



## HEALTH

### **Why we get sick – and how to prevent it.**

Do you want longer life? Be careful what you wish for. In Greek myth, the goddess who pleaded with Zeus to make her handsome (but human) lover immortal gained, as the decades and the centuries passed, a dried out gibbering husk of a man who lived on beyond function, beyond pain, and beyond endurance.

Are we making, unwittingly, the same Faustian bargain? Are we, in our search for healthier and better lives, blundering down the same blind alley? It could be that the industries of pleasure and hope – the food, pharmaceutical and slimming industries – have in fact created an infernal triangle within whose perimeter fence we are now confined, growing sicker, fatter, and ever more drug-dependent.

The food industry offers us more choice than ever before, with hundreds of new product launches every year, yet Type B malnutrition (a pattern of malnutrition characterised as multiple micronutrient depletion) is rife. The mammoth US Department of Agriculture Ongoing Survey of Micronutrient Intakes, and many similar studies, all show the same bleak picture. We no longer obtain even the RNI<sup>[1]</sup> values of vitamins and minerals from our diets; and the newer micronutrients such as lycopene, lutein and the flavonoids, which do not yet have RNI values, show the same depressing picture.

We are short of so many micronutrients, but hardly short of calories. While the slimming industry grows fat – to the tune of 2 billion pounds per year – by offering us delusions of thinness, we are getting larger. In the last 25 years, obesity in England has increased 4-fold from 5 to 22% of the population, and is projected to engulf 1 in 4 of us by 2010. Fad diets come and go, but hardly leave a trace; and the impact of our increasing size, which spills over into increased risks of heart disease, diabetes, cancer, renal failure and other unpleasant diseases, already generates health costs of 7.4 billion pounds / year. It will break the Health Service if allowed to continue unchecked.

The message is very clear. The foods we eat are far from the diet we were designed to live on. We are paying an increasingly heavy price for this great and unplanned dietary experiment that we have all, however unwittingly, agreed to participate in. The slimming industry has been unable to keep its promises. The drug industry will not help either.

### **Are Drugs and Antibiotics the way forward?**

We spend around 1.2% of our GDP on drugs - around £140/year for every man, woman and child in the country. Our much-lauded pharmaceutical industry makes a trade surplus of Billions each year; yet the industry is in a deepening productivity crisis which has not been helped by their Gadarene rush for growth. The investors are clear on this point; in terms of payback, the returns per dollar invested in pharma have fallen behind IT, defence, and other key sectors.

Desperate to keep the stock-holders happy, even the largest companies have resorted to spinning their clinical results; it is an open secret in the academic world that the pharmaceutical industry only publishes studies with favourable outcomes, while the results of negative studies are systematically suppressed. Scientific journals and medical groups have been badgering the industry for years to publish all their results, so that proper judgement can be made on new drugs. However, it was only when New York attorney-general Elliot Spitzer accused GlaxoSmithKline of fraudulently suppressing information about the lack of efficacy and the high incidence of adverse effects of their antidepressant Paxil in children, that the industry grudgingly started to concede that full disclosure must be followed.

This long-standing lack of transparency has led to severe distortions in medical practice. For example, many children suffered severe adverse effects from a drug that their doctors would not have prescribed if they had known the full story. At the other end of the age scale, industry-funded studies have boosted the sales of anti-Alzheimer's drugs which have now been shown by an impartial, NHS-funded study to be almost totally ineffective, and far less cost-effective than providing better social services.

The blame for this mass deception of the public has little to do with the scientists and clinicians involved in developing new drugs. It lies closer to the marketing and financial elements within the industry; whose main motivation is to boost the flagging rates of return in the pharmaceutical sector for example - no new strain of antibiotic has been discovered since 1987 as it is not considered cost effective. Prime Minister Cameron recently (July 2014) drew attention to this and called for further research and hinted at Government funding...

But pharmaceutical break-throughs are getting fewer and further between. Products spun off from research into the human genome are unlikely to redress the balance books, and neither will the fancy new model of pharma networking, whereby the drug companies out-source non-core elements of their business.

These 'breakthroughs' cannot do the trick, because Big Pharma is knocking on the wrong door. A glance through any pharmacopeia reveals that we have many hundreds of specific and potent drugs - so potent, in fact, that iatrogenic illness (disease caused by the side effects of drugs), is now the 4<sup>th</sup> leading cause of death. Yet with the notable exception of the antibiotics, we have hardly any cures. Almost all the drugs we use are palliatives which sooth or suppress the symptoms of disease but are unable to cure the underlying condition, which generally continues to deteriorate.

