

What Is Our Natural Diet And Should We Really Care?
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What is our natural diet? This question has been a central issue in the vegetarian movement for 150 years or more. Vegetarian authors have explored the question through comparative anatomy and physiology of varying sophistication. The conclusion has usually been that humans are best suited to a vegetarian diet, which shouldn't come as a great surprise. The evidence presented, however, has never been definitive and I don't believe it ever will be. Implicit in the question is the belief that our natural diet would certainly be the best diet for us. Natural equals best--or does it? Perhaps our myths have clouded our thinking. Even if we could determine our true natural diet, would we be able to find the foods that comprised it? We wouldn't find them in our local supermarket - we have changed our foods as dramatically as we have changed our eating habits. Should we even be asking this question in the first place? Or should we be asking instead what the best diet would be for us today, with our current lifestyle and food choices and forget about a mythical (natural) perfect lost diet? Let's explore the issue.

The Garden of Eden is a powerful and pervasive myth, at least in Western cultures. Allusions to this myth are everywhere. Snakes, apples, fig leaves and the concept of a lost carefree paradise or "Golden Age" are so much a part of our collective consciousness that they are taken for granted. The idea is extended to our evolutionary history as well. We lived in a forest paradise until something (climate change?) forced us to move to the harsh savannah to fend for ourselves and in the process lost our innocence. Perhaps this myth resonates so universally because, in part, the story mirrors our own development as individuals. We are provided for as we grow up in a safe home where we are looked over by powerful beings who have our interest at heart. We are eventually expected to leave that nice home and fend for ourselves (and this is wrapped up with our loss of innocence). Even our scientific tale of the evolution of life on earth is informed by and told as a creation myth, as the narrative always leads to and ends with the evolution of us.¹ This mythology leaves us open to calls for a "return to nature," to reclaim "ancient wisdom" and to live a more pristine life. The following quote is from a book published in 1896 that advocates a raw, mostly fruit and nut diet; the author was Adolf Just, a German naturopath:

In paradise man lived originally free from sin and disease, in perpetual joy and unclouded happiness. But man lost paradise--was driven from it. The ancient myths, especially the myths concerning paradise, which we find among all civilized peoples, embody the profoundest truths regarding the original state of man and the primitive history of mankind.²

How does the "Garden of Eden" myth square with reality? Not very well. The last 150 years or so have brought a revolution in the scientific understanding of our closest ape relatives and our true evolutionary history. Until the 1970's our place within the primates was a bit uncertain, although we have always been thought of as closely allied with the great apes. Since that time our close relationship with the chimpanzees has been demonstrated without any doubt. It is very likely that the ancestors of modern humans were living (and probably looking) much like today's chimpanzees only six million years ago. As we continue to carefully study our great ape cousins, the "jungle

paradise" we inhabited long ago begins to look a little harsher and less friendly. In modern ape habitat fruit is abundant at some times but quite scarce at others. The fruits that are available would not appeal to our domesticated tastes as they are much less sweet and have a lot more fiber than those found in supermarket bins. Common chimpanzees make war on neighboring groups - killing males and often injuring females. Apes carry parasites, suffer from broken bones and die of diseases that also affect humans. Aggression and infanticide are unpleasant realities of many primate societies. By just about any measure we are much better off or have the potential to be much better off than our ancestors and close relatives. Myth, however, is often more powerful than truth--or perhaps just more appealing to believe. The first thing we need to do in order to look at this issue clearly is to abandon the "Garden of Eden" mythology.

How have vegetarian authors looked at our diet in the past? Pick up a book on vegetarianism from the 1880s or the 1980s and you are likely to find a chapter on our natural diet. In fact, there will probably not be much difference among such chapters written 100 years apart. The logic is simple: by comparing our anatomy and physiology with that of other animals we should be able to determine the diet to which we are most suited. I've heard the same arguments made in an evolutionary or Biblical context. Call it "physical dietary determinism." The focus is usually on tooth shape and size, length and complexity of the digestive tract plus some other features. Are we more like the carnivores or the herbivores? What about omnivores? Humans are classifiers--we like to put things into categories--but how rigid are these designations? In the natural world there are no iron-clad divisions such as "the carnivores." It's not that there aren't natural groups formed by lines of descent, but these groups aren't necessarily homogeneous. Furthermore, animals change what they eat over time. They must. Because all mammals are derived from a common ancestor, dietary changes must have occurred at many points in mammalian evolution, including along the branch leading to humans.

