing saturated fat to monounsaturated fat (MUFA). The Kanwu study assigned 162 healthy people from five different countries to a diet high in either saturated fat or MUFA, but with both diets having the same total number of calories.¹ In the group eating more saturated fat, insulin sensitivity worsened a small amount, while no change occurred in the group eating more MUFA. A more interesting finding was that while individuals whose diet was 37% fat or higher (meaning, 37% or more of total calories coming from fat) there was no significant change in insulin sensitivity, individuals whose diets were lower



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in fat did show a change: insulin sensitivity was 12.5% worse on the saturated fat diet and 8.8% better on the MUFA diet. On the lower fat diet, when more of the fat came from saturated fat, insulin sensitivity worsened, while it improved when more of the diet came from MUFA.

Different foods were consumed in each group in this study and thus a direct comparison between saturated fat and MUFA cannot be directly made in the study. Thus, the changes in insulin sensitivity could have been the result of differences in the food sources, themselves, rather than solely the type of fat they contain. Moreover, the diets in the Kanwu study were high in carbohydrates (around 45% of total calories coming from carbs). Thus, the Kanwu study showed that in people eating a relatively high-carbohydrate diet, when total fat intake is low, insulin sensitivity might worsen slightly when foods higher in MUFA are replaced by foods higher in saturated fat. To put this in context, the mean dietary intake of carbohydrates for American adults ≥ 20 years of age is 46% for males and 48% for females. The Dietary Guidelines for Americans recommends that carbohydrates comprise 45 to 65% of total daily calories consumed.

What might the effect of replacing saturated fats with monounsaturated fats be among people following low-carbohydrate diets? Would the effects be different if the saturated fats came from coconut oil and lamb tallow as compared to butter and cheese? How about if the monounsaturated fats came from macadamia nuts and avocado, as compared to olive oil? The effects might well be different, and the findings of such studies—if anyone ever decides to do them—shouldn't be extrapolated to diets where the fats come from other foods.

Food sources do matter. Palm oil, in particular, seems to induce hyperinsulinemia when added to a diet high in sugar.² In a study in healthy adults, a diet high in saturated palmitic acid (about 17% palmitic acid in a diet with 40% of total calories from fat) led to decreases in energy expenditure and the use of fat for energy. In the same study, people following a diet higher in monounsaturated oleic acid (31% oleic acid; 40% of total calories from fat) showed a slight increase in both the daily energy expenditure and the use of fat for fuel.³ The high palmitic acid group also had a greater increase in body fat compared to the high oleic acid group. Thus, eating foods higher in monounsaturated fat compared to foods higher in saturated fat may have some benefits in the context of a moderately high carbohydrate

intake—46% of total calories from carbohydrates, where replacing saturated fats with monounsaturated fats might lead to less body fat gain.

In another study comparing different proportions of fat in people's diets, a small group of obese but non-diabetic subjects followed one of three diets: 1) MUFA diet moderately high in fat (35-45% of total calories from fat, of which MUFA was $> 20\%$); 2) Low-fat diet (20-30% of total calories from fat); or 3) Control diet (35% of total calories from fat, of which saturated fat was $> 15\%$).⁴ Compared to the MUFA diet, the control diet (high in saturated fat) significantly increased fasting glucose, fasting insulin and HOMA-IR (a measurement of insulin resistance), whereas only very small changes in these parameters were observed in the low-fat diet or the MUFA diet. However, the MUFA diet was a low-glycemic diet, whereas the low-fat diet was medium-glycemic and the control diet was high-glycemic. Thus, the diet that seemed to be the best for blood sugar control and healthy insulin levels had an overall low glycemic impact compared to the other diets. With these confounding factors, it's impossible to conclude that the beneficial effects of the MUFA diet were due solely to the presence of monounsaturated fats and not due to the absence of high-glycemic foods. Moreover, these results were, again, on top of a moderately high-carbohydrate intake. Many studies make the same mistake, comparing the effects on insulin in people consuming MUFAs versus saturated or trans fats in the context of a diet that is 50% carbohydrate.⁵ It's impossible to say whether adverse effects on insulin are due to the change in the type of fat, or due to some way in which the different types of fat interact with a large amount of carbohydrate. Moreover, the MUFA diet was 45% carbohydrate, the control (high saturated fat) diet was 50% carbs, and the low-fat diet was 60% carbohydrate. Thus, the apparently beneficial MUFA diet was lowest not just in glycemic impact, but in total carbohydrate content as well. Whatever the results from a study like this—good, bad, or indifferent—where multiple factors regarding both fats and carbohydrates are altered (but all the diets tested are still high in carbohydrates), the findings cannot automatically be extrapolated to people following low-carb diets.