## **Could they have they got it all wrong?**

This simple truth shows through in our actuarial tables. Life expectancy has increased by an average of 2 years per decade for the last half century, largely due to public health measures, but our health expectancy has not kept pace. In 2001, British men could reasonably hope to make 75, while women scored a respectable 79.9. Unfortunately, men can expect to develop the first clinical signs of chronic degenerative illness at the age of 65, with women beginning to fall ill around 4 years later; so that both sexes experience a 'health gap', a period of increasing medical dependency, of around a decade.

To make matters worse, more of us are falling ill at ever-younger ages. Once uncommon, asthma and allergy are now so prevalent that the Royal College of Surgeons issued a despairing statement in 2003 to the effect that the NHS could no longer cope. The life-time risk of breast cancer in women was 1 in 36 when I was at medical school in the 70's and 80's, but has now reached 1 in 9. Data from Cancer Research UK shows that the incidence of cancer overall increased by a third in the last two decades alone: from 30% of the population in 1981, to 40% by 1996. Age-related macular degeneration, once a disease of old age, is now commonly diagnosed in middle-aged subjects – and there are plenty of other examples of increased disease and accelerated ageing, from autism at one end of the age spectrum to Alzheimer's at the other.

To make matters worse yet there is a developing epidemic of Type 2 diabetes, no longer called adult-onset diabetes because it is occurring ever more frequently in young adults and adolescents. According to figures provided by the British Diabetes Association and related groups, this condition may affect anything between 5 and 8 million Britons by the year 2010. This disease of our time, closely linked to weight gain, insufficient exercise and a poor diet, is coming to be regarded as a form of accelerated ageing which brings forward the onset of vascular disease (including heart attacks and strokes), renal failure, peripheral nerve damage, impotence and blindness.

As a consequence, it is hardly surprising that the numbers of adults and children who describe themselves as chronically ill has risen alarmingly from 21% in 1972, to 45% in 2012; and that spending on healthcare has risen remorselessly from 3.9% of our GDP in 1960 to 6.9% in 1994 and is approaching 10% in 2014.

But have the economic, technological and medical successes of the last century given us, at least, peace of mind? Hardly ... According to the UK Office for National Statistics, around 1 in 3 of the population have psychological symptoms. A very small number, perhaps 2% of the population, are seen by psychiatrists, but millions live below the threshold of clinically definable mental illness in a state of unhappiness and insecurity. 1 in 5 women suffer from anxiety or depressive disorders, as do 1 in 7 men – a figure which is probably lowered by under-reporting. The widening gulf between the shape we're in, and the shape we'd like to be, in an increasingly commercialised and objectified world, makes matters worse for many; as shown by the increasing incidence of eating disorders in both sexes.

Something is manifestly going wrong with the nation's health, its psyche and its waistline. The support systems we rely on are clearly not helping – and are making our problems worse by ignoring their cause, and concentrating on the most superficial of symptoms. Our guns are pointing out to sea, but the enemy is coming from overland.

## **Ask the right question... and you may get the right answer**

There is an alternative strategy; one which focuses on the causes of illness, obesity and unhappiness, and offers a fundamentally curative model for these and many other health and life problems. This is the emerging science of pharmaco-nutrition, a new science now being developed and taught at a number of British Universities and Royal Colleges.

Pharmaco-nutrition is fundamentally different from pharmaceutical medicine. It does not suggest that there is a pill for every ill. Rather, it marries the old wisdom that we are what we eat, with the scientific disciplines of pharmacology, biochemistry and epidemiology, to produce novel diets and multiple micronutrient regimes that re-configure the body, and its complex metabolic workings. No more of the 'magic bullets' that wound so many of us, but support systems, free of adverse effects and curative in a way that drugs, by definition, cannot be.

The foundations for this new science have already been laid, and published in many thousands of research papers. This book draws the research findings together and translates them into simple guidelines which you can use to improve your chances of staying younger, healthier and slimmer, for longer.

## **Your Dynamic Body**

Very few of us – perhaps 1 in 10,000 – die of old age. The vast majority of us sicken and die prematurely, picked off by ‘natural causes’ long before our biological life span has run its course. Cell culture studies, and the small but growing proportion of individuals who live on healthily into their second century, indicate that our true life span may lie somewhere between 110 and 120.

