PALEO CONSENSUS REPORT



Are Potatoes Paleo?
Establishing the official status of the world's most controversial tuber through logical evaluation.

A Paleo Foundation Project, Copyright 2019



Are Potatoes Paleo? Establishing the official status of the world's most controversial

tuber.: A Paleo Foundation Project

By: Karen Pendergrass

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Statement of Purpose

In loose terms, the *Paleo Diet* is a diet based on the types of foods presumed to have been eaten by early humans before the advent of agriculture. These foods included meat and seafood, nuts and seeds, roots and tubers, and fruits and berries. The diet of our ancient Paleolithic ancestors presumably excluded dairy, grains, and highly refined foods.

Unfortunately, the food landscape has changed significantly in the past 10,000 years, which makes defining items that fall into 21st Century Paleo Diet a bit... *tricky*. Because the diet is theoretical in nature and up for wide interpretation, no one single 'Paleo Diet' definition exists, and disagreements over specific food items and processing among the Paleo Community is common.

Our aim with the Paleo Consensus Report is to provide a comprehensive look at various arguments made by the Paleo Community, and to offer a definitive guide and current **Official Paleo Status** for foods and ingredients. We do so by taking several factors into account, including current research, archaeological records, paleogenetics, sustainability concerns, proposed health benefits, and input from various leading health experts of the Paleo Movement.

Enjoy,



CFO

Karen Pendergrass
Paleo Foundation





The Experts



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Robb Wolf Research Biochemist, Author of The Paleo Solution



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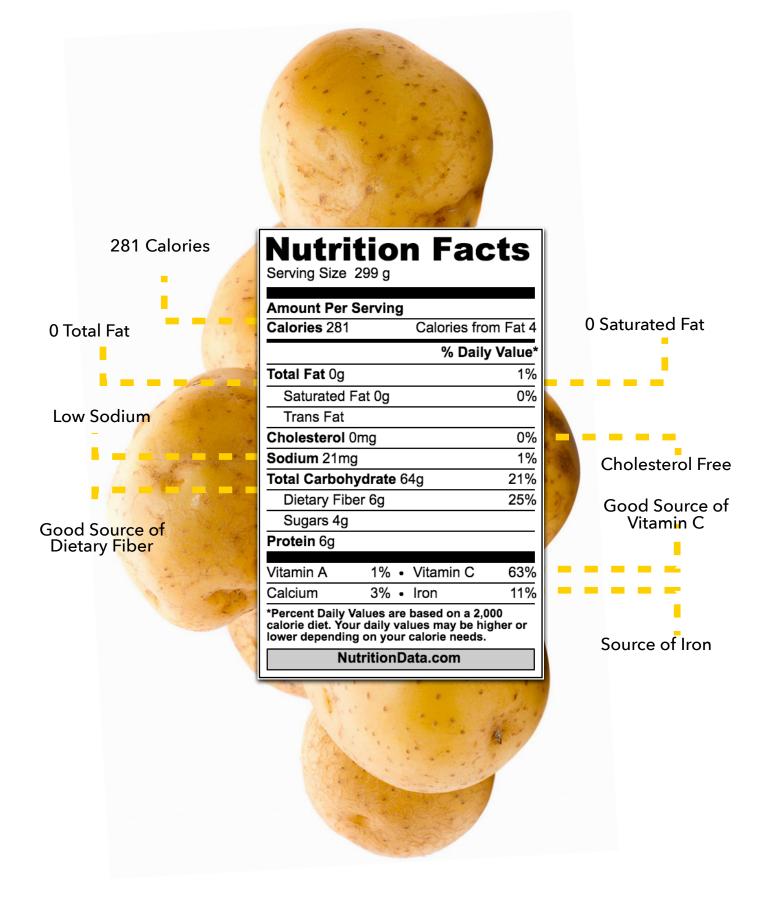


Diana Rogers, RD Author of Sustainable Dish

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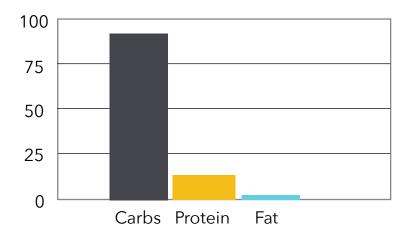
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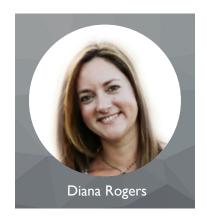
The Potato



Nutritional Value of Potatoes

Macronutrient Profile of the Potato





"I think one of the biggest misperceptions about potatoes is that they're just a "carb bomb with no nutritional value" but the nutritional data suggests otherwise."

