EVIDENCE CLIP

The Popular Paleo Diet

November 2014

Topic Overview

The Paleo diet is very trendy right now. You may see it on menus, in popular books, many blogs, websites and cookbooks or hear it talked about just about everywhere. This diet is also referred to as the Paleolithic, caveman, Stone Age and the hunter-gatherer diet.

The Premises of the Paleo Diet

This diet attempts to duplicate the diet of early humans. It is based on the idea that human genetics have not changed or evolved over the past 10,000 years, since the time before the use of agriculture and so we are better adapted to the diet and lifestyle of the Paleo period than now. Additionally, anthropological studies suggest little to no evidence of today's prevalent chronic diseases (cardiovascular disease, diabetes and obesity) as well as dental cavities, joint disorders and acne in our Paleo ancestors, despite often consuming a high meat diet.

The Paleo diet promotes predominantly meat, fish, vegetables and fruit, and nuts, while foods that come from agriculture, including all grains, dairy foods, sugar, salt and low nutrient processed foods are to be avoided, since they were not consumed by Paleo people (1). Legumes are considered "toxic" by the Paleo proponents since raw beans contain anti-nutrients such as lectin. The macronutrient breakdown of the Paleo diet is promoted to be 19-35% protein, 34-45% carbohydrate, without a specified amount of fat (1).

Strengths of the Paleo Diet

- Fats are not as bad as once thought, and consuming omega 3-rich foods is of particular importance (2).
- Nuts are also valuable sources of desirable fats, vitamins, minerals and phytochemicals. Research suggests that nut consumption is associated with decreased LDL cholesterol (3) and a lower incidence of fatal and non-fatal ischemic heart disease (4).
- Vegetables and fruit, especially dark green, are very nutritious.

Evidence Analysis

Challenges with the Paleo Premises

The evidence is contradictory in the efficacy of the Paleo diet. Three randomized controlled trials have been conducted on the Paleo diet (5-7). All three studies examined the Paleo diet in participants who were either obese, had type 2 diabetes, or glucose intolerance. The control groups in these studies were instructed to follow a Mediterranean-like diet (5), a diabetic diet (6) or a low fat/high fibre diet (7). None of the purported benefits of the Paleo diet were consistently observed except for lower triglycerides, which was observed among the participants instructed to follow the Paleo diet in two of the studies (6,7).

In contrast, there is evidence that a high protein, low fat, moderate carbohydrate weight control diet can produce weight loss among obese subjects and also a significant reduction in serum triglycerides, even though it includes dairy foods and whole grains (8).

While two studies of the Paleo diet showed greater weight loss in the short term (three to six months) compared to the diabetic (6) and low fat/high fibre (7) diets, the weight loss

differential was not maintained relative to the latter diet at two years (7), and the Paleo diet was not superior to the Mediterranean-like diet for weight loss (6). There was no significant difference in body fat loss on the Paleo diet compared to either the Mediterranean-like diet at three months (5) or the low fat/high fibre diet at two years (7). While waist circumference was lower among the people on the Paleo diet at three months compared to the Mediterranean-like (5) and diabetic (6) diets and at six months for the low fat/high fibre diet, the latter difference was not maintained at two years (7).

Participants on the Paleo diet did not have superior LDL cholesterol, systolic blood pressure or C-reactive protein levels (a marker of inflammation) (6,7). Inconsistent results were seen for the Paleo diet regarding whether it was superior regarding glucose tolerance (5-7), or HDL cholesterol (6,7), or diastolic blood pressure (6,7).

Two secondary analyses of the Paleo diet assessed whether satiety was greater on the Paleo diet compared to the Mediterranean-like and diabetic diets (9,10). One of these studies found that compared to a diabetic diet, subjects eating a Paleo diet reported a significantly higher Satiety Quotient per reported calorie consumed (9). Compared to a Mediterranean-like diet, people on a Paleo diet did not report a significant difference in Satiety Quotient per calorie, until the researchers did an additional analysis based on the means (10). Basing this additional calculation on the means would lower the standard deviations thus increasing the chances of finding a statistically significant result (11), so this is not a valid statistical analysis.

