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High Animal Protein Diet Raises Risk of Negative Calcium Balance

Analysis by Dr. Joseph Mercola | June 29, 2024

STORY AT-A-GLANCE

- A diet high in animal protein may increase your risk of negative calcium balance, putting your health at risk
- Negative calcium balance occurs when your body loses more calcium than it absorbs, which can lead to kidney damage, insulin resistance, bone breakdown and other problems
- Animal protein, particularly, meat, eggs and cheese, leads to the formation of large amounts of acid in your body
- If your body can't combat acid accumulation, metabolic acidosis can occur; even low-grade metabolic acidosis can lead to Type 2 diabetes, high blood pressure, fibromyalgia, gout and other chronic conditions
- While I don't recommend vegan or vegetarian diets, including more fruits and vegetables, which are alkaline, as well as bicarbonate mineral waters, can help counteract acid load

In the video above, James DiNicolantonio, Pharm.D., who is also the coauthor of my book, "Superfuel: Ketogenic Keys to Unlock the Secrets of Good Fats, Bad Fats, and Great Health," explains why a diet high in animal protein may increase your risk of negative calcium balance, putting your health at risk.[1]

Negative calcium balance occurs when your body loses more calcium than it absorbs. Almost all calcium — 99% — is found in your teeth and bones, so your body

compensates for a lack of calcium by leaching it from your bones.

This process helps maintain necessary calcium levels in your blood, which is crucial for vital functions such as muscle contraction, blood clotting and nerve transmission, but can lead to weakened bones and an increased risk of conditions like osteoporosis.

"Animal foods, like meat, fish, eggs and dairy are the most nutrient-dense foods you can eat. However, there's one downside to an animal-based diet, and that's the high acid load," DiNicolantonio says. The solution, according to DiNicolantonio, is to balance the acid from animal foods with base.

Carnivore Diet Linked to Negative Calcium Balance Since 1930

DiNicolantonio cites a study published in 1930,[2] which details Arctic explorer Vilhjalmur Stefansson's journey of eating only meat for a year.[3] Over 12 periods of recorded data, "calcium balance was negative every single time," DiNicolantonio says. "All this proves is that since 1930 we have known that consuming an all-meat diet — a carnivore diet — leads to negative calcium balance."[4]

Another example included 10 healthy participants who consumed a strict low-carb diet for two weeks, then another carb-restricted diet for four weeks that was high in animal protein.

This led to a decrease in calcium balance, with the researchers concluding, "Consumption of an LCHP [low-carbohydrate high-protein] diet for 6 weeks delivers a marked acid load to the kidney, increases the risk for stone formation, decreases estimated calcium balance, and may increase the risk for bone loss."[5]

The participants were still in positive calcium balance in this case, however, which DiNicolantonio says is only because they were consuming more than 800 milligrams (mg) of calcium a day:[6]

> *"You may not go in negative calcium balance if you're consuming over 800 milligrams of calcium and you're consuming a multivitamin, which likely*

> *contains vitamin D, which increases the absorption of calcium, you may not go in negative balance. But it still increased the propensity by significantly increasing the urinary calcium level by about 100 milligram a day.*
>
> *… so if you're on a carnivore diet you likely want to consume somewhere around 16 ounces of milk or three slices of cheddar cheese or a mixture of the two to give you about 600 milligrams of calcium because then you'll get about another 81 milligrams of calcium from consuming 1.5 pounds of meat — which is what most people do consume on an animal-based or carnivore diet — around 1.5 pounds, maybe 2 pounds, of meat per day."*

Other research, published in Calcified Tissue International, found that when acid levels were higher, due to increased dietary protein intake, people had more acid in their bodies and lost more calcium in their urine.[7] Meanwhile, research shows high-protein diets can cause increased calcium loss in urine, or calciuria.

In a study of 39 premenopausal women who lowered their protein intake to U.S. recommended dietary allowance levels, acid excretion, calciuria and bone resorption were reduced, suggesting that lower protein consumption might reduce bone loss.[8] But as DiNicolantonio said:[9]

> *"Now don't confuse this — I am not recommending nor do I think it is good to consume a low-protein diet. The object really, and what I do, is I consume a high animal protein diet. I just offset it with base, because we know low-protein diets aren't good for bone health. So, you want to have a good protein intake."*

The Problem With a High Acid Load in Your Body

Diets high in animal proteins can produce excess acid in your body. To neutralize the excess acid, your body uses alkaline minerals, primarily calcium. This calcium is often mobilized from your bones, leading to a decrease in bone density over time. High acid levels also increase calcium excretion through urine, further depleting your body's calcium reserves, which can exacerbate bone loss. DiNicolantonio explains:

"When we consume animal foods it forms a lot of hydrogen ions (H+) or acid in the body, which must be balanced with base (citrate or bicarbonate). If we don't balance the acid with base, then the body must strip connective tissue and muscle to form ammonia so that the kidneys can eliminate the acid.

Additionally, producing ammonia to eliminate the acid is detrimental to the kidneys. Furthermore, the body will need more positively charged ions (like sodium, calcium, magnesium and potassium) to eliminate the negatively charged sulfate that comes from animal foods (animal foods contain a lot of sulfur-containing amino acids).