While the macronutrient

makeup of a potato is 90% carbohydrate, 1% fat, and 9% protein, <u>nutritional data</u> suggests that it is also a very good source of essential vitamins such as vitamin C, niacin, vitamin B6, folate, and pantothenic acid, and minerals like magnesium, phosphorus, potassium, copper, and manganese.

Vitamins

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	Pantothenic Acid	1.1 mg	11%
Betaine 0.6 mg	Choline	43.1 mg	
	Betaine	0.6 mg	

Minerals

Amounts Per Selected Serving		%DV
Calcium	29.9 mg	3%
Iron	1.9 mg	11%
Magnesium	80.7 mg	20%
Phosphorus	224 mg	22%
Potassium	1626 mg	46%
Sodium	20.9 mg	1%
Zinc	1.0 mg	7%
Copper	0.4 mg	19%
Manganese	0.6 mg	28%
Selenium	1.5 mcg	2%

Are Potatoes Healthy?

Biological Facts about the Potato

Botanical Family

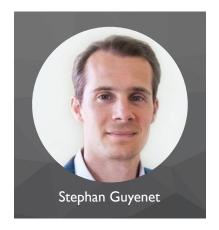
Potatoes (*Solanum tuberosum*) are in the *Solanaceae* family, related to tomatoes, peppers, and eggplant.

Tubers

The part of the potato plant we eat is called the tuber, which is actually an enlarged underground stem. Each plant will produce multiple tubers. Potato tubers come in a variety of colors, but most common are red and white. Their shape can be round, oblong, flattened, or elongated.

Biodiversity

There are about 4,000 known varieties of potatoes with about 3,000 existing in the South American Andes region alone where they originated, and can drastically differ in type, size, shape, color, and even starch content.



"From a nutritional standpoint, potatoes have a bad reputation, but this is undeserved in my opinion. If I had to pick a single food to eat exclusively for an extended period of time, potatoes would be

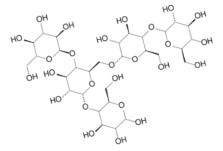
high on the list. One reason is that they contain an adequate amount of complete protein, meaning they don't have to be mixed with another protein source as with grains and legumes. Another reason is that a number of cultures throughout history have successfully relied on the potato as their principal source of calories, and several continue to do so. A third reason is that they're eaten in an unrefined, fresh state.

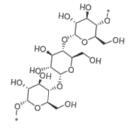
Potatoes contain an adequate amount of many essential minerals, and due to their low phytic acid content, the minerals they contain are well absorbed. They're rich in magnesium and copper, two minerals that are important for insulin sensitivity and cardiovascular health. They're also high in potassium, which helps control blood pressure, and vitamin C. Overall, they have a micronutrient content that compares favorably with other starchy root vegetables such as taro and cassava, and they offer considerably more micronutrients than refined carbohydrates such as white flour, white rice and white sugar." [Read full text]



Resistant Starch

noun: resistant starch (RS) is any starch that is not digested in the small intestine but passes to the large bowel.





Amylopectin

Amylose



Starch is a naturally occurring dietary carbohydrate. In plants its primary role is to store energy from photosynthesis in the form of long chains of glucose so that it can be used later to fuel important processes including seed germination.

All starches are composed of two types of polysaccharides: *amylose* and *amylopectin*.

Amylopectin is highly branched, leaving more surface area available for digestion. It's broken down quickly, which means it produces a larger rise in blood sugar and subsequently, a larger rise in insulin. Amylose is a straighter chain, which limits the amount of surface area exposed for digestion. This is the dominant structure in Resistant Starch. Foods high in amylose are digested more slowly, and are less likely to spike blood glucose or insulin.

Therefore, it resists digestion in the small intestine and travels on into the large intestine, where it becomes a food source, or *prebiotic*, for the bacteria that reside there. Thus, resistant starch is so named because it resists digestion.

The purpose for consuming resistant starch is to feed and cross-feed the healthy flora that live in your colon, so that they will multiply and regulate the gut microbiome.

