

Beans, Beans the Magical Fruit: Why the Paleo Diet Should Not Exclude Legumes

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The Paleo Diet has gained popularity over the last several decades and has been described in numerous publications (e.g., Cordain 2011; Cordain et al. 2005; Cordain and Friel 2012; Eaton and Konner 1985; Eaton et al. 1988; Lindeberg 2005; Seib 2013; Sisson 2012; Voegtlin 1975; Wolf 2010). It advocates that the healthiest regimen for maintaining weight and reducing diet-related chronic illnesses (e.g., type 2 diabetes, cardiovascular disease) is one based on the diet of Paleolithic humans. The Paleolithic period extended from approximately 2.6 million years ago to 10,000 years ago. Humans (*Homo sapiens*) came onto the Paleolithic scene about 250,000 years ago, preceded by ancestral species of the genus *Homo*. For the vast majority of the existence of *H. sapiens*, the primary mode of subsistence was hunting and gathering. This changed about 10,000 years ago, when humans began developing agriculture. The switch from a hunting and gathering based diet, which was high in fruits and vegetables, to an agricultural diet based largely on cereal grains is thought to be an important factor in many chronic human diseases. Proponents of the Paleo Diet recommend a return to the meat and plant based diet of our ancestors.

Preagricultural humans consumed roughly three times the amount of fruits and vegetables than typical westerners do today (Eaton 2006; Eaton et al. 1997). When compared to modern Americans, Paleolithic humans are estimated to have consumed more fiber, more protein, more omega-3 fatty acids, more unsaturated fat, less saturated fat,

and less sodium, but more vitamins and minerals (Eaton 2006; Eaton et al. 1997; O'Keefe and Cordain 2004). Paleolithic humans consumed no refined grains or sugars except seasonally available honey. This practice has existed in nearly all other primates for many millions of years; estimates of Paleolithic nutritional intake parallel that of modern chimpanzees (Eaton et al. 1997).

All versions of the Paleo Diet recommend high intake of protein, with moderate intake of fats and carbohydrates. Importantly, most versions of the diet entirely exclude several types of food: dairy, cereal grains, and legumes. The latter, legumes, is the focus of this editorial. In banning consumption of legumes, Paleo promoters typically make two arguments: [1] Paleolithic humans did not eat many legumes, and [2] legumes have "antinutritional" properties (i.e., compounds that interfere with nutrient absorption) that make them not worth eating. Both of these claims are misleading. I am granting them attention because I find the basic notion that we should eat nutrients in similar proportions to our Paleolithic ancestors very compelling. There are valid arguments for eliminating dairy and grains from the diet in the various Paleo diet publications, but legumes are unfairly targeted.

Earlier versions of the Paleo Diet (e.g., Eaton et al. 1988; Voegtlin 1975) do not recommend excluding legumes. It is not clear where the idea that Paleolithic humans did not use legumes originated, but even legitimate scientists (e.g., Drs. Loren Cordain and Staffan Lindeberg) make this claim, while providing no appropriate citations. The pattern is to lump legumes with grains and then cite sources that discuss grains only (e.g., Cordain 2002, 2009; Lindeberg 2005, 2009). Ironically, Lindeberg (2009:44) writes that legumes were "practically unavailable in the Paleolithic" in the very same volume that Jones (2009) reviews the abundant evidence

that legumes were an important part of the diet of Paleolithic humans, as well as the diets of other primates like chimpanzees. Legumes have been found in Middle and Upper Paleolithic assemblages from humans in Israel, Iraq, Syria, Jordan, Turkey, Albania, and Spain, in some sites being the dominant type of plant food found (Jones 2009; Lev et al. 2005; Savard et al. 2006). This is unsurprising given the vast geographical range of legumes. It is likely that neandertals used legumes as food too, and may have even cooked them (Henry et al. 2011).

The issue of cooking brings me to my second beef with barring beans. Nearly every article I have read claims that legumes should be avoided because of their “antinutritional” properties. This research is old by scientific standards. As understanding of their properties has increased, scientists have reevaluated the term “antinutritional,” widely concluding that not only do the benefits of legumes outweigh the negative effects, the negative effects are largely eliminated in cooking (Bouchenak and Lamri-Senhadji 2013; Campos-Vega et al. 2010; Roy et al. 2010). Humorously, many Paleo Diet bloggers claim that Paleolithic humans ate their food raw, so would not have been able to tolerate legumes. Even Dr. Loren Cordain (1999) tends in this direction when he asks whether legumes could be “realistically eaten as a staple by primitive groups without cooking.” Traditional legume preparation worldwide involves soaking and then cooking (Bouchenak and Lamri-Senhadji 2013; Campos-Vega et al. 2010).

