Eight Keys to Sustainable Weight Loss

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Introduction

The traditional formula for weight loss goes something like this:

- Wt loss = calories consumed – calories burned off
- Therefore you must either consume less calories or burn more off by exercising more, or both.

My own view is that this is far too simplistic a picture, and it won't be enough for a lot of people. It leaves out two major factors: (i) appetite and (ii) resting metabolic rate – the rate at which we burn calories – is not fixed but highly variable and highly changeable. The eight keys to weight loss described here are designed to collectively optimise both metabolic rate and appetite control. Furthermore, metabolic rate is closely related to your general health and well-being. If your metabolic rate is not optimal, your health isn't optimal. So you can expect to benefit from implementing the eight keys in other ways besides losing weight – for example better and more stable energy levels.

A Sustainable Programme

My weight loss programme is about eating for health. It's based on a presupposition: if you meet all your body's health needs, it will naturally regulate itself in terms of both weight and appetite. So it doesn't involve going hungry, or counting calories – if it did it wouldn't be sustainable in the long term.

The programme is not a diet in the conventional sense of a time-limited period of eating a particular way before you "go back to normal" having lost the weight you wanted. Remember Albert Einstein's definition of insanity: doing the same thing and expecting a different result. Science tells us that the weight simply goes back on again (1). In fact, crash diets can dysregulate your metabolic rate, leaving you worse off in the long term. So my advice is to think in terms of permanently changing your eating patterns. That demands commitment but it doesn't have to be very difficult. A programme that leaves you hungry or craving is not sustainable, so satisfying appetite is an integral part of the approach.

The Psychology of Eating

The eight keys mostly address the physiological aspects of weight management. But your weight ultimately comes down to your decisions about what, how and when to eat. Of course a major factor is your individual psychology. Generally, decisions to eat are conditioned by past habits, often involving particular triggers. For example you might have chocolate whenever you watch a film, or a biscuit every time you have a cup of tea, or maybe you binge eat whenever you are upset emotionally. Since you will still encounter these triggers, you'll need ways to deal with inappropriate impulses to eat. This is one reason why seeing a good therapist or coach can be very helpful.

The Eight Keys

It will be useful to list all the keys at the outset, before discussing each in detail.

1 Eat for your metabolic type.
2 Boost the metabolic power of your mitochondria.
3 Balance Insulin and Blood Sugar.
4 Optimise brain chemistry for appetite control.
5 Control stress and stress hormones.
6 Optimise hormonal control of metabolic rate.
7 Reduce inflammation.
8 Optimise detoxification.

One way to think of these keys is as potential obstacles or physiological problems that, if present, will make it difficult for you to lose weight. But of course they may not all apply to you. The first step is to find out which of the eight are relevant, or most relevant to you personally. That's why I recommend you see a good practitioner – the assessment is ideally based on some sort of testing (2), or at least on your particular pattern of symptoms and health concerns.

In other words there is a need for an individualised approach to weight loss. Genetic variation means that each of us is biochemically and metabolically individual, and no single diet will work for everyone. This idea is developed in Key 1.

Key 1: Eat for your Metabolic Type

In 1956 a biochemist named Roger Williams proposed that there are wide variations in human biochemical functioning, with the implication that our nutritional requirements are similarly individual (3). In more recent times research into genetic differences (known as polymorphisms) has given weight to this idea. Other research has demonstrated that metabolic rate varies quite widely between individuals, and moreover is quite malleable.

We derive our energy from three main dietary components: carbohydrate, fat and protein. Biochemical individuality means that we utilise these components with variable efficiency. Just as some cars run on diesel and others on petrol, so some people will function better on a particular mix of these food components. This idea has developed into the concept of metabolic types. Determining your metabolic type enables you to predict what kind of diet will optimise your physiological and metabolic functioning.

The idea helps explain why such widely divergent opinions abound in the world of nutrition. Different weight loss diets are almost completely contradictory - and yet they seem to work for at least some people. The Atkins diet for example, advocates a high fat, high protein, low carbohydrate diet, while the Dean Ornish diet advocates the opposite. At least part of the answer seems to be that these diets are suited to different metabolic types.

The Innuit (Eskimo) people traditionally eat a diet very high in fat and protein, with very little carbohydrate, which according to conventional wisdom should be a recipe for high cholesterol and cardiovascular disease. Yet heart disease was almost unknown in these traditional communities. We can surmise that genetically, these people evolved to cope well on their traditional diet.

In broad terms, the main metabolic types are:

- **Protein type**: people in this group do well on relatively high levels of protein and fat. Their metabolism tends to run quite fast, but can be quite variable leading to energy swings, if they don't eat the right diet.
- **Carbohydrate type**: people in this group do well on a high carbohydrate diet with relatively lower levels of protein and fat. Their metabolism is prone to run slow, especially if they don't eat the right diet.
- **Mixed type**: these people come somewhere between the above two poles.

Vitamins and Minerals

According to some researchers, metabolic type even influences the effects of vitamins and nutrients. One of the leading figures in the history of metabolic typing is George Watson, who investigated the role of nutrition in mental illness. Through meticulous research he discerned a set of vitamins and minerals which in supplement form could benefit each of the main metabolic types. He found that the opposite supplements could make his patients feel even worse.

