

Paleonutrition-salvation or fantasy?

Abstract

Paleonutrition is currently considered to be one of the healthiest diets. On the other hand, numerous nutritionists believe that this type of diet is nothing more than unsubstantiated fantasy. In this article, we discuss this topic from the historical and evolutionary perspective.

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Introduction

Paleonutrition refers to the diet of prehistoric humans characterized by typical composition of nutrition, which reflect the food resources and their availability. Recently, this type of diet which consists mainly of fish, grass-fed pasture raised meats, eggs, vegetables, fruit, fungi, roots, and nuts, and excludes grains, legumes, dairy products, potatoes, refined salt, refined sugar, and processed oils, is hailed as the healthiest way one can eat because it is the Only nutritional approach that works with body's genetics to help it stay lean, strong and full of energy. However, others believe that the whole concept is nothing more than a myth. The studies of paleodiet are interesting not only for experts in diets, but also for physicians and nutritionists. The Paleolithic diet, which is generally considered to be a composition of food used by our ancestors in Paleolithic Age is studied mostly by fossil findings (such as size and shape of teeth and craniomandibular morphology) and by ethnic anthropology, which evaluates the nutritional aspects of ethnics still maintaining a primitive lifestyle.

History

It was earlier believed that the main part of the nutrition of pre-agricultural Paleolithic hominins was the meat of big game and their diets were primarily carnivorous in nature.¹ Later, in the studies of authors studying dietary habits of contemporary ethnics, it was concluded that diets of ancestral man derived from diets of higher primates and were mainly plant based.² Fossil evidence shows that this pattern of nutrition was characteristic for early bipedal hominids living between 6 and 2million years ago.³ Reliance on animal flesh increased substantially after 2million years with the evolution of *Homo habilis* and especially *Homo erectus*, who were already capable of hunting larger game. It was also shown that contemporary hunter-gatherer populations consumed more gathered plant food than hunted game meat.⁴ Currently, living tribes still using traditional type of life defined as hunters-gatherers or gatherers-hunters⁵ show very different and varied diets based on region, climate and biocenosis. Clearly, studies of do not allow us to confirm a universal diet used by all hominins in prehistoric times. On the contrary, our ancestors lived

and developed in relatively homogenous area. Other rarely mentioned differences are the strategy of obtaining food and frequency of food uptake. Typical primates, including the closest relative of hominins, eat in small doses throughout the day. This trend was completely reversed by the appearance of meat and by the fact that the meat was obtained by hunting, which did not allow constant eating. In addition, people are the only primates accumulating food for later use and able to share it.⁶ Higher primates are (with some exceptions) vegetarians. *Australopithecus* and most of all *Homo erectus* used food which included a relatively high portion of meat.⁷ The meat included mostly fish, small animals and insects, but in some cases large animals, such as horses and pigs.⁸ Nutritional behavior, *i.e.*, the type of food and its processing, significantly influenced the further evolution of hominins, resulting in current *H. sapiens sapiens*. Meat became the main staple of our food more than 1 million years ago.^{9,10}

People advertising the advantages of various paleodiets often suggest that our ancestors lived much healthier life. A significant amount of skeletal findings suggests that these ancestors were healthier compared to us. However, their lifespan was significantly shorter. The reasons for better health were most probably based on their lifestyle,¹¹ *i.e.*, lack of communicable (parasitic and infectious) diseases based on life in small and isolated groups, no accumulation of garbage due to the constant relocations and limited exposure to bacteria and viruses transferred from animals (due to the lack of domesticated animals).

All this changed app. 10,000years ago with the shift towards agricultural type of life. Domestication of various animals had devastating effects on the health of the population.¹² Agriculture managed to feed people, but the food was still nutritionally lacking. This food was energetically good with plentiful sugars and starches, but had minimum amounts of vitamins, minerals and proteins, leading to the appearance of previously unknown diseases.¹³ The most typical diseases are kwashiorkor caused by lack of proteins or keratomalacia caused by insufficient intake of vitamin A.