All this being said, monounsaturated fat may, in fact, have a slight edge over saturated fat in certain areas. In a study that followed overweight or obese men who ate a diet high in saturated fat and then switched to a diet where fat was predominately MUFA (or vice-



Sources of monounsaturated fats.

versa), and each diet was followed for four weeks, the men lost weight (and lost more body fat, as opposed to losing muscle) while on the MUFA diet than on the saturated fat diet, even though they ate the same number of calories.⁶ Sources of fat in the saturated-rich diet were milk, butter, cheese and fatty meat, whereas the MUFA-rich diet contained olive oil, nuts, and avocados. All food was provided to the subjects by the researchers, and no other food was permitted. The study authors concluded, “Substituting dietary saturated with unsaturated fat, predominantly MUFA, can induce a small but significant loss of body weight and fat mass without a significant change in total energy or fat intake.”⁶

These results occurred on top of a diet where carbohydrates supplied around 42% of total calories, and fat made up approximately 40% of calories. We can't say that these results would apply equally to people following a low-carb diet, but the evidence implies that for people eating a moderate amount of carbohydrate, replacing saturated fat with MUFA may help promote weight loss—specifically, fat loss, and will improve insulin sensitivity, even if one consumes same number of calories and the same amount of total fat as they were before.

There are other benefits to replacing saturated fat with monounsaturated fat. Subjects report feeling more physically energetic while following the MUFA-rich diet than while following the diet higher in saturated fat. Higher energy levels could potentially translate into becoming more physically active. Another noteworthy benefit of switching from saturated to monounsaturated fats was a significant decrease in mean arterial blood pressure. On the high saturated fat diet, mean arterial pressure increased by 1.5 mmHg, while it was decreased by 5.6 mmHg on the MUFA diet. These blood pressure changes might have been even more substantial if the subjects followed the diet for months, rather than weeks.

As for the loss in body fat, it wasn't just the amount of body fat that changed, but where it's stored in the body. While subjects on the MUFA-rich diet lost 3.75 pounds (1.7 kg) of fat (despite still eating a relatively high amount of carbs), subjects on the saturated fat diet gained 1 kg, and most of this fat was deposited in the abdomen (i.e., dangerous visceral fat).

The overall evidence suggests that, in the context of a diet moderately high in carbohydrate, consuming monounsaturated fats as compared to saturated fats leads to greater fat burning, increased satiety, reduced

Table 1. MCTs lead to a higher post-meal increase in thermogenesis.

Effects of Consuming Less Saturated Fat and More Monounsaturated Fat in the Context of a Diet Moderate-to-High in Carbohydrates ^{6, 10, 15, 16}	
Greater weight loss and greater fat loss	Less loss of muscle and lean tissue
Reduced blood pressure	Greater post-meal fat oxidation (burning fat, rather than burning carbohydrate)
Lower post-meal triglycerides	Higher post-meal HDL

body fat (particularly abdominal fat), and improved insulin sensitivity. This may be why many people living in the Mediterranean manage to stay slim and healthy while enjoying bread and pasta: first, while they do enjoy these foods, they don't gorge on them, and second, when they do eat them, they're often accompanied by a generous drizzle of olive oil. Nuts are also rich in MUFA and PUFA and are an essential feature of the traditional Mediterranean diet. In randomized controlled trials, a Mediterranean diet enriched with either nuts or extra-virgin olive oil produced cardiometabolic benefits including improvements in insulin sensitivity, cholesterol, inflammation, and vascular reactivity, and reductions in myocardial infarction, stroke and cardiovascular death.⁷

A large analysis of fifty epidemiological and randomized controlled studies encompassing over 500,000 people found that adherence to a Mediterranean diet can improve waist circumference, HDL, triglycerides, blood pressure, and blood glucose levels.⁸ All of these factors are criteria for diagnosing insulin resistance and metabolic syndrome, so dietary changes that improve these are a good thing. The overall evidence in the scientific literature indicates that consuming more foods high in MUFA, and fewer foods high in saturated fat may be a beneficial change, especially if one is eating moderate to high amount of carbohydrates.

