

The dairy-free diet

Milk is a complex substance, which is not surprising, as it is a complete food for the baby animal in its first weeks or months of life. The macro ingredients are protein, fat and sugar. The micro ingredients include vitamins and minerals, essential fatty acids, hormones, and other small molecules such as immune globulins. Casein and albumin are two of the predominant proteins in milk. Lactose is the name of the main sugar in milk. The mineral which most people think about in relation to milk is, of course, calcium.

If milk is a problem, just exactly what is the nature of this problem? The milk, the cholesterol, or something to do with the cow itself?

Honorary 'cows'

In discussing milk, we usually refer to cow's milk because the cow is the greatest provider of milk products in the West. In South American and Middle Eastern cultures the animal is more likely to be a sheep or a goat. By and large, their products seem to be better tolerated than those of bovine origin. There are several possible reasons for this, of which the most important is probably the A1, A2 difference (Chapter 2).

However, many people who cannot tolerate dairy products from cows find that milk from other animals causes similar difficulty.

Clinical problems associated with dairy products

Here are some of the clinical problems which can arise from a diet high in milk and its products:

- *Allergy, sensitivity and intolerance:* Allergy is a specific immune response, mediated by the IgE arm of the immune system. People who talk about 'milk allergy' may be referring to this response, but more often the correct term is 'milk sensitivity' or 'milk intolerance', often used interchangeably. Such reactions can be mediated through either immune or non-immune mechanisms. Immune reactions include IgG or IgA responses (Chapters 3 and 6). Typically, both allergy and sensitivity responses are reactions to the protein component of milk. People with these reactions may also react to other cow proteins such as beef and gelatine. IgE-mediated allergy can cause

eczema, asthma and even anaphylaxis. Cot death has some biochemical features in common with anaphylaxis, and it has been proposed that cow's milk allergy could be one of the mechanisms by which cot death can occur (Chapter 9).

- *Other immunological problems:* Illnesses which may be caused by the various intolerance mechanisms, or possibly some other immune mechanism not yet identified, include inflammatory bowel diseases such as Crohn's disease and ulcerative colitis, irritable bowel syndrome, asthma, migraine, autism, learning and behavioural difficulties, psoriasis, tonsillitis, and autoimmune diseases like diabetes. All of these illnesses have multiple causes including genetic predisposition, nutritional status, and environmental exposure; milk consumption alone is unlikely to be the culprit. However, when such illnesses appear more frequently in a dairy culture, the possible contribution of dairy has to be considered.
- *Digestive problems due to the lack of the appropriate enzyme in the gut:* When the problem relates to the sugar content of milk, the person is said to have a lactose intolerance. This is not an allergy. Lactose-intolerant people, either temporarily or permanently, lack the enzyme lactase. They are unable to digest the sugar in milk, and are prone to wind and diarrhoea as a result. Such people can digest lactose-free milk, which has no benefit for those who react to the milk proteins.
- *Cholesterol content:* The cholesterol in milk products *may* contribute to the burden of 'bad' cholesterol in the body.
- *Casein content:* The protein called casein, especially the beta casein found in A1 milk, is implicated in raising serum cholesterol and in autoimmune disorders. Most of these have been discussed in Chapters 2 and 6. The discussion about casein-free (and gluten-free) diets in schizophrenia, autism and learning difficulties also appears in Chapter 9, and will be concluded shortly.
- *Calcium and magnesium:* Unbalanced calcium supplementation may be undertaken as a result of misguided medical advice. The dairy industry promoted calcium supplements and milk as the solution to the rising problem of osteoporosis, and yet it is only in the dairy cultures of the developed world that osteoporosis is a problem. It is true that calcium

deficiency can cause osteoporosis and that milk overload is not the only cause of osteoporosis, but we should remember that the ratio of calcium to magnesium in cow's milk is between 15 to 1 and 8 to 1. At a cellular level, calcium and magnesium compete with each other for absorption; a high-dairy diet is often by definition a low-magnesium diet. A calf nibbles on grass when it is a few weeks old, obtaining magnesium and other essential minerals. If by the age of six weeks it is not nibbling grass, it will become sick from magnesium deficiency because it cannot get enough from milk. By about one year of age it is weaned and will not drink milk again even if it is available. In humans, by contrast, a dairy-based diet can give rise to a problem of magnesium balance. Many of the illnesses associated with magnesium deficiency are diseases of dairy cultures, rather than of affluent societies.

Which milk?

Low-fat milk

Many patients attempt to address their milk intolerance by only drinking low-fat milk. Often they are making their problem worse. When fat or cream is removed from milk, the remaining buttermilk is a generally unacceptable product. To thicken it, milk solids and other milk proteins are added, increasing the protein load and thus the intolerance burden.

If Cholesterol were a character in a medieval play, its mask would without doubt represent evil. This is a pity, and the defence of cholesterol appeared in Chapters 3, 8 and 9. The milk solids added back include casein, which can actually increase serum cholesterol. Whether this is a problem specific to A1 milk, or is true of all casein, remains unknown.

Lactose-free milk

The common problem of lactose intolerance was discussed above. It comes about because many people after the age of two permanently lose the gut enzyme known as lactase. People in dairy cultures may retain this enzyme throughout most of their lives: 80 per cent of Caucasians are in this category, although they may temporarily lose it after viral illness or other damaging event such as the consumption of gluten

by people with coeliac disease. By contrast, most Asians and dark-skinned people do not retain this enzyme, and have a poor tolerance of milk. They may be able to tolerate milk from which the lactose has been removed.

Cultured milk products

Those who lack the enzyme lactase can still consume milk under certain circumstances. The lactobacilli bacteria used to produce yoghurt actually consume lactose as their own energy source, producing a by-product known as lactate. Just as a wine fermented out to 'dry' no longer contains sugar, cheese and yoghurt often contain little milk sugar; the lactose-intolerant can often enjoy a fully cultured yoghurt. For this reason we often find that milk products have persisted in cultures which are genetically predisposed to lose the lactase enzyme after infancy.

