

REVIEW

## What Actually was the Stone Age Diet?

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**Abstract**

**Purpose:** *In the last few years there has been considerable talk of the 'Stone Age diet' as an attractive alternative to the 'modern' diet. The underlying idea is that recent distortions of diet are likely to be harmful and that, if we can recover a primeval diet, we will live in closer harmony with our digestive systems and their evolutionary biochemistry. This paper aims to evaluate that set of ideas rigorously in relation to the extensive and sometimes detailed records of the past.*

**Design:** *Comparative and direct palaeoanthropology and archaeology.*

**Methodology:** *To review evidence of the comparative picture established by the nearest living relations of hominids (extant apes), and of the deep view given by the fossil records and archaeological evidence.*

**Results:** *The broad outline of the evolutionary record is becoming increasingly clear: human ancestors diverged from the last common ape ancestor about 8–10 million years ago. Since then major stages of dietary evolution can be traced, involving the incorporation of roots/tubers and additional meat into a previously largely fruit-based diet. Within the last 2 million years, early humans colonized highly diverse environments, including arctic regions where there was no choice but to eat meat.*

**Conclusions:** *There was no one Stone Age diet. Overall, diets of the past varied greatly. The adoption of agriculture within the last few thousand years led to great changes in diet, especially concentration on single cereals and milk.*

**Keywords:** diet, Stone Age, hominid origins, apes, Palaeolithic.

Much of the modern diet is suspect—often dominated by over-processed foods. Logically, then, we might turn to the past to find the foods that our species evolved with. It is tempting to think that by going back further we will get closer to the ideal. Hence, the Stone Age diet, the idea that in primeval times all was well, that more modern ways of life have made something go wrong, and that by drawing upon old recipes we can put things right again.

If this synopsis caricatures the idea of the Stone Age diet, then like other caricatures it sharpens up the reality. Archaeologists and palaeoanthropologists have uncovered a picture far more complex than the popular media presentation, but the guiding principle is highly likely to be true—that we can learn from the deep past. The main thing that archaeology and evolutionary science can offer on the matter of diet is knowledge—an

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outline sequence of events, a timescale, and in particular knowledge emphasizing that the past was highly varied, and that human ancestors made a multiplicity of adaptations through millions of years.

This is not to say that ‘the Stone Age’ is the term that an archaeologist would begin with. Archaeology distinguishes between the Palaeolithic or Old Stone Age, associated with human origins and economies of hunting and gathering; and the Neolithic (never now termed the New Stone Age), which is defined by the economies of domestication and agriculture (perhaps where things began to go wrong in dietary terms!).

The deep background of humanity can be traced back some 10 million years, among ancestors of our closest relatives, the great apes [1, 2]. Biochemically—in our DNA and proteins—and in the evolutionary sequence of descent, humans are most closely related to the chimpanzees and bonobos, slightly less so to gorillas, and less so again to orang-utans. The apes are varied in adaptation, but fundamentally are rainforest animals. Apes have a diet based largely on fruits. Gorillas eat more leaves, such as wild ginger herbs, and also a proportion of bark and pith [3], whereas in addition to a high content of fruit, such as wild figs, chimpanzees eat substantial components of insects and meat gained by hunting. Chimpanzees are the most closely related to us, and it is tempting to think that some related aspects of diet go back to the common ancestor. It is interesting, for example, that the eating of meat is preferentially carried out by males, and of insects more habitually by females—gender differences in the diet may have a very ancient history [4, 5]. Generally the chimpanzees, especially the common chimpanzees, eat less leafy material, but are more omnivorous, adding in, for example, honey and eggs. Hundreds of cases of chimpanzee hunting have been observed, generally of monkeys, but sometimes of baby antelope or baboons [6, 7].

Recent finds show that hominids (the family of human ancestors) diverged from ape ancestors probably 8–10 million years ago. DNA differences between existing species can be calibrated to suggest dates for a last common ancestor with the apes as recently as about 5 million years ago [1], but recent discoveries of very old hominid fossils—*Orrorin tugenensis* in Kenya and *Sahelanthropus tchadensis* in Chad—show that the biochemical evidence underestimates the real divergence date [8, 9]. The hominids are likely to have developed in drier environments than those inhabited by modern apes, becoming successful enough to generate their own adaptive radiation, leading to a ‘bush’ of new species. As a group they are recognizable by changes in their teeth and in locomotion habits, both probably associated with life in bushland rather than in the traditional ape rainforest habitats [4, 10]. Changes in their teeth indicate diets involving heavier chewing on the molar teeth, coupled with a reduction in the front dentition (already seen in the recent finds of *Sahelanthropus*, dated to 7 million years). The canine teeth are strongly reduced compared with those of chimpanzees.

These characteristics are emphasized in *Australopithecus afarensis* of 3–4 million years, which has a complex of large molars, with M3 as the largest. Upright walking or bipedalism concerns us less directly, but may also be linked with changes in feeding habits [11]. Hominids may have had to stand up, reach out, and range for food more widely than their rainforest cousins.

