MERCOLA
Take Control of Your Health

Keto Diet Risks Are Varied, Multiple Studies Show

Analysis by Dr. Joseph Mercola | November 05, 2026

STORY AT-A-GLANCE

- A ketogenic diet can improve weight loss, insulin sensitivity, and blood sugar control initially, but these gains typically level off after six to 12 months of adherence
- Long-term keto can elevate low-density lipoprotein (LDL) cholesterol levels, particularly during rapid weight loss, raising cardiovascular concerns especially in healthy young women following this diet
- Restricting carbohydrates eliminates healthy fruits, vegetables, and whole grains, raising the risk of deficiencies in essential vitamins (B-complex, A, E, K) and minerals like magnesium and potassium
- Extended ketogenic diet use has been associated with kidney stones, reduced bone mineral density, thyroid hormone changes, and gut microbiome changes linked to cancer risk
- The keto diet has been used as a short-term strategy for metabolic inflexibility and diabetes, but requires transitioning to balanced carbohydrate intake for long-term health

Over the past decade, the ketogenic diet has drawn significant attention for its reported ability to reverse metabolic disease, promote fat loss, and improve blood sugar regulation. In fact, regular readers of Mercola.com will know that I have championed it, too.

But as I will explain later, I've updated my stance on the ketogenic diet. After discovering the work of the late Ray Peat, Ph.D., a pioneer of Bioenergetic medicine, strictly following a low-carbohydrate diet can have serious consequences for your health, especially when followed for a long time. As it turns out, glucose, especially from healthy sources, **is your body's preferred fuel**, not fat.

Now, as the ketogenic diet enters the long-term memory of the scientific community, researchers are now discovering the long-term effects of a high-fat diet. I will go over some of the most notable findings below.

What Do Studies Say About Keto's Long-Term Safety and Efficacy?

In a study published in Science Advances, researchers paint a different picture contrary to the mainstream view of the ketogenic diet. Specifically, its long-term safety and metabolic effects are still under investigation, with growing evidence suggesting both promise and potential pitfalls:[1]

- **The research affirms the short-term benefits —** Ketogenic diets produce early improvements in body weight, insulin sensitivity, and glycemic control. However, the literature the researchers reviewed shows that these gains tend to level off after several months, and the sustainability of such changes depends heavily on adherence and nutrient quality.

  Several long-term trials included in the paper note that after the first six to 12 months, weight loss plateaus, and metabolic markers may begin to shift in variable directions depending on the composition of the diet and the individual's baseline metabolic health.*

- **One of the recurring themes is that the ketogenic diet's effectiveness depends on the context —** It appears to work particularly well in individuals with insulin resistance or **Type 2 diabetes**, but the metabolic benefits are less clear in healthy

populations.* The study also noted that adherence rates in long-term studies are relatively low, highlighting that maintaining nutritional ketosis over extended periods can be difficult in real-world conditions.

- **Long-term safety isn't fully understood yet —** Another important finding is that while ketogenic diets can improve key metabolic markers, they also trigger compensatory changes that blunt or reverse some of those benefits. In fact, certain health problems have already been recorded, as you'll learn below.

How Does Keto Affect Insulin Resistance and Other Metabolic Markers?

The study goes into detail on how ketogenic diets influence insulin resistance and associated biomarkers:[2]

- **HOMA-IR and insulin sensitivity —** Ketogenic diets have been shown to lower fasting insulin levels significantly, reducing the homeostasis model assessment for insulin resistance (HOMA-IR) index, which measures insulin resistance.

  The paper reports that in both obese and diabetic subjects, HOMA-IR improves substantially during the first months of ketosis.* This improvement is largely attributed to the reduction in carbohydrate intake, which minimizes the need for insulin secretion and allows tissues to regain sensitivity to insulin.

  However, the paper also warns that this improvement is not uniform across all individuals. In some of the studies reviewed by the team, insulin sensitivity initially improved but later reached a plateau or showed mixed results after extended ketosis. This variability is attributed to physiological adaptation, differences in macronutrient ratios, or the duration of adherence by the participants.