Determining Your Metabolic Type

Several authors have developed questionnaires designed to determine your type. They ask about your physical characteristics (including your tendency to experience particular symptoms), and also about psychological and personality traits. Perhaps most importantly they ask how you typically would feel after eating certain foods - a protein heavy meal, for instance.

Questionnaires can be quick and inexpensive. You can find them in books on the topic of metabolic typing - examples are 'The True You Diet' by John Briffa, and 'The Metabolic Typing

Diet' by William Wolcott. More advanced versions are available online. Their disadvantage is that they require a degree of awareness of the effects foods have on you.

Some researchers have developed procedures based on measuring the pH or acidity of venous blood (as opposed to arterial blood). For example Harold Krystal tracks pH following consumption of a sugar drink (4). The pH of venous blood reflects metabolism because it contains metabolic by-products. It be either too acidic or too alkaline, depending on how metabolism is working.

Another researcher, Dr David Watts, considered how metabolic type affects relative levels of minerals in tissue, more specifically in hair. His research showed that ratios between minerals (e.g. calcium and magnesium) correlated with metabolic type. Hair mineral analysis is a useful and widely used tool for nutritionally oriented health practitioners. Dr Watts' laboratory (Trace Elements Inc.) offers this test which provides valuable information including metabolic type (5).

Metabolic typing is a complex science since so many factors can influence metabolism. Probably no one test is perfect. The ultimate arbiter must be your own experience. The diet that is right for you is the one that works: it gives you a better sense of energy, satisfies your appetite and ultimately helps you to lose weight. Moreover your metabolic type is not cast in stone, so a clear awareness of the effects your meals have on you is vital.

In summary, metabolic typing says that:

- There is no one diet suitable for everyone.
- A diet that works well for one person can actually be harmful for another. Individual nutrients can have opposite effects in different people.
- Accurately determining your metabolic type enables you to predict what kind of diet will optimise your metabolism, help you lose weight and give you more energy.
- Practically speaking, the main import of metabolic typing is the relative proportions of protein, fat and carbohydrate you should eat.

Key 2: Boost the Metabolic Power of Your Mitochondria

Mitochondria are the powerhouses of your cells. A single cell may have from 200 to 2,000 or more of these structures, whose job is to turn energy stored in sugars and other fuels from the diet, into a form that's useable for the numerous biochemical reactions going on in the cell - a molecule called ATP (adenosine triphosphate). This process of liberating energy from food is known chemically as oxidation. It amounts to burning nutrients in the presence of oxygen from the air we breathe.

Optimising metabolic rate means optimising mitochondria, both in terms of their efficiency or healthy functioning, and their numbers. We'll consider how to increase numbers later, but first we'll consider why they may not be functioning well.

Oxidative Stress

Oxidative stress is a natural and inevitable by-product of the processes of life. Oxidation generates highly reactive molecules called free radicals. You can think of them as the exhaust fumes of your cells, and especially of mitochondria. Free radicals are dangerous because they can cause damage to the cells' functional molecules by chemically reacting with them, leaving them unfit for purpose. For example this can affect DNA (genetic material) ultimately making cancer more likely. It's believed that free radical damage is a major factor in aging (6).

To protect against this damage, the body has molecular defences called antioxidants. Antioxidants mop up free radicals by preferentially reacting with them – and so are used up in the process.

You need a wide range of antioxidants – they work together as a team. The most powerful antioxidants are manufactured by the body, but many others are nutrients that come directly from the food you eat. (This is just one reason why a healthy and varied diet is essential.) Several vitamins act as antioxidants (the most prominent being vitamins A, C and E) but thousands of other substances are also antioxidants. The major sources of antioxidants are fresh vegeta-

bles and fruit (especially berries). Furthermore, a number of essential minerals such as selenium act as co-factors in the biochemical reactions of antioxidants.

Because free radicals also derive from environmental pollution, the need for antioxidants is greater now than at any time in our evolutionary past (7). Add to this the fact that modern food industry practices mean the food we buy in shops is less rich in essential vitamins and minerals, and you can understand why some argue that even a healthy diet cannot provide us with sufficient (8). However it is of course possible to take extra antioxidants in supplement form. A range of nutritional supplements have been shown to boost metabolic rate in trials. Bruce Ames was amongst the first to point to the importance of mitochondrial function for health. His research group investigated the hypothesis that free radical damage to mitochondria results in the lower energy production seen with aging. In a series of experiments his group gave two major antioxidants to older rats, and within a few weeks saw dramatic improvements, not only in energy production but in many other functions including memory (9).

In summary, antioxidants are important to weight loss because without a good supply, mitochondria can be damaged by free radicals, reducing their efficiency and lowering metabolic rate (your ability to burn calories).

Boosting Mitochondrial Numbers

The key to boosting numbers of mitochondria is exercise – and it also improves their efficiency. What this means is that exercise has value for weight loss way beyond the number of calories you burn while working out – it actually raises your resting metabolic rate.