How does MUFA Beat Saturated Fat for Weight Loss?

Some of the studies we have discussed involved changes to the types of fat people ate, and the subjects lost body fat even though they were eating the same number of calories. How is this possible? If they were

taking in the same amount of energy, and all that really changed was where that energy came from—for example, olive oil instead of butter—how did they lose weight?

One answer may be that oleic acid (the predominant fat in olive oil) has a greater oxidation rate than stearic acid (a saturated fat found in beef and chocolate).⁹ A fat that has a higher oxidation rate liberates more energy and can thus reduce subsequent food intake due to increased satiety. In other words, if you get more energy from one type of fat than from another, eating that first fat is likely to leave you more satisfied and feeling less hungry later on. But there's more to it than that.

Fat loss doesn't just come from eating less. The change from saturated to monounsaturated fat in people's diets seems to actually increase fat burning at the cellular level. A study looking at the use of fat for energy (as opposed to carbohydrate) showed that, during the five hours after a meal whose main fat was olive oil, subjects burned more fat for energy than subjects whose meal fat source was cream.¹⁰ In subjects with a large waist circumference (an indicator of insulin resistance), there was a significant increase in the thermic effect of food with the MUFA-rich meal versus the SFA-rich meal. The thermic effect of food is the amount of energy your body uses—that is, how many calories you burn—just to digest and metabolize that food, and it contributes to your overall metabolic rate.

The amount of energy required to process MUFA seems to be higher than that for saturated fat (again, in the presence of a moderate amount of carbohydrate), which may partially explain why studies have shown increased weight loss—and specifically, increased fat loss—with diets that are higher in MUFA compared to diets higher in saturated fat. For overall better health, it's fat loss that's important, and not necessarily weight

loss, as the goal is to lose body fat, rather than bone, connective tissue, or muscle.

These findings—that fat burning and the thermic effect of food are higher from monounsaturated fat than from saturated fat—have been replicated in multiple studies.¹¹ This even holds true for obese postmenopausal women, a group that has a notoriously difficult time losing weight. One study showed that, after consuming meals with equal calories, but one with fat coming from olive oil, and the other with fat coming from cream, women who ate the olive oil meal had higher rates of fat oxidation after the meal.¹² Meaning, in the hours after the meal, these women used more fat for cellular energy rather than carbohydrate—and if you want to lose fat, you've got to burn fat. In this study, among the obese women, the thermic effect of food (called “diet-induced thermogenesis”) was significantly higher in the meal containing olive oil versus the meal containing cream—5.1% vs. 2.5%—approximately double.¹²

While many people lose body fat on low-carb diets, many do not like following these diets for prolonged periods of times. In individuals who consume moderate amounts of carbohydrates, getting more dietary fats from MUFA might help with fat loss and improved insulin sensitivity compared to getting more fat from saturated sources. Thus, strategic fats for a higher carbohydrate diet include more nuts, olive oil, and avocados, and less fatty meat, full-fat dairy (cheese, milk, butter) and chocolate.

One study found greater weight loss in people using MCTs compared to olive oil as part of a weight loss program.¹³ Another study showed that, compared to a margarine enriched in long-chain saturated fats, consuming a margarine enriched with MCTs led to greater decreases in total body fat and visceral fat after 12 weeks.¹⁴ The authors speculated that MCTs lead to a higher post-meal increase in thermogenesis. Table 1 summarizes the effects of consuming less saturated fat and more monounsaturated fat in the context of a diet moderate-to-high in carbohydrates.^{6, 10, 15, 16}

Conclusion

The intake of foods higher in MUFA compared to foods higher in saturated fat may reduce body weight, body fat and insulin resistance when consumed on top of a diet moderate to high in carbohydrates. Further studies should be performed in individuals consuming low-carbohydrate diets to see if these effects would apply to these situations.