Additional Challenges with the Paleo Premises

- The reasons ancient people may have had lower rates of chronic diseases associated with plenty of food are that they had to work hard at collecting enough food to survive, and they had shorter life expectancies than today (12).
- There likely was some obesity in the Paleolithic era, since many of the statues were of obese women (13).
- Humans have evolved on myriad different diets, with varying composition, depending on their location (14), but a common thread until recently was that their diet was based on whole foods without added sugars, fats and salt.

Are Legumes Really Toxic?

Cordain dictates that legumes (including peanuts and soy) are "toxic" since raw or undercooked beans induce "nausea, vomiting, abdominal pain, and severe diarrhea" (14). An additional reason he recommends avoiding them, is that legumes "are nutritional lightweights when compared to meat, fish and other animal foods" (15).

Raw or undercooked beans (such as those cooked in slow cookers that do not reach 100 degrees Celsius (16) can temporarily trigger these symptoms due to their content of a lectin, known as phytohaemaglutanin (PHA) (17,18). It is important to note that, soaking decreases the lectin content of beans (19) and ensures that subsequent boiling can completely eliminate the lectins in only 10 minutes (16,18). Germinating beans reduces their lectin content, one study reported a decrease of 25%, but it does not eliminate lectin (20). Thus, the standard way in which humans typically consume beans drastically reduces or eliminates the lectin content.

Legumes are a dietary staple in many traditional cultures in Latin America, Africa, and Asia without indications of toxicity (21). Legume consumption has been associated with health benefits and better nutrition intakes. People who eat beans have higher intakes of fibre, folate, potassium, phosphorus, magnesium, iron and zinc than individuals who rarely or never consume legumes (22). A systematic review of five observational cohort studies found that legume consumption (4 x 100 gram servings per week) was associated with a 14% lower rate of ischemic heart disease (RR=0.86; CI 0.78 to 0.94) (4). However, these observational studies did not find an association between legume eating with any difference in the risk of stroke or type 2 diabetes (4).

Systematic reviews have been performed on randomized controlled trials to evaluate the effect of legumes on several health and weight outcomes. Intakes of about 130 grams of legumes per day reduces LDL cholesterol levels by 0.17 mmol/ (95% CI, 0.25 to 0.09 mmol/L) (23). Another systematic review found that legumes significantly lowered systolic (-2.25 mm Hg; 95% CI, -4.22 to -0.28, *P*=0.03) but not diastolic BP (-0.71 mm Hg; 95% CI, -1.74 to 0.31, *P*=0.17) (24). Although the use of green beans (*Phaseolus vulgaris*) was not associated with a significant difference in weight loss compared to a placebo in a systematic review of randomized controlled trials (-1.77 kg, 95% CI, -3.33 to 0.33, *P*= 0.10), these beans were helpful in terms of a significant loss of body fat (-1.86 kg; 95% CI, -3.39 to -0.32, *P*=0.02) (25). Of importance, legume consumption reduces oxidative stress markers, the pro-inflammatory marker C-reactive protein, as well as improves LDL cholesterol levels and systolic blood pressure in overweight subjects (26,27).

What About Dairy?

The Paleo diet excludes dairy for five reasons, which have limits to their validity:

1. **"***Until the dawn of agriculture 10,000 years ago and the subsequent domestication of dairy animals, milk, butter, cheese and yogurt were never part of our ancestors' menu* (28)*."* However, several European, African, and Middle Eastern populations have evolved to tolerate lactose (29), suggesting that many populations have evolved their capacity to digest dietary components, which contradicts a primary premise of the Paleo diet.
2. *Milk is net-acid producing* (28). However, milk is not net-acid producing as measured by the two methods used to define acid excretion, i.e. net-acid excretion and acid pH (30).
3. *Dairy products produce a high insulin response, despite modest glycemic effect* (28). However, dairy products are also trophic to muscle growth, which is considered desirable (31).
4. *Milk may be a trigger for acne as part of wider inflammatory response* (28). However, this evidence is from observational studies. Double blind randomized trials are needed before a causal relationship is assumed.
5. *North Americans have some of the highest calcium intake in the world, but also some of the highest rates of osteoporosis* (28). However, this is not true, and is an ecologic fallacy, which is the "bias that may occur because an association observed between variables on an aggregate level does not necessarily represent the association that exists at an individual level" (32). Another important fallacy is that osteoporosis fracture risk is lower among Asian populations, since overall fracture prevalence rates are similar between urbanized Asians and Caucasians (33), and vertebral fractures rates are actually higher among Asians (34). There are considerable

differences in osteoporosis fracture rates among urbanized versus rural Asians, which is assumed to be at least in part due to differences in physical activity levels (33).