Humans have likely been cooking their food since before they were humans. *Homo erectus*, the probable ancestor of humans that lived throughout Eurasia from roughly 1.9 mya to 150,000 ya, was the first hominin likely to control fire and cook food; indeed, the history of cooking extends so deep in the human story that we may be biologically adapted for eating cooked food (Carmody

and Wrangham 2009; Wrangham and Conklin-Brittain 2003). Paleolithic humans probably cooked their beans.

The nutritional aspects of legumes have also been mischaracterized in the literature. For example, when Lindeberg (2009) writes that legumes are problematic because they have phytates, substances found in plant tissues that inhibit absorption of nutrients, he cites three articles (the most recent of which is nearly 20 years old), all specifically about the effects of wheat bran on iron absorption; not one even mentions legumes. Whether phytates in legumes are problematic is a valid question that has received increasing attention because of the recognized importance of legumes as a staple food in developing countries (Bouchenak and Lamri-Senhadji 2013). Phytic acid is sometimes considered an antinutrient because of its strong mineral, protein, and starch binding properties, which decreases their bioavailability (Campos-Vega et al. 2010). However, phytic acid plays many beneficial roles, such as exhibiting antioxidant activity, protecting DNA from damage, eliciting prebiotic activity, displaying anticarcinogenic effects, and reducing bioavailability of toxic heavy metals like cadmium and lead (Bouchenak and Lamri-Senhadji 2013; Campos-Vega et al. 2010; Roy et al. 2010). Phytic acid is not reduced by cooking, but this is probably a good thing since the benefits so heavily outweigh the detriments.

The other supposedly villainous substances found in legumes- lectins and protease inhibitors- are greatly reduced with cooking (Bouchenak and Lamri-Senhadji 2013; Campos-Vega et al. 2010; Roy et al. 2010). Protease inhibitors can interfere with protein digestibility, but this is only a problem if the legumes are consumed raw. Once denatured, protease inhibitors have several advantageous effects, including use as anti-inflammatory and anticarcinogenic agents (Roy et al. 2010). Lectins reduce

nutrient absorption, but again, cooking nearly nullifies the effects (Bouchenak and Lamri-Senhadjji 2013), and lectins are now better known for their ability to reduce growth of tumors (Campos-Vega et al. 2010).

There are a few more benefits of legumes that are worth mentioning. They are a good source of melatonin, which aids in sleeping and limits tumor growth (Campos-Vega et al. 2010). They are a rich source of protein, carbohydrates, dietary fiber, polyunsaturated fatty acids, micronutrients like vitamin E, and many other beneficial bioactive compounds. They are low in fat and have a low glycemic index (Bouchenak and Lamri-Senhadjji 2013). Due to their high fiber content, eating legumes results in faster and longer-lasting satiety than consumption of lower-fiber foods does (Bouchenak and Lamri-Senhadjji 2013). In general, legumes have a high ratio of omega-3 to omega-6 fatty acids (Bouchenak and Lamri-Senhadjji 2013); the western diet contains a greatly off-balanced ratio of omega-3 to omega-6 because many vegetable-based cooking oils (e.g., corn, cottonseed, peanut, safflower, sunflower) are high in omega-6 fatty acids, but low in omega-3 (Prasad 2000). For the modern American diet, the ratio of omega-6 to omega-3 fatty acids is 15:1, but for Paleolithic Americans, the ratio was an estimated 1:1 to 4:1 (Prasad 2000).

To summarize their nutritional quality, legumes have antioxidant, anti-inflammatory, hepatoprotective, hypolipidemic, and hypotensive properties, as well as are effective in prevention of diabetes, osteoporosis, DNA damage due to aging, heart disease, and other disorders (Bouchenak and Lamri-Senhadjji 2013; Campos-Vega et al. 2010; Roy et al. 2010). Just do not eat them raw.

The Paleolithic Diet can be a healthy diet, but there are many ways to eat a healthy diet; hominin diets have varied widely in different

times and places (Eaton 2006; Eaton and Konner 1985; Unger et al. 2006). The Mediterranean Diet, for example, relies heavily on legumes, and an overwhelming body of evidence supports its use to reduce risk of major chronic degenerative diseases (Sofi et al. 2010). My point is merely that the exclusion of legumes from the Paleo Diet, or any diet for that matter, is probably ill-conceived. I like to imagine that this negativity toward legumes is intimately tied to human dislike of flatulence. Why else exclude a food group that is so nutritionally rich, has a deep history of being eaten by hominins and other primates, is one of the most concentrated sources of fiber available to humans, is inexpensive and widely available, and is so very delicious?

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