Mitochondria are particularly dense in muscle cells – as you might expect since they require more energy. Exercise, especially forms of resistance training (for strength) such as working with weights, will increase muscle mass (incidentally, having high muscle mass is one of the best predictors of longevity). Muscle tissue is relatively more metabolically active, even when inactive, meaning you burn more calories. One of the reasons that crash dieting usually leads to greater weight gain in the long term is that it causes muscle loss, thus reducing metabolic rate.

Exercise

Exercise (in moderation) is healthy all-round, and relates to several of the keys to weight loss described in this report. It will be useful to list benefits it confers in one place:

- Exercise corrects and prevents insulin resistance (see key 3). Research demonstrates it is associated with lower insulin levels and more balanced blood glucose (10).
- Exercise boosts levels of neurotransmitters such as serotonin, dopamine and GABA (see key 4). As an antidepressant it is as affective as medication (11).
- It helps balance hormones (see keys 5 and 6) - e.g. it boosts testosterone and growth hormone, and balances swings in oestrogen and progesterone which may cause symptoms of PMS.
- It reduces inflammation (see key 7) (12).

Is Exercise Necessary?

I wouldn't go so far as to say weight loss is impossible without exercise, but it will clearly help most people. However it's worth pointing out that there is a condition called adrenal fatigue, where all but the lightest exercise will be counter-productive. If you've found that exercise leaves you feeling exhausted and even hungover, especially if you are getting on in years, you may need to have your hormone levels checked out. (Adrenal fatigue is discussed more fully in key 5.) Again we see the importance of an individualised approach.

Key 3: Balance Insulin and Blood Sugar

Insulin resistance is strongly connected with being overweight, and difficulty losing weight. It's part of a constellation of symptoms collectively known as metabolic syndrome, the other symptoms being obesity, high blood pressure and high cholesterol. In insulin resistance, the hormone insulin does not function effectively, leading to chronically high insulin levels and also high blood sugar levels. It is a precursor of diabetes, and also represents a risk factor for other major illnesses such as cardiovascular disease. However it is controllable and even reversible with good diet and the right nutritional supplements.

What Does Insulin Do?

Insulin is one of the most important hormones in the control of metabolism, and of blood sugar. It's released by the pancreas when blood sugar levels rise, after you've eaten. Insulin communicates powerful messages to all cells:

- It instructs cells to open their doors to glucose (the main form of sugar) so lowering blood concentrations. This is important because sugar can actually cause damage by reacting chemically with functional molecules, when blood concentration gets too high. This is what happens in diabetes.
- Insulin blocks the release of fat from storage, so it can't be used for energy. This is one of the reasons why insulin resistance and associated high insulin levels, if not corrected, can make it near-impossible to lose weight.
- Insulin is a strongly anabolic hormone, meaning that it instructs cells, especially in the liver, to manufacture proteins from amino acids.

Blood Sugar Control

If we eat a sugary food such as chocolate, the sugar is rapidly absorbed causing a peak in blood sugar concentration. The same is true of foods based on refined carbohydrates. Refined carbohydrates derive from refined grain-based foods such as white flour used to make bread, cakes and biscuits. They are rapidly broken down into sugars by the digestive system, which are then easily absorbed. The resulting strong surge in blood sugar requires a correspondingly high insulin response.

Spikes in blood sugar are often followed by troughs - the body's insulin response over-compensates. Blood sugar troughs are often experienced as a drop in energy levels, and also as a trigger for hunger.

Not only do spikes in blood sugar levels place a strain on the insulin system, but they also promote the conversion of sugar into fat. (The energy can't be used all at once, so the excess is put into storage.)

You begin to see that managing blood sugar is key to managing weight.

What Causes Insulin Resistance?

When cells are exposed to repeated surges of insulin, or chronically high levels, their responses to it become blunted – this is the beginning of insulin resistance. In a desperate attempt to maintain equilibrium, the pancreas produces more and more insulin, creating a negative spiral, until (perhaps many years later) it becomes exhausted at which point you have diabetes. Bear in mind that these insulin-stimulating foods are products of the modern era, and puts a strain on the control system that we did not evolve to cope with.

So poor diet (high in sugary foods and refined carbohydrates) is the major causal factor, but others are:

- sedentary lifestyle
- stress
- excess body fat, especially abdominal fat
- systemic inflammation (see key 7)
- high blood pressure
- genetic predisposition (a relatively minor factor – rarely if ever enough on its own to cause insulin resistance).

Note that diabetes can also be caused by an autoimmune reaction, and this is separate from insulin resistance.

Managing Insulin Resistance

Nutritional supplements can improve insulin sensitivity, but for them to have a chance of working you need to eliminate or reduce the causes of insulin resistance, and that means managing blood sugar levels.

Glycaemic Index and Glycaemic Load

To recap, the immediate stimulus for secretion of insulin is high blood sugar. The key factor for weight management is the speed of absorption of sugars into the bloodstream. This concept has been quantified in terms of glycaemic index (GI) and glycaemic load (GL). The two are slightly different, and without going into the technical details, GL is the more useful concept so we'll stick with that. Suffice it to say that the GL of a food portion is a measure of how rapidly and by how much blood sugar levels rise after eating it.