It's clear that we aren't specialized carnivores like cats - narrowly adapted to a flesh diet. Few would argue that we are, however. It's clear that we aren't specialized herbivores like the artiodactyl ruminants (i.e., cows), either. They have evolved a digestive system that, with the help of cellulose-digesting microbes in a special foregut, can process roughage that most other mammals can't. Interestingly, a group of Old World monkeys (and one New World bird) developed a similar system independently. Other mammals, including some primates, digest some roughage in the hindgut. The human hindgut doesn't seem to be enlarged for this purpose, however. In fact our digestive system doesn't seem very specialized at all. Our teeth aren't much help either. One thing that defines humans and our hominid ancestors (species that evolved since our split with the chimpanzees) is reduced canines. A quick look at the great apes (chimpanzees, gorillas and orangutans) shows pretty large canines, yet they are supposed to be our vegetarian cousins. It turns out that these teeth are used in intra-species competition - males vying for and sometimes fighting over access to females. If males don't fight over females (i.e., if they form pair bonds) large canines may be unnecessary. Our teeth may have more to say about our social system than our diet. The bottom line is that nothing about our anatomy or physiology dictates a vegetarian diet (or precludes one either). So much for physical dietary determinism.

What about the diets of our close living relatives? Studies of great-ape eating habits have clearly shown that our closest non-human relatives subsist primarily on plant foods. But are they really vegetarian? It's important to keep in mind that vegetarianism is a human concept. Other animals may have plant-based diets but they aren't vegetarian in the sense of intentionally avoiding foods of animal origin. For instance, most primates will consume insects when they are available. Chimpanzees love

termites and make specialized tools to catch them. Ants and grubs are ape favorites as well. Common chimpanzees will hunt and eat mammals also, although this is rarer. Pygmy chimpanzees (or bonobos) don't hunt as much but still occasionally eat flesh. This species, which is just as closely related to humans as common chimpanzees, are also generally less aggressive. Both kinds of chimpanzees prefer ripe fruit when it's available. In general, our closest relatives have diets that are mainly plant-based but none of them vegetarian in our sense of the word.

What about food in human evolution? Since we have learned more about our evolutionary history, modern authors advocating various ways of eating have expanded dietary comparisons to include species and diets from our past. Throughout almost all of the last six million years, our ancestors existed as small nomadic groups living by hunting and gathering. The amount of meat and other animal foods probably rose gradually to become a significant portion of at least some of our ancestors' diets. How significant is an open question, and opinions may say more about the current thinking about human evolution than they do about any real scientific estimate. Does that pile of bones with stone-tool marks on them correspond to one meal or a complete lifestyle? How could we tell if hunting was something that was done three times a week or three times a year? Gathering and eating a piece of fruit or digging up a tuber don't leave traces in the fossil record.

Reconstructing past diets is no easy task. In fact, it's not that easy to determine what people are eating *today*, either in contemporary hunter-gatherer (H/G) societies or our own. Diets often change on a seasonal basis and to get a full picture, surveys need to be taken throughout the year. Diets may even change from year to year depending upon rainfall, availability of game and other factors. One recent analysis of worldwide contemporary H/G diets found a relatively high proportion of these groups rely upon animal foods for more than half of their energy requirements, regardless of latitude. However, the archaeological record clearly shows dramatic shifts in the mental and technological capabilities of our ancestors after about 50,000 years ago. How would the reduced hunting capabilities of archaic *Homo sapiens*, or *Homo erectus* have altered the ratio of hunted vs. gathered foods? If we were able to go backwards in time and sample human societies scattered throughout the globe 30,000 years ago or 90,000 years ago--looking at what they ate, how they lived and died--I'm sure we would find an enormous amount of variability.

Dietary changes that occurred throughout most of human evolution were gradual, although certainly not insignificant. The changes that occurred with the invention of agriculture, however, both in terms of diet and lifestyle, were rapid and dramatic shifts from anything that had existed previously. In one sense, our diets probably became more plant based and less reliant on wild animal foods (as they had been millions of years prior). However, the grains that became the staples of our Neolithic (New Stone Age: after about 10,000 years ago) diets were foods introduced only shortly before their domestication. Shifts in activity levels, mobility and population density were also very dramatic changes from the lifestyle of the small bands of nomadic hunter-gathers that spread throughout the world in the Paleolithic (Old Stone Age: prior to 10,000 years ago).

