

Effects of a Low-Carbohydrate Diet on Insulin-Resistant Dyslipoproteinemia - A Randomized Controlled Feeding Trial

Announcer: Welcome to the Mayo Clinic cardiovascular continuing medical education podcast. Join us each week to discuss the most pressing topics in cardiology and gain valuable insights that can be directly applied to your practice.

Dr. Friedman: Hello, my name is Paul Friedman. I'm chair of the Department of Cardiovascular Medicine at Mayo Clinic. I'm delighted to have with me, my colleague, Dr. Stephen Kopecky, who has transformed his career from taking care of heart disease invasively to preventing it as a preventive cardiologist. He's a professor of medicine and has recently authored "Live Younger Longer," describing how we can use our lifestyles to prevent heart disease. Steve, thank you so much for joining me.

Dr. Kopecky: Thank you for having me, Paul.

Dr. Friedman: So I'd like to talk today about a study on the effects of a low-carbohydrate diet on insulin-resistant dyslipoproteinemia. There was a recent randomized control trial. What were the goals of study, and why was the study important?

Dr. Kopecky: Well, the study is important, Paul, because there's a lot of interest, as you know, in low-carb, high-carb diets talking about macronutrients. And it's interesting because as humans, we have eaten about 50 to 55% of our calories as carbohydrates over the last few hundred thousand years. That's what our species does. In fact, if you look at Lancet, a few years ago, they said the Tsimane Indians in the Bolivian rainforest, who had the healthiest hearts in the world as judged by CT scans, eat about 72% of their calories as carbohydrates. But again, these are very complex carbohydrates. Well, we, in our country now, unfortunately, with the pandemic, we're up to a lot of ultra-processed foods, which is a lot of carbohydrates, a lot of fat. About 57% of our calories every day is now ultra-processed food. The average American eats about 7.5 servings a day. So they tried to do, I think it's a very good study. It was a feeding study, meaning they gave the participants spends the food. So they ate what they gave them over about 20 weeks, four or five months, and they looked at the effects on cholesterols, lipids, cholesterol size, cholesterol particle counts, chronic inflammation, and blood pressure. And that was really the goal. And what they gave them was three diets randomized. After they had a lower calorie diet for a couple of months, they lost about 12, 15% of their weight. They put 'em on either a high-carb diet, which was 60% carbs. Everybody had about 20% protein, but they had 60% carbs and about 20% fat. And then the high-fat diet was about 60% fat and 20% carbs. Again, they had about 20% protein.

Dr. Friedman: So with these three very different diets, what was the effect on total cholesterol, LDL, and measures of inflammation and other risk markers?

Dr. Kopecky: Yeah, it was quite interesting. And so if you look at the lipids, the things we always care about, the triglycerides went down a little more with the higher fat diet. The HDL went up a little bit more. The LDL didn't really change in either group. But if you look at blood pressure, the blood pressure did better in the higher fat group. The CRP went down more in the

higher fat group. And then the lipoprotein a, actually, and this was somewhat surprising, lipoprotein a actually went down a little more in the high-fat group.

Dr. Friedman: Now, I thought lipoprotein a was impervious to lifestyle changes. Tell me about that. Is this an important finding?

Dr. Kopecky: Well, this needs to be replicated because most studies have not shown this. In fact, the recent guidelines came out and said, guidelines have said diet doesn't really matter for lipoprotein a. So we need to look at this further, I think. And the diet that they used was fairly unique and a very good diet, I think.

Dr. Friedman: Now, one of the things that's confusing for many of us non-diet experts on risk factors is that the studies haven't all been consistent, at first blush, anyway. So how is this low-carb diet different than the previous ones looking at the effects on lipid markers? And what do you think the main difference is?

Dr. Kopecky: Yes. Well, that's a very good question. You know, what we kind of encourage people to go to in our clinic every day is a Mediterranean diet. But basically, the two essentials are extra virgin olive oil and nuts. Eating more fruits, vegetables, legumes. A little bit of fish, a little bit of white meat, poultry. And then cutting down on saturated animal fats, cutting down on dairy, cutting down on certainly processed foods, ultra-processed foods, and then cutting down on sugar, like sugar-sweetened beverages. So in this diet, it was quite interesting. So the low-carb diet, Paul, the low-carb diet, high fat, was the only group that got extra virgin olive oil. The low-carb diet was the only group that got nuts. The low-carb diet got more fresh vegetables. But they did get butter, they did get milk, they did get red meat, and they got cheese. Now, when you think about a high-fat diet, how much red meat do you think of? Well, usually, a couple of big servings.

Dr. Friedman: Yeah. Right.