- **Fasting glucose —** The paper highlights consistent reductions in fasting glucose across several trials. Subjects on ketogenic diets typically exhibit lower baseline glucose values compared to those on higher-carbohydrate regimens.* This effect is

particularly strong among individuals with impaired glucose tolerance or Type 2 diabetes.

However, in some long-term interventions, fasting glucose levels tend to stabilize rather than continue to decline, suggesting a new metabolic steady state rather than ongoing improvement.

What Happens to Your Lipids on Keto?

Lipids are fatty compounds that travel throughout your body. They're found in your cell membranes and play a role in what goes in and out of the cells. In addition, they transport nutrients and are used in the production of hormones.[3] Within this context, what happens when your body has a high intake of fat?

- **Increase in low-density lipoprotein (LDL) occurs —** In a case study published in Cureus, a 56-year-old woman had already been on a ketogenic diet for 30 to 40 days (along with regular exercise) before approaching the research team due to fatigue complaints.*[4] After tests were administered, the team discovered that she had a rapid increase in LDL cholesterol, often referred to as the **bad cholesterol**.

- **Factors contributing to rise in LDL cholesterol —** Under the ketogenic diet, the subject lost weight, but the speed at which it happened may have caused unforeseen health problems*:[5]

  > *"The drastic elevation in her LDL-C could also be explained due to the rapid weight loss, as cholesterol in the adipose tissue is known to mobilize as the fat cells shrink. Interestingly, her BMI [body mass index] four weeks after the discontinuation of ketogenic diet did not change despite a marked improvement in her LDL-C."*

- **Other studies support the findings —** In a 2021 randomized trial published in Nutrients, researchers noted that following a ketogenic low-carbohydrate high-fat diet (LCHF) contributed to a rise in LDL cholesterol in 17 healthy young women.

Overall, they described the elevated LDL cholesterol as a cause for concern*:[6]

> *"The data suggest that feeding healthy, young, normal-weight women a ketogenic LCHF diet induces a deleterious blood lipid profile. The elevated LDL cholesterol should be a cause for concern in young, healthy, normal-weight women following this kind of LCHF diet."*

Do Animal Data Reveal Metabolic Risks You Should Care About?

Going back to the Science Advances study, the researchers drew on several animal studies to illuminate possible long-term metabolic risks associated with sustained ketosis. These findings provide mechanistic insight into what can occur in humans after prolonged adherence to a high-fat diet:[7]

- **Animal data suggest that ketogenic feeding alters lipid metabolism and mitochondrial function —** Some rodent studies reviewed in the paper reveal hepatic lipid accumulation, suggesting that long-term ketosis may promote fatty liver changes in certain conditions.* This outcome appears to depend on the fat type and overall energy intake, as not all studies report this effect.

- **Changes in gut microbiota composition —** In another study, researchers showed that the ketogenic diet altered gut microbial composition in both mice and 17 men with overweight or obesity. Specifically, they noted that Bifidobacterium was affected, which, **as I noted in a previous article**, is important in maintaining the integrity of mucin in your gut:[8]

> *"We focused on Bifidobacterium which had a reproducible decrease in abundance during KD consumption in both humans and mice and also with feeding of a synthetic KE in mice. Changes in Bifidobacterium abundance resulted in a significant alteration to intestinal Th17 cell populations …*

In humans, both Fusobacteria and Escherichia were significantly enriched on the KD, which have both been implicated in predisposition to colorectal cancer."

Where Do Safety Flags Appear?

