

The Beneficial Effects of a Paleolithic Diet on Type 2 Diabetes and Other Risk Factors for Cardiovascular Disease

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Introduction

A 2009 report by Jönsson and colleagues in *Cardiovascular Diabetology* has highlighted the potential benefits of a Paleolithic diet for patients with type 2 diabetes (T2DM). In a randomized crossover study spanning two consecutive 3-month study periods, a Paleolithic diet improved glycemic control and several cardiovascular risk factors compared to a diabetes diet in a cohort of patients with T2DM.¹ Because a Paleolithic diet differs from a traditional diabetes diet, it is worthwhile to consider the potential benefits of this diet for patients with diabetes who are at increased risk for cardiovascular disease.

What Is a Paleolithic Diet?

The Paleolithic diet is also referred to as the caveman diet, Stone Age diet, and hunter-gatherer diet. This diet consists of foods that are assumed to have been available to humans prior to the establishment of agriculture. The Paleolithic period began approximately 2.5 million years ago, when humans first started to use stone tools. The period ended with the emergence of agriculture approximately 10,000 years ago. The principal components of this diet are wild-animal source and uncultivated-plant source foods, such as lean meat, fish, vegetables, fruits, roots, eggs, and nuts. The diet excludes grains, legumes, dairy products, salt, refined sugar, and processed oils, all of which were unavailable before humans began cultivating plants and

domesticating animals. Observational studies of modern-day Paleolithic types of populations support a conclusion that a Paleolithic diet prevents obesity and metabolic syndrome. The main ingredient lacking in a Paleolithic diet is calcium, which must be supplemented to prevent bone mineral loss.

The appeal of this diet is that, since the advent of agriculture and animal domestication approximately 10,000 years ago, there has been little time for significant evolution of core metabolic and physiological processes in response to the major dietary changes introduced by these new food-producing practices. Proponents of the Paleolithic diet believe that modern humans are genetically adapted to a Paleolithic diet and not to the current so-called civilized diet. They believe that the modern so-called civilized diet may lead to chronic diseases such as T2DM, obesity, and cardiovascular disease, which are associated with societal affluence.²

How Does a Paleolithic Diet Differ from a Diabetes Diet?

In the Jönsson study, the diabetes diet was intended to deliver meals with increased intake of vegetables, root vegetables, dietary fiber, whole-grain bread and other whole-grain cereal products, and fruits and berries and decreased intake of total fat with more unsaturated fat.¹

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In that study, the majority of dietary energy in the diabetes diet came from carbohydrates found in foods naturally rich in carbohydrate and dietary fiber. The concepts of glycemic index and varied meals were taught with a visual meal-planning plate model. Salt intake was recommended to be kept below 6 g per day. The diabetes diet differed from the Paleolithic diet, which was based on lean meat, fish, fruit, leafy and cruciferous vegetables, root vegetables, eggs, and nuts. The Paleolithic diet excluded dairy products, cereal grains, beans, refined fats, sugar, candy, soft drinks, beer, and any extra addition of salt. The following items were recommended in limited amounts for the Paleolithic diet: eggs (≤ 2 per day), nuts (preferentially walnuts), dried fruit, potatoes (≤ 1 medium-sized per day), grape seed or olive oil (≤ 1 tablespoon per day), and wine (≤ 1 glass per day). The intake of other foods was not restricted and no advice was given with regard to proportions of food categories (such as animal versus plant foods). The evolutionary rationale for a Paleolithic diet and potential benefits were explained.

In the Jönsson study, the Paleolithic diet was lower in cereals, dairy products, potatoes, beans, and bakery foods but higher in fruits, vegetables, meat, and eggs compared to the diabetes diet. The Paleolithic diet worked out to be lower in total energy, energy density, carbohydrate, dietary glycemic load, fiber, saturated fatty acids, and calcium but higher in unsaturated fatty acids, dietary cholesterol, and several vitamins and minerals.¹

What Effect Does a Paleolithic Diet Have on Type 2 Diabetes?

The Jönsson study was the first to assess the potential benefit of the Paleolithic diet compared to a diabetes diet for patients with T2DM.¹ This pilot crossover study evaluated 13 subjects with T2DM on oral agent therapy. Subjects consumed, for three months each, either a Paleolithic diet followed by a diabetes diet or the same two diets in the opposite order for three months each. Compared to the diabetes diet, the Paleolithic diet resulted in statistically significant lower mean values of hemoglobin A1c, triglycerides, diastolic blood pressure, weight, body mass index, and waist circumference, while mean values for high-density lipoprotein were higher. The larger decrease of fasting plasma glucose following the Paleolithic diet nearly reached statistical significance, and systolic blood pressure also tended to decrease more following the Paleolithic diet. Ingestion of a Paleolithic diet (compared to a diabetes diet) did not result in a significant reduction in the area under the curve between

0 and 120 min for glucose during a 75 g oral glucose tolerance test, and that measure had been a prespecified endpoint.

The impact of this study was limited by its small size, which did not recruit the number of participants needed according to the prestudy power calculation. The investigators decided to terminate the study early because recruitment had failed to yield any new participants for more than 6 months before termination. The subjects were not blinded as to which diet they were ingesting, but the investigators told them both diets were healthy and that it was unknown whether either diet was superior.

What Effect Does a Paleolithic Diet Have on Cardiovascular Risk Factors?