Gut Microbiome

noun: the genomes of the gut microbiota. Gut microorganisms benefit the host by gleaning the energy from the fermentation of undigested carbohydrates and the subsequent absorption of short-chain fatty acids.



"Over the past several years there have been an exponential increase in the number of studies linking imbalances or disturbances of the gut microbiota to a wide range of diseases including obesity, inflammatory bowel diseases, depression, and anxiety.

One of the best ways to establish and support a healthy gut microbiome is by providing the right "foods" or prebiotics for your gut bacteria. Some common Paleo food sources of prebiotics include (unripe) bananas, plantains, and cooked and cooled potatoes. However, if you are on a low carbohydrate diet or don't tolerate those foods well, you can add Resistant starch to your diet without adding digestible carbohydrates. Bob's Red Mill Unmodified Potato Starch is one of the best sources of RS with approximately eight grams of RS in one tablespoon. Potato starch is generally well tolerated even by those who react adversely to nightshades." [Read full text]



Nightshades

noun: a plant related to the potato, typically having poisonous black or red berries.

Nightshades can be problematic for many people due to their lectin, saponin, capsaicin, and glycoalkaloid content. However, these properties tend to be even more problematic for those with autoimmune disease.



Glycoalkaloids

noun: Glycoalkaloids are a family of chemical compounds which serve as natural pesticides. There are several that are potentially toxic, most notably those commonly found in nightshades.

Autoimmune Considerations



"Another reason for avoiding white potatoes is that they belong to the nightshade family, a group of vegetables that also includes tomatoes, eggplant, and peppers.

Nightshades contain a type of chemicals called glycoalkaloids

that can trigger leaky gut symptoms in people who are intolerant to them.

Another notable concern with aggressively supplementing with resistant starch, especially potato starch, is what happens to the composition of your gut microbiome. Different strains of bacteria have specific substrates they like to munch on, and while some are happy to dine on [Resistant Starch], others prefer different forms of fiber. When we consume unnaturally high (e.g., supplemented) levels of one type of resistant starch (or one type of any fiber), we risk selectively feeding certain strains of bacteria while lowering the proportion of other beneficial kinds. Even beneficial probiotic strains of bacteria can overgrow, and this is especially a concern when this comes at the expense of microbial diversity—while much remains unknown about the optimum gut microbiome, one thing we know for sure is that a diverse microbiome is a resilient and healthy one." [Read full text]

Are Potatoes Sustainable?



Monoculture

noun: the cultivation of a single homogeneous crop, without diversity, across a broad area of land.

Mychorrhiza

noun: a fungus that grows as an extension of plant root systems and are more effective in nutrient and water absorption than the roots of plants themselves.



"In 1845, a airborne fungal spore carried aboard a ship from the United States spread across Ireland within a matter of weeks, causing potatoes to turn black and rot.

At the time, Irish farmers almost

exclusively grew "Irish Lumper" potatoes. So when the fungal disease caused by *Phytophthora infestans* struck their potatoes— it became a national disaster. Although other countries also experienced the same fungal infection with their potatoes, the effects weren't as pronounced as they were in Ireland.

Although the Irish Potato Famine devastated the nation for 3 years and killed nearly 1/8th of the population, this was not because potatoes were an inherently inferior food source. What the Irish potato famine illustrated was a fundamental danger associated with monoculture crops, and what can happen when a single crop is relied upon as a primary food source.

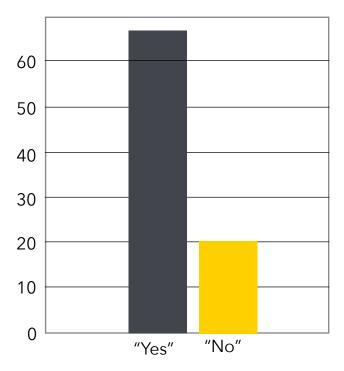
Ireland <u>relied</u> on potatoes as a staple food because the "Irish Lumper" cultivar of potatoes were wellsuited to the soils and the climate, and could be grown in vast quantities. It is speculated that a surplus of calories from potatoes allowed the population to boom. However, when the crop failed, the population no longer had a reliable food source.