Are Grains Really So Unhealthy?

Proponents of the Paleo diet claim that grains should not be consumed because of health risks, because they are net-acid producing, lower in nutrients by weight than vegetables and fruit, and humans did not evolve eating these foods.

The health risks the Paleo proponents are concerned about for grains include high glycemic and insulin responses, inflammation promotion, and thus CVD, type 2 diabetes and cancer risk. However, the glycemic and insulin responses depend on individuals' glucose tolerance (7) and varies across grain foods and which foods are consumed with the grains (35). There is evidence that shows that early humans did consume some starch-containing foods, and may have consumed grains as long ago as 30,000 years (36-38).

Although health benefits have not been associated with refined grain foods, a diet high in whole grains is associated with lower body mass index, smaller waist circumference, and reduced risk of being overweight (39).

In terms of the claim that grains are net-acid producing, no studies have evaluated net-acid excretion after grain consumption, and a critical examination of the acid-ash hypothesis shows it does not stand up under scrutiny (40).

Other Points about the Paleo Diet

- Is a Paleo diet expensive? No studies were found that that examined the Paleo diet in terms of food costs, but one computer analysis study examined the feasibility of consuming a nutritionally adequate Paleo diet given a limited budget (41). Metzger, et al. found that an almost nutritionally adequate Paleo diet could be achieved; except for calcium, iron and fibre; if the following quantities of food were consumed daily: poultry 399 g, eggs 45 g, low cost fish 75 g, potatoes 909 g, dark green vegetables 110 g, other vegetables 134 g (41). This study raises the question – if a computer could almost create a nutritious diet given limited funds, can consumers?
- The Paleo diet as defined today likely does not reflect actual ancient eating patterns. For example, individuals in the Paleo period likely ate insects (42), marrow and organ meats (43) for their important nutrient contributions, and lived with feast and famine.
- The premise of the Paleo diet opposes other known healthful diets, such as the vegetarian diet.
- Early humans reportedly ate many different diets, ranging substantially in composition and macronutrient content) depending on where they lived (14).
- The ancient forms of many of our foods, before plant breeding to improve palatability and yields, were less nutritious, less tasty, and are impossible to obtain now (43).

The Paleo diet is the latest diet to be claimed to support weight loss and optimal health. Testing of whether this diet has advantages has only begun.

While it is possible to choose nutritionally adequate diets while adhering to the Paleo diet it requires careful food selection to ensure nutritional adequacy. The Paleo diet is most limiting for fibre and calcium, and surprisingly, iron (41) and most likely vitamin D. This diet is

driven, not by nutrition science, but by flawed interpretations of anthropology (43) and opinion. The randomized trials reveal that the Paleo diet is not a magical solution to weight control or health concerns (5-7).

A superior diet? Most people's diets would likely improve with less processed foods/added sugars/refined grains, especially if those calories are replaced with vegetables, as advocated in the Paleo diet (45). However, the randomized trials on this diet revealed that their reported protein intakes (6,7), and nitrogen excretion (7) were not higher in the Paleo groups compared to the control diet groups, despite the higher protein intake advocated by the Paleo diet. These findings suggest that the Paleo diet may be hard to adhere to (7), and the diet may not appeal to all people (5). If people find it hard to comply with the diet, attempting to follow it could lead to feelings of failure.

Many of the health problems of modern society are likely to be related to the sedentary nature of modern lifestyles (46,47) combined with generous consumption of energy, rather than the distribution of food across food groups.

So far, there have been only three randomized, controlled trials of the Paleo diet (5-7), and there is a need for more trials to fully understand the potential effects of this diet. These RCTs have been conducted among people with metabolic syndrome. If healthy non-obese subjects are consuming this diet, it would be very advantageous to have studies among these people.

The Bottom Line

The Paleo diet does not provide exceptional results in terms of weight loss or health advantages (5-7). Little is known about what actual foods were eaten by our Paleolithic ancestors but there is evidence that they ate some grains and legumes (36-38). It is important to consider that humans have evolved since the advent of agriculture and the consumption of dairy foods, as several populations have evolved to tolerate lactose (29). Thus, the Paleo diet is not a miracle diet and several of the premises of the Paleo diet are not supported by evidence.

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