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The Paleo Diet: Claims Versus Evidence



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First off, a word of...



Agenda

- ✓ Background & Definitional Claims
- ✓ Grains & Legumes Claims
- ✓ Dairy Claims
- ✓ Sugar Claims
- ✓ Fatty Acid Claims
- ✓ Comparative Research Claims
- ✓ Conclusions & Applications

Background: The Paleolithic Era

- It's generally accepted that the **Paleolithic period** spanned from the earliest estimated use of stone tools (about 2.5 million years ago) until roughly 10,000 years ago [1].
- The **Agricultural Revolution** (also called the Neolithic Revolution) began roughly 10,000 years ago, with widespread grain production and animal husbandry representing less than 1% of human existence [2].
- Paleo diet proponents blame the spread of agriculture for the so-called "*diseases of civilization*."
- It's been proposed that the human genome has not undergone sufficient mutation & evolutionary change to handle Neolithic food consumption without adverse health consequences. **The big question is, how strong is the evidence behind this claim?**

Background: Cherry-Picking the Culprit

- The **Industrial Revolution** occurred approximately 200 years ago. It's characterized by the widespread transition of hand production methods to machine-based methods.
- The **Digital Revolution** (which includes the advent of the internet), characterized by the change from analog, mechanical, and electronic technology to digital technology, began roughly 30 years ago, and continues until the present.
- The Industrial & Digital Revolution are marked by **progressive downshifts in physical activity**. It's odd that these important periods of history are ignored by Paleo diet proponents, who selectively blame the 10,000 year-old agricultural revolution for diseases of the modern day.

Modern Adaptation of the Paleo Diet

Allowed:

- Poultry, fish, meat (purists prefer organic/grass-fed)
- Eggs
- Fruit (purists stick to berries)
- Vegetables (except nightshades like tomatoes, potatoes, & eggplants)
- Nuts (except peanuts), seeds (sparingly)

Prohibited:

- Grains & legumes
- Milk & milk products
- Refined/added sugars
- High omega-6, refined or hydrogenated vegetable oils
- Nightshade vegetables such as tomatoes, potatoes, & eggplant
- Added salt
- Coffee & alcohol

Definitional Claims

Claim: *“The Paleo Diet consists of a strict, specific set of foods that we as humans were meant to eat since this is how our prehistoric ancestors ate, and all else should be avoided.”*

Evidence:

- Ancestral diets varied widely in terms of both food selection and macronutrient composition, depending upon the foods available geographically.



Definitional Claims

Evidence (continued):³

- Immediate ancestors of modern humans are believed to have evolved in the tropics (i.e., Africa) roughly 200,000 years ago, where the large majority (perhaps 70%) of their diet was plant-based.
- In contrast, modern humans entering Europe 40,000 years ago are likely – through necessity – to have had a meat-based diet, which was maintained over hundreds of generations.
- The dietary habits of modern hunters & gatherers potentially reflect the widely varying diets of our prehistoric ancestors because they cover the range from being largely plant-based (in the tropics) to animal-based (in the arctic).

Definitional Claims

Claim: *“The diet of our prehistoric ancestors is accurately defined by the eating habits of modern-day hunter-gatherer societies.”*

Evidence:

- Actual intake of our Stone Age forefathers is devoid of any accurate historical records. Thus, Paleo dieting is largely based on educated guessing, at best. To quote Lauren Cordain [4], ***“Unfortunately, not a single comprehensive study evaluating the macronutrient and trace nutrient contents of the wild plant and animal foods actually consumed in un-Westernized hunter-gatherer diets was ever conducted.”***

Grains & Legumes Claims

Claim: *“Grains were not a part of our prehistoric ancestors’ diets. They have only been consumed since the advent of agriculture 10,000 years ago, and therefore should not be eaten by modern humans.”*

Evidence:

- Recent = dangerous = false.
- Recent peer-reviewed data have challenged the idea that grain production & consumption is as recent a phenomenon as suggested by Paleo diet proponents.