Some potatoes are less susceptible to blight, and if multiple varieties of potatoes or other crops were grown, the devastation may not have been so dramatic. Perhaps the Irish potato famine could have been avoided altogether. Today, pesticides and fungicides preclude most crop losses related to infestation and fungal infection. However, chemical interventions and monocultures are not without further concerns.

In monoculture potato production, applications of fungicides, single-species crop production, and tilling methods negatively impact topsoil and disrupt *mycorrhizae*, reducing the nutrient and water absorption capacity of the soils. To produce more nutritious food, protect biodiversity, and improve soil profiles, other methods of potato production that include biological fungicides and pesticides that do not adversely affect soil microbiota should be explored." [Read full text]

Potato Arguments

"Are Potatoes Paleo?"



Polling Conducted September 2016 in the International Paleo Movement Group

When The Paleo Diet was first popularized, white potatoes were omitted from the diet. The initial reasons cited for the exclusion which were due to their high glycemic index and their glycoalkaloid content.

However, as time passed, the original exclusion became controversial. Evidence to support the inclusion of white potatoes gained traction, and the community perception of the Paleo Status of potatoes changed.

According to a recent polling, 77% of Paleo adherents believe potatoes to be Paleo, while 23% believe they do not fit the Paleo bill.

In order to begin to make critical assessments of the Official Paleo Status of the potato, individual arguments against its inclusion must be critically assessed.

This will often include feedback from experts of the Paleo Community, and sheer logical arguments. After all, given that the Paleo Diet is a theoretical template, logic must be employed as well when making determinations for an entire community.

Main Arguments Against Potatoes for Paleo Consideration

- "Potatoes weren't eaten until the Agricultural Revolution."
- "White potatoes aren't paleo because they're starchy vegetables and have a high glycemic index.
- "Potatoes aren't Paleo because they contain glycoalkaloids."
- "Potatoes aren't paleo because they are consumed in highly processed forms like french fries and potato chips."
- "Potatoes aren't Paleo because they are Nightshades."
- "Potatoes aren't Paleo because [a Paleo Expert] said they weren't."
- "Potatoes aren't Paleo because they are a high-carbohydrate food."

Unpacking the Pre-Agricultural Argument Against Potatoes for Paleo Consideration.

Although the potato was first <u>cultivated</u> in South America between 7,000 and 9,000 years ago, research suggests they grew wild in the region over 13,000 years ago. Use of the potato in pre-Inca cultures exists in ancient altiplano Indian pottery (Nazca and Chimú), dating back to 8,000 years ago, suggesting the possible consumption of potatoes before the agricultural revolution in the Americas.

Today there are 151 species of wild potato, progenitors of today's cultivated potato. Wild species of potato exist in diverse soils and climates, and are mostly concentrated in South America where potatoes originated.

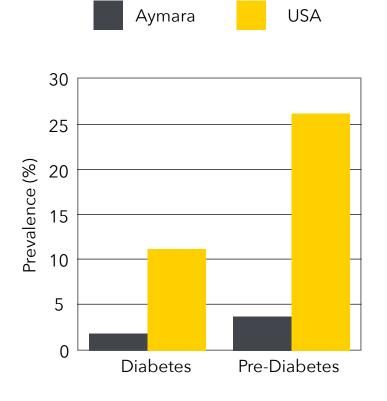
Indigenous Peoples and Potato Consumption

The Aymara are a potato-dependent group of indigenous people who span Peru, northern Chile, and western Bolivia. According to some archaeological estimates, the Aymara have occupied the Altiplano region of the Andes for more than 5,000 years.

More to Munch On

Potatoes are hypothesized to increase insulin resistance and risk of type 2 diabetes due to strong correlations between the two factors. However, Despite the high prevalence of an overweight population, cases of diabetes were remarkably low at 1.5%, while pre-diabetes was 3.6%, even among the elderly. For cross-reference, see the figure (right) for comparison between Diabetes and Pre-Diabetes among Aymara vs the United States compiled by Stephan Guyenet.





Unpacking The Glycemic Index Argument



Glycemic Load

noun: a classification of different carbohydrates that measures their impact on the body and blood sugar.