Dr. Kopecky: Well, they got red meat. They got one ounce of red meat. One ounce a day. They got butter, a little over one teaspoon a day. Milk was a six-ounce glass of 3%. And then the cheese, they had six dice of cheese. So about three ounces of cheese. Now, let's look at the high-carb group. What did they get? The high-carb group got a lot more ultra-processed foods. They were the only group to get processed rice, processed macaroni, processed fruit spread. You know, like a jam. And then a multigrain instead of a whole wheat bread. They were the only one to get multigrain bread. So it was a very different diet than what you would normally think you would eat if you're eating a high-fat-type diet. And so I think that what this tells us is that you can eat a very high fat Mediterranean diet. In fact, Mediterranean is the second highest fat diet out there after the high fat, the keto, those those types of diets.

Dr. Friedman: Is it the fat and carb, or is it the processed foods? Is it possible to tease that apart do you think?

Dr. Kopecky: Yeah, that's a very good question. If you look back at Ancel Keys when he did the Seven Nations Study decades ago, he really focused more on the saturated fat. You know, this

was an NIH-funded study, and so you can go back and look in the records. And I've done that and looked at the minutes of their meetings, and many of the Italians, the Greeks said, "Dr. Keys, we understand what you're saying about red meat, but you're ignoring the monounsaturated fats that we eat." The olive oil, the nuts, things like that. We think it's more important to focus on that rather than focusing on the absence of red meat. And they didn't have a lot of processed foods, obviously, in that diet. So it really seemed to be more of the mono unsaturated fats. And remember, extra virgin olive oil, Paul, is not pure. It has about 15% saturated fat in the it. You know, there's no pure fat that we can really eat, hardly. But if you put on top of this now ultra-processed foods, which has a lot of calories in a small space, a lot of processed carbs, and a lot of processed fat, that really makes the mix much worse.

Dr. Friedman: I see. Now, just to underscore, all three diets have the same overall caloric content, right?

Dr. Kopecky: Yeah, they were 2,000-calorie diets a day after they had lost about 10, 15% of their weight.

Dr. Friedman: Yeah. Are all low-carb diets the same? And is this a keto diet? Is this Dr. Atkins' diet or? Explain to us the difference between those

Dr. Kopecky: Yeah. Yeah, that's very interesting because if you look at a keto diet, it's usually less than 10% carbs. You know, we as a species have eaten about 50, 55% carbs for hundreds of thousands of years. A low-carb diet is usually less than 20% carbs.

Dr. Friedman: I see.

Dr. Kopecky: It's very hard to stick with the keto. And that's where you really go into people check their urine and see if they have ketones in their urine and such.

Dr. Friedman: Yeah. A couple more questions. Really fascinating, and thank you for discussing this with me. The first one is, the diets were applied after initial weight loss. You know, why is that important? And how do you think that impacts the study?

Dr. Kopecky: Well, I think these were younger populations, about 35 years old. These weren't hyperlipidemics. Their LDL was average. I wouldn't say normal, but average. I think losing the weight just helped even the playing field and get rid of some of the obesity issues that can occur. And they knew that, as they go on a 2,000-calorie diet, they knew they were gonna lose weight. And they didn't want that to kind of muddy the waters.

Dr. Friedman: I see. I see. Are there certain patients or certain comorbidities that make you favor one diet over another one? Does the presence of diabetes make you want to say, "Gee, we should probably go with low carb or low fat or other considerations"?

Dr. Kopecky: Yeah. That's been pushed a lot. The low-carb diet has been pushed for diabetics. And I think that, in first blush, you think, "Well, gosh, a diabetic eating all this meat and all this cheese and all this dairy." I think what this diet tells us, what this study tells us, is a low-carb diet

would be very good for 'em, but it's a pretty specific low-carb diet. It's a healthy low-carb diet with more mono unsaturated fats in it than what we normally think of.

Dr. Friedman: So the take-home message I'm getting is that, to avoid heart risk factors and to stay healthy, a Mediterranean diet that's lower in carbs is a good diet for most people to consider. Fair summary?

Dr. Kopecky: That's exactly right. I would agree with that entirely. And remember, the Mediterranean diet is the second highest fat diet we have. It just has a lot of fresh fruits, vegetables, legumes, very little processed food. One other thing of interest was the blood pressure went up in the high-carb group. But I looked in the paper, and I looked for the salt load and the sodium load. It's interesting. They never used the word "sodium" in the whole paper. So I assume there's a whole lot more salt in the high-carb group 'cause they got a lot more ultra-processed foods.

Dr. Friedman: Well, it never ceases us to amaze me just how complex this whole area is, and I really appreciate you simplifying it for us and helping me understand what a reasonable recommendation is for me and my patients. Steve, thanks so much for joining me today.

Dr. Kopecky: Thanks for having me, Paul.

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