Cultured milk products are an interesting adaptation of the agricultural revolution. From the time humans first started to tend animals, the advantages of using their milk must have been obvious. The making of cultured products reduced spoilage and also renewed the supply of good gut bacteria and shared those bacteria within the tribal group. It is probable that these cultures of yoghurt were 'contaminated' in a beneficial way as the human cultivators tasted and handled the product.

Coeliac disease and the gluten-free diet

Coeliac disease was discussed in Chapters 2 and 6. It is an absolute, and (at this stage of medical knowledge) lifelong intolerance to gluten, one of the proteins found in wheat, rye, oats and barley. Of the cereals which form the basis of the food pyramid, only rice and corn among the common staples are gluten-free.

I have discussed in earlier chapters the problem of clinical coeliac disease. Relevant here is the question of the 25 per cent of the population who have the genes for coeliac disease but do not develop it. Possibly these people might feel better on a gluten-free or low-gluten diet. My experience is that many people who are not coeliac feel better when gluten-free. Very recently it has become feasible to do the blood test (HLA typing) which determines whether coeliac genes are present. It is impressive just how many of these people are carrying coeliac genes.

Then there are researchers like Alessio Fasano (Chapter 6) who seem to feel that we'd all be better off without gluten. It may be that those doctors who regard

gluten-free diets as faddish may end up eating some humble (gluten-free) pie.

In Western culture it is hard to avoid gluten; but before the arrival of the white man the diet of the Australian Aboriginal, like many other aboriginal diets, would have done so.

The casein-free, gluten-free diet

Based on the considerations in Chapters 2, 6 and 9, this diet has been proposed to manage conditions such as autism, specific learning defects and schizophrenia. There is a strong belief that schizophrenia is a disorder of dopamine metabolism, hence the idea of removing dopaminergic and opiate foods.

As early as the 1960s, Dohan was proposing a link between cereals and schizophrenia.¹⁹ The clinical evidence that such diets make a difference is considerable.

The low-salicylate, low-amine diet

Salicylates illustrate Tudge's concept that an ideal diet contains natural medicines.²⁰ A little salicylic acid acts as an anti-inflammatory, reduces our risk of heart attacks and bowel cancer, and all round seems like a good idea. But the chronic neglect of bowel health, combined with green harvesting of fruit, has caused many people to become sensitive to salicylates. All manner of allergies seem to follow.

We now have the ludicrous situation where half of the population is taking aspirin to make up for the lack of fresh fruit and vegetables in their diet, and the other half is avoiding some of nature's healthiest bounty because they suffer from a 'salicylate sensitivity'.

Blood group diets

The varying incidence of coeliac disease and milk intolerance according to culture gives some credibility for the concept of the blood group diet.

A number of research centres now support the idea that some people require an individual food pyramid. Blood groups give a clue to our racial origins. The Children's Hospital Oakland Research Institute in California and the Cornell Institute for Nutritional Genomics are just two of the centres looking at diets to match our genetic makeup. The science has been named nutrigenetics, and is as yet in its infancy.

The limitation of current blood group diets is that they are based on the red blood cell or ABO Rh system. If we could type the white cells, we would be able to determine the status of the HLA class II genes of the individual. The HLA groups determine our vulnerability to some illnesses where dietary intervention may be significant, such as coeliac and diabetes. HLA typing is technically straightforward, but at the moment prohibitively expensive. That is changing, and we can now look at two class II genes, HLA-DR and HLA-DQ, with relatively cheap tests. These tests detect the increased risk for coeliac (plus or minus diabetes). The alleles for HLA class I genes, expressed on all cells, also offer diagnostic potential. Class I HLA B27 alleles can determine a risk for Crohn's disease and can be easily tested. Watch this space.

In future, typing may show us not only what to avoid, but what we need to seek out. Some racial groups may have actually become dependent upon certain foods. It is hard to imagine that Inuit, after thousands of years living on fish and fish oils, would tolerate deprivation of omega-3 fatty acids. (It has been suggested that Inuit might not need to ingest Vitamin C. This has not been confirmed, and probably will not be, but it is an interesting concept.)

Elimination diets

The diets mentioned both above, and in other parts of this book, are often referred to as elimination diets. The principle is that, if sensitivity to a particular food or food chemical is provoking a certain reaction, the strict removal of the offending substance/s from the diet may help recovery. Elimination diets are most commonly used in treating eczema, irritable bowel, migraine and, of course, coeliac disease, but the management of many medical conditions can involve an elimination diet.

The food list in Appendix 2 can be useful here. Not only does it remind us that there is more than wheat and milk to eat, but it also lists a rich variety of foods that we might never have thought of eating. This list groups foods in families because members of the same food family often share similar proteins and chemicals. Sensitivity to one food in a family may warn of problems with related foods. If mangoes give you migraine, don't be surprised if cashews have the same effect. People with peanut allergy may react to curries containing fenugreek, and so on.

RESPONSES TO MASS FOOD PRODUCTION

Bad food, contaminated food, refined diets, loss of diversity, loss of unique food cultures—these things have not gone unnoticed. An attempt by the McDonald's chain to open a branch in an area of France known for its regional produce ignited outrage. The outbreak of diseases like BSE (mad-cow) and avian flu has caused people to question where their food has come from. The appearance of diseases in cultures where they were unknown has forced attention at the highest levels. In the case of Australian Aboriginals, suffering one of the highest incidences of diabetes, coronary artery disease and hypertension in the world, the message has been stark:

Replacing fatty, sugar-laden foods with a traditional meat, fish and root diet ... was not just about improving lifestyle ... It is simply about ensuring the survival of Aboriginal culture and people. If we don't, children and adults will continue to die and the only need for land will be for cemeteries.²¹

The response to the globalisation of food production comes from many quarters. It is impossible to separate the food from the grower, the culture, the economy or the health of the consumer. As a sober world reflects on the damage as well as the benefits of 20th-century globalisation, many questions are being asked about the price we pay for agribusiness. I will discuss a few of the responses to this situation.

