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Human history and food

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OBJECTIVES

- To explore the origins of human food culture.
- To provide an historical basis for deductions about preferred ways of eating in the contemporary world.
- To consider the long-term and unintended consequences of changes in the human diet.

REDISCOVERING THE HUMAN DIET

The more we understand about how early humans ate, and how well they lived, the more we are likely to be able to optimise present food consumption for social, mental and physical wellbeing and longevity.

There are broadly three ways through which we rediscover these early patterns:

1 anthropological study of our ancestors (Eaton and Konner, 1985; Bryant, 1994)
2 the study of contemporary communities who have most retained earlier dietary patterns, notably hunter-gatherer societies like Aboriginal Australians or Malaysians (Orang Asli) (Chong, 1975) or Kung Bushmen in Southern Africa (Truswell and Hanson, 1968; Truswell, 1977)
3 the study of the human genome (complement of genes) and how genetic expression may be affected by food intake. This requires the documentation of the genetic capacity and limitations of the human species under various food cultural circumstances, which may be reconstructions of our ecological past. The studies of Kerin O'Dea on the metabolic and health effects of different dietary patterns in Aboriginal and other Australians typify this approach (Temple and Burkitt, 1994).

ANTHROPOLOGICAL STUDY OF THE HUMAN DIET

Anthropologists reconstruct earlier ways of eating by various methods including:

1 the examination of middens and burial sites for evidence of food types eaten (Meehan, 1982)
2 the study of coprolites (fossilised or hardened preserved faecal specimens (Eaton and Konner, 1985)
3 the reconstruction of period ecosystems and their food providing potential (Hetzel and Firth, 1978; Woodward et al., 1987)
4 detailed examination of teeth and jaw development as indices to food types eaten (Katzenberg et al., 1993)

The health evidence comes principally from human remains, which are usually skeletal, but a few spectacular finds of mummified or frozen corpses have been found (Polosmak, 1984; Spindler, 1994). These remains have indicated that:

1 hunter-gatherers were able to live apparently healthy lives at least into their seventh decade
2 they were sometimes taller than subsequent generations, suggesting that the overall food supply was better and susceptibility to recurrent disease less. Recent increases in human height which have been documented in Scandinavia, through studies at the Stockholm museum, have followed a nadir in height after an earlier taller hunter-gatherer population.

CONTEMPORARY AND ANCESTRAL HUNTER-GATHERERS

From the work of Eaton and Konner (1985) it is possible to make the following deductions about the paleolithic (pleistocene, 400 000–45 000 BC) diet:

1 there were appreciable quantities of low fat animal-derived foods (Table 1.1)
2 the plant-derived foods were unrefined

With regards to nutrient intakes (Table 1.2):

1 for macronutrients, protein was a relatively high, and fat a relatively low, contributor to energy intake

Table 1.1 Proposed average daily macronutrient intake for late paleolithic human beings consuming a 3000kcal (12 500 kjoule) diet containing 35 % meat and 65 % vegetable foods

Macronutrient	Intake (g)
Protein	251.1
animal	190.7
vegetable	60.4
Fat	71.3
animal	29.7
vegetable	41.6
Carbohydrate	333.6
Fibre	45.7

Source: Eaton and Konner, 1985

2 relatively high cholesterol intakes were tolerated, but against a dietary background high in fibre and low in fat (with a high P:S ratio)
3 salt (or sodium) intake was relatively low and the potassium: sodium ratio high
4 calcium intakes exceeded those in industrialised societies today
5 the diet achieved upwards of 400 mg vitamin C (ascorbic acid)

Table 1.2 Comparison of the late paleolithic diet*, the current American diet, and US dietary recommendations

	Late paleolithic diet	Current American diet	US Senate Select Committee recommendations
Total dietary energy (%)			
Protein	34	12	12
Carbohydrate	45	46	58
Fat	21	42	30
P:S ratio†	1.41	0.44	1.00
Cholesterol (mg)	591	600	300
Fibre (g)	45.7	19.7‡	30–60
Sodium (mg)	690	2300–6900	1100–3300
Calcium (mg)	1580	740§	800–1200¶
Ascorbic acid (mg)	392.3	87.7§	45¶