But why is such a long and healthy life such a rarity? Why do so few of us live out our biological potential?

We used to die, in the main, of infection, starvation or trauma. Twentieth century medicine and social planning have scored significant victories against these killers – although the infectious diseases show signs of making a comeback, due to the wasteful way we use antibiotics and the prospect of emergent viruses.

At the time of writing, however, the major causes of death are the chronic degenerative diseases such as cardiovascular disease and cancer, conditions worsened by the parallel epidemic of overweight and obesity. What we need now is a 21<sup>st</sup> century medicine which will slow or stabilise these conditions, prevent them from making our last years difficult, extend our healthy middle years, and allow us to remain physically young into our 50’s, 60’s and even beyond.

The new model of healthcare which has the potential to do just this is called pharmaco-nutritional medicine; and like much good new science, it is based on a surprisingly small number of simple and self-evident truths.

Firstly, all living tissue is dynamic – that is, it is constantly repairing and renewing itself. Skin cells are sloughed off and replaced every day; red blood cells last for around 4 months before they wear out and new ones take their place; you grow a new skeleton every ten years or so. This type of change is imperceptible and constant. Cartilage in the joints is eroded and regenerated, atheroma is constantly deposited in the artery walls and is constantly being removed, calories are taken into the body in food every day, and every day transformed into heat, movement, and all the businesses of life.

Secondly, the body has incredible powers of regeneration and renewal, forged in the evolutionary fires of our Neolithic past. If that were not the case, we would not have survived as a species. Our joints would wear thin by the age of 20, our arteries would solidify by 30, and our brains would burn out by the age of 40. And for most of us, that is simply not the case.

But thirdly, it is equally true that as the years pass, these types of degenerative change eventually gather momentum, and emerge in increasing numbers of us as clinical disease. This trend is so commonplace as to almost beyond questioning – but I think we need to ask why this pattern is so prevalent. Just what is so different about old age?

During the first 20 years of life we are dominated by the processes of growth and renewal - a condition sometimes described as ‘anabolic dominance’. As we age, however, growth and renewal slow, and the forces of breakdown and decay accelerate. By the time we have reached the roaring 40’s they are predominant, and we have shifted from ‘anabolic dominance’ to ‘catabolic dominance’.

We are now typically storing more calories than we can use, and the majority of us begin to put on weight. Our ability to heal is compromised; wounds, for example, take longer to mend, and are more likely to become infected. In general, the rate at which we can re-build and renew our tissues declines, and is overtaken by the processes of decay. Little by little, therefore, tissue damage begins to accumulate, rather like the slow erosion of a landscape; whether we are talking about the slow silting of an artery, the equally slow thinning of the cartilage in a hip or knee; or the silent dying of our brain cells. We grow slow, ill and fat, and by the time we emerge, blinking, into the 6<sup>th</sup> decade of life, 5 out of 6 of us have the symptoms of one or more of the degenerative diseases, and the majority of us are overweight.

## **Age-linked metabolic imbalance**

A number of theories have been advanced to try to explain this shift from anabolic to catabolic dominance. The accumulation of genetic damage leading to a failure of tissue renewal held sway for some time; until it was pointed out that many types of tissue breakdown are extremely active, and if the breakdown side of the health equation ran down at the same speed as the renewal side (which the genetic damage model implied), this would not lead to catabolic dominance but a general slowing of both breakdown and renewal. This is not what we see.

An interesting new theory which explains the evidence rather more convincingly, in my view, is termed ‘Age-linked Metabolic Imbalance’. This theory is based on the concept of Type B malnutrition. And now for a slight deviation, in order to explain these new terms ...

The processes of growth and renewal depend on the presence, in the body, of a number of vital co-factors derived from the diet. These are, broadly, the classical vitamins and minerals, or trace elements – such as vitamins C and D, and the minerals iron, calcium, magnesium and zinc. These micronutrients can be thought of as anabolic co-factors. Conversely, the processes of breakdown and decay are, in health, held in check by many of the newer micronutrients such as lycopene, lutein, the sterols, the flavonoids and the fermentable starches. These compounds can be reasonably considered to be anti-catabolic agents. A

perfectly healthy diet would provide optimal amounts of all these micronutrients, and keep the processes of tissue wear and renewal in perfect balance.

