

## Lifestyle and Disease

# Western diseases and their emergence related to diet

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### Summary

Many of the commonest diseases in the economically more developed communities are characteristic of modern Western culture. Evidence is presented suggesting that they represent a failure of adaptation to the dramatic changes in diet that have been associated with the emergence of modern Western culture. Dietary changes aimed at the alleviation and prevention of these diseases are discussed and recommended.

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### Decline in infective diseases

Until about half a century ago the commonest causes of death throughout the world were infective diseases. These included not only the great epidemics of tropical diseases, but also ubiquitous infections such as tuberculosis, whooping-cough, scarlet fever, measles and gastro-enteritis. In the economically more developed communities this is no longer the case.

The progressive reduction in mortality from infective diseases in Britain between the middle of the 19th century and World War II was due to factors other than therapy, for effective drugs such as sulphonamides and antibiotics were not introduced until mortality rates had virtually reached their present low levels. McKeown<sup>1</sup> has urged that the factors most responsible for this reduction were: (i) improved nutrition, which increased resistance against disease; (ii) adequate sewage disposal, clean water and clean milk, which reduced contact with pathogenic organisms; and (iii) prophylactic vaccination against diseases such as diphtheria and later poliomyelitis. Therapy is extremely important to sick individuals but it does little to affect disease prevalence.

### Emergence or rise in prevalence of non-infective diseases

The reductions in mortality rates from infective diseases in affluent societies have been associated with a dramatic emergence or rise in incidence of a formidable list of relatively new disorders now referred to collectively as Western diseases.<sup>2</sup> These include such major health hazards as coronary heart disease, diabetes type II, gallstones, diverticular disease of the

colon, appendicitis, hiatus hernia, colorectal cancer, varicose veins, haemorrhoids, venous thrombosis, obesity and hypertension. All of these have their highest prevalences in the most economically developed communities and their lowest in rural populations of the Third World. There is, moreover, no evidence that any of them was other than relatively rare even in Western countries before the first quarter of this century. Their prevalences, in the main, are currently comparable in Black and White Americans, whereas they were much more frequent in Whites two and more generations ago. It can be confidently assumed that the ancestors of Black Americans on first arrival in America cannot have been more affected by these diseases than are rural Blacks in Africa today. When communities emigrate from low to high prevalence areas the next and subsequent generations have disease prevalences similar to those of the host country, as is exemplified by Japanese immigrants to Hawaii and California, and by Jews who emigrated from the Yemen and North Africa to Israel after World War II.

Such observations compel the inescapable conclusion that these diseases are predominantly the result of environmental rather than genetic factors, although this is not to deny the importance of varying genetic susceptibility to environmental influence.

### Determining possible responsible factors

The factors responsible for these diseases must be assumed to have increased in intensity in all the situations in which these diseases have been observed to emerge or to increase in prevalence. It is appropriate to mention here that some of them, notably hypertension, diabetes, obesity and appendicitis, increase many years before others, such as gallstones and ischaemic heart disease, and that these, in turn, emerge before bowel cancer, hiatus hernia and diverticular disease.

Certain cultural and other environmental changes invariably precede rises in disease frequency associated with, but obviously not causally related to, these changes, such as increased availability of plastic utensils, Western clothes and transistor radios. But in view of the fact that all these diseases can be shown to be either directly or indirectly related to the alimentary tract it seems reasonable to consider that the environmental factors most likely to be responsible are dietary. Contrasts between the composition of the diet in communities with high and in those with low prevalences of these diseases are similar to the respective dietary situations that prevailed in Western nations before and during the rise in prevalence of these diseases.<sup>3</sup>

The main dietary contrasts that distinguish affluent from poorer communities can be summarized as follows:

**Protein:** The proportion of energy derived from protein varies little, but with westernization its source becomes predominantly animal rather than vegetable.

**Carbohydrate:** Not only is total energy from carbohydrates halved with westernization, but half of that is provided by sugars.

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**Fat:** This provides approximately 3 times the proportion of energy in the West that it does in the Third World and, as with protein, its predominant source has changed from vegetable to animal.

**Fibre:** Intake is 3 - 5 times greater in Third World communities than in the West. Moreover, in the former situation most of it is derived from starchy staple foods, which in the latter has been to a large extent replaced by fibre from fruit and vegetables.

**Salt:** Hunter-gatherer populations in whom blood pressure does not rise with age consume little over 1 g salt a day. Modern Western man consumes about 10 - 15 g.