The last few hundred years have brought even more dramatic changes to the diets and lifestyles of Westernized societies. Mechanized agriculture and other aspects of industrialization have further reduced the average daily energy expenditures (exercise). Global networks of trade ensure that plants and animals domesticated in one part of the world are raised in similar climates all over the planet. New World domesticates such as

maize and potatoes are now grown in Africa and Europe while Asian domesticates such as rice are grown in the New World. Many of these changes are beneficial; however, some have reduced dietary quality dramatically. Refinements in milling techniques that efficiently separate out the bran and germ from wheat result in a flour that has a longer shelf life but is far less nutritious. The production of refined sugar from cane and beets has also dramatically altered the relationship between nutrients and calories. It is now possible to consume a diet adequate in total calories yet almost completely devoid of any other nutrients. Another dramatic change in Western diets is the inclusion of larger and larger amounts of meat from domesticated animals, which tends to be higher in fat than meat from wild game.

So, how far back should we go to find our "natural diet"? One hundred years, 500 years, 20,000 years, more? "Paleodiet" advocates³ (paleodiets include only foods available before agriculture) would say that modern humans have the genetic constitution of our Paleolithic ancestors but diets and lifestyles that are very different from what they had. The "diseases of civilization"--which include atherosclerosis, hypertension, diabetes, cancer, osteoporosis, hearing loss, dental caries, alcohol-related diseases and obesity--are the result of the discordance between our ancient genetic makeup and our modern lifestyles and diets--according to these advocates. This presumes we haven't adapted to these new lifestyles and diets. But how long does it take to adapt to a new diet? The emerging consensus regarding genetic evolution is of great variability in the rates of change. Our genes are a patchwork of remarkable stability and amazingly rapid change, depending upon the selective pressures on individual genes. While it is true that we share a large percentage of our genetic makeup with our ancestors, other primate species and indeed with all other animals, this in no way negates the importance of the genes that do differ. The genetic differences between chimpanzees and ourselves are quite small yet the manifestations of those differences are quite dramatic. In addition, changes in diet seem to be capable of inducing rapid evolutionary change due to the central importance of diet in species survival. One example is the retention of lactase expression (to digest milk sugar or lactose) in adults whose ancestors have utilized animal milk as a food source. Recent genetic changes have only begun to be investigated and there may be many genetic adaptations to dietary changes that have occurred in the last 10,000 years.

It is far less likely that the changes in diet and lifestyle that have occurred since the industrial revolution have had a significant impact on our genetic make up. Interestingly, paleodiet advocates stress the recent origin (within the last 100 years or so as a major health problem) for the major diseases that mark Western civilization; however, agriculture is many thousands of years old. If Neolithic foods were to blame for these diseases, we would have a multi-thousand year history of them. Why have paleodiet-promoting authors suggested a return to a 10,000+ year-old diet as a prescription for diseases that have become a major problem only since the industrial revolution? There are no convincing reasons to start eating like a "cave-man."

Perhaps then, instead of a Paleolithic prescription for the diseases of modern civilization, we need a Neolithic prescription. Unlike questions regarding the ratio of plant and animal foods in the diets of our distant ancestors, it's an easy task to pick out the changes that occurred so recently that there is a written record. A Neolithic diet would be based on whole grains with a much greater proportion of unrefined foods and far less meat and sugar (the Macrobiotic diet as well as a whole food vegetarian diets could be considered "Neolithic diets"). Lifestyle changes would include greater amounts of exercise--although not to the level of contemporary hunter-gatherers. I'm not suggesting that all aspects of Neolithic life should be replicated. However, there are

many aspects of industrial ecology that should be called into question. The widespread use of pesticides, herbicides, preservatives and other chemicals in our food supply may have long-term consequences that are unappreciated and understudied. Many of these have uncontested benefits, but without a true understanding of the costs, proper decisions regarding their use can never be made.