The Policy Commission on the Future of Farming and Food

In 2001, the British Labour Government set up the Policy Commission on the Future of Farming and Food to enquire how agriculture could meet the diverse demands of the economy, sustainability, the environment, human health and animal welfare. Its approach was multidisciplinary. The medical input was endorsed by several august bodies, including the Faculty of Public Health Medicine of the Royal Colleges of Physicians and the National Heart Forum. It is not possible here to do justice to its 59-page report, *Why Health is the Key to the Future of Food and Farming*. Here are some of my favourite extracts:

The key purpose of food and farming is—or should be—to advance the health and well-being of the population. Other considerations such as the economy, trade liberalisation, CAP reform, etc., should all meet this goal of improved public

health; if they do not, they should be rejected ... Farming and food should give equal weight to both human and environmental health. Policy and practice should encourage diversity of foods and biodiversity in fields. The food chain should decrease its reliance on non-renewable energy over and above global, European and UK commitments. Food costs should more fully reflect their real costs of production, distribution and mal-consumption. Food chains should be as short as possible ... Financial measures currently encourage policy confusion: [between] conventional 'efficiency' ... and ecological efficiency. Food policies should ... encourage local food suppliers, providers and retailers to reduce in 'food miles' [more shortly], ensuring that all citizens are within walking or bicycling distance of food shops ... health goals need not conflict with other goals for a sustainable, competitive and diverse farming and food sector ... environmental goals and health goals are entirely complementary. In order to advance both environmental and health goals there needs to be a switch from animal based foods to plant-based foods—particularly vegetables and fruit ... There is evidence that diet is a factor in some mental ill-health conditions. [pp 3–11]

On pesticides, the report says:

in 1995 when the Working Party on Pesticide Residues found excessive residues in carrots ... the Chief Medical Officer issued advice in 1997 to peel carrots ... there is currently some negotiation ... whether the CMO's advice ... is still needed. *Whether this is so or not is almost beside the point. The fact that so-called Good Agricultural Practice allowed application of pesticides to carrots in such quantities that consumer safety was even slightly in doubt suggests that agricultural production was coming before consumer safety* [p 19—my italics].

On antibiotics, it has this to say:

Recent best estimates indicate that more antibiotics are used in agriculture each year than in treating humans. Evidence now links widespread use of antibiotics in animal feed, common to confined animal feeding operations, with rising numbers of humans infected with bacteria that respond poorly or not at all to treatments with these same antibiotics, or closely related drugs. [p 29]

Other observations included:

- In Europe, the most heavily subsidised crop per hectare was tobacco. [p 40]
- The loss of local greengrocers had produced urban 'food deserts'. [p 20]
- The relocation of food outlets to supermarkets on the edges of large towns committed the public to using fuelled transport to purchase food. The consequences of this were: increase in greenhouse gases; reduction in physical exercise; loss of social capital as neighbours encountered one another less; and money saved on cheaper food was matched by increased transport expenditure. [p 37]
- Ready-made meals and better cleaning agents saved the average person 2 hours and 41 minutes in domestic chores per week. This was balanced by an increase of 2 hours and 48 minutes travelling to, and spent in, shopping outlets. [p 33]
- It is naive to believe that this trend will be reversed by increases in individual responsibility and self-management alone. [p 37]
- 'Universities ... agricultural and veterinary colleges rely for their research support on government departments, the research councils, the private sector.' Such bodies are 'in many cases well placed to respond to new incentives to research into producing safer foods and healthier diets, but the current pattern of incentives are pushing academic researchers in contrary directions.' [p 52]

This report prompts some what-if questions. What if governments stopped spending money on highways and diverted the funds into public transport, shopping buses for the elderly, dedicated bicycle paths? What if the lands used to build the highways that transport vegetables were given over to the growing of those vegetables instead? What if public and private moneys spent on exercise regimes for young and old were diverted to enable people to exercise as they weeded the nation's food-gardens?

What if the price of an apple grown on one continent, flown to another, and finally trucked the length of that country, were truly costed in environmental terms? (Australian orchardists have pulled out productive orchards because they can't compete with the prices of oranges grown in the United States.) This is no abstract concern. The benefits of eating good food are diminished if its transport increases pollution and global warming. Some 2003 'food miles' statistics from

Britain make us think:

- *Apples*: 76 per cent of those consumed came from overseas — many from the United States, a journey of 10,133 miles. Meanwhile, 60 per cent of Britain's orchards had been destroyed in the last three decades.
- *Pears*: from Argentina, 6886 miles. Local production had fallen 22 per cent in the last decade.
- *Grapes*: from Chile, 7247 miles — with a lot of packaging to prevent damage. Where does this packaging go?
- *Lettuce*: from Spain, a mere 958 miles. The authors estimated that it cost 127 calories of energy (in aviation fuel) to import 1 calorie of lettuce-energy.
- *Strawberries*: also from Spain, but sometimes from California. The authors estimated that the energy cost of importing 1 kg of out-of-season strawberries from California was the equivalent of keeping a 100-watt light bulb on for eight days.
- *And the rest*: broccoli and spinach came from Spain; potatoes from Israel, 2187 miles; tomatoes from Saudi Arabia, 3086 miles (long-life varieties picked early — less flavour, fewer nutrients); prawns from Indonesia, 7278 miles; brussels sprouts from Australia, 10,562 miles; wine from New Zealand, 14,287 miles; carrots and peas from South Africa, 5979 miles.²²

In conclusion we have to ask what if governments were obliged to take the social and moral costs of cheap overseas foods into account when they negotiated trade deals? None of these what-ifs are technically difficult.