Low GL Diet

Eating a low GL diet is healthy for everyone, especially those wanting to lose weight. Generally the method is to count (and limit) GL points rather than calories. The idea is rooted in sound science, and there is probably better evidence in support of a low GL approach than any other weight loss diet.

For instance, leading weight loss researcher Professor Brand-Miller fed two groups of rats calorie-matched diets - the difference was one group had their calories in the form of high GL food while the other had low GL. The result was that the high GL rats gained weight steadily while the low GL rats didn't. After 32 weeks the high GL rats were 16% heavier (13). These results have been reproduced with other species, including humans (14).

Key 4: Optimise Brain Chemistry for Appetite Control

Many people find it near impossible to lose weight because they experience insatiable hunger, and especially a craving for sweet things. In these cases clearly something has gone wrong with the appetite control systems. Appetite control should ideally be completely automatic and unconscious – you eat when hungry and stop some minutes later when you feel satiated, banishing hunger for probably a few hours, without having to even think about it.

Another group of people eats (again especially sweet things) in an effort to pick up their energy levels. They feel flat and fatigued, either intermittently or most of the time. A third group eats in an attempt to lift their mood – they eat in response to feeling depressed.

What these three groups share in common is a need to better regulate their brain chemistry, that ultimately controls appetite.

There are three inter-related chemical signal systems underpinning appetite, energy levels and mood:

- **Neurotransmitters** – molecules that facilitate communication between nerve cells. They strongly influence mood, drive and motivation, energy and focus.
- **Hormones** – these are released into the blood and so have the opportunity to affect cells all over the body. They also strongly influence energy levels, and are considered in keys 5 and 6 too.
- **Cytokines** – these are the messengers of the immune system, and control systemic inflammation (see key 7)

Neurotransmitters

Neurotransmitters are especially significant for brain function. For weight management the most important players are the following.

Serotonin

Serotonin is the most critical neurotransmitter for appetite. It also plays an important role in mood and also sleep. Normally when brain serotonin levels rise this leads to satiety. And research suggests a link between serotonin deficiency and obesity (15). Could it be that serotonin deficient people over-eat because they can't satisfy their appetite?

Serotonin is made from a substance called tryptophan – it's an amino acid that comes from protein we eat in our diet. You might think that eating more protein would raise your tryptophan levels and therefore serotonin too, but it turns out not to be so easy for tryptophan to be transported into the brain. In fact you need carbohydrates to facilitate the brain's uptake. Research has shown that eating carbohydrates raises serotonin levels in the brain(16). This may be why sweet foods lift the mood, and it could be at least part of the reason why people crave sweet foods.

You may be aware that serotonin deficiency is also associated with depression (17).

The good news is that serotonin deficiency can be quite easily corrected with nutritional supplements, and research shows this leads to a significant decrease in caloric consumption (18), suggesting appetite control is restored.

Dopamine

Dopamine is associated with drive, energy and motivation. Most addictive drugs stimulate the brain's dopamine system – e.g. cocaine and alcohol. For many people, losing weight is hard because it comes down to a sugar addiction – without it they experience withdrawal symptoms. Neuroscientist and author Candace Pert says 'I consider sugar to be a drug, a highly purified plant product that can become addictive. Relying on an artificial form of glucose - sugar - to give us a quick pick-me-up, is analogous to, if not as dangerous as, shooting heroine' (19).

Other Neurotransmitters

- GABA - the brain's main inhibitory neurotransmitter, meaning it tends to dampen down neural activity. Not surprisingly it's associated with a calming effect.
- Noradrenalin - important for attention and alertness, and biochemically on the same pathway as dopamine, meaning that often both are deficient.
- Endorphins and enkephalins - associated with the feeling of pleasure and absence of pain. Opiates have their effect because they are structurally similar to these, and mimic their effects in the brain.

How to Balance Neurotransmitters

Most neurotransmitters either are, or are derived from, amino acids which come from protein in the diet. Most problems can be improved significantly with amino acid supplements, and perhaps also other nutrients needed for their productions, such as vitamins B6 and B12. Supplementation would ideally be based on testing or assessment of neurotransmitter status.

Hormones

A number of hormones are relevant to weight management.

- Insulin – already covered in key 3.
- Thyroid – so important it's a separate key (see key 6).
- Cortisol – a stress hormone, considered in more detail in key 5.
- Leptin – the hormone of satiety. It's released by fat storing cells and signals to the brain that you've had enough to eat. The brain normally responds by turning off appetite. Somewhat surprisingly, leptin has been found to be more abundant in overweight people, suggesting a kind of leptin resistance is at work (20). Supplements can improve leptin sensitivity and help restore appetite control.
- Adiponectin – another hormone secreted by fat storing cells. It enhances insulin sensitivity (see key 3).
- Oestrogen – low levels (in post-menopausal women) promote weight gain.
- Testosterone – again low levels promote weight gain.