The metabolic effects on humans consuming a Paleolithic diet have been studied in only a handful of studies to date. O'Dea and colleagues reported a controlled 3-month trial of a Paleolithic diet in 13 healthy northwestern Australian Aborigines in *Diabetes Care* in 1980. An elevated insulin response to ingested glucose was ameliorated, but not normalized, by reverting to a traditional lifestyle. Glucose levels were unaffected by the dietary intervention in these subjects without diabetes.³

O'Dea reported an uncontrolled study of initiating a Paleolithic diet in a cohort of 10 northwest Australian Aboriginal type 2 diabetes patients in *Diabetes* in 1984. Adoption of a hunter-gatherer lifestyle for 7 weeks resulted in a 10% weight loss and reductions in 2 h glucose levels as well as fasting levels of glucose, insulin, and triglycerides.⁴

Lindeberg and associates reported a randomized controlled study in *Diabetologia* in 2007 in which a cohort of 29 patients with ischemic heart disease and either glucose intolerance or type 2 diabetes was placed on either a Paleolithic diet or a Mediterranean diet. The Mediterranean diet was based on whole grains, low-fat dairy products, vegetables, fruits, fish, oils, and margarines. They found improved glucose tolerance independent of weight loss after 12 weeks in both groups, but the improvement was significantly greater in the Paleolithic diet group. There was no relationship between improvement in glucose tolerance and any decline in weight or waist circumference.⁵

Osterdahl and coworkers reported a small uncontrolled 3-week study of a Paleolithic diet in 14 healthy subjects in the *European Journal of Clinical Nutrition* in 2008.

They found significant improvements in weight, body mass index, waist circumference, systolic blood pressure, and plasminogen activator inhibitor-1.⁶

The effect of a Paleolithic diet on a variety of metabolic risk factors for cardiovascular disease in an uncontrolled trial was reported in August 2009 in the *European Journal of Clinical Nutrition*. Compared with the usual diet, nine sedentary subjects receiving the intervention diet experienced (a) significant reductions in blood pressure, (b) improved arterial distensibility, (c) significant reduction in plasma insulin versus time in the area under the curve during oral glucose tolerance testing, and (d) significant reductions in total cholesterol, low-density lipoproteins, and triglycerides. The authors concluded that even short-term consumption of a Paleolithic type diet improves blood pressure and glucose tolerance, decreases insulin secretion, increases insulin sensitivity, and improves lipid profiles without weight loss in healthy sedentary humans.⁷

The effect of a Paleolithic diet in a randomized controlled trial on domestic pigs was reported in 2006. Jönsson and colleagues provided either a Paleolithic diet or cereal-based swine feed to 24 pigs during a 15-month study. The pigs receiving a Paleolithic diet weighed less and had less subcutaneous fat deposits, lower C-reactive protein levels, lower blood pressure, and greater insulin sensitivity than pigs that received a cereal-based diet. The cereal-fed pigs demonstrated a low-grade inflammation of the exocrine pancreas, although no significant difference was seen in fasting glucose levels between groups.⁸

What Is the Mechanism of the Benefits of a Paleolithic Diet in Diabetes?

The mechanism of achieving greater improvements in levels of cardiovascular risk factors with a Paleolithic diet compared to diabetes diet is not known. In the Jönsson and colleagues study, the diets of subjects during their period of consuming a Paleolithic diet (compared to a diabetic diet) contained fewer calories and a lower glycemic index in spite of a lower fiber content. The investigators postulated that a Paleolithic diet (compared to a diabetes diet) is more satiating and facilitates a reduced caloric intake. In fact, the Paleolithic diet resulted in greater reductions in both weight and waist circumference. The higher amount of fruit and vegetables during the Paleolithic period was postulated to have promoted weight loss because of the high content of water in fruit, which may be satiating. The Paleolithic diet compared to the diabetes diet resulted in a higher percentage of

protein intake as a percentage of total daily calories. A weight loss diet with moderate carbohydrate, moderate protein has been shown to result in more favorable changes in body composition, dyslipidemia, and the postprandial insulin response compared to a high-carbohydrate, low-protein diet.⁹ Therefore, the greater protein intake during a Paleolithic diet might confer an additional benefit (beyond weight reduction) in its favorable effects on risk reduction for metabolic disease.

What Further Research on the Paleolithic Diet is Needed?

The implications of identifying a safer and more effective diet than what is currently being recommended for patients with obesity or T2DM are enormous. The Paleolithic diet is certainly not a new discovery. What is needed now is more clinical data with greater numbers of subjects and longer study durations so that more robust conclusions can be drawn. It will be interesting to see the outcomes on normal-weight, obese, and T2DM subjects and also to see the effects of the Paleolithic diet compared with a variety of popular diets. Potential disadvantages of a Paleolithic diet might include deficient intake of vitamin D and calcium as well as exposure to environmental toxins from high intake of fish.¹⁰ In addition to these needed clinical trials, it will also be important to see results of mechanistic basic science studies to understand why the Paleolithic diet appears to be beneficial and whether it can be improved upon.

All populations appear to develop diseases of civilization if they consume Western foods and have sedentary lifestyles.¹¹ It therefore seems prudent for modern-day humans to remember their evolutionary heritage and to increase their intake of vegetables and fruits and to decrease their intake of animal fats and domesticated grains. The Paleolithic diet might be the best antidote to the unhealthy Western diet.

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