The Slow Food Movement

Blessed are the cheesemakers. — *Monty Python's Life of Brian*

A small market town in the foothills of the Italian Alps was the birthplace of a movement known as Slow Food. The year was 1986, and the triggering event was the opening of a McDonald's restaurant in the famous Piazza di Spagna in Rome. The founder of the movement was a man called Carlo Petrini who, in an interview in *The Nation* said, 'A hundred years ago, people ate between 100 and 120 species of food. Now our diet is made up of, at most, 10 or 12 species.'²³

No matter how this story is played out, or which statistics are given, the estimates and themes are consistent. Within any one production line, the range is dictated by the demands of commerce. The vegetables we can buy are not the healthiest, or even those that taste the best. They are the ones which crop in a convenient time band, pack easily, endure transport. The medical consequences of this have been the subject of much of this book. These health considerations, the risk of famine when monocultures fail, the loss of gastronomic delights and of traditional livelihoods—all of these factors have boosted the Slow Food Movement.

Spurred on by factors like mad-cow disease and the risk of GM monocultures, support for Slow Food has spread to many countries. Membership has increased beyond the 1.4 million members it had when Petrini first discussed the organisation with Ralph Nader.

Slow Food extends its concern beyond the range of available foods to the production methods. To meet modern hygiene standards, governments prohibit such activities as the traditional production of cheese. Yet a master cheesemaker, perhaps the sixth or seventh generation to practise the craft, may pose less threat than a factory where commercial interest is the driving force. The same is true of traditionally produced breads, wines, and many other foods.

In fact, when we consider the factors raised in Chapter 6: The Gut, it is probable that the friendly micro-organisms in our intestines actually *depend* on the products of natural fermentation processes to maintain their own health and balance. The pathogens in naturally produced cheeses, such as *Listeria monocytogenes*, may pose a health risk only when intestinal flora are out of balance. And this lack of balance comes largely as a result of the use of antibiotics, preservatives and sugar in the modern production of food, none of which is countermanded by food safety laws. The members of the Slow Food Movement understand this well.

Permaculture

The term Permaculture was coined by Australian bio-geographer Dr Bill Mollison in the 1970s as a contraction of 'permanent agriculture'. He developed guidelines for the design and maintenance of agriculturally productive ecosystems. These guidelines cover the inter-relationships of landform features (slopes, watercourses), plant species and built structures (dwellings, gardens, roads, lakes). The objective is

to achieve a harmonious integration of landscape and people, providing their material and non-material needs in a sustainable way. Although the focus is on agriculture, the guidelines extend to the design of buildings and to social and organisational structures.

Permaculture draws on the patterns found in natural ecosystems, and it encourages protracted and thoughtful observation, as opposed to protracted and thoughtless action. By getting the design right, needless expenditure of energy (both human and mechanical) can be avoided. The diversity of products needed for quality of life can be produced.

Permaculture is now an international movement. As well as several books written by Mollison, there is the *International Permaculture Journal* and a Permaculture Institute involved in training (see www.permaculture.org.au and www.tagari.com). Permaculturists follow design principles that are generally supportive of human health, for example:

- Short supply chain for food from point of production to consumption, resulting in fresh produce with minimal nutrient loss.
- Diversity and density of plants and animals similar to that found in natural ecosystems, leading to resilience and stability on one hand, and continuity of production on the other, while avoiding any need for poisons or artificial fertilisers.

A design based on Permaculture principles might use warmth generated by a compost heap or a fowl house to protect frost-tender plant species. Manure from ducks and hens fertilises the vegetables growing nearby. The ducks and hens keep insects and grubs under control. Pesticides are avoided or eliminated altogether.

Ancient crops and rare breeds

In a seaside village in Cornwall there is a sign on a tiny cottage which reads: 'Here lived Dolly Pentreath, the last person to speak the Cornish language as a mother tongue until her death in 1777 aged 102.' There is a haunting image of an ageing Dolly standing at her front gate, the sole reservoir of a precious Gaelic heritage. Such loss of language is poignant. Language, culture, food—how can we separate these? Some linguists argue that languages have spread not by conquest and exploration, but by farming and agriculture. But as languages and cultures have

spread, others have been lost.

Certain plants, aided by the forces of the global economy, seemed bent on conquest, as if they were malevolent vegetable imperialists. As linguists strive to preserve tongues which are on the brink of extinction, so many rare species have found their defenders.

Inspired by movements such as Permaculture and Slow Food, many farmers are now beginning to recognise the value in preserving ancient crops and rare animal breeds. Cultivated over centuries, these species resulted in rich diversity and had many adaptive benefits. The problems of monocultures were avoided, and biodiversity was maintained. Sustainability was not mentioned because it was taken for granted.

Seed-saving organisations, with names like Seeds of Change, Heritage Crops and Eden Seeds, have appeared around the world. Some have been started by altruistic bodies to help poor nations recover the means of feeding themselves. Others are the efforts of biologists and field scientists appalled by loss of diversity. Many have been started by small-scale farmers and gardeners of the First World.

Some wonderful stories have emerged from this quest—an onion was thought to be extinct until it was found growing in a tiny country cemetery; a pear tree producing fruit weighing half a kilogram; rare varieties are found growing beside country roads, railway lines, in abandoned lots and old vineyards. Seeds and cuttings from these plants are traded and cultivated through national and international seed-saving organisations. Some are available through commercial outlets.

Not long ago, few had heard of bread made from quinoa, spelt or kamut, progenitors of modern wheat. Amaranth is an ancient grain used by the Aztecs for cereals and bread; something of a wonder plant, its leaves are rich in protein, vitamins and minerals and its seeds are a good source of amino acids. We might ask how such a useful grain was all but lost to agriculture. The answer is not attractive. When Cortes invaded Mexico, he and his Spanish army burned the amaranth plantations and forced the Indians to grow barley.