* Assuming the diet contained 35% meat and 65% vegetables
† P:S denotes polyunsaturated: saturated fats
‡ British National Food Survey, 1976
§ U.S. Department of Agriculture Food Consumption Survey, 1977–1978
¶ Recommended Daily Dietary Allowance, Food and Nutrition Board, National Academy of Sciences-National Research Council

Source: Eaton and Konner, 1985

These deductions depend on the application of ancestral and contemporary anthropological studies of hunter-gatherers. There are some important conclusions to be drawn about this work along with related studies:

1 Food derived from the sea, rivers, lakes, or streams ('aquafood') consistently played a role in human nutrition. Human populations remote from waterways (e.g in deserts) sought access to water holes and oases.
2 Animal-derived fat intake was low because the creatures caught were undomesticated and lean—the fatty part of a hunted animal, like that in the breast of a gazelle, was highly prized. Plant-derived fat was relatively unrefined from seeds or nuts.
3 Cholesterol intake could be relatively high (500–600 mg/day), from land and sea creatures combined, but unaccompanied by significant amounts of animal-derived fat.

THE HUMAN GENOME AND ITS EXPRESSION

The earlier form of Homo sapiens appeared about 400 000 years ago. The human species as we know it has existed for about 200 000 years, or some 6000 generations, as judged by mitochondrial genetics which are independent of nuclear genetics and maternal only. The mutation rate is well-characterised and allows for an estimate of the time-frame of the existence of the species. Anatomically modern humans (Homo sapiens sapiens) appeared about 45 000 years ago. It is likely that, in the 300 or so generations since the emergence of subsistence agriculture, most of the genetic advantage of the hunter-gatherer period has been retained, whether or not it is now advantageous, or even disadvantageous. Among the genes concerned are those which apparently increase the efficiency of energy (calorie) expenditure in the face of a limited food supply (the so-called 'thrifty gene or genes expressed as a 'thrifty phenotype') (Zimmet, 1993) or those which allow resistance to certain infectious, especially parasitic diseases such as those for thalassaemia, ovalocytosis, sickle cell anaemia, or which generate marginal folic acid status (White and Breman, 1994; Simopoulos et al., 1993) (see Chapter 33). Now, of course, with an abundant food supply, and less physical activity, a 'thrifty gene' or 'thrifty phenotype' may predispose towards obesity and its sequelae; or marginal folic acid status, no longer required to protect against malaria, leaves us with problems of nutritional anaemia and the development of neural tube defects (NTD) like spina bifida which arise during early antenatal life (see Chapter 24).

FOOD BELIEFS AND CULTURE

What is difficult to retrieve is information about the entire food culture of our ancestors, especially the belief system which would have developed out of observations about food and health, and social and personal experiences of food. Efforts have been made to deduce the origins of food beliefs now couched in religious or other cultural terms (Farb and Armelagos, 1983). For example, what are the origins of beliefs about the undesirability of pork in the human diet in religious systems whose origin is in the Middle East, namely Judaism and Islam, but not in major food cultures like Chinese where pork is prized? Is it that infestation with cysticercosis could only be dealt with by food exclusion and religious law, but that in Chinese culture the problem was overcome in other ways? Or is it simply that the habits of pigs were regarded as filthy and risky by some cultures, but not others? Fasting, which is often partial or periodic, is part of many religious traditions, like Christian orthodoxy, but may have been a societal way of achieving equity in food distribution or eking out limited supplies of certain commodities like meat. Such intentions, overt or covert, may nevertheless have had biological justification in terms of preferred meal patterns, or avoidances of over- consumption (propositions even now not fully tested); or the practices may have had a fundamental philosophical, rather than religious, basis in respect for animal life, so minimising meat consumption. Beliefs, no matter how strongly they are apparently held, may not be always or consistently translated into action (Kouris et al., 1991). This limits the certainty of deductions about early food cultures from which the beliefs have been derived, but nevertheless tells something about the food culture of our ancestors (see also Chapter 2).