In addition to the health effects of the keto diet discussed above, the ketogenic diet has been associated with other concerning issues. These include:

- **Nutrient deficiencies —** The ketogenic diet requires you to take out many carbohydrate-rich food sources, like whole fruits, vegetables, and certain whole grains, all of which are loaded with vital nutrients your body needs. As noted in a review published in Frontiers in Nutrition:[9]

  "Low-carbohydrate diets are often low in thiamin, folate, vitamin A, vitamin E, vitamin B6, calcium, magnesium, iron, and potassium. In the absence of multivitamin supplements, individuals on low-carbohydrate diets are at risk of frank nutritional deficiencies.

  Even when consuming only nutrient-dense foods, a 4:1 ketogenic diet is reported to have multiple micronutrient …."

- **Kidney stones —** The risk of kidney stones is highlighted as a consistent observation, especially in studies involving long-term ketogenic use. In a 2023 study, for example, 15 out of 88 epileptic children developed renal stones, and 12 of them received medication. Moreover, one of them required surgery.[10]

- **Bone health and overall fitness —** The ketogenic diet also raises concern about bone health. Although the mechanisms are unclear, even a short-term regimen impaired markers of bone health in elite athletes. As noted in a study published in 2020:[11]

> *"Our data reveal novel and robust evidence of acute and likely negative effects on the bone modeling/remodeling process in elite athletes after a short-term ketogenic LCHF diet, including increased marker of resorption (at rest and post-exercise) and decreased formation (at rest and across exercise), with only partial recovery of these effects following acute restoration of CHO [carbohydrate] availability.*
>
> *Long-term effects of such alterations remain unknown, but may be detrimental to bone mineral density (BMD) and bone strength, with major consequences to health and performance."*

- **Thyroid function and body weight —** In another small pilot trial of 11 healthy adults, following the ketogenic diet for three weeks lowered levels of the thyroid hormone T3, and participants lost more body mass than when they ate a diet high in carbohydrates.[12]

How Can You Reduce Risks if You Still Choose Keto?

While I've highlighted the pitfalls of a ketogenic diet, remember that the devil is in the details. I don't recommend dismissing it entirely, as some people still use it short term, particularly when it's done safely and correctly.

- **Short-term keto is still used by some people —** In my interview with Georgi Dinkov, we discussed that the ketogenic diet, when followed properly, can be useful for people who are metabolically inflexible. It's mainly in long-term applications that you'll run into health problems.

  Your body requires glucose and depriving it of this fuel raises cortisol levels. Through a process called gluconeogenesis, cortisol can break down your muscles, bones, and brain to create its own glucose levels — a likely explanation for the changes in bone health markers discussed in the studies earlier.

- **Dietary recommendations —** If you go on a short-term ketogenic diet, make sure your healthy fats come from nutritious sources, such as pasture-raised eggs, grass fed butter, and wild-caught fish. In addition, minimize your intake of ultraprocessed foods, meats, and snacks.

  Talk to your healthcare provider about a high-quality multivitamin supplement, too. As explained earlier, strictly following a ketogenic diet can introduce nutritional deficiencies, and taking a supplement can mitigate these issues down the road.

- **Eat more carbohydrates as time goes on —** Listen to your body to know when your metabolic flexibility returns. This process can take anywhere from a few weeks to a few months, and when you reach this point, you'll need to eat more carbohydrates. Again, this goes back to the cortisol-glucose connection.

What's the Bottom Line for Your Metabolic Health?

Tying everything together, a short-term ketogenic diet has been associated with improved metabolic health, especially in the context of insulin resistance and Type 2 diabetes.

- **However, the long-term picture is more complex —** The same mechanisms that drive early benefits — reduced insulin resistance and elevated fat oxidation — can introduce new physiological challenges when sustained indefinitely. Potential risks include nutrient deficiencies, renal strain, thyroid dysfunction, altered gut health, and lower bone mineral density.

- **Don't overdo the ketogenic diet —** As I highlighted earlier, it would be wise to view the ketogenic diet as a temporary dietary strategy, not necessarily a lifelong eating pattern. For long-term health maintenance, however, the studies suggest that a high-fat diet isn't sustainable, and that carbohydrates are needed for a balanced approach that creates metabolic flexibility.