Slowly these heritage plants are being rediscovered, along with their nutritional and environmental advantages. Amaranth, cassava, yams, arrowroot and taro are gluten-free. Whole cultures lived well on diets which to Western eyes are severely limited simply because they lack gluten and dairy products.

Bush foods

In Australia a growing awareness of the value of bush foods has paralleled the interest in rare breeds. They are the foods which sustained hunter-gatherers in ancient times and were only passively cultivated by humans. These fruits, nuts, berries, herbs and vegetables are an untapped resource. They can provide food with minimal ecological impact. They promise a wide array of novel medicines. Only a fragment of the total number appears in Appendix 2. As with the ancient crops, scientists, researchers and ethno-botanists are seeking to intervene before it is too late.

In 1989 the journal *Nature* published a paper described as seminal. Entitled 'Valuation of an Amazonian Rainforest', it argued that the revenues from the sale of rainforest fruit alone would exceed the one-off sale of trees to loggers. This original research has led to the production of a simple book for locals, explaining in pictures the subsistence value of the fruits, fibres, game and medicines preserved when logging was avoided. Described as a 'blend of hard science and local knowledge', the book (also known as the 'fruit book'), has been well received by locals, politicians in Western Amazonia, and even Brazil's environment minister.²⁴

The consumption of a bush food diet has so many benefits that it makes the development of agriculture seem like a backward step. Agriculture's obvious benefits are social rather than nutritional. Bush food by contrast is fresh, seasonal, varied, and possibly uniquely suitable to meet the biochemical needs of the inhabitants of the local region. Both in Australia and the rest of the world, many local foods have been ignored. Edible nettles, dandelions, sorrels and brambles have been regarded as weeds. They have been sprayed with expensive poison, while we rush to import vegetables which are neither fresh nor free of agricultural chemicals.

Wild game also has many adaptive benefits. It is rich in omega-3 fatty acids because wild animals graze on the algae and seeds which are a source of omega-3s. The eggs and meat of these animals are similarly enriched. Nowadays animals used in native diets may be endangered, so there is understandable resistance to promoting them as a food source. The sensitivities of the Western world recoil at the idea of eating our primate cousins or cute animals, yet we countenance overfishing and the use of primates in inhumane experiments. Another irony. 'Primitive' peoples, who throughout the ages respected their food supply, suffer

under rules imposed by an 'advanced culture', responsible for all the commercial misuse and most of the extinctions in the first place.

Australia: a case in point

The macadamia nut is one of the few native foods which most Australians know, yet we are surrounded by bush foods of high nutritional value. For instance, Warrigal greens are leafy tender greens which grow in abundance on sand dunes, stony beaches and salt marshes. They are sought by chefs overseas, but few non-indigenous Australians would recognise them as food. Also growing on dunes and otherwise unpromising land is a plant called pigface; its fleshy succulent leaves and fruit are both edible.

Not all Australian bush foods grow on hostile terrain: many are the product of rich rainforest environments. But as Australia's fragile ecosystems are further degraded by attempts to grow inappropriate crops, the foods which do are of special interest. The native peach or quandong, *Santalum acuminatum*, which thrives in desert country, is a good source of Vitamin C, and the large seed contains an edible, oil-rich nut.

Thousands of edible tubers, fruits, nuts and seeds are native to Australia, and further variety is provided by seaweed, algae, edible wattle gums and nectars. They are so numerous that no complete list exists. In the least food-rich environment, the Western Australian desert, the Aboriginal inhabitants still were able to avail themselves of an estimated 150 foods. Compare this with the estimate by chef Vic Cherikoff, in his landmark books on Australian native cuisine, that even the most adventurous eater in Sydney has a repertoire of 80–85 foods.²⁵

Many of the animals once used by Aboriginals are now 'protected'. Often this means that commercial operations have a quota for the numbers of fish, shellfish or kangaroos that they can harvest. Other animals are completely protected. Recent gains have been made in making exemptions for traditional hunters. There is still a long way to go in this regard.

Farmers' markets and food co-operatives around the world

Concerns about mass food production have come together in the growing phenomenon of farmers' markets. The atmosphere at these events is often festive and a spirit of camaraderie flourishes as people try nettle soups and bush foods, and

buy free-range eggs from farmers who can tell you the names of all the hens who laid them. Much of the produce is organically grown. Organic produce is also a fast-growing sector within the general retail market. Available, too, at these markets are seeds from the seed-saver organisations mentioned above.

LIFESTYLE AND CULTURE

Heard melodies are sweet, but those unheard
 Are sweeter; therefore, ye soft pipes, play on;
 Not to the sensual ear, but, more endear'd,
 Pipe to the spirit ditties of no tone ...
 – John Keats, 'Ode on a Grecian Urn'

In these beautiful lines Keats captures some of the complexity of human experience. Western medicine has neglected these abstract and subtle aspects of life, and their impact on health.

Fortunately, lifestyle is now making its appearance on the health agenda. Everything that happens to us, from cradle to grave, has some impact on our physical and mental well-being. Some of this experience comes to us through sight, smell, and touch, and some is cued more subtly. A baby in the womb responds to its mother's anxiety, probably as a result of her neurotransmitters. Women in group housing menstruate in synchrony, completely unaware of the pheromones that drive this phenomenon.

Our senses are far more than the transmission of electrical signals from the receptive organs. We come into a room and sense an atmosphere. We talk about seeing with our inner eye, or hearing the silence between two phrases of music.

With no full understanding of the impact of sensory—or even extra-sensory—phenomena, we have made changes in the modern world which are unique in human and animal experience. The impact of these on health, 'hael' or 'wholeness' is the subject of the remainder of this book. Many of the lessons we are learning come from cultural and anthropological studies. Some come from studying animals as they function in natural groups in the wild.