Another popular dietary movement that looks backward in its search for a better diet is raw foodism.⁴ Advocates of raw food diets are fond of saying (with derision) that modern humans are the only animals that cook food. How long humans have been cooking food is currently an active question in anthropology. It is safe to say that at some point in human evolution we started cooking foods and prior to that our diets were all raw. This change may have been as far back as the origin of *Homo erectus* (1.8 million years ago) or as late as the origin of modern *Homo sapiens* (40-100,000 years ago). In any case, there is no evidence that starting to eat cooked foods had any detrimental effects on us--quite the contrary, by all unbiased accounts humans are doing quite well in comparison to our raw-eating ape relatives. The current raw food movement is an offshoot of the vegetarian movement and eating raw is sometimes considered the "next dietary level." Where exactly this progression might lead isn't really clear--"breathatarianism" perhaps? In any case, it might be instructive to look at a central theme of the raw movement: food enzymes.

The food enzyme concept can be summarized as follows: Living cells contain enzymes that mediate all activities within the cell. Foods that are raw, including those that have been warmed but not above a certain critical temperature (this temperature varies from author to author), retain their enzymes intact. These active enzymes, obtained from raw foods, are an essential component of our diet. By consuming foods which contain active enzymes, we conserve our own supply of enzymes which can then be utilized for important cellular functions rather than digestion. Food enzymes may also be absorbed, redistributed and used throughout the body. There is an almost mystical importance and quality ascribed to enzymes. They are said to contain the "life force" and this is destroyed by cooking (i.e., by heat). This is why raw food diets are also called "living food" diets. Unfortunately, there is NO merit to this concept and, as any thoughtful high school biology student could show, no way that active enzymes in food could be an essential dietary component.

The food-enzyme concept starts with an important observation about the biochemistry of living cells: the central role of enzymes in mediating biochemical reactions. So far, so good; but one crucial fact about enzymes is glossed over in this argument - enzymes are VERY specific. There are many thousands of different enzymes in a typical cell, each mediating a specific biochemical reaction. Enzymes are proteins, often working in concert with metal ions and co-factors. Proteins are made of long chains of about 20 different amino acids that are arranged in a specific order. This order is dictated by the DNA sequence that codes for the protein. The activity of specific enzymes is regulated by the production of the protein when required and the complex interplay of enzymes that regulate the activities of other enzymes. The important fact is that enzymes are not interchangeable. Specifically, enzymes from food, no matter how active, would be useless to us as enzymes because they were produced to mediate the activities of the cells in the plant (or animal) that became our food. Enzymes required to produce a wheat grass sprout are quite different from those needed to make red blood cells.

In any case, enzymes and other structural proteins don't make it through our digestive system intact. The whole purpose of the digestive system is to break down

macromolecules to their components for absorption. Proteins are broken down into amino acids, starches to sugars, and lipids to fatty acids. These components are then transported to our cells to become the building blocks for the proteins (including enzymes), carbohydrates and lipids we require in our cells. This is very basic biology. Furthermore, there is nothing mystical about enzymes. Some operate at high temperatures (like those in organisms living near deep ocean vents) and others preferentially at low temperatures. Some at high pH, some at low pH. Some are very unstable and will break down quickly while others (such as lysozyme) can be boiled in acid and then function quite well (in fact, this is how researchers purify lysozyme). These differences in function are the result of specific evolutionary pressures over long periods of time. Enough about enzymes.

To be perfectly clear, there is nothing wrong with raw foods. Fresh fruits and vegetables are excellent sources of many nutrients and even the most conservative nutrition guidelines promote their consumption. On the other hand, cooking shouldn't be considered a sin. Cooking destroys some nutrients but makes others more available. It also makes a wide range of foods edible that are almost useless as food otherwise. Humans have done quite well eating a diet of mixed raw and cooked foods.

So why are people drawn to extreme diets such as raw food or paleodiets? Part of it is the "return to Eden" mentality outlined above--simple solutions for complex problems. Testimonials are another powerful factor in convincing people to change their diets. They often involve dramatic cures from serious, life-threatening diseases. If someone says that they were near death and a certain diet cured them, others take notice. In this way, these diets take on an almost religious character and followers have a similar kind of faith and fervor. Testimonials are not scientific evidence, however, and people promoting completely different diets will often present testimonials that are virtually interchangeable (perhaps any change from a diet of cola and "junk food" is a potentially good change). If one half of one percent of the people who try a particular diet have a marked improvement in health and the remainder show no change (or do poorly), that's not really such a great endorsement (and the improvements might have occurred by chance). However, if 5,000 people try that diet there will still potentially be 25 impressive sounding testimonials out there. For many on extreme diets, food becomes an obsession. One author coined a term for obsession in the quest for a perfectly healthy diet: "orthorexia nervosa."⁵ This is not to suggest that eating healthy is a disorder, but that some people in an effort to get a perfectly pure and health-promoting diet might stray onto the path towards an eating disorder. No diet will allow you to live forever--our ape cousins certainly don't. For all our dietary impurity we outlive chimpanzees by decades on average.