**These findings are from research conducted in clinical settings. Results may not apply to all individuals. These findings are from laboratory or animal research and may not directly apply to human health.*

This article is for informational purposes only and does not constitute medical advice. Consult a qualified healthcare provider before making changes to your health regimen.

Frequently Asked Questions (FAQs) About Following a Chronic Ketogenic Diet

Q: Is the keto diet safe long term?

A: The long-term safety of the ketogenic diet remains uncertain. While early studies affirm short-term benefits such as weight loss, improved insulin sensitivity, and better glycemic control, the article stresses that these effects tend to level off after six to twelve months.

Moreover, adherence is difficult, and researchers have observed metabolic adaptations — including changes in lipid metabolism, energy expenditure, and thyroid hormone activity — that reduce metabolic efficiency or alter endocrine balance over time.

Q: What are the common side effects of the keto diet?

A: There are several safety concerns and side effects that arise with prolonged ketogenic eating:

- **Nutrient gaps —** By removing many healthy carbohydrate foods, keto can cause deficiencies in vitamins (B-complex, A, E, C, K) and minerals such as magnesium, potassium, calcium, and iron.

- **Kidney stones —** Published research linked long-term ketogenic use, especially in children with epilepsy, to renal stones.
- **Bone health issues —** Keto may reduce bone mineral density and increase markers of bone resorption, weakening bones over time.
- **Thyroid hormone changes —** In one small trial, a ketogenic diet lowered levels of the thyroid hormone T3, and participants lost more body mass than on a high-carbohydrate diet.

Q: Does the ketogenic diet improve or worsen insulin resistance (HOMA-IR)?

A: Ketogenic diets initially improve insulin resistance, as shown by significant reductions in the HOMA-IR index (a measure of insulin resistance). This is mainly due to lowered carbohydrate intake, which decreases insulin demand and allows cells to regain responsiveness.

However, the improvements are not consistent across all individuals. In some studies, insulin sensitivity improved early but later plateaued or showed mixed results with extended ketosis. The variability depends on factors such as diet composition, physiological adaptation, and duration of adherence.

Q: What are the reported long-term effects of a ketogenic diet?

A: There are several long-term effects, many of which are still being studied:

- **Weight loss plateaus —** Initial fat loss typically slows or stops after six to 12 months.
- **Altered lipid metabolism —** Some people experience increased LDL cholesterol, as seen in case reports and trials, raising concerns about cardiovascular risk.

- **Changes in gut microbiota —** In one study, ketosis reduced beneficial bacteria like Bifidobacterium, while increasing species such as Fusobacteria and Escherichia, both linked to colorectal cancer risk.
- **Thyroid and hormonal adaptations —** In one small trial, ketosis altered thyroid hormone levels.

Q: What are the overall effects of the keto diet on metabolic health?

A: Keto has been associated with short-term improvements in insulin resistance, Type 2 diabetes, and body weight regulation. It has been associated with lower fasting glucose and improved HOMA-IR.

However, the overall long-term metabolic picture is complex. The same mechanisms that improve metabolism early — carbohydrate restriction and enhanced fat oxidation — can, over time, cause new physiological challenges. These include nutrient deficiencies, thyroid suppression, kidney strain, reduced bone density, and microbiome imbalances.

Sources and References

- [1, 2, 7] Sci Adv. 2025 Sep 19;11(38):eadx2752
- [3] Cleveland Clinic, Lipids
- [4, 5] Cureus. 2020 Jul 27;12(7):e9418
- [6] Nutrients. 2021 Mar 2;13(3):814
- [8] Cell. 2020 May 20;181(6):1263-1275.e16
- [9] Front Nutr. 2021 Jul 16;8:702802
- [10] Neuropediatrics. 2023 Oct;54(5):308-314
- [11] Front Endocrinol (Lausanne). 2020 Jan 21;10:880
- [12] PLoS One. 2022 Jun 3;17(6):e0269440