Unfortunately, a great deal of evidence has emerged showing that the majority of us are depleted in both the anabolic co-factors, and the anti-catabolic agents. This is not the near-absolute absence of a micronutrient that causes a deficiency disease (such as scurvy, an example of Type A Malnutrition), but a pattern of sub-optimal intakes of most of the micronutrients, often associated with calorie excess. This is Type B malnutrition; and it is emerging as a likely common cause of the majority of the degenerative diseases, and much of the process of ageing as we know it.

## **TYPE B Malnutrition Explained**

The reasons for this prevalent pattern of multiple micronutrient depletion are structural and well established. Perhaps the single most important cause of Type B malnutrition is that we don't eat enough. This sounds paradoxical, given that we are getting fatter, but we actually eat far less than we used to. Read, for example, accounts written by the diarists James Boswell or Samuel Pepys of the vast lunches and dinners that were regularly consumed by our relatively recent ancestors. But then remember that those diners and lunchers walked or rode horseback where we drive, climbed stairs where we take elevators, and burned calories to keep warm where we turn up the central heating.

Looked at through a longer lens, humans were designed to live active lives, and to consume between 3 and 4 thousand calories per day. No longer hunter-gatherers, we live sedentary lives, working at a computer screen during the day and basking in the glow of the cathode ray tube at night. The result is that we burn, on average, slightly fewer than 2,000 calories a day. Our appetites have indeed shrunk, but not quite to match; thus leaving most of us in a slight but persistent state of calorie excess, which explains, over time, the weight gain.

But by cutting our food intakes in half, we have at a stroke halved our intakes of many of essential micronutrients. To make matters worse, our dietary habits are out of joint. We no longer eat very much unprocessed foods, but increasingly rely on pre-processed, pre-cooked and ready to eat meals and snacks which in many cases are significantly less nutritious than the original ingredients would have been.

These and other factors have dramatically reduced our intakes of such valuable micronutrients as flavonoids, sterols, phospholipids, selenium and resistant starch; resulting in the wide-spread problem of Type B malnutrition we see today. But does it matter? Well, yes ....

A person who is depleted in anabolic co-factors and the anti-catabolic agents is heading for trouble. Tissue renewal is down, tissue decay and breakdown are up; he or she is now catabolically dominant, accumulating tissue damage, and heading towards clinical illness.

To make matters worse, Type B malnutrition generally worsens as we age, due to such factors as dental problems, difficulties with swallowing, a deteriorating sense of taste and appetite, and often reduced finances. This neatly explains why we become progressively more catabolically dominant, and ever more likely to become diseased, as the years and decades pass.

This also explains why the degenerative diseases, and indeed obesity, have such long latency periods. Coronary artery disease, Type 2 diabetes, cancer, Alzheimer's and osteoporosis do not occur overnight, although the first symptoms might do. These are slowly progressing conditions, which develop for decades before symptoms finally emerge.

In other words, the majority of apparently healthy adults are, in reality, pre-ill. They contain, in their bodies, the growing seeds of the illness(es) which will eventually become overt, and perhaps kill them. Fat is accumulating, arteries are beginning to silt up, bones and joints are thinning, brain cells are dying; leading inevitably, eventually, to obesity, a heart attack, osteoporotic fracture, or clinically confirmed dementia. By that very late stage, of course, once symptoms have begun to emerge, the ability of the current medical system to put things right is very limited and generally restricted to suppressing the symptoms of the disease.

This is a truly bizarre situation. It is as if we taught car mechanics to carry out crash repairs, but nothing of maintenance. It is an inheritance from the early successes of pharmaceutical medicine, the sulpha drugs and penicillins which cured infectious diseases, the dominant diseases of that time, so effectively, and laid the foundations of the pharmaceutical industry of today. Unfortunately, they also created models of disease treatment which are no longer appropriate to the diseases which are important now – the degenerative diseases. Even more unfortunately, these ideas still underpin the ruinously expensive system of crisis-management medicine currently on offer. They hugely influence the medical curriculum, dominate medical post-qualification training, and determine the overwhelming bulk of clinical research.

## **Drugs may not be the answer**

Pharmaceutical models which developed from the concept of 'magic bullets' (drugs which kill micro-organisms but do not hurt the host), and the closely related idea of specificity (find a target unique to the bacterium, which does not occur in the host), are fine when dealing with an infectious illness. They are not the right tools, however, for dealing with a degenerative illness caused by adverse life-style factors, and consequently many metabolic imbalances, going subtly wrong over many years. The huge increases in obesity, diabetes, asthma, cancer, neurotic disorders and other diseases, the recent declines in life

expectancy reported in parts of the former Soviet Union, Italy and the UK, and the persistent failure of the pharmaceutical model to find cures for any of these problems, tells us that we need a new way of looking at health; one which takes life-style and nutritional factors into account.