Key 5: Control Stress and Stress Hormones

Scientific research has demonstrated clearly that stress causes weight gain – along with potentially lots of other health problems. One experiment subjected rats to the stress of immobilisation. Their diet remained the same – in fact they ate less. Their energy expenditure did not go down – in fact it increased. And yet they gained weight (21).

Research with humans backs up these findings. For instance one study measured subjective anxiety levels in a group of women, and found they correlated with both stress hormone levels and abdominal fat (22).

How Does Stress Cause Weight Gain?

The effects of stress are sometimes known as the fight-or-flight response – they are designed to prepare the body for action. They are communicated via two routes.

(i) Hormones

Adrenalin is probably the best known stress hormone. Cortisol is another, which has similar ef-

fects but over a longer time scale. Both these increase blood sugar levels. Chronically high levels of cortisol (often triggered by chronic stress) are damaging (23). Effects include insulin resistance (key 3), and decreased leptin sensitivity (as mentioned, leptin is the hormone of satiety).

Stress may also affect sex hormones such as testosterone.

In some people the normal daily rhythm of hormones such as cortisol is disrupted. This may be the reason behind increased night-time appetite and associated sleep disruption.

(ii) The Autonomic Nervous System (ANS)

The ANS controls many automatic body functions such as heart rate and digestion. It has two branches, known as the sympathetic and parasympathetic, which affect your stress level like a car's accelerator and brake respectively. Traditionally, the sympathetic (accelerator) is associated with acute stress or the "fight or flight" response, while the parasympathetic calms us down again. However it seems that in some people the parasympathetic is dominant. Such people may be vulnerable to stress because the sympathetic (which nornally helps us cope) is unresponsive. In general it is thought that the sympathetic system increases metabolic rate while the parasympathetic depresses it, so parasympathetic dominant people may be more vulnerable to weight gain. On the other hand , the sympathetic increases blood sugar levels which may lead to increased fat deposition.

It seems that in some people the hormonal stress pathway is more dominant, while in others it is the ANS. Some evidence suggests that in people who are making efforts to cope with stress, the sympathetic nervous system is the dominant factor, while in people who have given up trying to cope and have sunk into helplessness and despair, the cortisol pathway is dominant.

Stress and Appetite

Stress certainly can affect appetite, but in different directions in different people. Research suggests two thirds of people eat more under stress while the remaining one third eat less (24). The explanation for this could lie in the specific nature of the stress. Acute stress depresses the appetite, while there is a rebound increase in appetite in the recovery phase (when the hormone cortisol is dominant). Frequent short periods of stress (for example, a conflict situation in which there are lots of arguments) might therefore be expected to raise appetite on the whole, since the recovery periods dominate, while a sustained stress such as financial pressure might suppress appetite.

Adrenal Fatigue

The stress hormones adrenalin and cortisol are produced by the adrenal glands, situated just above the kidneys. The adrenals produce several other hormones including DHEA, which has been dubbed the "youth hormone" because its levels drop gradually as we age, while supplementing it can to some extent reverse the effects of aging.

In some individuals the adrenal glands can become weakened, perhaps as a result of a long period of chronic stress (and high cortisol), or of a sudden trauma or illness. With this adrenal fatigue, there is a drop in levels of adrenal hormones, especially cortisol and DHEA. There is some controversy surrounding the idea, and many doctors don't recognise it. It's perhaps best regarded as a sub-clinical condition, but the worst cases result in chronic fatigue syndrome.

The adrenals can be supported with healthy diet and lifestyle, herbs and nutrients, but over-exertion must be avoided as it puts undue strain on the adrenals.

Key 6: Optimise Hormonal Control of Metabolic Rate

The thyroid gland is the master controller of metabolic rate (the rate you burn off calories). When it is out of balance, your metabolism is out of balance, with numerous potential consequences. Along with insulin, thyroid hormones are the most significant in weight management.

Sluggish functioning of the thyroid, known as hypothyroidism, results in low metabolic rate. You burn off less calories, even to the point where you body temperature is lower than normal. It's thought to be common (25) and, if not corrected, makes weight loss extremely difficult.

Because the role of the thyroid is so fundamental, there can be a wide range of symptoms making hypothyroidism hard to spot. Actually there's a lot of controversy surrounding its diagnosis and the extent of its prevalence, as many doctors believe that standard blood tests are inadequate (26). One reason is that the typical normal range (which covers 95% of the population) is considered too broad. Another is that there are several different hormones involved in thyroid functioning, but usually only one is tested. The most active thyroid hormone, called T3, is not normally tested. It's important to do comprehensive testing in order not to miss problems.

The most common symptoms of low thyroid function are:

- fatigue and low energy, especially on waking in the morning (sleep is unrefreshing)
- weight gain or inability to lose weight
- tendency to constipation and bloating
- depression and apathy
- poor concentration and memory – "brain fog"
- PMS and menstrual problems
- fluid retention – swelling in hands and feet
- prone to feeling cold, especially in hands and feet
- low blood pressure and/or heart rate.

If you've struggled to lose weight, it's important to have your thyroid checked out, even if it's only "sub-clinical" low functioning. The thyroid can be supported with the right diet and nutritional supplements, and also lifestyle changes. The most serious cases can be helped with thyroid hormones prescribed by a doctor. It's also important to reduce or eliminate causes of thyroid problems such as allergy, toxicity and stress.