Lifestyle includes areas as wide as literature, art and music, sport and recreation, and it also covers how and where we live, and with whom. Do we live in large family groups, or alone in an inner-city studio flat? Do we get up at dawn to meditate or read our email, or are we night-owls whose day starts around 11 am with a cup of strong black coffee? Do we deal with stress by listening to Mozart, fighting with our neighbour, or going for a jog? Perhaps we are a Renaissance woman or man and do all of the above. In the remaining pages I will look at a few aspects of lifestyle which may affect our health.

A walk in the forest

If you come to me on a Monday morning and say that you feel tired, unwell and unable to face work, I may ask you how you spent the weekend. If you tell me that you stayed back late at work on Friday, slept in on Saturday, had a few beers too many on Saturday night, and loafed around on Sunday after doing some essential chores, you might not be surprised if I suggested that next weekend you plan a camping trip or a bushwalk in the nearest National Park.

But if you take up my suggestion, do you have any idea how powerful the ‘medicine’ I have prescribed might be? One biologist might be able to help you understand. Joan Maloof says that 120 chemical compounds were found in the mountain forest air of the Sierra Nevada.²⁶ Among them were volatile organic compounds, including the monoterpenes used by aromatherapists as ‘essential oils’. Edible monoterpenes, Maloof says, have been shown both to prevent and to cure cancer. Of the 120 plant chemicals, only 70 were identifiable: ‘when we lose our forests, we don’t know what we are losing ...’

Even if you don’t have a cancer you need to treat, I’m pretty sure you’ll feel better for that walk in the bush.

Biological clocks

The lifestyle of individuals is largely directed by the culture they live in but, as any parent of adolescent and young adult children knows, two different shifts of people can live in the same household with almost no overlap at all. This has been made possible largely by the advent of the electric light. We have not taken into account the effect that living across varied time zones can have on our biorhythms.

We know about jet lag, produced by the disturbance of the circadian rhythm — a

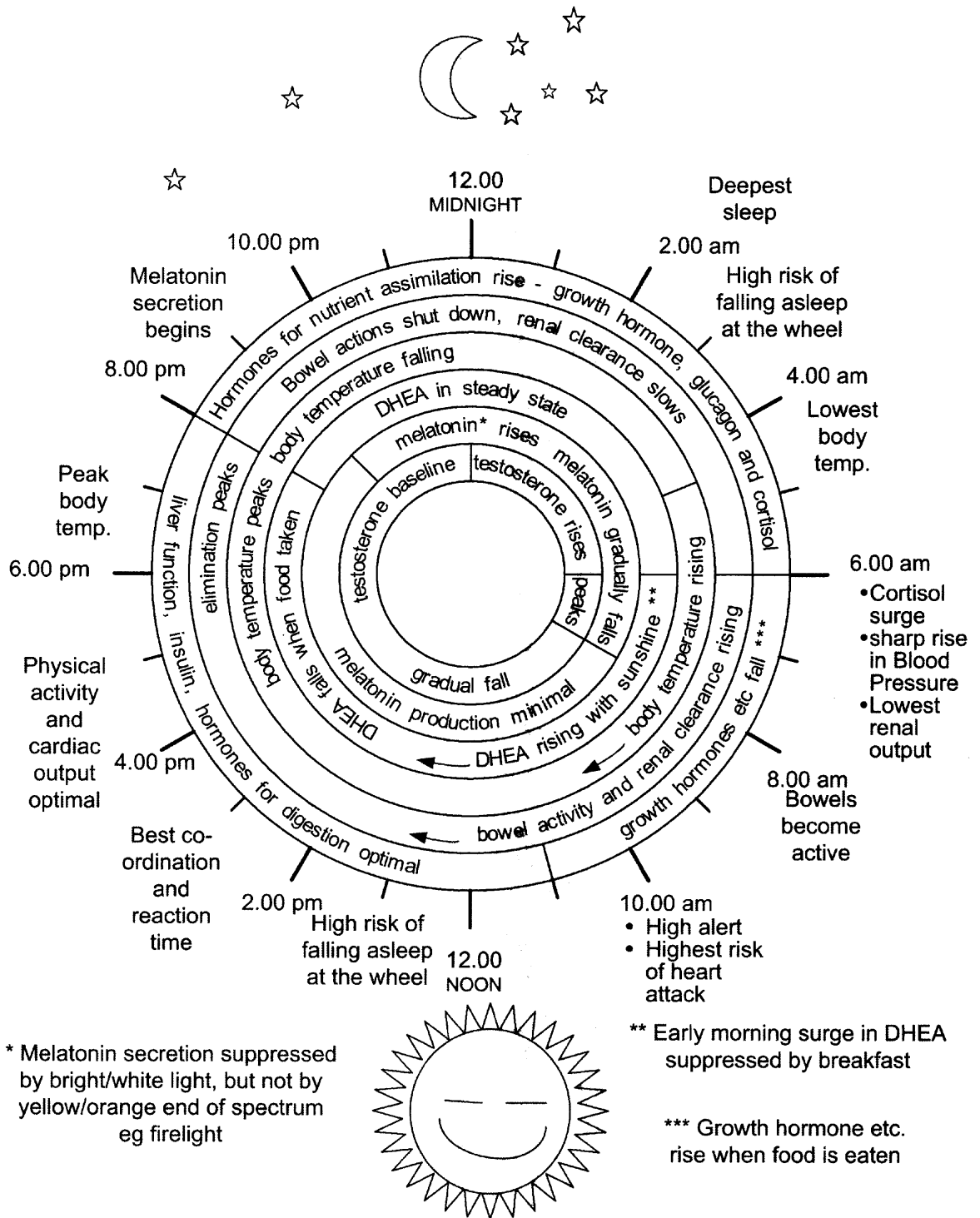
sick feeling that is independent of the amount of sleep lost. The word circadian is derived from two Latin words: *circa*, 'about'; and *diem*, '(within) a day'. It describes the changes that occur approximately every 24 hours in the human body. Many important bodily functions are affected by circadian rhythm.