"Glycemic load is now recognized as a better measure of how a food will impact blood sugar levels than glycemic index, because glycemic load corrects for the carbohydrate density of a particular food. Potatoes have a

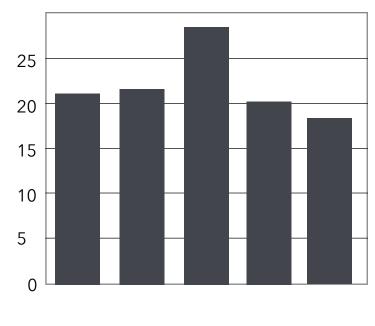
moderate to high glycemic load of between 16 and 33 for a 150g serving (which is a pretty hefty serving), depending on the type of potato and how it's prepared (boiling tends to lower glycemic load compared to baked).

For reference, glycemic load less than 10 is low, between 10 and 20 is moderate, and above 20 is high.

Studies show that blood sugar is very well regulated when people avoid high glycemic load foods (or limit portion size) and stick with mostly low and moderate glycemic load foods (someone with metabolic syndrome, diabetes or insulin resistance may have to be more measured with moderate glycemic load foods as well though).

What does this mean? That in an overall healthy Paleo Diet, a small side of potatoes as part of a meal is unlikely to cause blood sugar dysregulation and insulin sensitivity problems." [Read full text]

Glycemic Load of Various Foods



Boiled Sweet Raisins Yam Snickers White Potato Candy Potato Bar

Harvard Glycemic Index and Load for 100 Common Foods

The above graph plots the glycemic index using information of various foods selected from the Harvard Glycemic Index and Load for 100 Common Foods. In this graph, the sweet potato has a higher glycemic index than a sweet potato, which is almost universally recognized as a Paleo food. If glycemic load is indeed a factor in determining the Paleo Status of potatoes, then yams, sweet potatoes, raisins, and other officially recognized Paleo Foods could no longer be classified as Paleo.

DISCOVERY

Glycemic Load may not serve as a good determining factor for the Official Paleo Status of Potatoes.

Unpacking The Glycoalkaloid Argument

Glycoalkaloids are natural pesticides produced by nightshade plants, and exist as a defense mechanism to deter predation from bacteria, fungi, viruses, insects, and humans.

Glycoalkaloids are <u>bitter compounds</u> which are found throughout the plant, but their concentrations are especially high in leaves, flowers, and unripe fruits.

Although nightshades do indeed contain glycoalkaloids, they are not the only generally recognized Paleo foods which contain them: Cherries, apples, and beets also contain amounts of glycoalkaloid.

If glycoalkaloid content determines the Paleo Status, cherries, apples, beets, and other generally recognized Paleo Foods would also no longer receive Official Paleo Status.

DISCOVERY

Glycoalkaloid content may not serve as a good determining factor for the Official Paleo Status of Potatoes.

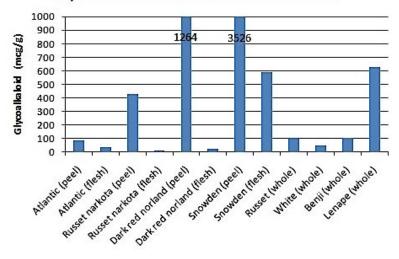


More to Munch On

Although glycoalkaloids may not be a deterministic factor in deciding the Official Paleo Status of Potatoes, they may be a concern for anyone with chronic inflammation.

Glycoalkaloids can increase intestinal permeability, and may amplify immunoligical responses. Therefore, glycoalkaloids— and foods which contain them— remain a concern especially for individuals with autoimmune conditions. For this reason, it may be necessary for individuals with persistent health challenges to avoid glycoalkaloids. But does this mean avoid potatoes altogether?

Glycoalkaloid content of Selected Potato Varieties



The two most toxic and present glycoalkaloids in potatoes are called α -solanine and α -chaconine.

According to this graph by Stephan Guyenet, different varieties of potatoes contain different levels of glycoalkaloids, and the concentrations differ between the peel and the flesh of the potato. The implications of these findings suggest that concerns about glycoalkaloid load can be mitigated by peeling, and choosing potatoes with low glycoalkaloid content may even be safe for those with autoimmune conditions.

Unpacking The "Highly Processed Argument"

While the heavy processing involved in making foods from potatoes undoubtedly changes its health profile and has been linked to obesity and diabetes, we must ask ourselves: Is the culprit the potato, or is it the processing?