CRITICAL EVENTS IN HUMAN HISTORY AND FOOD INTAKE

Food intake has, arguably, affected human history in profound ways (Wahlqvist, 1992). These include:

1 ecological change
2 population size
3 war and conflict
4 migration
5 loss of indigenous cultures

Some specific examples are worthy of consideration.

The role of the potato in human history

In the eighteenth century Linnaeus counselled against the introduction of the potato into Sweden as food because of its potential toxicity, later confirmed when the neurotoxicity of solanene in green potatoes was appreciated. Linnaeus's concern proved correct in another way, as with the introduction of the potato, the Swedish population exploded. Farms were able to produce many more calories of food per hectare than before and so larger families could be accommodated on the same farm. But balance between population and food production was not achieved and, during the latter part of the nineteenth century one quarter of the Swedish population, one million out of four million, emigrated, principally to North America. Similar impacts of potato production on human population were seen in the British Isles (Figure 1.1).

Perhaps one of the major influences of food on history was the transfer of the potato and of maize to Europe from central America. Evidence points to these crop introductions to Europe as having led to a major population explosion and ultimately to the colonisation of the Americas, Australia and New Zealand by Europeans. Earliest evidence for the use of the potato comes from central and southern America, where it was represented in pottery as early as 200 AD. It appears to have become a strong part of food belief and culture, although not to have led to the same degree of population growth as in Europe. What checks and balances operated in the Americas and not in Europe are unclear. We know well enough what a profound social effect the potato had on Europe. On account of the monoculture and susceptibility to plant disease, famine became a problem, most notably the Irish potato famine of 1845 and 1846. The potato was also sometimes misused as a source of alcoholic beverage even when the food supply was short. During the years of World War II, Britain still saw the potato as a preferred crop as it could be produced locally with less dependence on grains. One of the remarkable aspects of the potato is that it can grow at almost any altitude and in almost any location. There is ongoing pressure to meet human food requirements, especially locally, by more and more successful potato production, despite the lessons of history. Recently the Australian Foreign Affairs and Trade journal reported the development by Australian scientists of a 'hairy potato' to alleviate food problems through greater disease resistance.