Ratio of vegetarian and meat parts of food

Most studies suggest that ancestors of hominins and early hominins gained app. 35% of energy from fatty food, 35% from saccharide and rest from proteins. Amount of polyunsaturated was app. 5x better than it is now. Intake of dietary fiber was around 100g/day, which is a number current nutritionist can only dream about. A significant amount of energy came in the form of essential amino acids from meat, which also offered easily utilized dietary nucleotides, useful in growth and regeneration of tissues.¹⁴ Later, hunters-gatherers increased the meat intake and their food ratio changed to 22% of energy from fatty food, 37% from saccharide and 37% from proteins.¹⁵ Thirty five percent of energy came from plants and vegetables, which is considerably different from our current diet consisting of cereals (31%), milk (14%), drinks (8%), vegetable fats and oils (4%) and sweets (4%).¹⁶ All these differences are not based on needs, but on availability of food. It is not possible to form original diet of Paleolithic hominins based on food composition of current ethnics. Even less possible is to call this diet healthy.

Current molecular and analytic experiments demonstrated both complexity and diversity of diet of early hominins.¹⁷ From the time of fossil hominins and prehistoric humans, the food composition was fundamentally changed only three times. The first change came with the ability to hunt larger animals, allowing the addition of meat and animal fats as a significant part of the diet. The second change came in late Neolithic only in *H. sapiens* and *H. sapiens sapiens*. App. 10,000years ago, agrarian revolution significantly narrowed variety of food, despite the addition of milk and cereals. The last significant change appeared during the industrial revolution and included reduction in resources and changes in the technology of food preparation. These changes were also accompanied with rather uniform westernized lifestyle. With lower variety came also the intake of highly calorized food, resulting in the increased appearance of obesity and leading to current high rate of non-communicable diseases such as cardiovascular problems, diabetes 2 and cancer.

It is clear that nutritional habits accompanying dramatic changes in modern lifestyle are not necessarily in agreement with genetically pre-adaptive metabolism. On the other hand we have to remember that these diseases did not appear as *deus ex machina* or as result of nutritional changes only, but has to reflect the genomes of prehistoric men. In this regard, it might be important to note that signs of arteriosclerotic changes were found in Iceman *Ötzi* who lived app. 5,300 AD and died at 45years of age.¹⁸ Similar changes can be found in today's Inuit in Alaska,¹⁹ therefore so called "lifestyle diseases" are not fully a current problem.

Nutrition in perspective

At the beginning of Paleolithic, collecting of food was the primary way. Middle Paleolithic (250,000-40,000 years) is still experiencing gatherer-hunter type of subsistence, with significantly improved ways of hunting, which became a team affair. App. 12,000years ago is the end of the last ice age. Increased temperature offered better conditions for agriculture, leading to more settled lifestyle and better adaptation to the biotope. The real agriculture (in common sense) arrived,²⁰ followed by domestication of animals, from dogs to cattle. All of this resulted in the abrupt increase in population. Similarly, the input of energy was strongly higher than in Paleolithic.²¹ The current age is witnessing the most fundamental changes in nutrition since Neolithic revolution. The assortment of food, technological ways of preparation

of food and availability of food are changing and improving. However, the importance of the rather limited assortment of cultured plants remains. It is not surprising that the highest energetic input can be seen in the population of 20% of most industrial countries, which use almost 50% of world's production of grains.²²

As mentioned above, too high input of energy negatively affects human health. Non-communicable diseases such as diabetes 2, cancer, obesity or cardiovascular diseases (and indirectly also suppression of immunity) are to the most extent based on unhealthy input of calories.¹³ Accumulation of fats probably offered some evolutionary advantages to primitive people or ancestors, but the current lifestyle does not allow such high energy output, leading to accumulation of fat, obesity and subsequent health problems.