Sadly, despite the fact that the majority of risk factors and protective factors for degenerative disease are nutritional, nutrition as a subject is almost absent from medical schools. And because micronutrients are generic (ie they are not owned by any one company), there is little commercial incentive to do the studies that would provide the levels of proof that are required, for example, in the licensing of new drugs.

Luckily, this situation is beginning to change. Literally thousands of small-scale studies have begun to chart the detailed relationships between diet, micro-nutrition and health; and have recently given birth to the new science of pharmaco-nutrition.

Pharmaco-nutrition starts by analysing the multiple metabolic errors that drive, for example, coronary artery disease. It then cross-references these against the known pharmacology of food derivatives; and finally assembles a comprehensive micronutritional support programme that rectifies all the metabolic errors, or as many as can be identified. This is not a magic bullet, but a comprehensive support programme. Using this approach the chemistry of the blood and the physiology of the blood vessel walls can be re-programmed and re-configured in a way that effectively immunises the owner against cardiovascular disease. If disease is present it can be forced to regress, as the catabolic processes that drive it are damped and the healing processes that clean and remodel the arterial beds are supported and strengthened.

Another example of the gains that can be made by using comprehensive support programmes as opposed to magic bullets, can be found in the area of heart disease, where Professor Dean Ornish has been able to demonstrate that atherome in affected blood vessels can be made to regress (shrink) by dietary means alone.

In a more general sense, the pharmaco-nutritional approach teaches us that the pattern of decline that generally runs in parallel with ageing, is not inevitable. Diseases we thought of as inherently progressive are not; atheroma can be made to shrink, worn joints can be re-built. These diseases are called degenerative because, in a typical patient on a typically Western diet, they do worsen with age. But to assume that because this is what we always see, this is the way things must be, is a serious and all-too common philosophical error.

This, then, is a hugely significant shift in the way we think about, and treat, illness and the symptoms of ageing. I personally believe that pharmaco-nutrition will prove to be as effective in treating and curing the degenerative diseases as the antibiotics were in curing the bacterial illnesses. And if that sounds too radical for the average doctor, remind them how the antibiotics were initially scorned by many practitioners, who felt that the infectious diseases were both natural (they are), and untreatable (they clearly are not).

## **Weight Gain - Weight Loss**

The principles of tissue dynamism, and the slow emergence of problems driven by slight imbalances sustained over long periods of time, also give us new ways of looking at the problems of weight gain.

The changes in our eating habits which have gathered speed over the last half century have moved us away from a high micronutrient, high fibre, low GL<sup>[2]</sup> and low energy density diet, which encourages satiation; towards a low micronutrient, low fibre diet with an excessive GL and high energy density, which does not. When the fast food franchises, with their finely honed commercial instincts, introduced super-sizing, they made matters worse. Even the stately Food Standards Authority has abandoned the idea that there are 'no bad foods, only bad diets'; and admitted that there are 'relatively unhealthy food options'.

To make matters worse, cheap energy and new technologies have reduced our need to be physically active, so we burn fewer calories; cars, lifts and remote controls have cut our calorific requirements by nearly a third in the last generation alone. Bear with me while I re-make this fundamental point: diet as we may, it has become almost impossible NOT to consume a hundred or so calories per day more than we now need. One hundred calories is nothing. But that is 700 calories too many each week, 3000 excess calories a month, 35,000 excess calories a year; and so, gradually, imperceptibly, we leave our slim, youthful bodies behind and accumulate the avoirdupois of middle age.

Is this all the individual's fault? Some commentators have tried to portray the tide of overweight and obesity as a collective failure of moral fibre and self-discipline; but in reality, this tells us more about the speaker's prejudices and moral values than the real nature of the problem.