What does this all mean for vegetarians and vegans? Are these diets natural? I would argue that humans don't really have a natural diet. We evolved eating a wide variety of diets containing both plant and animal foods. We could spend time and energy trying to figure out what these were but this would still only tell us where we have been--not where we are. We really don't know how healthy our ancestors were or how long they lived, anyway. We can be certain that they survived, of course; otherwise we would not be here. However, as modern humans in Western industrial societies (or any contemporary society), we want to know what foods and lifestyle choices will provide the best chance of a long and healthy life right here and right now.

There is a lot of scientific evidence to show that vegetarian and vegan diets are potentially as healthy as or healthier than mixed diets. There is no reason for ethical vegetarians or vegans to sacrifice their ethics and alter their eating habits so their diets

are more "natural." Indeed, one could argue that no diet consisting of today's foods is really natural--and that's not necessarily a bad thing. Over the last 10,000 years we have not only changed what foods we eat but have changed the foods themselves. Someone from the Paleolithic wouldn't recognize most of the fruits and vegetables in our supermarkets. Artificial selection (people choosing only certain seeds, usually from the best plants, to be sown the following year) has produced foods lower in fiber, sweeter and larger than their natural relatives. They have also been selected to contain lower amounts of compounds that plants produce to thwart herbivores such as tannins, alkaloids and oxalates. Remember, it's only in the Garden of Eden myth that plants are created for our benefit. In the real world, plants don't usually "want" to be eaten and have evolved all sorts of defenses. Our current quality and selection of foods (I'm referring to whole, unprocessed foods) may not really be "natural" but it's probably better than at any point in the past.

However, it is important that vegans and vegetarians not ignore potential problems with certain vitamins and other nutrients under the false assumption that their diets are "natural" and therefore perfect--a common notion in my experience. In the same vein, though from the opposite direction, it's curious how the traditional dietetic community will harp on the lack of vitamin B12 in a vegan diet--implying that without supplements it is inherently deficient and restrictive--while ignoring the many vitamin and mineral supplements added to common foods (iodine in salt, B vitamins in grain products, vitamin D in milk, calcium in many foods, etc). Do these important additions make "standard" mixed diets inherently deficient and restrictive? Deficiencies of certain nutrients may have been a common feature of existence throughout human evolution or they might be the result of very recent changes in food processing technologies and lifestyle or both. In any case, vegetarian and vegan diets shouldn't be singled out as special in this regard nor should vegetarians and vegans be complacent.

Dietary arrogance and ancient mythology have no place in modern food policy and nutrition. Neither do pressures from specific food producers and industries. We need to be looking, in an unbiased fashion, at what dietary regimes will promote long and healthy lives for people living with current food and lifestyle choices. Much nutritional research seeks answers that are far too narrow to address this larger question and/or is funded by entities that seek a particular answer. Broader inquiries that do seek to address the wider relationships between longevity, disease and diet may provide some answers, and this is certainly a better way to proceed.⁶ No diet will ever provide the potentially endless and 100 percent disease-free life of mythology. However, vegetarian and vegan diets can provide a lifetime of healthy nutrition.

¹ See *Ishmael* by Daniel Quinn Bantam Books; Reissue edition, 1995.

² Adolf Just, *Return to Nature*, 4th edition, 1896. New York: Published by the Translator in 1904.

³ See, for example, *The Paleolithic Prescription* by S. Boyd Eaton. HarperCollins, 1988.

⁴ See, for example, *Nature's First Law: The Raw-Food Diet* by Stephen Arlin, Fouad Dini, David Wolfe, R.C. Dini, Ken Seaney, Marc Wolfe. Maul Brothers Publishing; 2nd edition, 1997.

⁵ See *Health Food Junkies: Overcoming the Obsession With Healthful Eating* by Steven, Md. Bratman, David Knight (Contributor) Bantam Doubleday Dell, 2000.

⁶ See, for example, the "China-Oxford-Cornell" study
<http://www.nutrition.cornell.edu/ChinaProject/>