Grains & Legumes Claims

Evidence (continued):

- **2009:** Mercader et al found a “large assemblage of starch granules” on the surfaces of Middle Stone Age stone tools from Mozambique, showing that early Homo sapiens relied on grass seeds – including those of sorghum grasses – starting at least 105,000 years ago [5].
- **2010:** Revedin et al found evidence of starch grains on the surfaces of grinding tools from a variety of geographical and environmental contexts, ranging from northeastern Europe to the central Mediterranean, and dated to the Mid-Upper Paleolithic. The three sites suggest that plant food processing, and possibly the production of flour (predictable/reliable high energy), was a widespread practice across Europe from at least 30,000 years ago [6].

Grains & Legumes Claims

Evidence (continued):

- **2011:** Henry et al found direct evidence for Neanderthal consumption of a variety of plant foods, including starch grains recovered from dental calculus of Neanderthal skeletons from Shanidar Cave, Iraq, and Spy Cave, Belgium. Some of the plants are typical of recent modern human diets, including date palms, legumes, and grass seeds [7].
- Henry et al concluded that in both warm Eastern Mediterranean and cold Northwestern European climates, and across their latitudinal range, Neanderthals made use of the diverse available plant foods by transforming them into more easily digestible foodstuffs (in part, through cooking), suggesting an overall sophistication in Neanderthal dietary regimes – dating back 44,000 years.

Grains & Legumes Claims

Claim: *“Grains & legumes are unhealthy and should be avoided.”*

Evidence:

- A **convergence of evidence** from observational research [8-14] and experimental research [15-24] have shown multiple therapeutic and protective health benefits of whole grain (& legume) consumption, including improved blood lipid profile, glucose control, reduction of inflammation, and reduced risk of stroke & coronary heart disease.



Grains & Legumes Claims

Claim: *“Grains contain phytates and oxalates, which are antinutrients (designed to protect the plant) that reduce the bioavailability of essential minerals.”*

Evidence:

- Phytates and oxalates are not exclusively contained in grains. They exist in a wide range of plant foods, including green/leafy vegetables [25].
- Selectively claiming that certain plants should not be eaten because they were designed to resist consumption is as illogical as claiming no one should eat animals with defenses against predation.



Grains & Legumes Claims

Evidence (continued):

- In vegetarians, the elimination of meat alongside increased consumption of phytate from grains & legumes has been seen to reduce iron and zinc absorption.
- Despite iron and zinc being the trace minerals of greatest concern in vegetarian diets, these deficiencies seen in impoverished nations are not associated with the vegetarian diets in industrialized nations with diverse and abundant food supplies [26].
- Keep in mind that these reductions of nutrient bioavailability are of questionable significance in vegetarian diets. In the case of varied, omnivorous diets, these concerns would be minimal, at best.

Grains & Legumes Claims

Claim: *“Grains cause inflammation, the root of all disease.”*

Evidence:

- First of all, inflammation is not the root of all disease. Chronic, systemic inflammation is often a symptom of disease rather than a causal agent of disease.
- In addition to the fact that correlation does not automatically equal causation, there are several origins of disease stemming from factors other than inflammation.



Grains & Legumes Claims

Evidence (continued):

- An example of multiple possibilities for the origin of disease is the **universal differential diagnosis mnemonic** (a well-known memory jogger in medicine), contained in the acronym **VINDICATE** [27]:

V – Vascular

I – Infectious

N – Neoplastic

D – Drug-related (or) degenerative

I – Inflammatory (or) idiopathic

C – Congenital (or) developmental

A – Autoimmune (or) allergic

T – Traumatic (or) toxic

E – Endocrine (or) metabolic

Grains & Legumes Claims

Evidence (continued):

- Observational research has shown divergent effects – a positive correlation between refined grain consumption and inflammation, but an inverse correlation between whole grain consumption and inflammation [28].
- However, controlled comparisons between refined and whole grain consumption have consistently shown no inflammatory effects from either type of grain consumption, with servings ranging from 3 to 4 per day [29-32].
- The claim that grains cause systemic inflammation therefore has no basis in controlled human research, which largely has shown a neutral effect on health markers.