Circadian rhythm explains many things. It makes us wake up at the usual time, often within minutes of our weekday pattern, even on weekends when we don't have to. It prevents us from opening our bowels in the middle of the night, although we sometimes wake to urinate. It causes us to reach for an extra blanket just before dawn, even though the ambient temperature has not dropped. It explains why we are most at risk of heart attacks first thing in the morning and why people with a fever have a temperature 'spike' in the late afternoon.

In the mid-1990s researchers discovered four genes that regulate the circadian cycles of flies, mice and humans (a good cross-section of the Ark). These genes were found to be expressed in *every cell* of the body. Indeed, they were found to operate *outside* the body. Not only do your pineal gland and your kidney keep an eye on the time, but so do your cells when they have been taken and grown in a laboratory somewhere. What's more, your liver cells run on a different time schedule to your heart cells, your gut cells, and so on.

Although the circadian clock runs on a 24-hour schedule, it needs continual resetting. This is done in two centres in the hypothalamus, each known as a suprachiasmatic nucleus (SCN). These centres affect the daily fluctuations of body temperature, blood pressure and alertness level. The SCN also tells the pineal gland when to secrete melatonin. Cells in the retina (known as ganglion cells) give the SCN information about light levels. These cells can respond to light levels over long periods, ignoring brief fluctuations such as switching on a light in the middle of the night or entering a dark space in the daytime. Several neurotransmitters are involved in the setting of the clock. Dopamine, which has many and varied roles, is thought to act as a timekeeper when released in bursts by the substantia nigra in the brain.

If every cell in the body is paced by the circadian rhythm, we can begin to understand why disruption of these body rhythms can affect our health. Most, if not all, of our hormones and organs are running to some type of clock. This explains why nurses and other shift workers are prone to thyroid and fertility problems. At the level of cell division, there is known to be a mitotic clock. Both accelerated



* Melatonin secretion suppressed by bright/white light, but not by yellow/orange end of spectrum eg firelight

** Early morning surge in DHEA suppressed by breakfast

*** Growth hormone etc. rise when food is eaten

Chart 10.1: Circadian rhythms

ageing and cancer are possible consequences of a disturbed mitotic clock. The increased levels of cancer and other serious health problems in shift workers are a warning that we meddle with biological clocks at our peril.

The circadian day

Significant melatonin secretion begins around 9.00 pm and ceases around 7.30 am: this is the time-frame in which we should do our sleeping. Within that, there are 90-minute sleep cycles. Deepest sleep occurs around 2.00 am, in the fourth cycle of an 'ideal' pattern. These 90-minute cycles continue throughout the day, but are much weaker in daylight. If you are jet-lagged or have had a bad night's sleep, you will notice periodic waves of fatigue. Timed, they will be found to occur about every 90 minutes. If you resist them you can probably stay awake, but this can be a dangerous practice, especially when driving a car.

The commonest time for planes to crash is said to be 6.00 am, and 'human error' is often listed as the cause. This is when the pilot and the air traffic controller should be entering the final phase of a good night's sleep. Their alarm clocks probably woke them during the REM phase of the deepest sleep cycle. (Do this with volunteers for several days and you will induce psychotic symptoms.) If they have drunk black coffee with sugar, the caffeine gives an adrenalin kick which interferes with the ability to adjust the biological clock. The sugar causes a spike in the blood glucose, followed by a precipitous fall, and they may experience functional hypoglycaemia, symptomatically akin to inebriation. (Many of the features of drunkenness are due to a drop in blood sugar. Children found in a coma after drinking punch at the family barbecue need urgent intravenous glucose to save them from fatal hypoglycaemia.)

Other functions have predictable timing. DHEA, known as a 'longevity hormone', surges at dawn, but this surge is suppressed by the first food of the day (Chapter 8). Surely a case for a late breakfast following the overnight fast.

At 4.30 am the body temperature reaches its lowest point, and we may reach for that extra blanket. At 6 am there is a cortisol surge, often accompanied by a fall in blood sugar. The (transient) hunger associated with this starts to stir the body into action. At 6.45 am, there is the sharpest rise of blood pressure. In a healthy person, this helps prepare for the day's activities. In someone with cardiovascular disease, it may precipitate a heart attack.

At 8.30 am, just as most people are rushing off to work, there is a natural cycle for a bowel action. At 10.00 am, there is a period of high alertness—at least we get that one right.

In addition to these daily rhythms, there are seasonal rhythms. Before the industrial revolution dictated the rhythms of life by mechanical clocks, people adjusted their circadian rhythm to suit the seasons. The advantage of having a clock which could be reset by melatonin is obvious. When days were long, they got up earlier and went to bed later. In the long nights of a northern winter, while not actually hibernating, they probably slowed down, slept more. In the long dark winters, many of our cultural pursuits arose. This became a time for repairing nets, weaving cloth, telling stories.

There is a tantalising possibility that some racial groups are genetically more tolerant of seasonal change than others. This may help to throw some light on disease patterns which vary according to racial origin. If we argue that the disruption of circadian rhythms results in significant health impacts, then disruptions brought about by seasonal change may be tolerated better by some than others.

Racial variation aside, what evidence is there of the health effects of disrupted cycles? Apart from the sleep disturbance which occurs in jet lag, there are several indicators. The phenomenon known as SAD (seasonal affective disorder) is suspected to be a disjunction between the circadian rhythm and the demands of a society which runs to the clock. Waking to an alarm clock interrupts deep sleep and causes surges of stress hormones such as adrenalin and cortisol.

Dopamine and time perception

Schizophrenia and non-seasonal depression are two psychological conditions associated with altered dopamine metabolism. In vulnerable people, disruption of biological rhythms could be the trigger that precipitates the illness. We know that there is a seasonal variation in the birth month of people who later develop schizophrenia, although the implications of this have yet to be unravelled.