One piece of evidence which has often been cited as a means to indemnify the potato may perhaps do the exact opposite:

Table 3. Concentrations (mg/kg) of total glycoalkaloids (α -chaconine + α -solanine) in a variety of potato foods.¹⁰

Food Item a	-chaconine + α-solanin
	(mg/kg)
Fried skins	567-1450
Chips with skins	95 - 720
Chips (US potatoes)	23 - 180
Frozen baked potatoes	80 - 123
Frozen skins	65 - 121
Baked potato w/jacket	99 - 113
Dehydrated potato flour	65 - 75
Boiled peeled potato	27 - 42
Canned whole new potat	roes 24 - 34
Frozen fried potato	4 - 31
Frozen French fries	2 - 29
Dehydrated potato flakes	15 - 23
French fries	0.4 - 8
Frozen mashed potatoes	2 - 5
Canned peeled potato	1 - 2

What this graph suggests is that glycoalkaloid content of potatoes is significantly higher with different methods of processing, and when the skins are present in the end-product. It does not, however, point to the peeled or mashed potatoes themselves as being high in glycoalkaloid content as other findings have also suggested.

It also suggests that peeled potatoes are relatively innocuous compared to their processed counterparts, giving weight to the argument that it's not the potato itself that is the culprit, but rather the processing itself.



"Because most
Americans eat the
highly processed
version of the white
potato—for instance,
french fries and potato
chips—consumption
of this root vegetable
has been linked to
obesity and an
increased diabetes risk.

Meanwhile, sweet potatoes, which are typically eaten whole, have been celebrated [among Paleo Diet adherents] for being rich in nutrients and also having a lower glycemic index than their white brethren.

What science really shows is that white potatoes and sweet potatoes have complementary nutritional differences; one isn't necessarily better than the other. For instance, sweet potatoes have more fiber and vitamin A, but white potatoes are higher in essential minerals, such as iron, magnesium, and potassium.

As for the glycemic index (GI), sweet potatoes are lower on the scale, but this is inconsequential in the large scheme. GI has been shown to lack functional impact (even on glucose control) once you match fiber and macronutrition between the diets compared. The health advantages of low-GI diets are largely attributable to a higher protein and fiber content. Once those variables are controlled, GI's utility becomes trivial to meaningless.

The bottom line, the form in which you consume a potato—for instance, a whole baked or boiled potato versus a processed potato that's used to make chips—is more important than the type of spud." [Read full text]



Fallacy of Division

adverb & adjective: When one reasons that something true for the whole must also be true of all or some of its parts.

Although the argument against certain forms of processing potatoes is valid, the argument which suggests that because a potato chip is unhealthy, that the potato itself must be unhealthy commits the logical fallacy of division.

For example, sweet potatoes can be prepared in a highly processed form just as easily as a white potato could. Under this same line of reasoning, we could suggest that the more available processed sweet potatoes become, the less "Paleo" the sweet potato itself, becomes.

Therefore, the "Highly Processed Argument" may not be a good indicator as a factor in making determinations about the Official Paleo Status of the potato.

DISCOVERY

Highly Processed Argument may not serve as a good determining factor for the Official Paleo Status of Potatoes.

Unpacking The "Nightshade" Argument



Ethnocentrism

adjective: Evaluating other peoples according to the standards of one's own culture.

The most prominent argument against the addition of nightshades into the Paleo Diet stems from the fact that nightshades, members of the botanical *Solanaceae* family, came from the Americas and were not "discovered" until 1492.

Not only is this a very *ethnocentric* argument, it grossly undermines the fact that hunter-gatherer peoples occupied the Americas as long as 15,500 years ago and likely consumed nightshades, such as peppers, tomatoes, goji berries, and eggplant.

By this same line of reasoning, it could be suggested that all aforementioned fruits, vegetables, and animals indigenous to the Americas would not be considered Paleo, including North American bison.

DISCOVERY

The "Nightshade Argument may not serve as a good determining factor for the Official Paleo Status of Potatoes.

Unpacking The "Authority" Argument

(X)

Appeal to Authority

adverb & adjective: Attacking or praising the people who make an argument rather than discussing the argument itself.

In the case of potatoes, it an oft-cited appeal to authority is stated the following form:

"Person A says potatoes are not Paleo, therefore this is true. Person A is an expert."