Grains & Legumes Claims

Claim: *“Gluten intolerance is widespread, and mainstream science is in denial of it.”*

Evidence:

- Celiac disease (CD), a gluten-dependent autoimmune disorder of the small intestine, is estimated to affect 0.3-1.2% of the population [33].
- Gluten intolerance – also called non-celiac gluten sensitivity (NCGS) or simply gluten sensitivity – currently has no clear diagnostic criteria. The combined prevalence of CD, NCGS, and wheat allergy is hypothesized to be as high as 10% of the general population [33].



Gluten-Intolerant?

Gluten-Containing Grains

- Barley
- Rye
- Triticale
- Wheat—including bulgur, durum, faro, kamut, semolina, spelt

Gluten-Free Grains

- Amaranth
- Buckwheat
- Corn
- Millet
- Montina (Indian rice grass)
- Oats*
- Quinoa
- Rice (brown & white)
- Sorghum
- Teff
- Wild rice

**Oats are a naturally gluten-free grain, but there have been instances of gluten contamination in factories producing multiple grain products. Companies that specialize in uncontaminated gluten-free grains are: [Avena Foods](#), [Bob's Red Mill](#), [Cream Hill Estates](#), [Gifts of Nature](#), [GF Harvest](#), [Gluten Solutions](#).*

Grains & Legumes Claims

Claim: *“Grains, legumes, and nightshade vegetables like tomato, potato, and eggplant contain lectins which cause ‘leaky gut’ and adverse autoimmune responses.”*

Evidence:

- This claim is largely speculative since it’s primarily based on *in vitro* and animal data. To quote Carrera-Bastos et al [34]:
“Unfortunately, the effects of lectins and saponins on intestinal permeability, endotoxemia, and inflammation have been poorly studied in humans to allow us to draw significant conclusions.”



Grains & Legumes Claims

Evidence (continued):

- Despite claims of grain, legume, & nightshade vegetable consumption damaging the intestines, there is no research on healthy humans supporting this. Even in the diseased population, grain consumption has not been consistently demonstrated to exacerbate pre-existing GI disorders.
- In fact, supplementing with wheat bran has been investigated as a therapeutic treatment option for irritable bowel syndrome (IBS), the most common intestinal problem that causes patients to be referred to a gastroenterologist. Although it has largely been ineffective for treating IBS, no adverse effects on GI function have been observed with bran supplementation [35-37].

Grains & Legumes Claims

2012: Ajala et al assessed the effect of various diets on glycemic control, lipids, and weight loss in a systematic review & meta-analysis . The main findings were:

- The low-carbohydrate, low-GI, Mediterranean, and high-protein diets all led to a greater improvement in glycemic control compared with their respective control diets (which included low-fat, high-GI, American Diabetes Association, European Association for the Study of Diabetes, and low-protein diets).
- The low-carbohydrate diet was the most effective for raising HDL.
- The Mediterranean diet showed the greatest improvements in glycemic control and weight loss compared to the control diets.

Ajala O, English P, Pinkney J. Systematic review and meta-analysis of different dietary approaches to the management of type 2 diabetes. Am J Clin Nutr. 2013 Mar;97(3):505-16.

Paleo Violation Royale: Grains, Legumes, Nightshades, & Dairy – Mediterranean Peril on a Plate!