## Adaptation to environment

Given sufficient time, all forms of life tend to adapt to the environment in which they are placed. This is a slow process and may require long periods. Man, as defined anthropologically, rather than theologically, has apparently been on the earth for over 2 million years. For most of this time, some 80 000 generations, he lived as a hunter-gatherer. Then for some 10 000 years, or 800 generations, he was a peasant agriculturalist. The lifestyle of modern Western man has only prevailed for some 200 years or 8 generations, a mere moment in evolutionary time. More changes have been made in the composition of food during this last period than during the previous 2 million years, so it seems reasonable to speculate that Western man has had insufficient time to adapt to his new dietary environment. In this case Western diseases may represent maladaptation to a new environment.

## The nature of dietary fibre

Because the role of fibre has been misunderstood and its properties unrecognized, not only has it been neglected in studies of nutrition, but it has in fact been deliberately removed from food in polishing rice in the East, making white flour in the West and fine maize meal in Africa. Fibre is the skeleton of all plant foods, the structure of all plant cell walls, and is that part of plant foods that largely resists digestion in the small bowel and provides little energy. It was partly for this reason that it was intentionally discarded. Yet almost every measurable event which takes place in the colon is affected in a major way by the presence or absence of dietary fibre.

The term previously used, 'crude fibre', was totally misleading, for it measured only part of the lignin and part of the cellulose. It did not include the all important non-cellulosic polysaccharides that are removed in the estimation of crude fibre. The current term 'dietary fibre' includes all non-starch polysaccharides, lignin and certain gums.

## Postulated role of fibre in the prevention of disease

Fibre, by increasing bacterial mass and retaining water in the colon, ensures the presence of a large volume of soft faeces which results in short intestinal transit times.<sup>4</sup> Inadequate fibre in the faeces is in fact the only common cause of constipation. Increased viscosity and diminished volume of faeces is generally believed to be responsible for the causation of diverticular disease.<sup>5</sup> It has likewise been suggested that the presence of firm faecal particles in the appendix may contribute to the obstruction of the lumen that initiates appendicitis. The difficulty encountered in evacuating hard stools entails abdominal straining which greatly raises intra-abdominal pressure and this has been postulated as a major cause of hiatus hernia.<sup>6</sup> These

pressures are transmitted retrogradely down the veins of the legs and have been incriminated in the pathogenesis of varicose veins.<sup>7</sup> The shearing stress of passing hard stools together with the engorgement of vascular anal cushions is considered a major factor in the development of haemorrhoids.<sup>8,9</sup> Reduction of faecal volume with its associated prolongation of intestinal transit time both increase concentration of faecal carcinogens or pre-carcinogens and prolong their contact with intestinal mucosa.<sup>10</sup>

In addition to its influence on faecal bulk, consistency and transit time, the fibre content of food profoundly affects both the nature and amount of intestinal bacteria and consequently the faecal pH.<sup>11</sup> This in turn reduces the bacterial degradation of cholesterol and bile acids to substances viewed as potential carcinogens.<sup>12</sup> Moreover, the high fat intake that is associated with low fibre intake is believed to increase the concentration of bile acids which are the substrate on which bacteria act to produce potentially carcinogenic metabolites. These and other mechanisms have been postulated to play important roles in the pathogenesis of colorectal cancer.

By rendering small-bowel content more viscid, fibre delays the speed of absorption of energy from the gut and may thereby be considered as conferring a measure of protection against diabetes.<sup>13,14</sup> By increasing the bulk but not the caloric value of food it tends to militate against excessive energy intake and resultant obesity.<sup>15</sup> Its effects on the metabolism of both bile acids and cholesterol influence the lithogenicity of bile<sup>16</sup> and may, by mechanisms not yet understood, influence the development of atherosclerosis.

## Dietary recommendations

It can no longer be disputed that a formidable list of diseases common in affluent societies are in fact characteristic of modern Western culture. Moreover, an impressive volume of evidence has now been accumulated indicating that dietary changes have been paramount, though not exclusive, in their causation. Since any suggestion that adaptation to our newly acquired diets will soon occur is a vain hope, the only logical approach to the problem is to retrace to some extent the steps of dietary changes that those in the West have taken over the past century, while retaining as far as possible the advantages of modern food technology.