Comparisons of diet with living apes and modern peoples using similar ranges of plant foods in Africa suggest that a major factor in the change was adoption of roots and tubers in the diet [4, 12]. This addition to the diet was probably necessitated by the need to gain food at all times in a more seasonal environment (the savannah), and it places starchy carbohydrate consumption as part of the deep ancestry of human beings. The size and shape of teeth suggest that the pattern of heavier chewing was already in place 3 million years ago [13].

Among human ancestors, meat became more important around 2 million years ago, as documented by associations of stone tools and bones with cutmarks [14]. Meat eating

would have been more necessary in colder environments, where alternatives were limited. We now know that early humans had colonized temperate latitudes by about 1.7 million years. At this date, remains of early *Homo* are found at Dmanisi in Georgia, associated with stone tools and a non-African range of fauna [15]. Both the range of plant foods and their seasonal availability were more restricted in the north.

Here, too, human populations were exposed to cyclical climate changes of the ice ages. Hominids may have expanded their range in cool times when vegetation was not closed and dense, but when it was not an extreme of ice age cold. Steppe environments hosted very rich faunas, including mammoth and woolly rhinoceros [16].

Fire would have been useful to early humans, for warmth and protection, but also for cooking. We think obviously of cooking meat, where fire saves us some of the energy costs of digestion, but it may have been equally important for dealing with starchy foods [4, 12]. About half of the roots and tubers used in sub-Saharan Africa are indigestible without cooking [12]. Unfortunately, dates for initial fire use are uncertain, in a range 1.5 to 0.5 million years.

Recent evidence shows that by 50,000 years ago, humans were highly adapted even to extremes of arctic cold [17, 18]. Many archaeologists have wondered whether early (and therefore putatively primitive) humans could have hunted large animals successfully. It is hard to see otherwise. The reality is that if early humans were there at all, they had to survive through conditions which would seem terrifyingly harsh to their armchair detractors. Stable isotope analyses of carbon and nitrogen in bone collagen now show Neanderthals to have been carnivores to a very high degree [19].

Ancestors of modern humans are now believed to have evolved in the tropics, probably in Africa, from about 200,000 years ago. Their diet was, therefore, probably largely (perhaps 70%) plant based like that of modern hunters and gatherers in the region [20]. A similarly wide range of plant food was available in parts of the Middle East and Asia.

In contrast, modern humans entering Europe 40,000 years ago would have adopted a meat-based diet by necessity, and maintained this over hundreds of generations. Palaeolithic cave art of Europe centres very heavily on the representation of animals. Modern hunters and gatherers echo the variety of past diets, ranging from largely plant based in the tropics, to being also heavily meat based in the arctic [20].

There can be little doubt that the ancestors of most Europeans had such a meat-based diet for approximately 30,000 years of ice age (40,000–10,000 before present), some 1200 generations. From 10,000 years ago, climatic improvement led to warm-period hunting and gathering, probably involving larger components of roots and berries. Then farming came in, so that cereals and milk have been major products for the last 5000 years, or 200 generations.

Agriculture began from about 10,000 years ago, in several centres of domestication around the world, notably the Middle East [21, 22]. A consequence of adopting staples, especially cereals, was that people reduced the range of foods consumed, although initially domestication may have involved a wide range of plants, some valuable for their fatty acids [21]. The intensive use of many seeds probably became possible only when the use of grindstones and cooking rendered them more palatable. Agriculture has spread steadily from its beginnings, but in some parts of the world it arrived only within the last 2000 years, and so we can wonder how far populations have been able to adapt genetically to diet change.

All this evidence combines to show that there was a huge variety of Stone Age diet. A north–south cline was always the dominant factor. The climate cycles of the ice ages have also entailed colossal changes in environment in any one place. Ancient African and Near Eastern diets may have been close to optimal (in our view) involving large ranges of plant foods, supplemented by meat. But at many stages, human ancestors, including those of

most Europeans, must have specialized heavily in a meat-based diet for hundreds of generations.

Perhaps it is disappointing to underline that there was no one Stone Age diet. Yet the variety has its own interest, as we may be able to learn from it. Can any generalization be made? First, no ancient population would have been heavily dependent on milk or other dairy products—all that belongs to the last 5000 years. Second, a heavy dependence on individual cereal staples is also a recent phenomenon. Fruit certainly came first of all; but carbohydrates in the form of roots are also an ancient component of diet. The general point is that in the past more species of roots and perhaps grasses would have been consumed, lessening the exposure to drawbacks from any one. ‘Stone Age diet’ is something of a misnomer, but the deep past does allow us to see which foods have been humanity’s primeval companions. The key question is: How long does it take a human population to adapt genetically to new circumstances and a new diet? We can reflect whether our biochemistry is now better suited to diets of 3 million years ago, 30,000 years ago, or 3000 years ago. It seems likely that biochemical evidence already exists which can provide many of the answers. From a general standpoint—even though some past populations have adopted specialized diets—many lines of evidence point to human ancestors having become omnivores. We can be reasonably sure that a broadly based diet sustained most of our ancestors for most of the course of human evolution.

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