Type 2 diabetes may be another case in point. Two people eating the same diet will have different outcomes depending on *when* they eat the food, as discussed in Chapter 8: Obesity. Eating out of synchrony with the rhythms of liver and gut cells is almost certainly a part of this effect.

Earlier it was noted that dopamine plays a role in the timekeeping process. Conditions characterised by altered dopamine metabolism are often associated with altered time perception. People with Parkinson's disease release less dopamine from the substantia nigra, and these patients consistently underestimate the amount of time which has passed. Marijuana and alcohol have a similar effect because they lower the availability of dopamine. Stimulants such as cocaine and amphetamines do the opposite. With increased dopamine available, time appears to speed up (hence, 'speed'). Stress, via the action of adrenalin and cortisol, also leads us to believe that an unpleasant event lasted interminably, when in reality it was all over in a short time.

Altered dopamine levels affect both the perception of time and the actual function of the biological clock. It is not difficult to see how stress and drugs, by altering dopamine metabolism, increase the risks of certain medical conditions.

Meditation, music and the arts

Volumes have been written on the health benefits of meditation, which in one form or another has been practised by many different cultures. It is now assumed that many activities—watching a flickering fire and gardening, as well as meditating—exert their beneficial effects by inducing alpha brain waves and releasing feel-good hormones such as dopamine.

The association between longevity and involvement in the arts has often been noted. The greatest longevity by occupation seems to be that of conductors of classical music. Long after many of their contemporaries are in nursing homes or deceased, these people can be found treading the boards of some of the world's most famous concert platforms. The tasks they perform require executive functions that would challenge people half their age. It is not just a metaphor that the role of the conductor is literally to harmonise, to bring all themes together.

Music therapy is an established discipline, which probably began with the observation that children with Down syndrome are unusually responsive to music. Perhaps also the striking association between the savant syndrome and artistic genius alerted people to this aspect of the arts.

Many argue that the brain is actually hard-wired by evolution to respond to pleasing musical sounds. When we hear an incomplete set of arpeggios the brain cries out for, even indeed 'hears', the resolution to the tonic or home chord. The

'incompleteness' is identifiable regardless of formal musical training. Similarly the ability to distinguish chord from discord does not need to be learned. Play a chord in a major and then a minor key and ask a five-year-old which is sad and which is happy. The response is impressively consistent.

One of the devices used by composers is the insertion of notes known as accidentals. These are notes which are in the 'wrong' key or timing. They give colour to the music and they work because they are unexpected. But why is the brain 'expecting' anything, if it has not heard the piece before? We can only assume that the brain has been drawn into the pattern, is responding to the harmony, and is startled by the unexpected.

There are, of course, cultural variations in scale, harmony and tone. However, even people exposed to a totally alien music form usually recognise it as music, and can apply words such as sad, happy, angry or contemplative to describe it. Indeed, the range of adjectives used to describe music from any genre encompass wide-ranging concepts such as 'narrative', 'ceremonial' 'grandiose'.

Some argue that because music expresses to a significant degree the type of emotions that we express in speech, it has co-evolved with language. A falling cadence expresses sadness, even depression, whether in music or in speech. Music by Elgar is said to express English sound patterns, while European composers express the European languages. The idea that language and music intertwine is demonstrated in the musicality of animal, and particularly bird, vocalisations. Even a narrow range of notes has a musical quality. Buddhist or Gregorian chants may lack 'melody' as such, but the impact can be electrifying.

The visual arts, of course, date from the earliest cave drawings and rock carvings, and include jewellery, decorations on vases and drinking vessels, spears and woven fabrics. The tattoos that are popular today presumably fulfil some primeval need. Self-decoration, indeed, seems to have significant psychological benefit. A depressed woman who cheers herself up with a new hairdo or hat shows a healthier response than one who reaches for Prozac.

We need music and artistic endeavour for the 'wholeness' which makes us human. The most convincing evidence of this is that no human cultures are devoid of the arts. As a means of recording experience, marking ceremonies, or simply relaxing, art is abundant and it predates our own era by tens of thousands of years.

Cultural practices

The insidious loss of cultural practices is only now being appreciated. Many were the result of communal living.

Sleep

Along with all the factors already considered in the causation of insomnia, we need to remember that for most of human history the tribe slept within a heartbeat of one another. Insomniacs describe the nightmares and anxieties that recur in the sleepless hours. Children worry about monsters and burglars in the dark. Parents once of necessity slept with their children. Perhaps now the seeds of insomnia are sown in early childhood. In later years, under multiple assaults of alcohol, disturbed biorhythms and stress, insomnia is waiting to happen.

Communal living

The tribe has become redefined, and is often alien. People living in a high-rise apartment block may not know each other, not even the person who sleeps the thickness of one brick away. By contrast, on a 'lonely' farm road, in all probability, every neighbour knows all the others and watches out for them.

If telling stories and making music around the campfire has been with us for centuries, is the B-grade movie on television an adequate substitute? Does it set up the brain-wave patterns which will aid digestion, relieve stress, prepare us for sleep?

Contrast the average night in our suburban home to the holiday taken with friends in a congenial environment—the discussions over the evening meal, the night fishing expedition, shared endings to shared days. Children fall asleep around the campfire and are carried to their tents. Sounds idyllic doesn't it? We have to contrive the artifice of the holiday to re-create the pattern which was the norm for most of human history.

Some people are taking the problem of cultural isolation into their own hands. I know of two extended friendship groups, one in Canberra, Australia, and another in Davis, California, who are building their own retirement villages. This makes a lot of sense in an age where biological families are scattered over the globe and 'family' is more a friendship group than shared genes. If eventually one needs residential care, why not share it with the friends of a lifetime? It will be interesting to track the health profile of such groups. We can reasonably anticipate an