Chicken Souvlaki, olive & feta relish, and pinto bean jalapeño hummus: extremely un-Paleo

Source: <http://www.motherfitness.com/my-kitchen-chicken-souvlaki-olive-and-feta-relish-and-pinto-bean-jalapeno-hummus/>

Dairy Claims

Claim: *“Dairy has an acidic instead of alkaline effect on the body and does not protect bone health.”*

Evidence:

- The acid/base claim does not reflect the current scientific evidence [38,39]. Milk and dairy products neither produce acid upon metabolism, nor do they cause metabolic acidosis.
- Furthermore, systemic pH is not influenced by diet; acidic pH urine does not automatically reflect metabolic acidosis or an adverse state of health [38].
- Dairy’s bone-protective effect is supported by the majority of observational research and nearly ALL controlled interventional research [40,41].



Dairy Claims

Claim: *“Cow’s milk is good for baby cows, but not humans. We are the only animal that drinks the milk of another animal.”*

Evidence:

- It’s false to think that only humans consume the milk of other animal species. For example, feral cats and western gulls were recently reported to steal milk from northern elephant seals [42].
- Who gets to decide which parts of the cow we should consume? It’s perfectly Paleo to eat the cow’s muscles, but not the milk that laid the foundation for the growth of those same muscles? Illogic abounds in this claim.



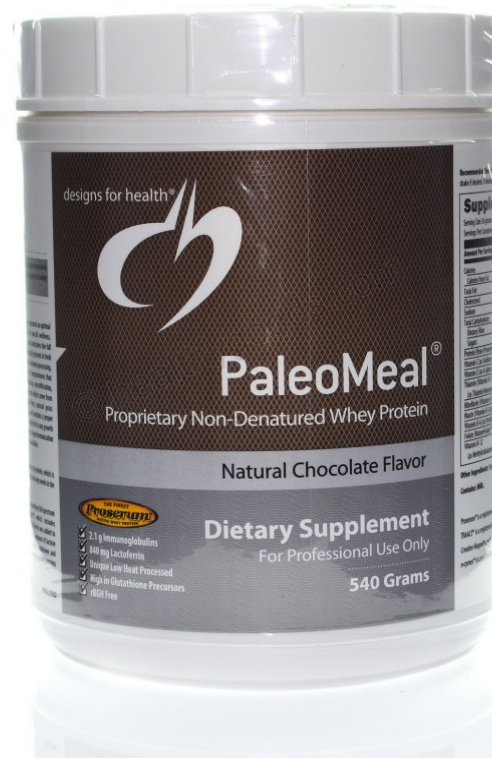
Nightshades & Dairy – Deadly!



Potato & eggplant bake, with tomato & mozzarella cheese: very un-Paleo

Source: <http://www.grandmaskitchen.com/recipes/comforting-potatoes/potato-eggplant-bake>

Whey Ironic 😊



NOT PALEO



Roti Mediterranean Grill, Washington DC

PALEO

The Paleologix Paleo Diet Support System



<http://paleologix.com/>

Sugar Claims

Claim: *“Sugar is toxic, and is responsible for the rise of obesity in recent decades.”*

Evidence:

- Saying that sugar is toxic is just as silly as saying that salt is toxic. It depends on the dose & the context.
- The median lethal dose (LD50) of sugar is about 30 g/kg of body mass (6 pounds for a 180 lb man).
- In contrast, the LD50 of table salt is about 3 g/kg (0.6 pounds for a 180 lb man). Is it fair to say that salt is 10 times more toxic than sugar?



Sugar Claims

Evidence (continued):

According to the most recent data from the ERS/USDA [43]:

- In 1970, Americans consumed an estimated 2,169 calories per person per day. In 2010, they consumed an estimated 2,614 calories (an increase of 445 kcal).
- Of this 445 kcal increase, grains (mainly refined grains) accounted for 188 calories; added fats and oils, 188 calories; caloric sweeteners, 42 calories; dairy fats, 16 calories; fruits and vegetables, 15 calories; and meats, 8 calories. Only dairy products declined (12 calories).
- This indicates that caloric sweeteners contributed less than 10% of the total caloric increase that occurred in the last 4 decades.