Key 7: Reduce Inflammation

You'll be familiar with inflammation if you've ever cut yourself or had a sore throat: the classic signs are pain, swelling, redness and heat. These are examples of localised inflammatory conditions, but it's also possible to have a generalised inflammatory response happening throughout the body, affecting for example blood vessels. Known as systemic inflammation, it's much more quiet and insidious. In fact research is now linking systemic inflammation to many serious illnesses including cardiovascular disease, cancer, depression and Alzheimer's (27).

Fat storage cells, adipocytes, are affected by inflammation too. These cells aren't just passive storage sites as was once thought, but actively secrete hormones and other signalling molecules, including the mediators of inflammation (cytokines). Inflammation is actually a causal factor for obesity, and at the same time obesity stimulates inflammation in a vicious cycle, making it vital to control all the sources of inflammation.

The Immune System

Inflammation is your body's defensive response to infections, toxins, allergens and other foreign invaders. Actually many of the symptoms you experience, such fever associated with infection, are side effects of your immune system's attempts to restore normality. So in general, inflammation is an adaptive response, a useful thing, but it can easily get out of balance.

Immune System Balance

There's always some degree of inflammation – too little would leave you vulnerable. The level is controlled by a complex interplay of cytokines (molecules secreted by immune cells to signal other parts of the immune system).

Many chronic illnesses are the result of imbalance in the inflammation control systems, which can manifest as:

- Allergy - the immune system responds inappropriately to harmless substances such as pollen.
- Autoimmune disease - the immune system mistakenly attacks the body's own cells. Examples are rheumatoid arthritis and type I diabetes.
- Susceptibility to infection - a weakened immune system cannot fight off infections.

Sources of Inflammation and Immune System Imbalance

All the following cause inflammation, and hence can contribute to weight gain:

- inflammatory foods - sugar is the main culprit
- nutrient deficiencies - several essential nutrients are anti-inflammatory e.g. vitamin D
- food allergy and intolerance
- stress - both physical and psychological
- inadequate sleep
- sedentary lifestyle
- toxins such as pesticides, or heavy metals like mercury
- dysbiosis – see the following section.

The Immune System & The Gut

Around 70% of the immune system is in the lining of the gut – the most likely point of contact with infectious micro-organisms and toxic substances. Throughout our lives but especially in childhood, the immune system develops, learns and matures through exposure to micro-organisms. You may know that a healthy gut is home to large numbers of beneficial bacteria – in fact they out-number human cells in the body by around 10 to 1! Research suggests that exposure to these bacteria, as well as harmful micro-organisms, is essential for a healthy immune system and inflammatory balance (28). When beneficial bacteria either don't develop in the gut or are displaced by harmful bacteria, it's known as dysbiosis. Dysbiosis can cause digestive symptoms such as bloating, but it can be more insidious. Even in the absence of direct symptoms, dysbiosis can cause negative effects in the body such as allergy or systemic inflammation.

The integrity of the gut lining is also vital, since damage can lead to toxins and micro-organisms entering the bloodstream and triggering an inflammatory response.

How Inflammation Causes Weight Gain

Inflammatory molecules actually communicate with genes: some genes are turned on while others are turned off. Genes are blueprints for the manufacture of proteins which perform specific roles in the body. For example if you need more insulin, cells access the gene coding for insulin, and more insulin is produced. This is what it means for a gene to be turned on or off. In this way, signalling molecules can control cells' metabolism by activating or deactivating genes.

Eating inflammatory foods – sugars and the wrong kind of fats – sends messages to the genes that slow metabolic rate and increase insulin resistance, leading to weight gain. Conversely, beneficial fats such as omega 3 oils, which are anti-inflammatory, tend to do the opposite. So you can begin to see how eating healthy food influences weight in ways far beyond how many calories they contain, and why calorie counting is really beside the point.

Controlling Inflammation

Studies show that both eating the right foods and taking anti-inflammatory nutritional supplements can reduce systemic inflammation (29).

Key 8: Optimise Detoxification

We're all exposed to toxins to some degree. Not only are they an unavoidable part of the environment, but the body produces its own as by-products of metabolism. Research demonstrates that toxins contribute to weight gain by lowering metabolic rate (our ability to burn off calories). To make matters worse, the body stores toxins it can't process in fat cells and other sites where they can do the least damage, meaning that when you start to lose weight and reduce your fat stores, toxins are again released into the system. This may be one reason why some people feel run down and unwell when they're dieting. So it's vital that the body can rid itself of toxins, and fortunately the liver (the body's main detoxifier) has an amazing capacity for disarming almost any kind of toxin. The key is to support the liver with the raw materials it needs, from a healthy diet and from supplements if need be.

Toxins

Toxins come from both the external environment and from within the body. External toxins include:

- heavy metals such as mercury, lead, cadmium, arsenic and aluminium
- pesticides and herbicides consumed with food
- chemicals such as volatile organic compounds (VOCs) and solvents
- drugs such as alcohol
- medications are not normally considered toxins but they also need to be cleared from the system because they have side effects, including some which contribute to weight gain.