Paleolithic diets

The concept of the Paleolithic diet can be traced to a 1975 Voegtlin's book.²³ The other terms such as "caveman diet" or "stone-age diet" are also commonly used. The recent popularity of such diets is so great that in recent years it is Google's most searched-for methods for losing weight. In general, this diet is based on avoiding all processed food as well as food people started to eat after the agriculture revolution. There are no doubts that current Western diet figures centrally in the pathogenesis of numerous non-communicable diseases. Ethnographic research in the South African! Kung tribes showed that plant foods formed 67% of their average daily nutritional dose and the rest was meat of small animals and insects of various species.²⁴ Evidence from cave deposits in the Chihuahuan Desert suggests utilization of desert plants with high content of prebiotics especially the inulin. It indicates that the Paleolithic diet had a much higher content of dietary fiber (prebiotics beneficial for health including β -glucans) and its total intake could reach up to 100g per day.²⁵

Foods high in prebiotics including β -glucans as structural components of cell walls of plants (grains), fungi, seaweed, yeasts (and also bacteria), have been consumed by predecessors of man since prehistoric times. From the viewpoint of evolution of hominids, to which modern species of man *H. sapiens sapiens* belong,²⁶ these substances still formed a substantial part of the food of these hunter-gatherers during at least the whole Paleolithic Era. Their health and especially anti-infectious branch of their immunity have been supported principally by β -glucans, which represent important biological response modifiers.²⁷⁻²⁹ This plant-based diet primarily formed the human genes controlling digestive metabolism and utilizing food components for growth, regeneration and immunity long before the shift to meat-based diets. These genes were specific for direct predecessors of man as well as hominins, and still determine the nutritional behavior of modern man.

The character of the current diet has changed considerably with the advent of the agrarian revolution before about 10,000 years when the former man added to its diet new products from cereals and milk. Particularly, the composition of the nutrition has changed for a second time, since the beginning of the period of industrialization more than 200 years ago. The extent of the diversity of the diet significantly narrowed in industrialized countries, which have adopted quite uniform, so called westernized lifestyle, which is obviously not always in accordance with genetically pre-adopted human metabolism during Paleolithic Era.

Some studies found short term improvements in metabolic syndrome components than did guideline-based diet,^{30,31} some studies found that the Mediterranean diet has same effects.³² The Paleolithic diet is based on foods presumed to be available to prehistoric humans. Where it is clear that foods like processed oils, alcohol, coffee, sugar or milk were not available, we do not really know the full variety of food in Paleolithic. In addition, our assumption that ancestral humans were beacons of health are not substantiated by any proofs and the skeletal remains clearly showed very short life expectancy. In addition, the digestive abilities of modern humans are different from those of Paleolithic ones, strongly undermining the Paleolithic diet's core premise.³³ In addition, humans evolved to be flexible eaters, with lactose tolerance being a good example of human adaptation to the introduction of dairy into diet.

We have to remember that our knowledge of the proportion of plant and animal food in the diet of humans living in the Stone Age is extremely limited and mostly circumstantial. Not for any reason are we able to identify the composition of nutritional needs for current humans based on this incomplete knowledge.

Conclusion

Our ancestors, originally obtaining food by means of hunting and collecting, had to move widely to obtain enough food. Resulting food composition was clearly seasonal and changed periodically. In the last 5,000 to 10,000 years, mankind changed the ways of getting food of agriculture and pastoral farming. Nutrition was based partly in the results of farming, partly on food from commercial animal production. We have to remember that our knowledge of the proportion of plant and animal food in the diet of humans living in Stone Age is extremely limited. Under no circumstances we are able to identify the composition of nutritional needs for current humans based on this incomplete knowledge. In addition, the genetic makeup of current humans does not match that of our ancestors, with more than 10,000 years since Neolithic revolution being more than enough time for the evolutionary changes in the digestive system and in the physiology of digestion. Therefore, the presumption that the Paleolithic diet is the only diet fitting our genetic makeup is false.

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Conflict of interest

The author declares no conflict of interest.

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