Seen from a socio-political perspective, it is fairly easy to identify a number of structural and cultural changes which have made it progressively harder for us to maintain normal weight. Some of the more objective groups working in this area have paved the way; the American Heart Association, for example, has come to understand that weight problems are social rather than personal, and has distanced itself from the use of specific pharmaceutical products such as the amphetamine derivatives which previously sold so well, but achieved so little. In the face of the serious increase in overweight and obesity in the US, and the tidal wave of diabetes and all its complications that are following in its wake, the AHA recently issued a series of recommendations which move directly into social engineering, including:

1. Bus stops to be further apart.
2. Waiting times for lifts to be increased.
3. Physical activity to be mandatory at all levels of the educational system.

4. Fast foods and soft drinks to be banned from all school campuses.
5. Car parks to be sited further from malls, offices etc..

Naturally these recommendations have been vigorously opposed by an array of special interest groups, from the major soft drink manufacturers to the oil lobbyists, and are unlikely to be adopted. Sadly, it seems likely that the same situation will prevail on this side of the Atlantic also.

## **Ineffective Government..**

The UK government has robustly criticised by the Commons Health Select Committee, who issued a statement saying that due to a comprehensive failure of governmental policy, 'the epidemic of overweight has produced the first generation of children who will die before their parents as a direct consequence of their childhood obesity.' This devastating prediction was immediately countered by the food industry, and the government's subsequent responses gave a clear indication that if any controls are to be implemented, they will be postponed, diluted and relatively ineffective.

In the meantime we continue to put on weight, and, thanks in no small measure to the stream of articles and books selling this or the other fad diet, still believe that it is natural to gain weight as we age, and that this is a natural process, facilitated by character flaws.

A pharmaco-nutritional perspective, however, shows us that this is not the case; and that the excess weight that so many of us gradually acquire can be persuaded, with time, to recede like the snows of winter. At the same time, pharmaco-nutritional programming can halt and reverse many of the other signs of ageing, and help to uncover the individual's true physical and mental potential.

But there remains one glaring paradox in this argument, well-known to those who take an interest in anti-ageing. If Type B malnutrition, caused largely by our declining energy needs and food intakes, is a cause of ageing, how can we explain the large body of work, popularised by scientists such as Professor Roy Walford at UCLA, which shows that sustained calorie restriction extends life-span in most species?

The paradox has been neatly explained by some very recent research by Drs Owino and Goldspink at the Royal Free Hospital School and University College of London. The role of insulin in helping to regulate blood glucose has long been known, but this fascinating hormone has now been discovered to have another, equally important function; it acts as a master regulator which activates many of the inter- and intra-cellular sequences that drive cellular ageing, and can thus be regarded as an ageing hormone.

This explains the general acceleration of the ageing process that occurs in diabetes. It also explains why calorie restriction slows ageing, because the calorie restricted diets reduce insulin secretion, and related cellular changes such as expression of the insulin-like growth factor 1 receptor.

And so we come full circle. Although a few highly motivated individuals such as Professor Walford might be willing to maintain a restricted calorie diet over periods of many years, most of us would be unable to follow suit. But now we know that it is not calorie restriction per se that extends life but reduced insulin secretion, a normal calorie low-carbohydrate diet (which also reduces insulin secretion), begins to look like a more attractive anti-ageing, health-promoting option.

Even 2,000 calories / day, however, is not enough to ward off Type B malnutrition, the other main driver of the ageing process; which is why badly designed low-carb diets, which make Type B malnutrition worse, are not good for your health. To the low-carb baseline, therefore, add a comprehensive micronutrient support programme specifically designed to restore and optimise your micronutrient profile.

Unfortunately, the low-carb diets that have thus far caught the public imagination fail in two major aspects. They have not understood the recent developments in pharmaco-nutrition, and are seriously flawed in their micronutrient content. Equally seriously, they have failed to incorporate the most important element of carbohydrate research of the last 50 years, namely the new classification of digestible vs fermentable carbohydrates.

Just as we now know that not all fats are bad, and in fact some are essential, so it is with carbohydrates. Some of them – particularly the fermentable, non-glycemic carbohydrates – are essential for health, and the traditional low-carb diets, which do not understand this key fact, are actively harmful.

The new science and the new diet, therefore, has moved on from the crude 'low-carb' model to a more sophisticated and finely-tuned approach. This is low in calories, high in micronutrients, and combines low glycemic load with the right carbohydrates.

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<sup>[1]</sup> RNI = Reference Nutrient Intake, the minimal level of intake required to prevent the emergence of deficiency disease in the population.

<sup>[2]</sup> Glycemic load refers to the overall glycemic impact of the diet, or the total amount of glucose provided by the food that enters the bloodstream.