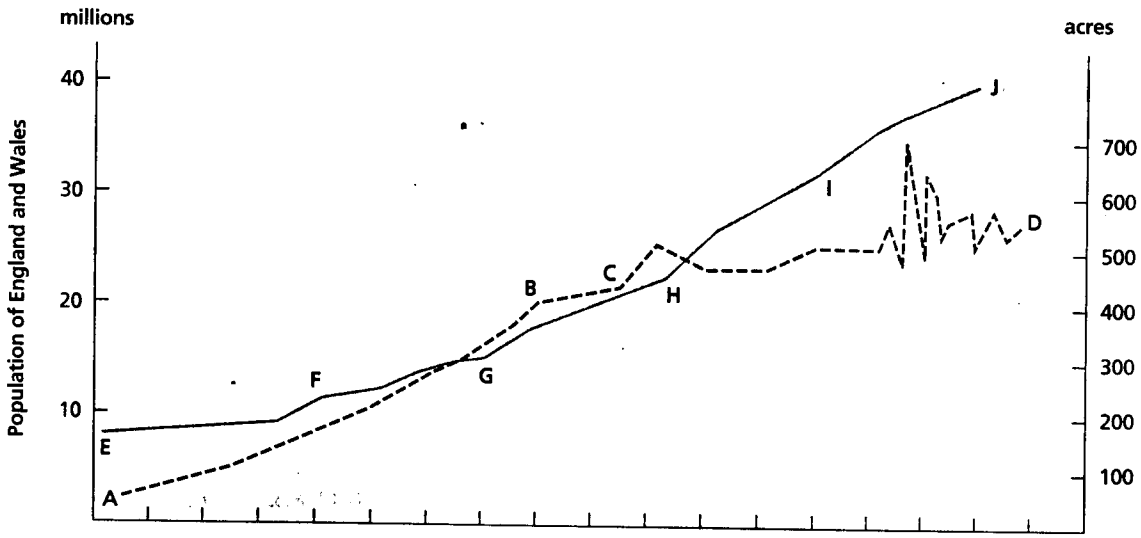

Figure 1.1 Population growth (EFGHIJ) in England and Wales from 1770 to 1940 in relation to the introduction and expanding acreage of potato as a crop (ABCD). During this time the acreage sown with wheat increased to a much lesser extent (Salaman, 1987)

Seafaring, exploration and nutrient deficiency

Not only did increased food production stimulate migration as a consequence of population growth, but the very ability to travel long distances depended on the resolution of problems of human nutrition. The classical example of this was the recognition that scurvy was a nutrient deficiency disease among seafarers. Scurvy had been recognised by the Egyptians and reference to it appears in the Papyrus Ebers about 50 BC. About 600 BC Hippocrates described what was probably scurvy among the Greeks, and Pliny described the condition among the Romans in 63 AD. An account of scurvy is given in the first edition of the *Encyclopaedia Britannica* in 1771. A report published in Leiden in 1734 by J.F. Bachstrom maintained that the cause of scurvy was a lack of fresh vegetables or greens in the diet. The prevention of scurvy among the crew of Captain James Cook aided his discovery of Australia, yet the first European settlement at Sydney Cove was bedevilled by scurvy. When planted crops and trees failed, the use of Australian bush food helped to reduce the problem. Although James Lind had discovered the effects of citrus fruit in preventing scurvy on the ship *Salisbury* in 1747, his treatise was not published until 1764 and the British Admiralty did not adopt his recommendations until 1795. Thereafter, British sailors were nicknamed 'Limeys'. The major food problem that arose from relocated populations was that they then required foods from a distance as well as those grown locally. The value of local food production in terms of overall cost-effectiveness and in a sense of control over the food supply was progressively lessened.

Early European settlement in Australia

The countries to which Europeans migrated lost a good deal of their indigenous food culture and knowledge. The immigrants had little insight into the potential value of local food culture for their own survival or health—let alone the ultimate value of the survival of the human species—through drawing on the heterogeneity of plants usable for human food, the local food cultures themselves and the knowledge that went with them. A major consequence of colonisation was deforestation and the turning of more and more of the new land to grazing for meat production and to land for grain production. By the beginning of the twentieth century, Australians had the highest per capita consumption of meat in the world, some 264 lbs (120 kg) per head per year, followed by the USA at 150 lbs (68 kg), England at 100 lbs (45 kg), France at 34 kg and Germany at 29 kg. Australia has since dropped down the international league of meat consumption, the lead now being taken by Argentinians with Australia ranking about fourth or fifth. The fattiness of our meat supply is also undergoing a revolution towards leanness and there appears to be significant associated change in the rates of disease, like coronary disease, that is likely to be dependent on fat intake. It has taken 200 years to identify and correct this particular nutritionally-related health problem of European settlement in Australia.

It can be said that these historical events were, in general, long-term and unintended, consequences of changes in human food acquisition, production, technology, trade and preferences.

SUMMARY

- The early human diet can be reconstructed with reasonable confidence through anthropological, genetic and experimental investigation.
- An understanding of common nutritional practices and health outcomes among hunter-gatherers has implications for contemporary food practices, notably in relation to food diversity, aquatic food sources, and fat intake.
- Genetic expression in response to diet may be undergoing profound change from an evolutionary point of view, particularly in regard to energy balance and food component (nutrient and non-nutrient) intake appropriateness.
- Food beliefs and cultures may have a long historical basis and provide insights into ancient and contemporary food practices, allowing them more rational review.

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