Internal toxins include:

- functional molecules such as hormones, which, though they serve useful roles, have toxic side effects, e.g. oestrogen
- substances produced by micro-organisms living in the gut which then enter the bloodstream.

There are tens of thousands of man-made chemicals in existence, the vast majority of which have not been tested for their health effects. As part of the National Heath and Nutrition Examination Survey, one of the largest health research projects ever undertaken, the US Centers for Disease Control and Prevention examined human blood and urine samples for toxic residues. They tested for 116 different substances, and found residues in almost every sample (30). But this doesn't tell the whole story, because as mentioned the body will try to sequester away its toxins in fat tissue and other sites. Another American study, the National Human Adipose Tissue Survey (31), monitored toxins in fat tissue (taken from cadavers and liposuction samples) between 1970 and 1989. Five of the most toxic substances ever created, including a dioxin, were found in 100% of samples.

How Toxins Affect Weight Control

This question was examined in an important review paper, published in the scientific journal Obesity Reviews in 2003 (32). The authors reviewed 63 studies on the link between chemical toxins and obesity. Among their conclusions were:

- Weight loss causes organochlorines (a type of pesticide) & PCBs (industrial pollutants) to be released from fat tissue, affecting metabolism and limiting weight loss.
- The more overweight you are, the more toxins you store.
- Toxins reduce levels of thyroid hormones (see key 6).
- Toxins compete with thyroid hormones at their receptor sites (the locks for which thyroid hormones are the keys) and also for their transporter proteins, thereby reducing efficacy of thyroid hormones.

Besides affecting the thyroid, toxins may also negatively affect metabolic rate via other mechanisms.

- One study suggests toxins damage mitochondria (33).
- There is evidence that toxins impact other hormones already mentioned as being relevant to weight loss, including leptin (the appetite controller), insulin, cortisol (stress hormone) and the sex hormones oestrogen and testosterone (34).
- Excess dietary sugars (which can be considered as toxins) can lead to a health condition called fatty liver: fatty deposits in liver tissue impair its capacity to process toxins, creating a spiral of further damage.

More on Detoxification

Lest all this should seem depressing, we need to remember that the body has a natural capacity to rid itself of toxins. For instance, traditional practices involving sweating (e.g. saunas) have been demonstrated to be effective means of detoxifying. Of course it's important to limit your exposure to toxins as far as possible.

Conclusion

This report has aimed to demonstrate that there is much more to successful and sustainable weight loss than calorie counting. It's necessary to meet all the body's health needs discussed here, which will otherwise serve as obstacles to weight loss.

It will be apparent that the eight keys are in fact highly inter-related. Just a few of the interconnections are:

- Insulin resistance (key 3) and systemic inflammation (key 7) seem to feed off each other in a classic chicken-and-egg scenario.
- Inflammation increases oxidative stress (key 2) - in fact inflammatory secretions are able to attack and destroy infectious organisms precisely for this reason.
- Toxicity affects hormone balance, most notably thyroid status.
- 2 factors have a bearing on all keys: exercise and the food that you eat.

Lest it all sound overly complex, it is worth repeating this central principle: if you meet all your body's health needs, it will naturally and effortlessly regulate itself in terms of both weight and appetite. There is no need to go hungry.

If you would like help in discovering what's holding you back, and in meeting the challenges, please contact the author.

Notes & References

1. For an example of one survey, reported in the Guardian, see http://www.guardian.co.uk/science/2007/apr/10/medicineandhealth.psychology
2. In my practice I offer both lab testing (based on urine, saliva and blood samples) and also the fast, non-invasive EIS screening tool (see http://www.weightlossyork.co.uk
3. See 'Biochemical Individuality' by Roger Williams.
4. His procedure is described in the book, 'The Nutrition Solution' by Harold Krystal and James Haig.
5. This test is available from York Mind-Body Health.
6. An excellent article covering the development of this theory can be found at http://www.lef.org/magazine/mag2006/feb2006_report_antioxidants_01.htm
7. Stephen Cherniske, in his book 'The Metabolic Plan', describes an informal experiment he did. He stood on a street corner with an instrument that can detect pollutants, similar to the ones that test emisions from a car exhaust. He calculated that, in a ten second period as a bus went past him, he was exposed to more free radicals than our ancient ancestors would have met in a lifetime (p58).
8. The Bateman report, published in 1985, found that over 85% of people who generally thought they ate a well-balanced diet failed to meet the Recommended Daily Allowances (RDAs) set by governments. Nutritional therapists such as Patrick Holford (e.g. see his 'New Optimum Nutrition Bible') argue that RDAs are set based on what will prevent deficiency diseases like scurvy and rickets, but this is quite different from what is needed for optimum health. Also, we know from genetics research that there is considerable individual variation in minimum requirements.
9. The two antioxidants were Alpha Lipoic Acid and Acetyl L-Carnitine. The research is reported in the leading scientific journal, *Proceedings of the National Academy of Sciences of the United States of America*, 99 no. 4 (Feb 2002) - 'Feeding Acetyl L-Carnitine and Lipoic Acid to Old Rats Significantly Improves Metabolic Function While Decreasing Oxidative Stress...' by T.M. Hagen et al.
10. This is a well established finding. An example of a study supporting this conclusion is Hughes and coworkers' paper, 'Exercise increases muscle GLUT 4 levels and insulin action in subjects with impaired glucose intolerance' published in the *American Journal of Physiology* (264) (1993).
11. A recent review paper by F. Chaouloff, 'Physical exercise and brain monoamines: a review' published in *Acta Physiologica Scandinavica* 137(1) 2008 reviews the evidence.
12. A very accessible, fascinating and well-referenced book, 'Fantastic Voyage: The Science Behind Radical Life Extension' by Ray Kurzweil and Terry Grossman M.D. has a chapter on the benefits of exercise.
13. This research is published in the *American Journal of Clinical Nutrition* 76(1) (2002) - 'Glycaemic Index and Obesity' by J. Brand-Miller et al.
14. Patrick Holford's book, 'The Low GL Diet Bible' discusses several other pieces of research supporting this idea, including experiments with human subjects.
15. The link between serotonin and obesity is discussed in a review article by Laviano A. & Meguid M. 'Serotonin and Obesity' published in *Current Medicinal Chemistry - Central Nervous System Agent*s, 3(2) 2003
16. This research was carried out by Professor Richard Wurtman and Judith Wurtman at the Massachu-