If you aren't getting enough positively charged ions in your diet, then the body will strip bone for those alkaline minerals. Additionally, a high acid load in the body activates osteoclasts to break down bone and it lowers the pH in the interstitial fluid (the fluid that surrounds our cells), which can cause insulin resistance. In other words, if you don't balance the acid from animal foods with base you can cause:

- *Kidney damage*
- *Insulin resistance*
- *Bone breakdown*
- *Mineral loss*
- *Kidney stones"*

Metabolic Acidosis Drives Chronic Disease

Metabolic acidosis happens when your body produces too much acid or your kidneys are not removing enough acid from your body. High intake of animal protein can increase the production of sulfuric acid due to the metabolism of sulfur-containing amino acids found in meat, poultry and fish. According to DiNicolantonio:[10]

"Metabolic acidosis is a chronic condition that many people in the Western world have but do not realize it … A normal healthy body has numerous buffering systems to combat acid accumulation.

However, if your buffering capacity is reduced or cannot meet the acid load, then harms can ensue such as a breakdown of muscle, connective tissue and bone … Animal protein is the largest source of dietary acid as it is high in the sulfur-containing amino acids methionine and cysteine, which leads to the formation of sulfuric acid and hydrogen ions in the body."

Even low-grade metabolic acidosis can lead to:[11]

Type 2 diabetes	Insulin resistance[12]	Increased gluconeogenesis
High blood pressure	Bone loss	Osteoporosis and osteopenia
Sarcopenia	Muscle loss	Gout
Fibromyalgia	Declines in kidney function	Dehydration
Decreased exercise performance	Kidney stones	Mineral deficiencies

DiNicolantonio points out that the average western diet leads to a net acid excretion of 50 to 100 milliequivalents (mEq) per day (milliequivalent measures the concentration of ions in a solution). However, "The kidneys of a healthy person can only excrete 40-70 mEq of acid per day before acid is retained in the body," he says. "Most Americans are consuming diets that produce this much acid or more per day."[13]

Further, "Animal-based or carnivore diets typically provide 150-250 mEq of acid per day, which means that these types of diets lead to significant acid retention unless

exogenous bicarbonate forming substances are being consumed (bicarbonate mineral waters or supplements, fruits or vegetables)."[14]

How to Balance Dietary Acid With Base

What you eat affects your body's acid base balance, and maintaining a diet that balances acid and alkaline foods can help protect your health.

"Animal protein, particularly, meat, eggs and cheese, is what leads to the formation of large amounts of acid in the body," DiNicolantonio says. "Fruits and vegetables are high in organic anions like citrate, malate and gluconate, which get converted to bicarbonate in the body. Bicarbonate is the base in our body that neutralizes the acid."[15]

While I don't recommend vegan or vegetarian diets, including more fruits and vegetables, which are alkaline, can help counteract acid load. DiNicolantonio says, "I personally try to neutralize the acid from my diet by calculating how much acid is going to be produced from the foods I consume." For example:

mEq of Acid per 3.5 oz		
Parmesan cheese: 34.2	Other cheeses: 18-29	Egg yolks: 23.4
Processed meats: 10 to 13.2	Fish: 10.8	Chicken: 8.7
Pork: 7.9	Beef: 7.8	Grains: 3.7 to 6.5

Alkaline Foods (Negative mEq of Acid per 3.5 oz)		
Broccoli: -1.2	Apples: -2.2	Lemon juice: -2.5
Potatoes/cauliflower: -4.0	Zucchini: -4.4	Carrots/celery: -5.0
Bananas: -5.5	Spinach: -14	Raisins: -21

As a rule, protein should make up about 15% of your daily calories. More specifically, most adults need about 0.8 grams of protein per pound of ideal body weight (the weight you would ideally be, not necessarily the weight you are now), or for Europeans, approximately 1.76 grams of protein per kilo.

For example, if your ideal weight is 135 pounds, your protein requirement would be 108 grams. Divided into two meals, that would be 54 grams per meal. For reference, there's approximately 7 grams of protein in each ounce of steak, so a 5-ounce steak would give you 35 grams of high-quality protein. For children, the average amount per meal is around 5 to 10 grams, while young adults typically can get away with 20 grams per meal.

For most normal-weight adults, 30 grams per meal is really the minimum you need to stimulate muscle protein synthesis. The key is to balance the acid load from animal foods in your diet with natural compounds that help neutralize the acid. In addition to fruits and vegetables, DiNicolantonio recommends:[16]

- **Sodium citrate —** 5 grams (g) suppresses 60 mEq of acid. Should be taken with food.
- **Potassium citrate —** 3 g suppresses 30 mEq of acid. Typically, no more than 3 g is taken with each meal.
- **Bicarbonate mineral waters (low in sulfate) —** 1 mEq of bicarbonate inhibits 1 mEq of acid. "Typically, the bicarbonate levels are fairly low and should not affect stomach pH. There is a slow accumulation of bicarbonate in the body when drinking bicarbonate mineral waters and this is a better option than sodium or potassium bicarbonate supplements."

You can find more details in **DiNicolantonio's video overview of acid base balance.**[17]

Sources and References

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