

evolutionary perspective. *Am J Med* 1988;84:739–49

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Reply: It is inappropriate to ignore the last 10 millennia of human evolution, during which time different groups of humankind learned the domestication of animals and the cultivation of plants. With different sets of post-Pleistocene ancestors, some of us cannot tolerate a glass of milk, some of us cannot tolerate a hot-dog bun, and still others of us are rather more tolerant of cyanides present in tropical starchy foods.^{1–3}

It is also inappropriate to ignore the last few millennia and the advent of single-cereal agricultural dependence in Asia, the Middle East, and the Americas. Very many of us originate from truly overdeveloped areas, where populations expanded and individual body sizes declined. The ability to subsist on sago, maize, barley, rice, wheat, cassava, or yams is not shared equally, whatever our more remote ancestors may have had for dinner.

When we venture back before the Mesolithic, we are confronted with many different groups of "ancestors," some living during long interglacial periods and subsisting as grubbers and gatherers. (Coprolites from more recent Kentucky Indians suggest very great dependence on grass-seeds of all kinds, with dozens of different *gramineae* represented in a single prehistoric stool.) Other ancestors of ours were cold-climate, big-game hunters, ingesting animal fats in quantity out of simple necessity.

It is true that "game" animals have a lower fat content per unit of edible carcass than is true for feedlot-fattened beef and for swine selected for lard production.

However, we do not know whether our hunting ancestors of the Pleistocene prudently restricted their diets to 80 g of animal flesh per day or imprudently doubled that amount, in which case they may have equaled or exceeded recent daily intakes of animal fat in the United States. Given the poorer digestibility of such game meats, dietary hyperlipidemia and hypercholesterolemia may have been the rule for those ancestors of ours who died so young from accidents and disease.

We are in general agreement with Eaton⁴ that our ancestors, even those of colonial times in the United States, had more fiber in their diets—and more grit and pebbles too. We can accord them larger stools and (probably) a lower prevalence of diverticulitis. However, a high-fiber diet has its disadvantages, limiting or inhibiting absorption of calcium and other nutrients.⁵ A low caloric density is not an unmitigated advantage, and many of our ancestors may have suffered from flatulence and emitted far more methane.

From the early Pleistocene and backward to the earliest hominoids, there is the question as to which fossils stand (or stood) in our ancestral line. Opinions on *Australopithecus* are increasingly varied, and we know little about what *Homo habilis* actually ate. We can, however, now reject the notion that we are descended—even remotely—from an exclusively browsing and frugivorous ancestor with immense intakes of ascorbic acid, as Linus Pauling once postulated.⁶ For reasons stated earlier, we can also reject the notion that we are the close descendants of carnivorous fossils, consuming hundreds of grams of animal flesh per day and therefore with huge protein needs.⁶

Obviously, each of our ancestors ate enough to grow and reproduce, and the proof is that we are here. For most of our ancestors, however, meeting the required dietary intake was neither routine nor easy. Indeed, most of humankind today subsist on diets well below internationally recommended allowances; this is especially true for the groups described in the popular

press as "stone-age survivors." Moreover, fossil and subfossil juveniles reveal, from their skeletons and dental remains, delayed ossification and delayed epiphyseal union as well as indications of iron deficiency and possible hypovitaminoses. Enamel defects (hypoplasias and hyperplasias) suggest that neonatal and early-childhood stresses were more prevalent then than now.^{7,8}

Thus, when we ask, "What did our ancestors eat?", we have to ask which ancestors and when (over a million years or more). We have to ask exactly what they ate (a difficult question), and how much and how often, and whether they alternated between feast and famine. We have to ask how safe their diets were, and whether they stored foods in pits or trenches, or consumed anything reasonably edible during the low-season and during droughts. Were our ancestors actually adapted to the low periods of food availability and were their dietary adaptations subject to repeated change as they took up agriculture, animal husbandry, and the challenges posed by such cultivars as the fava bean, manioc, and black-eyed peas? Moreover, each of us can properly claim a different ancestral sequence and therefore a different set of adaptations according to our geographical origins in Europe, Africa, Asia, or the Americas.

Our point now, as in our original review, is that we are not necessarily descended from browsers. We may have had mighty hunters among our ancestors, but we had grubbers and gatherers and seed-eaters, too. In more recent times our ancestors may have lived more on boiled wheat, bowls of rice, ground maize, or oatmeal porridge than on woodcock, partridge, deer, and sheep. Without facilities for defluoridation, some did suffer from fluorosis. Long before cane sugar became so widely available, some of our ancestors suffered

from rotten teeth. So, we need not postulate some archaic period when all of humankind subsisted on a "prudent" diet, free of *Salmonella*, aflatoxins, and neurotoxins and with dietary calcium in quantity and fully absorbed. What existed in the natural world was not necessarily the best, nor the same for all times and all seasons.

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