setts Institute of Technology (MIT). They described their work in a 1989 edition of *Scientific American* - Vol 260(1)

17. Japanese Professor Tapan Audhya showed that depressives in general have lower levels of serotonin. He measured serotonin levels in blood platelets, and showed that these correlated with serotonin levels in the brain. He then tested depressive subjects, and found that in 73% of these subjects, serotonin levels were 20% of the average of his non-depressed controls. This work was published in *Clinical Chemistry* Vol 51(6) supplement, 2005, 'Advances in measurement of platelet catecholamines at sub-picomole level for diagnosis of depression and anxiety' by T. Audhya.

18. In experiments by Dr C. Cangiano et al. at the University of Rome demonstrated this. The work is published in for example the *American Journal of Clinical Nutrition* 56(5) (1992), 'Eating bevaviour and adherence to dietary prescriptions in obese adult subjects treated with 5-hydroxytrypophan' by Cangiano et al.

19. From 'Molecules of Emotion' by Candace Pert.

20. Evidence linking obesity to leptin resistance was published in the International Journal of Obesity (25) (2001) by Lee, J. et al. Another paper on the subject can be found online at http://www.pubmedcentral.nih.gov/picrender.fcgi?pmid=8823291&blobtype=pdf

21. This research is published in the *American Journal of Physiology* 1989 - Chaouloff F. et al., 'Peripheral and central consequences of immobilisation stress in genetically obese Zucker rats'

22. Research published by Tull, E. et al. 'Relationships between perceived stress, coping behaviour and cortisol secretion with high and low levels of internalised racism' in the Journal of the National Medical Association, 2005, 97(2)

23. Dr Robert Sapolski, a leading researcher in the physiology of stress, has written an excellent, highly accessible book on stress, 'Why Zebras Don't Get Ulcers'.

24. Sapolski (Why Zebras Don't Get Ulcers) discusses this.

25. Estimates of the prevalence of low thyroid function vary widely. Dr Barry Durrant-Peatfield, a UK-based doctor who specialises in treating hormonal imbalances, suggests it may be as high as 30% (in his book, 'Your Thyroid and How to Keep It Healthy'). Author Mark Hyman MD. estimates it as 20% of women and 10% of men.

26. See Dr Durrant-Peatfield's book ('Your Thyroid and How to Keep It Healthy') for a fuller discussion of this topic.

27. A good source of further information is a book mentioned earlier, 'Fantastic Voyage: The Science Behind Radical Life Extension' by Ray Kurzweil and Terry Grossman M.D. Chapter 12 is about inflammation.

28. Another excellent popular book is 'The Probiotics Revolution' by researcher Dr Gary Huffnagle, with Sarah Wernick. The book presents recent research findings on the importance of gut flora, in a very accessible way.

29. An example is Esposito K, et al. 'Effect of weight loss and lifestyle changes on vascular inflammatory markers in obese women: a randomized trial' in *Journal of the American Medical Association* 2003 289(14)

30. Their data is published online at http://www.cdc.gov/exposurereport/

31. An online book is available (free) which reviews this data, at http://www.nap.edu/catalog.php?record_id=1787

32. Pelletier, C. et al. 'Energy balance and pollution by organochlorines and polychlorinated biphenyls', *Obesity Review* 2003 4(1)

33. Imbeault, P. Et al. 'Weight-loss induced rise in plasma pollutant is associated with reduced skeletal muscle oxidative capacity' *American Journal of Physiology Endocrinology and Metabolism* 2002 282(3)

34. Professor Sheldon Krimsky of Tufts University has extensively reviewed the research in this area, and has published a book, 'Hormonal Chaos: The Scientific and Social Origins of the Environmental Endocrine Hypothesis'