Sugar Claims

Evidence (continued):

- NHANES data shows a drop of 142 kcals in occupation-related energy expenditure compared to the early 1960's [44].
- This expenditure decrease combined with the estimated 445 kcal intake increase amounts to 587 kcal in the positive compared to a half century ago.
- This alone would account for the rise in rates of overweight & obesity (whose profile tracks closely with the advent of the internet).
- This still does not account for the decrease in non-occupational energy expenditure, which if we conservatively estimate dropped 100 kcal, would bring the surplus to roughly 700 kcal.
- Blaming everything on sugar ignores a host of larger factors.

Fatty Acid Claims

Claim: *“The modern Westernized diet has a much higher ratio of omega-6 to omega-3 fatty acids than the Paleo diet, so we must mimic our prehistoric ancestors and increase the proportion of omega-3s.”*

Evidence:

- The current scientific evidence does not support the importance of a specific ratio of omega-6 to omega-3 fatty acids [45]. To quote a review by Harris et al [46]:

“...the ratio is, on both theoretical and evidential grounds, of little value. Metrics that include omega-3 fatty acids alone, especially eicosapentaenoic acid and docosahexaenoic acids, appear to hold the greatest promise.”



Fatty Acid Claims

Evidence (continued):

- Increasing omega-3 intake (especially from marine sources) is a good general recommendation, especially when addressing the typical Western diet.
- However, Paleo proponents tend to encourage indiscriminate minimization or avoidance of omega-6 sources in an effort to decrease their proportion in the diet. This can be counterproductive for the goal of achieving a healthy diet. Here's a sample of some 'healthy' foods with high omega-6:3 ratios:
 - **Coconut oil** → **3923:1**
 - **Almonds** → **2010:1**
 - **Sunflower seeds** → **457:1**
 - **Olive oil** → **20:1**
 - **Avocado** → **15:1**
 - **Chicken** → **8:1**
 - **Beef** → **5:1**
 - **Walnuts** → **4:1**

Paleo Comparison Research: Not Surprising⁴⁷⁻⁵⁰

Study	Design, Subjects	Duration	Paleo Macros	Control Macros	Outcomes	Comment
Jonsson et al 2010	RCT, Paleo vs. Mediterranean, IHD patients	12 weeks	1385 kcal 92gP, 129gC, 46gF 22g fiber	1815 kcal 88gP, 211gC, 59gF 27g fiber	Paleo diet was more satiating per calorie than a Mediterranean-like diet.	Possibly due to higher proportion of protein & differing carb sources (fruit vs grains).
Frassetto et al 2009	Single arm, Paleo vs. habitual diet, healthy, sedentary subjects	10 days	2701 kcal 198gP, 249gC, 96gF Fiber: higher	2372 kcal 107gP, 254gC, 99gF Fiber: lower	Paleo diet improves BP and glucose tolerance, improves lipid profiles without weight loss.	Not surprising. Almost double the protein & higher intake of fruit & veg.
Jonsson et al 2009	Randomized cross-over, Paleo vs. standard diabetes diet, type-2 diabetics	12 weeks	1581 kcal 94gP, 125gC, 68gF 21g fiber	1878 kcal 90gP, 196gC, 72gF 26g fiber	Paleo diet improved glycemic control and several cardiovascular risk factors compared to a Diabetes diet.	Not surprising. Diabetes diet had 57% more carbs & an additional 297 kcals.
Lindeberg et al 2007	RCT, Paleo vs. Mediterranean, IHD patients with either glucose intolerance or type 2 diabetes	12 weeks	1344 kcal 90gP, 134gC, 42gF 21.4g fiber	1795 kcal 89gP, 231gC, 42gF 26.8g fiber	Paleo diet improved glucose tolerance independently of decreased waist circumference.	Not surprising. Mediterranean diet had almost double the carbs & an additional 451 kcals.

Dietary Habits of the World's Healthiest Populations

The Blue Zones are populations with the longest life expectancies, highest centenarian rates, and lowest rates of chronic & degenerative disease [51]. Five “longevity hot spots” have been identified and studied by research teams led by explorer Dan Buettner.