References

- 1 Vessby B, Uusitupa M, Hermansen K, et al. Substituting dietary saturated for monounsaturated fat impairs insulin sensitivity in healthy men and women: The KANWU Study. *Diabetologia* 2001;44:312-9.
- 2 Ikemoto S, Takahashi M, Tsunoda N, et al. High-fat diet-induced hyperglycemia and obesity in mice: differential effects of dietary oils. *Metabolism: clinical and experimental* 1996;45:1539-46.
- 3 Kien CL, Bunn JY, Ugrasbul F. Increasing dietary palmitic acid decreases fat oxidation and daily energy expenditure. *The American journal of clinical nutrition* 2005;82:320-6.
- 4 Due A, Larsen TM, Hermansen K, et al. Comparison of the effects on insulin resistance and glucose tolerance of 6-mo high-monounsaturated-fat, low-fat, and control diets. *The American journal of clinical nutrition* 2008;87:855-62.
- 5 Christiansen E, Schnider S, Palmvig B, et al. Intake of a diet high in trans monounsaturated fatty acids or saturated fatty acids. Effects on postprandial insulinemia and glycemia in obese patients with NIDDM. *Diabetes Care* 1997;20:881-7.
- 6 Piers LS, Walker KZ, Stoney RM, et al. Substitution of saturated with monounsaturated fat in a 4-week diet affects body weight and composition of overweight and obese men. *Br J Nutr* 2003;90:717-27.
- 7 O'Keefe JH, Torres-Acosta N, O'Keefe EL, et al. A Pesco-Mediterranean Diet With Intermittent Fasting: JACC Review Topic of the Week. *Journal of the American College of Cardiology* 2020;76:1484-93.
- 8 Kastorini CM, Milionis HJ, Esposito K, et al. The effect of Mediterranean diet on metabolic syndrome and its components: a meta-analysis of 50 studies and 534,906 individuals. *Journal of the American College of Cardiology* 2011;57:1299-313.
- 9 Jones PJ, Pencharz PB, Clandinin MT. Whole body oxidation of dietary fatty acids: implications for energy utilization. *The American journal of clinical nutrition* 1985;42:769-77.
- 10 Piers LS, Walker KZ, Stoney RM, et al. The influence of the type of dietary fat on postprandial fat oxidation rates: monounsaturated (olive oil) vs saturated fat (cream). *International journal of obesity and related metabolic disorders : journal of the International Association for the Study of Obesity* 2002;26:814-21.
- 11 Kien CL, Bunn JY. Gender alters the effects of palmitate and oleate on fat oxidation and energy expenditure. *Obesity (Silver Spring, Md)* 2008;16:29-33.
- 12 Soares MJ, Cummings SJ, Mamo JC, et al. The acute effects of olive oil v. cream on postprandial thermogenesis and substrate oxidation in postmenopausal women. *The British journal of nutrition* 2004;91:245-52.
- 13 St-Onge MP, Bosarge A, Goree LL, et al. Medium chain triglyceride oil consumption as part of a weight loss diet does not lead to an adverse metabolic profile when compared to olive oil. *Journal of the American College of Nutrition* 2008;27:547-52.
- 14 Nosaka N, Maki H, Suzuki Y, et al. Effects of margarine containing medium-chain triacylglycerols on body fat reduction in humans. *Journal of atherosclerosis and thrombosis* 2003;10:290-8.
- 15 Thomsen C, Storm H, Holst JJ, et al. Differential effects of saturated and monounsaturated fats on postprandial lipemia and glucagon-like peptide 1 responses in patients with type 2 diabetes. *The American journal of clinical nutrition* 2003;77:605-11.
- 16 Thomsen C, Rasmussen O, Lousen T, et al. Differential effects of saturated and monounsaturated fatty acids on postprandial lipemia and incretin responses in healthy subjects. *The American journal of clinical nutrition* 1999;69:1135-43.

Disclosure

JJD is Director of Scientific Affairs at Advanced Ingredients for Dietary Products. JOK is an owner of a nutraceutical company that sells omega-3 supplements.

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