When sources of energy in communities with minimal prevalences of Western diseases are compared with those with maximal prevalences, it is easy to see the direction in which changes should be made and then to consider what might be feasible (Fig. 1). Recommending the ultimate in dietary change is unlikely to be wholly acceptable, so that a compromise between idealism and practicality must be worked out.

As a general guideline, it is considered that the proportion of energy provided by starch foods as well as the intake of fibre should be doubled. Sugar consumption should be decreased, and salt consumption should be halved. Fat intake should be reduced by a third or more; certain enthusiasts would say by a half or two-thirds but the majority would find this entirely unacceptable (Fig. 2).

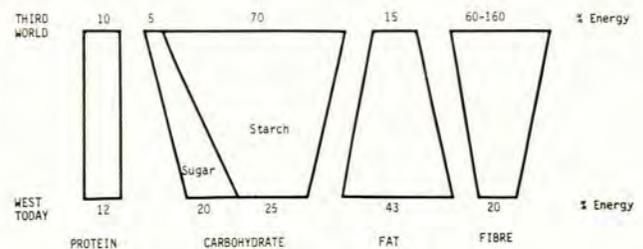


Fig. 1. Main contrasts between Third World and Western diets.

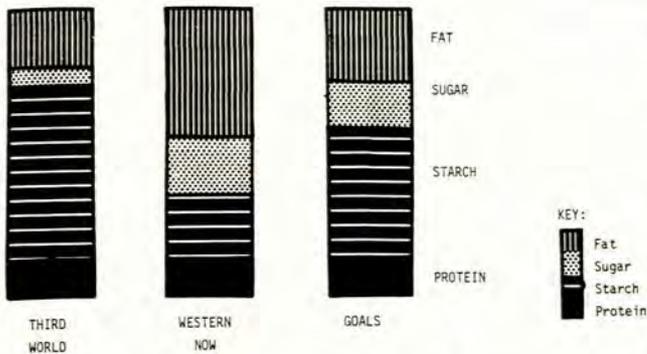


Fig. 2. Contrasts between Third World and Western diets and recommended changes.

These recommendations are in line with those of the *Dietary Goals for the US*.<sup>17</sup> It is equally if not more important that populations in Third World countries should be dissuaded from emulating the enormously harmful dietary customs of the West.

### Some practical considerations

More cereal foods should be consumed, with their fibre content retained. Not only are they an excellent source of carbohydrate, but the fibre from cereals is the most effective protection against constipation and its attendant hazards. Much more bread should therefore be eaten, made from high-extraction and preferably near-wholemeal flour. More fibre-rich breakfast cereals or oatmeal porridge should be eaten. Miller's bran, a particularly rich source of fibre, could in most cases be added with advantage, one or two heaped dessertspoonfuls a day. Other cereals and their products are also recommended, such as corn, barley, oats, rye and preferably unpolished rice.

Lentils and potatoes are other good sources of carbohydrate and fibre. The latter are not fattening provided they are neither cooked nor eaten with fat, and it is preferable not to remove the skins. To reduce fat intake, fried foods and particularly fried potatoes should be eaten sparingly. Meat consumption should also be reduced since 40% of even lean red meat as produced currently for human consumption consists of fat. Moreover, meat is the most uneconomical of all ways of providing satisfactory nutrition.

It is probably wise to refrain from adding salt to food at table; sweetened drinks such as cola beverages are rich sources of sugar. To protect Blacks from diseases of the West every effort should

be made to discourage the over-refining of maize meal and energetically to advocate the consumption of brown rather than white bread. It goes without saying for both races that every possible effort should be made to reduce tobacco consumption.

### Action or procrastination?

More than enough evidence is already available to warrant the recommendation of such procedures. The attitude that demands ultimate proof and total understanding before recommending action is neither scientifically acceptable nor morally justified. It is right to demand evidence before recommending action, but not to insist on ultimate proof or full understanding of the mechanisms involved. The scripture records that 'A man scatters seed on the land . . . the seed sprouts and grows . . . how he does not know' (Mark 4.27). The farmer here acted with confidence on the regularly observed association between sowing and reaping. Had he insisted, as some scientists would today, on an understanding of the process of seed germination before he undertook his task, he and his family would have starved. We have sufficient observed associations and tested mechanisms to make confident recommendations. All we have to do dietetically to continue on a disaster course is to make no changes at all.

The most imperative step with regard to improving health in both the West and the Third World is to redress the enormous emphasis on cure relative to prevention, the former receiving some 99% of total health expenditure in most Western countries.

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