The Blue Zones

- Ikaria, Greece: A variation of the Mediterranean diet, rich in olive oil, fruits, vegetables (wild greens), whole grains, fruit and a little fish. Goat milk and wine (about 2 glasses per day) are also traditional. Coffee and tea are consumed regularly.
- Seventh Day Adventists in Loma Linda, California: Vegetarian diet rich in beans & nuts, low EPA/DHA intake, high intake of the plant-derived omega-6 fatty acid, no alcoholic beverage consumption.

Dietary Habits of the World's Healthiest Populations

The Blue Zones (continued)

- Nicoya, Costa Rica: Black beans, white rice, corn tortillas, squash, eggs (mostly fried), and fruit are staples. More meat (mainly chicken & pork) and fruit is consumed compared to other blue zones. The water is very high in minerals, especially calcium due to the regions limestone bedrock. Coffee is drank daily, sweetened with raw sugar cane.
- Sardinia, Italy: Plant-dominant diet, large quantities of dark red wine, fava beans, and barley are consumed. Goat milk & goat cheese are staples. Meat intake (lamb, lean pork, oily fish, and shellfish) is modest & infrequent. Coffee is drank daily.
- Okinawa, Japan: Plant-dominant diet, large amounts of various types of seaweed are consumed. Staples include sweet potatoes, soy beans & soy products such as tofu & miso, white rice, and tea. Raw sugar is eaten with snacks. Minor consumption of fish & pork. The diet is very high-carb, very low-fat. Virtually no eggs or dairy.

Dietary Habits of the World's Healthiest Populations

Dietary Commonalities Among the Blue Zones

- Largely plant-based.
- No over-eating.
- Foods are locally or home-grown & home-prepared.
- Carbohydrate (largely from starch) is the predominant macronutrient.
- Beans, including fava, black, soy and lentils, are the cornerstone of most centenarian diets.
- 3 of the 5 zones are regular coffee consumers.
- 4 of the 5 zones are regular alcohol consumers.
- All 5 zones are regular consumers of grains & legumes.
- None of the zones follow a Paleo-type diet.

Conclusions

- It's impossible to universally define the diet of our pre-historic ancestors due to widely varying intakes according to food availability and geographical location.
- Multiple lines of recent archaeological data have challenged the idea that grain consumption was not a part of the Paleolithic/ancestral diet.
- Comparative research favoring Paleo diets have failed to match macronutrient intake, making it impossible to isolate the inherent benefit of Paleo-approved foods.
- Modern adaptations of the Paleo diet have distinct benefits. The strongest benefit is the focus on whole/unrefined foods. The “Paleo-friendly” foods have plenty of supporting research.
- On the down side, there is little to no supporting research for avoiding the main “Paleo-prohibited” foods (a practice which tends to foster orthorexia). Paleo proponents tend to think in extreme, black & white terms instead of the healthier alternative – moderation & sanity.

Applications

- Avoidance of gluten and dairy (or any food, for that matter), should be done the basis of an objectively diagnosed intolerance or allergy. Avoidance of any food should NOT be done on the basis of pseudoscientific hearsay or diet lore. My only personal 'rule' is, whenever possible, ***avoid food avoidance***.
- Achieving a healthy diet can be accomplished by:
 - ✓ Staying in the ballpark of your macronutrient targets.
 - ✓ Predominating your intake with a variety of whole and minimally refined foods.
 - ✓ Leaving a minority of the diet open for indulgences of whatever you want (10-20% guideline).
 - ✓ Ignoring the rules of fad diets & sticking with foods that fit your personal preference & tolerance.

Thanks for listening, enjoy your freedom!



Peanutbutter & chocolate oatmeal bars: mortal sin according to Paleo doctrine

Source: <http://pastrychefbaking.blogspot.com/2012/11/peanut-butter-chocolate-oatmeal-bars.html>

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Observational Evidence: My Clients