Unfortunately, the authority on a subject may not always be right, especially if the line of reasoning to make the assertion is fallacious. To argue that something is true because someone of authority says it is true commits the argument from authority fallacy.

Therefore, it would be logically poor to conclude that something was not Paleo because one expert had come to the conclusion.

DISCOVERY

The "Authority" Argument may not serve as a good determining factor for the Official Paleo Status of Potatoes.

Unpacking The "Carbohydrate" Argument

Although the Carbohydrate argument against potatoes for Official Paleo Status consideration is a lesser argument, it still warrants further inspection.

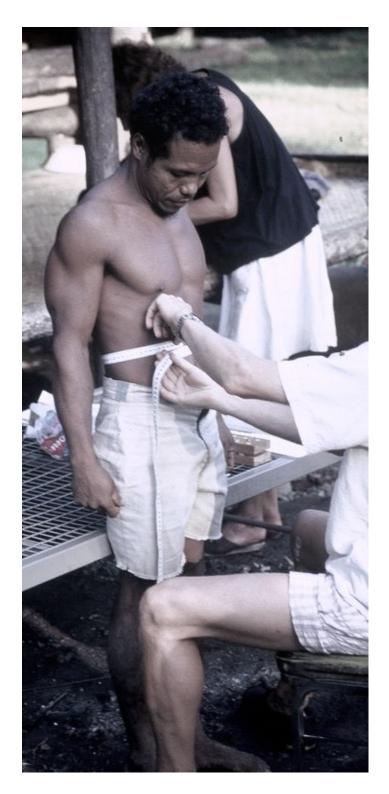


"Chimps have been known to use sticks to dig up and eat wild tubers, and they've got even less salivary amylase to break down starch than we Ihumansl do.

Evidence exists for human consumption

of roots and tubers from multiple sites spanning multiple time periods: Northern Europe (specifically Poland), in the terminal Paleolithic and early Mesolithic. Clearly, we have the physiology (amylase production, glucose metabolism), the tools, and the motivation (attraction to dense caloric sources with negligible or easily neutralized anti-nutrients) to consume starchy tubers.

A human metabolic tabula rasa can handle all macronutrients in whole food form without metabolic dysfunction. That's why you get folks like the Kitavans eating a high starchy tuber diet with excellent health and fit figures." [Read full text]



Male Kitavan, Photo Credit Staffan Lindeberg

More to Munch On

The Kitavans are a group of traditional farmers who live on the island of Kitava, an island of Papua New Guinea who almost exclusively consume a diet of universally accepted Paleo foods such as fish, yams, sweet potatoes, and taro. The astonishing macronutrient composition of the Kitavan diet is estimated to be 20% fat, 10% protein, and 70% carbohydrate.

According to Staffan Lindeberg's <u>studies</u> of the Kitavans, they do not experience cardiac death, stroke, hypertension, or obesity even though an estimated 80% of the population smokes regularly, and activity levels are reported to be similar to Western societies—which is remarkably low.

Though they do not consume white potatoes, the carbohydrates which they do consume do not seem to impart adverse health effects. Further, the line of reasoning which suggests that carbohydrates are not Paleo would also render the yam, sweet potato, and taro as non-Paleo food items. Therefore, this argument against potatoes due to carbohydrate content is not likely to be a factor in determining the Official Paleo Status of the potato.

DISCOVERY

The "Carbohydrate" Argument may not serve as a good determining factor for the Official Paleo Status of Potatoes.



Remarks and Conclusion



"Whether potatoes are something that will work for you will require experimentation."



"It's all about how you look, feel, and perform when including or excluding any particular food from your diet."



"Potatoes are controversial in the Primal and paleo world. They represent a bolus of dietary starch, which can wreak havoc on the insulin resistant, but they are undeniably

whole, real foods that don't require much processing beyond simple heating. Whether potatoes belong in your eating strategy may have a lot to do with the state of your metabolism. Deciding whether potatoes fit into your diet is ultimately a personal decision, but exactly how your body reacts to starch – in its current metabolic state, which, remember, is not set in stone – should be the major determinant."

Official Paleo Status of Potatoes

After careful consideration of the anthropological arguments, accounting for health benefits and concerns regarding the potato, and further reduction of common arguments levied against potatoes for inclusion into the Paleo foods list, The Paleo Foundation Consensus Report concludes that the Official Paleo Status of Potatoes is that they are:



