

THE NEED TO KNOW GUIDE TO

NUTRITION AND HEALTHY EATING

BY TIM SHAW

YMCA

HEALTH AND NUTRITION GUIDES

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Central YMCA Trading Ltd
112 Great Russell Street
London
WC1B 3NQ

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About the author



Hello and thanks for downloading this book.

I am an experienced instructor in the health and fitness industry, specialising in teaching the principles of exercise, nutrition and healthy eating to gym instructors and personal trainers. I am also involved in teaching fitness for disabled clients and training for older adults.

I have worked for London Central YMCA as a tutor in health and fitness for over 20 years. Prior to that I studied engineering and have a BSc in technology and an MSc in robotics.

My interest in nutrition first began back in the 1980s and over the past three decades I have tried most diets and food fads for myself, ultimately concluding that they are largely unnecessary and that the best nutrition is actually achieved by following simple guidelines and eating the right balance of healthy foods.

I hope you enjoy the book.

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Introduction

If you are interesting in eating a healthy diet, but you are confused by all the conflicting information and opinions that seem to change daily, then this book is for you.

Eating the right food is quite possibly the single most important means you have of improving your own health. There is now a wealth of evidence to suggest that diet has a whole range of health consequences, and there is also reasonable consensus amongst dietitians about what a healthy diet is for most people. But it is also a subject that suffers from too much attention in the media, leading to much confusion and conflicting views. Television and newspaper editors know that a good story linking some aspect of food to health is popular and boosts viewing figures or sells copy, especially if the story relates to heart disease, cancer, ageing and dementia – subjects that touch us all either directly or indirectly. We absorb such information daily, never quite knowing what to believe or not, pulled first one way then the other and ending up thoroughly confused. In such cases of information overload, what we really need is some analytical thought along with a little common sense to gain a clear picture of what we should be doing.

This book is therefore intended as a simple guide to healthy eating and what constitutes a balanced diet, clearly focussing on the basics that matter and make a difference, rather than confusing details that have little real consequence. There are no promises of quick weight loss and there are no fad ideas or radical changes in eating habits involved. Instead, you will learn the fundamentals of good nutrition and the many health benefits that can result. These include:

- Controlling your body weight in the long-term
- Having more energy, better mood and concentration, and coping with the effects of stress
- Having a stronger immune system to fight infection
- Having a healthier heart and circulation, controlling blood pressure and blood lipoprotein ('cholesterol') levels, and reducing risk of a heart attack or stroke
- Reducing insulin production, controlling your blood sugar level and preventing type-2 diabetes
- Reducing levels of the hormone insulin-like growth factor 1 (IGF-1) and reducing your risk of getting certain forms of cancer

Healthy eating also supports a more active lifestyle, giving your body the energy it needs to exercise and then the nutrients it needs to recover afterwards. But be aware that intense training places additional stresses on the body and, whilst nutrition for exercise is not so different from healthy eating, it does necessitate higher intakes of many nutrients and the use of supplements to obtain the best performance. Being fit is not quite the same as being healthy. *The Need to Know Guide to Nutrition for Exercise* covers the subject of diet and training in greater depth.

Throughout this book you should expect guidelines and principles for a long-term healthy eating plan, not a short-term fix. There are many commercial diets you can follow that will lead to quick weight loss, if that is what you want, but they all involve major dietary change and create a range of problems including low energy levels, depressed mood, unhealthy

changes to hormone levels, reduced vitamin and mineral status and lowered metabolism. Unless the change in eating is sustainable most will return to old habits and the original problems of poor health and weight gain will return.

As with anything worth doing, expect to contribute a little time and discipline to eating healthily in terms of food choices when shopping, food preparation, and occasionally resisting foods high in sugar, fat and salt. But if you make positive changes to your diet in a series of gradual steps, then effort and inconvenience is minimal, but the results are worth having.

Note on the Second Edition

Trends come and go, and since first writing the *Need to Know Guide to Healthy Eating* three main themes have regained popularity. Firstly, interest has moved away from the harmful effects of the fats we eat and back to the idea that sugar is the main culprit in the modern unhealthy diet. Secondly, several books have been published denouncing modern cereal grains like wheat as being the cause of obesity and ill health, and that we should return to hunter-gatherer or 'palaeolithic' eating. And lastly, in the world of diets, there has been a rise in popularity of intermittent fasting, where food intake is severely restricted on just some days of the week, but normal on most other days. All of these ideas deserve some discussion in this new edition.

1. Getting the balance right

The human body remains in good health and functions most efficiently if it obtains the food it needs in the right quantity and correct balance. The easiest way to ensure an optimum balance of nutrients is to divide foods into six main groups and then, over a day's eating, aim to consume the recommended number of portions of each group.

Food group	Recommended portions/day	Example of a portion?
1. Complex carbohydrates	6–11	1 slice of bread, 1 small bread roll, 1 potato, ½ cup of cooked rice or pasta, 30 g (just over 1 oz) breakfast cereal.
2. Fruits and vegetables	5–9*	1 medium fruit (apple, orange, banana, etc.) handful of berries or grapes, one 125 ml (5 fl oz) glass fruit juice or smoothie, 1 small bowl of salad, ½ cup of cooked vegetables.
3. Protein-rich foods	2–5	Meat, fish, chicken, tofu (size of a deck of cards), 1 egg, ½ cup of cooked beans or pulses.
4. Dairy foods	2–5	1 small carton of yoghurt, 1 × 200 ml (⅔ pint) glass of milk 40 g cheese (nearly 2 oz; size of a small matchbox).
5. Healthy fats	2–3	2 teaspoons of olive oil, oily fish (size of a deck of cards), ½ an avocado, 2 tablespoons of nuts or seeds.
6. Foods high in unhealthy fats and refined sugars	0–1 (eat sparingly)	1 biscuit, 1 slice of cake, 1 can of soft drink, 25 g (1 oz) bag of crisps, 1 small bowl of chocolate pudding, 125 ml glass fruit juice or smoothie (if you have more than 1 per day).

(Department of Health, 2012) (USDA, 2012) (Harvard School of Public Health, 2012) (Bean, 2003)

* Research published in 2014 has started to question the 5-a-day minimum guideline (see section 5).

Governments use a picture of a food plate to represent healthy proportions of these food groups. Complex carbohydrates and fruits and vegetables take up the largest segments of the plate, followed by smaller segments of protein-rich foods and dairy products. The thinnest wedge is reserved for foods high in unhealthy fats and refined sugars. Note that National Guidelines have been slightly adapted here, with an allowance given for healthy fats.

It isn't realistic to get this balance at every single meal or snack. Rather, you should try to get the balance right on *most* days. If this is hard because of work, study, travel or family commitments, you might find it easier to achieve a healthy balance over a longer timeframe such as a whole week. This gives you some flexibility for socialising and having the occasional lapse into 'junk' food.

What is a 'portion'?

I have added recommended portion numbers for each food group to the preceding table because they can be useful to keep track of how much you are eating throughout the day. You can use the examples as a guide to portion sizes for each food group. Although there are only a few foods listed here, they should be enough for you to estimate most other foods you eat simply by looking for the nearest similar item. Take note of how small some portion sizes are when compared to common expectation. For example, just 30 g of breakfast cereal is a portion. Most of us put three-times that amount in a bowl, giving us already one third to a half of our daily intake in one go. A single egg is a portion of protein-rich food. Hence a three-egg omelette meets the daily recommended intake. We have grown accustomed to a world of cheap food and super-sized portions, leading to unrealistic expectations about how much we should eat. Note also that more than one portion of fruit juice per day gets counted as sugar intake (we will discuss this more later).

Why these food groups in these proportions?

The fact is that these guidelines are based on the best evidence available of what is optimum for health; the fundamentals of nutrition are well understood and do not change. If you focus excessively on eating one food group, such as protein, then you inevitably displace another, such as fruit and vegetables, leading to a lack of vitamins, minerals, phytochemicals and fibre. Each food group plays its part and the proportions that work best are well established.

Does this balance suit everyone?

There are some valid reasons why this balance of food groups may not be ideal for some individuals. For example, when people first see these guidelines, many are surprised by the amount of complex carbohydrate recommended ('won't bread and potatoes make me fat?'). This is a legitimate concern, especially for sedentary individuals, and will be discussed more fully in section 4. Another frequent comment is: 'I've been told dairy foods are bad for me'; we will discuss this more fully in section 7.

There is also simple variation amongst individuals to consider. It is well recognised that people vary greatly in their anatomy and physiology (Williams, 1956). Exactly how this affects individual nutrition needs is hard to say. Attempts have been made to tailor eating to individual requirements based on 'metabolic typing' (Woolcott & Fahey, 2000), but ultimately they rely on questionnaires about how you feel after eating certain foods and what foods you naturally favour, making it hard to assess the reliability of this approach in any scientific way. Ultimately you will be the best judge of what works for you.

Keeping track of what you eat

A practical idea is to use a table to record the portions of each food group you eat on a daily basis. The table is blank at the start of the day, and you simply add a mark whenever you consume a portion of that particular food group. At the end of the day you can total each column to see how close you are to the recommended portions. For example:

Food group	Complex carbohydrates	Fruit and vegetables	Protein-rich foods	Dairy	Healthy fats	Foods high in unhealthy fats and refined sugar
Portions eaten	IIIIII III Total = 8	II Total = 2	III Total = 3	III Total = 3	I Total = 1	IIIIII II Total = 7
Portions recommended	6–11	5–9	2–5	2–5	2–3	0–1

Better still, use this method to keep track of what you eat over several days and then average your portions to give a more complete picture of your diet.

In this example the portions of complex carbohydrates, protein-rich foods and dairy are all *about* right. Healthy fats are lower than recommended. But most significantly, the intake of fruit and veg clearly needs to increase, and the quantity of foods high in processed fats and sugars is much too high. So it is easy to identify how eating can be improved the next day. And improvements can be made gradually. In this case, a good start would be to decline one of the fatty, sugary snacks and replace it with some fruit instead.

This type of analysis is easy, takes little time, and yields useful practical results. If you would like a more in-depth analysis that counts calories, calculates exact percentages of fats, proteins and carbohydrates, and evaluates intake of important vitamins and minerals, then there are web sites or smart phone apps that can help in this complex task.

2. How much to eat

In this section we will answer basic questions about energy, metabolism and how much to eat. Your body requires energy from food to perform basic metabolic functions of living, and for daily activity and exercise. Eating the correct amount of food to give us energy is essential for maintaining a healthy body weight and feeling energetic enough for daily activities.

If you don't eat enough food to supply all the energy you need, then inevitably you will feel tired, you will lack concentration, mood is depressed and eventually illness results. You will also lose weight, but this needs to be managed carefully so that fat is shed steadily over weeks and months but without suffering all the unhealthy consequences of not eating enough food.

On the other hand, if you eat too much food, then you may suffer digestive discomfort, and the excess of energy is stored as body fat. In a modern developed country, where high calorie foods containing lots of fat and sugar are widely available, it is very easy to eat too much food.

Our need for food intake to match our energy expenditure is neatly illustrated using the energy balance equations:

Energy in = energy out: results in weight maintenance

Energy in > energy out: results in weight gain

Energy in < energy out: results in weight loss

Energy is measured in kilocalories, which is commonly written on food packaging as kcal. However, they are usually called 'calories' for convenience.

How many calories should I eat each day?

It follows that, in order to know how many calories you should eat each day (energy in), we first have to know how many calories you expend (energy out). If the two are equal then your energy needs will be met. Current guidelines recommend that women should eat 2,000 kcal daily, whilst men should eat 2,500 kcal (NHS, 2012). However, these figures make a number of assumptions about body size and activity level.

Instead, a simple formula can be used to obtain a more accurate figure for you as an individual. There are two parts to the calculation: The first gives your basal metabolic rate (BMR), which is the sum of all the energy used in 24 hours to stay alive and maintain basic metabolic processes such as bodily warmth, breathing, circulation and cellular function. The second part estimates your activity level using a physical activity factor (PAF).

Part 1: BMR

BMR is mainly dependent on your age, gender and body weight. To calculate this we will use the Schofield equation (Schofield, 1985):

Women

10–17 years: $BMR = 13.4 \times W + 692$

18–29 years: $\text{BMR} = 14.8 \times W + 487$
 30–59 years: $\text{BMR} = 8.3 \times W + 846$

Men

10–17 years: $\text{BMR} = 17.7 \times W + 657$
 18–29 years: $\text{BMR} = 15.1 \times W + 692$
 30–59 years: $\text{BMR} = 11.5 \times W + 873$

(W = body weight in kilograms)

For example:

A 49-year-old female weighing 60 kg has a BMR of: $8.3 \times 60 + 846 = 1,344 \text{ kcal}$

A 23-year-old male weighing 80 kg has a BMR of: $15.1 \times 80 + 692 = 1,900 \text{ kcal}$

The BMR figure tells us the minimum calories needed for the body to maintain itself for 24 hours, before any activity is performed.

Part 2: PAF

Multiply the figure from part 1 by the PAF, depending on whether the person is inactive, moderately active or very active:

		PAF women	PAF men
Inactive	Desk job, drive everywhere or take public transport, negligible exercise or active pastimes	1.4	1.4
Moderately active	Moderately active job involving standing, walking, etc. Regular 3 × weekly gym visits or playing social sports	1.6	1.7
Very active	Very active job involving lifting and carrying, etc. Regular 5 × weekly gym visits with intense, longer duration training sessions or playing intense, competitive sports	1.8	1.9

So if our 49-year-old female is inactive, her PAF is 1.4 and her daily kcal total is:

$$1344 \times 1.4 = 1,881 \text{ kcal}$$

If our 23-year-old male is very active, his PAF is 1.9 and his daily kcal total is:

$$1900 \times 1.9 = 3,610 \text{ kcal}$$

So if you are the 60 kg person, you need to eat about 1900 kcal per day to maintain weight. If the 80 kg person is closer to you, you need about 3600 kcal per day, which is considerably more, but is a justified by the larger body and much higher activity level.

If you want to keep a detailed record of what you eat and count calories, then this calculation is a useful guide to how much you should eat. But it's not really necessary. The food plate and portion numbers work just as well.

How do calories relate to the food plate?

Following the portion numbers from the food plate equates closely to a healthy calorie intake. If you are closer to the 1800 kcal per day example above, this would be supplied by the lower portion numbers (6 of complex carbs, 5 of fruit and veg, 2 of protein-rich foods, etc.). If you need closer to 3600 kcal per day, this will be met by the higher portion numbers (11 of complex carbs, 9 of fruit and veg, 5 of protein-rich foods, etc.). If these portion numbers still don't meet your need, then it is OK to eat more; just use the plate as a guide to keeping the proportions healthy.

Increasing energy expenditure

It follows from the energy calculation that there are two possible ways of increasing energy expenditure:

1. Increase your metabolism. Basal metabolism can be increased within certain limits by increasing the amount of healthy lean tissue you have; in other words, by increasing how much muscle you have. The easiest way to do this in a structured way is to use resistance training. This doesn't mean you have to build large amounts of muscle mass, just toned muscle is enough.
2. Increase your activity. Activity can be increased in a variety of ways: Active daily living such as walking, gardening or housework. Pastimes such as golf or rambling increase activity levels in a relaxed and pleasurable way. Playing sports or going to the gym are other possibilities. But this book is primarily about healthy eating, so a discussion on exercise is out of the scope. However, other Guides in this series cover this topic in great detail.

Is there such a thing as a naturally slow or fast metabolism?

You will frequently hear some people say they are overweight because they have a 'naturally slow metabolism' or others say they can eat what they want and not put on weight because they have a 'fast metabolism'. Although it is tempting to believe this idea and it may *appear* to be the case, controlled studies fail to find these radically slow or fast metabolisers. Of course there are medical exceptions, such as low thyroid function, which do slow metabolism. But conditions like this are relatively easy to diagnose and treat. In the vast majority of cases, basal metabolic rate is affected mainly by body size, and in particular by how much lean muscle you have.

Science does offer an alternative explanation for apparent differences between people's ability to control body weight. Careful observations reveal that there are big variations in spontaneous activity levels between individuals. Those who tend towards obesity are naturally more sedentary, whilst those who tend towards thinness are more active and 'always on the go'. This is possibly hard wired in the genes (a natural set point for how active you are) and also influenced by lifestyle in early childhood, where obesity leads to inactivity as the child gets older (EarlyBird Diabetes Trust, 2012).

3. When to eat

The accepted advice concerning healthy eating is to have a regular structure of meals and snacks every day – a ‘little and often’ approach to taking in calories and nutrients. However, there is a growing school of thought that this may not be the best eating plan, particularly if you are overweight and have a high risk of type-2 diabetes. In this section we will look at the different viewpoints on when to eat and see if we can reach some sensible conclusions.

Regular meals and snacks

Standard dietary advice for a long time has been to eat regular meals, and there are two main reasons given for this: the first is to give an even supply of energy and nutrients to your body throughout the day; the second is to control appetite. A practical meal plan for this approach is to have three balanced main meals – breakfast, lunch and dinner – with two or three healthy snacks of fruit, nuts, etc. between meals to moderate hunger and elevate mood and energy levels.

When considering an even supply of energy and nutrients, breakfast becomes a particularly important meal. If you eat an evening meal at 8pm one day, then skip breakfast the next morning and don’t eat again until lunch time, that’s a total of 17 hours out of 24 where you have no energy or nutrient intake at all. Yet it can be very tempting to miss out breakfast altogether, either as a way to lose weight or because you just don’t have time. You might argue that this is a good way to cut out calories and lose weight, but there are other factors to consider: your mood, concentration and energy levels may suffer throughout the morning, particularly around 10.30-11am when blood sugar levels tend to hit a natural low anyway.

In terms of appetite control, research has identified certain ‘hunger hormones’, such as ghrelin, which are released by your stomach and fat cells in response to several hours of fasting. The longer you fast, the higher the level of hunger hormones in your blood, making you crave calorie-dense fats and sugars. So when you eat again at lunch time you are likely to binge on these satisfying foods, taking in all of the calories you would have done anyway had you eaten breakfast.

Regular energy supply and appetite control are both logical, well-reasoned arguments for a structured meal plan each day. However, the reality may be a little different. For example, it takes some will-power to limit the snacking to healthy options rather than more convenient high fat/sugar options, and it is hard to keep a track of your total energy intake. It is also true that significant health benefits can be gained from *not* eating for several hours, particularly if you are overweight and have an increased risk of type-2 diabetes.

Intermittent fasting

The most popular diet of the last year is the ‘5 and 2’ approach, which is based on the concept of intermittent fasting (Moseley & Spencer, 2013). The routine is to eat normally for five days of the week, but drastically reduce food intake and fast for the other two days. Calories are restricted to just 600 kcal for men and 500 kcal for women on each of the fast days – equating to about a quarter of normal daily calorie intake. This directly contradicts the usual advice about eating little and often to ensure an even energy supply and to

control hunger. So is there any evidence to support this approach to eating, or is it just another trend that will come and go?

It has been known for a long time that calorie restriction can significantly extend life span. Most experiments in the lab have been done with rodents, but there is good reason to suspect that humans will respond in a similar way, and thousands of people around the world are adherents to a regime of strict calorie restriction with the aim of living to a great age. Obviously it will be a while before the results concerning ageing are certain, but what is clear is that fasting can improve many measurable factors associated with good health and absence of disease; factors such as reduced blood lipoproteins (cholesterol), better insulin sensitivity, and lower levels of IGF-1, a growth promoter associated with development of certain cancers (Malin & al, 2004); (Renehan & al, 2004).

The problem with extreme calorie restriction is the harshness of the abstinence involved which defeats all but the true stoic. Most people value their quality of life and simply prefer to enjoy food and accept the associated risks. The intermittent fasting approach attempts to gain the health benefits of calorie restriction whilst making it more sustainable for more people. Alternate day fasting (ADF), has been tried to good effect (Varady KA, 2013), but is still very tough to follow. Hence the '5 and 2' pattern that has caught on.

Why might intermittent fasting be effective? The explanations given are based around our evolutionary adaptations to a varying food supply before agriculture made the next meal more reliable. The hunter gatherer human body is used to going for long periods without food, and in that fasting period, various cellular repair processes take place, the pancreas is rested from producing insulin and the body will start to utilise some of its stored fat for energy.

Does it matter if I eat my main meal in the evening?

You will often hear people advising you not to eat your main meal in the evening, or 'no carbs after 6pm' etc. However, the evidence for these arbitrary rules is limited. The usual justification for this advice is that, if several hours of sleep follow a big meal, you will store all the calories you have just eaten as fat. Better to eat those calories in the morning and burn them up during the day so your body doesn't store them. But the counter argument is that, so long as your total day's calories don't exceed your needs, over a longer timeframe of a few days things will even out; anything stored one night is simply used the next day. Also, it makes a lot of sense for nutrients to be available to your body as it recovers and repairs overnight. So there is nothing inherently wrong with eating healthy food at this time of the day. In fact, eating a main meal in the evening is so universal and inherent to social convention that to simply say 'don't do this' is unrealistic. It is possible that eating at the end of the day (after all that hunting and gathering) is deeply rooted in our circadian rhythms (Foster & Kreitzman, 2005).

In truth, it is not the evening meal that is the problem; it is the temptation to continue snacking afterwards. It is so easy to lapse and keep visiting the kitchen for some potato nibbles, corn chips, ice cream, etc. plus a glass or two of wine. The time of day is not the pivotal factor here; it is more that you feel tired, bored or stressed and you use your fridge full of treats to help relax and unwind.

Sensible conclusions about when to eat

If you are a healthy body weight, with no risks associated with blood sugar control or type-2 diabetes, then regular meals and snacks still make sense for the reasons given previously. This approach will also suit you if you are more active. However, if you are overweight and at risk of type-2 diabetes, then it may be worth asking your doctor for advice about intermittent fasting. And if you find the whole fasting idea unappealing, you can still apply the principle in a modest way simply by avoiding snacking between meals.

4. Complex carbohydrates

We should aim to eat 6–11 portions per day. Examples of portions include: 1 slice of bread, 1 small bread roll, 1 potato, ½ cup of cooked rice or pasta, 30 g (just over 1 oz) breakfast cereal.

Complex carbohydrates form one of the largest segments of the healthy eating plate and should be a significant part of our daily eating because they are such a good source of energy, fibre, vitamins and minerals. They also supply significant protein to the diet and they are relatively inexpensive when compared with meat, poultry, fish and dairy foods. But despite all of these positive points, carbohydrates have suffered from bad PR recently. This is because of the popularity of low-carb diets and the notion that ‘carbs make you fat’ or that ‘wheat is bad for you’.

Experience tells us that low-carb diets can definitely result in rapid weight loss. But before you are tempted to try this approach, consider some of the wider aspects of your health that may be affected. Without carbs in the diet you are likely to suffer from a serious lack of energy, depressed mood and lower concentration. You will also have a lower fibre intake due to lack of whole grains, which will affect your bowel function. Vitamin and mineral intake are likely to be compromised too. But your body still needs energy in order to function, and without carbs it must obtain this from the fats and proteins you eat. Metabolism of fats in the absence of enough carbohydrates leads to a state of ‘ketosis’, which has a range of effects, particularly on mental performance – the brain much preferring glucose in the blood to work well. The most noticeable sign of ketosis is a distinctive smell to the breath.

Eliminating carbohydrates from your diet is not a sensible long term plan. Instead ‘*good carbs not no carbs*’ should be your rule.

What type of complex carbs should I eat?

You should choose unrefined complex carbohydrates where possible in preference to refined products. This is because:

- Unrefined carbs include the vitamins, minerals and fibre that your body needs. They take time to digest, releasing their energy relatively slowly, satisfying your appetite for longer. Slow release of energy also makes it harder to store calories as fat. Examples of unrefined carbs include: wholemeal bread, wholegrain rice and whole wheat pasta.
- Refined carbs supply the energy component, but they don’t necessarily have the vitamins, mineral and fibre. Their refined state means your gut digests them and releases their energy more quickly. So although you satisfy your hunger rapidly you will feel hungry again soon. Quick energy release also makes it more likely that calories will be stored as fat. Examples of refined complex carbs include: white bread, white rice and white pasta.

So a wise plan is to include unrefined complex carbohydrates as part of each healthy meal to ensure you obtain all of the nutrition in a whole complete package, and to keep you feeling fuller for longer.

Why is fibre important?

Fibre is the 'roughage' part of unrefined complex carbs. Other plant foods like pulses, fruit and vegetables are also excellent sources of fibre. There are two main types of fibre and most foods contain a mixture of both:

Insoluble fibre cannot be digested by your body. It is resilient to the acid and digestive juices in stomach and remains largely intact when passing through the intestines. In other words, it leaves your body in much the same form as it went in. Insoluble fibre is not absorbed from the digestive tract into the blood and is therefore not an essential nutrient, strictly speaking. However it does have important health benefits: it adds bulk to the food you eat, helping it to move through the gut more easily. In particular it keeps your bowels healthy, helping to prevent constipation.

Soluble fibre can be digested by your body. It may help to reduce the amount of low-density lipoprotein (LDL) 'bad' cholesterol in your blood. Porridge oats, beans, lentils and many fruits are all good sources of soluble fibre.

Foods that are high in both types of fibre take longer to leave your stomach and will keep you feeling fuller for longer, which can be useful if you are trying to lose weight.

Typical fibre intake per day is around 14 g. Health guidelines suggest you should be aiming to eat at least 18 g, along with plenty of fluids (NHS, 2012). But there is no need to check grams on food labels. Fibre intake is naturally taken care of anyway if you eat the recommended portions of unrefined carbohydrates, fruit and vegetables. It is unnecessary to eat any special foods or add fibre supplements, such as bran, to your diet. In fact, too much fibre can cause bloating, wind, abdominal discomfort and reduced nutrient absorption.

What is GI?

GI stands for glycaemic index. It is a way of measuring how quickly carbohydrates are digested and raise your blood sugar level. Glucose is used as the reference food (GI = 100) and then other foods are compared to this reference point and given a number on a 1–100 scale.

High GI carbs such as a breakfast cereal (GI = 80+) will raise blood sugar significantly within minutes of ingestion. Lower GI carbs such as those found in apples (GI = 38) or porridge (GI = 42) take much longer to have any measurable effect on blood sugar. This matters because a quick peak in blood sugar from a high GI carbs stimulates your pancreas to release a large amount of insulin which in turn causes blood sugar to decrease quickly as it transports sugar into the cells. This 'trough' in blood sugar makes you feel tired, irritable, unable to concentrate and hungry (low blood sugar is a powerful hunger signal for the brain).

A low GI carb gives a slower rise in blood sugar and so avoids the large release of insulin and therefore avoids the reactive low blood sugar that follows. You feel more energetic, less irritable, you are able to concentrate and you feel fuller for longer. They may play a role in helping to prevent type-2 diabetes. Research has shown that lower GI diets have also been associated with a lower incidence of heart disease (Diabetes UK, 2012). So the rule is to eat low GI carbs when you can.

How can you tell if carbs are high GI or low GI?

There is a general belief that sugary carbs are fast acting high GI and starchy complex carbs are slow acting and low GI, but this is not the case and the truth is much more complicated. For example, the carbohydrate in apples is all sugar and yet they are low GI. This is because the sugar in apples is mainly in the form of fructose, or 'fruit sugar', which your body takes much longer to digest than glucose (more on the subject of fructose in section 9). White bread, which contains mainly complex carbohydrates, has a high GI. It happens that the intense processing involved in the production of a modern white loaf makes the starch particles very easy for your body to break down and utilise. Baked potatoes actually have a higher GI than boiled potatoes (it's to do with the cooking process). With so many factors contributing to GI, you will probably be thinking: do I have to consult a GI reference table every time I eat carbs? Well you could do this if you have the time, but a simpler way is to just follow the unrefined rule. Not only do unrefined carbs give us vitamins, minerals and fibre they also tend to be lower GI as well.

There are a couple of other points to consider regarding GI carbs. Firstly, the number only applies to a 50 g portion of carbs eaten in isolation. If a larger or smaller portion is eaten then the effect on blood sugar will increase or decrease respectively. There is another number you will encounter called the glycaemic load (GL), which takes into account a more typical serving size, and may therefore be a more useful reference. Secondly, as soon as fats and proteins are combined with the carbs, then digestion and the blood sugar spike are slowed significantly. For example, high GI white bread combined with butter, cheese and pickle to make a tasty sandwich, results in a lower GI meal. So a good rule to follow with complex carbs is to eat them as part of a balanced meal or snack that also contains proteins and healthy fats.

Is wheat bad for you?

Several claims have been made about the negative effects of modern cereal grains, particularly wheat, on our health. The basis for these claims is essentially the same as for the palaeolithic diet: humans evolved as hunter gatherers and did not eat cereals until the agricultural revolution approximately 10,000 years ago. This is not sufficient time for our genetics to have changed and we should therefore avoid grains because they do not meet our evolutionary nutritional needs.

Claimed negative effects of wheat consumption include: gastrointestinal irritation, obesity and insulin resistance leading to type-2 diabetes. Whilst there are some truths to these claims, there are also many exaggerations as well and it does not mean we should all immediately stop eating bread and pasta. For example, it is well recognised that the protein gluten in wheat and other grains will cause inflammation of the gut and interfere with the absorption of nutrients in some people, and this is called coeliac disease (NHS, 2012).

Coeliac disease is diagnosed by your doctor and then treated by maintaining a gluten-free diet. Food intolerances on the other hand are much harder to diagnose with any certainty because the symptoms are diverse and variable; the only truly reliable test being to adopt an exclusion diet and see if the symptoms improve, then re-introduce the offending food and see if symptoms return.

In terms of obesity and type-2 diabetes, refined wheat products like white bread, bagels and breakfast cereals are mostly high GI. Even the modern brown or wholemeal loaf is high GI too. We have already discussed how such foods can contribute to fat storage and insulin resistance. Also, wheat is a staple food and when you consider the sheer quantity of refined wheat-based products that are available to us it is easy to see how cutting these out of the diet can be beneficial. But in the end, this is simply a restatement of the 'eat low GI' rule. The same arguments could be used to say that potatoes are bad for you – and they have only been part of the European diet for about 450 years.

So until more evidence is available to the contrary, it should be considered OK to eat wheat. Choose unrefined products for the fibre, vitamins, minerals and the lower GI values. And if you think you may be intolerant or suffer from coeliac disease then get it properly diagnosed by a doctor rather than depriving yourself of a major food group for no reason.

5. Fruit and vegetables

We should aim to eat between 5–9 portions per day. This is still the official guideline. However, there is recent research suggesting 7+ portions per day should be the minimum guideline (Oyebode, Gordon-Dseagu, Walker, & Mindell, 2014).

Examples of portions include: 1 medium fruit (apple, orange, banana, etc.), one 125 ml (5 fl oz) glass fruit juice or smoothie, a handful of berries or grapes, 1 small bowl of salad, ½ cup of cooked vegetables.

We are advised to eat lots of fruit and vegetables because they are packed with important vitamins (especially vitamin C) and minerals (particularly potassium and magnesium), they are high in water content, bulk and fibre and they are usually low in fat. Note that there are some exceptions to the low fat rule, such as avocados and olives, but even then they count as a 'healthy fat'. In addition, fruit and veg contain antioxidant phytochemicals that have further health benefits.

Antioxidants

Antioxidants are substances found in food that help to prevent cellular damage from oxygen free radicals. Free radicals are inevitable by-products of respiration and oxygen use in the body. They are very unstable molecules and can damage cells unless they are neutralised, or 'quenched', by antioxidants. The most effective antioxidants from food are vitamin C from fresh fruit and vegetables, vitamin E from wheat germ, fruits, nuts and cereals, and a number of phytochemicals.

Phytochemicals

Phytochemicals are substances found in plants that can have a beneficial effect on our health ('phyto' is Greek for 'plant'). You may have heard results of research saying that red wine, grapes, berries, garlic, onions, tea, tomatoes, broccoli etc. are all good for us. This advice is usually based on phytochemicals they contain, such as carotenoids and flavanoids. Although phytochemicals are not counted as essential nutrients, many of them appear to have a significant protective effect against the development of heart disease and cancer. This is possibly why there is a strong link between eating lots of plant foods and a lowered risk of suffering from these health problems.

Dark green vegetables (DGV) and hormesis

Research into antioxidants and phytochemicals and their importance for health has yielded conflicting results. They may not be the anti-cancer, anti-ageing panacea we expected. Yet the evidence for the beneficial effects of eating fruit and veg is universal and getting stronger, suggesting mechanisms other than antioxidants may be involved.

Another possible explanation for the health-giving properties of DGVs like broccoli, kale and cabbage is known as 'hormesis'. The name derives from toxicology – the study of poisons – and it means that a toxin taken in small enough doses can actually be beneficial to an organism because it can stimulate defences and adaptations that make the organism stronger. DGVs taste bitter because they contain low levels of naturally occurring toxins, but according to the theory of hormesis, our bodies react to overcome those toxins, leaving us stronger and healthier in the long run. The principle is similar to going to the gym and

working your muscles hard so they ache the next day. But given enough recovery time the muscles actually adapt to the demands placed upon them and become stronger.

The principle of hormesis is an interesting and plausible explanation of why DGVs can be so beneficial to health. It also implies that at least some of our five a day should consist of dark-coloured veg, not just sweet tasting fruits.

How can I increase my fruit and veg intake?

We have all heard of the five-a-day recommendation, yet many of us still find it hard to meet this simple guideline, let alone the seven a day we may all soon be advised to follow.

Increasing fruit and veg intake can be difficult because they require more preparation than convenience foods like crisps, flapjacks and chocolate bars. They also have less immediate appeal to our taste buds. Most people, given the choice between an apple and a bar of chocolate, will choose the chocolate. So here are a few practical ways you can try to increase your daily portions of fruit and veg that don't take a lot of time or effort:

- Add a chopped banana or handful of berries to your breakfast cereal
- Make a habit of having a side salad with lunch or dinner
- Blend vegetables into a soup. This is a useful way to include more veg without it being noticed. Ideal for recalcitrant children of all ages
- 125 ml of fruit juice or smoothie counts as a portion. So pour yourself a glass of orange juice each morning, or have one small carton from the supermarket with lunch. But beware that more than one portion of fruit juice starts to count as sugar intake (see section 9). Eating the whole fruit is a better option.

6. Protein-rich foods

We should aim to eat 2–5 portions per day.

Examples of portions include: meat, fish, chicken, tofu (size of a deck of cards), 1 egg, ½ cup of cooked beans or pulses.

Protein-rich foods are well known as being important for growth and repair of body tissues. But they have a whole range of other functions too: they support the immune system, they are essential for hormone and enzyme production, and they can also supply significant energy.

What protein foods are best?

Animal proteins such as meat, fish, poultry, eggs, etc. are called ‘complete’ because they supply all of the amino acids your body needs for growth and repair. Non-animal proteins like beans, lentils, cereals and nuts are ‘incomplete’ because each is missing some vital amino acids. So in this respect, animal proteins are higher quality than non-animal proteins. An exception to this rule is the soya bean. Soya based products such as tofu (soya bean curd) or soya milk are considered to be complete proteins because they contain such a good range of amino acids.

But before planning meals based around chicken, steak, tuna and omelettes, there are other factors to consider: animal proteins are expensive and often come packaged together with high fat (50% of the calories in a good steak will be from fat; an egg is even higher at around 60% fat). In contrast, most non-animal proteins like beans and lentils are inexpensive and naturally low in fat. In addition, it is easy to improve the quality of these proteins and make them complete simply by combining two or more foods together. For example, baked beans on toast combines beans with wheat giving a complete source of protein. A peanut butter sandwich gives a similar result.

Protein for the vegetarian or vegan

Concerns about vegetarian eating and lack of protein are generally unfounded, so long as the healthy eating plate is followed and there are sufficient protein-rich foods included. In fact, vegetarian and vegan eating approaches have many positive benefits: they are low in saturated fat, low in salt and high in fibre, vitamins and minerals when compared with meat eating approaches. Vegetarians can easily get enough protein from a well-planned diet. Even when meat, poultry and fish are excluded, there are still complete proteins from milk, cheese, yoghurt, eggs, tofu and soya milk. Then there are the incomplete proteins in beans, pulses, nuts, seeds and cereals which, eaten in combination, provide more than enough essential amino acids for protein needs to be met. Even if incomplete proteins are eaten at different meals throughout the day, the amino acids are available to the body long enough for the necessary combinations to be formed.

If you are vegan and eat no animal products at all, you will find it a little harder to get sufficient protein. But it is still possible. The main complete protein sources available to you are soya products. The remainder must come from good combinations of plant proteins.

Can too much protein be harmful?

Protein is essential in a healthy diet but, like all nutrients, too much can have negative consequences. For example, once the body has all the protein it needs for growth and repair, the remaining calories are available for energy and can be stored as fat. The liver breaks down excess proteins and converts them into energy, then the kidneys excrete the waste products; this places additional load on these two organs. In healthy people this additional load is not a problem, but individuals with existing liver and kidney conditions should check with a dietician about how much protein they can eat.

Another potential concern of a high-protein diet is that it increases circulating levels of the hormone IGF-1, a growth promoter associated with increased risk of breast cancer in women and prostate cancer in men (see section 3). And, lastly, high-protein diets lead to more acidic urine and a rise in urinary calcium levels. Whether this increases the risk of kidney stones or osteoporosis is still the subject of ongoing research.

A reasonable conclusion from all the evidence is that a small excess of protein is unlikely to cause problems for healthy people. However, the long-term heavy consumption of protein typical of gym users can affect health.

7. Dairy foods

We should aim to eat 2–5 portions per day.

Examples of portions include: one 200 ml ($\frac{1}{2}$ pint) glass of milk, 1 small carton of yoghurt, 40 g (nearly 2 oz) cheese (size of a small matchbox).

Dairy foods such as milk, cheese and yoghurt are a good source of protein. However they are not counted along with other protein foods on the food plate, instead being given a place of their own. This is because they are a particularly good source of calcium, essential for strong bones and teeth.

A potential problem with dairy foods is their high fat content and therefore their high calories. If the guideline of 2–5 portions per day is followed, then this shouldn't be a problem. But if you eat significantly more than this and you are counting calories to lose weight, then you may benefit from using low fat dairy products.

Should I choose low fat dairy products?

Low fat dairy products can be a useful way of reducing your fat and calorie intake, whilst still obtaining the protein and calcium your body needs. Semi-skimmed milk roughly halves the fat content of whole milk and retains some of the flavour. Skimmed milk has most of the fat removed but as a consequence it has little taste; the choice is yours. Low fat yoghurts are now so universal it is actually harder to find a full fat version in the supermarket. One word of caution here: manufacturers have to add sugar to low fat yoghurts to make them palatable, so check the label. Most cheeses contain 70–75% of their calories as fat, which is very high, so choosing a lower fat alternative could make a significant difference. A typical cottage cheese has around 17% fat calories, but the taste and texture is not for everyone. A 'light' cream cheese typically has 40–45% fat, which is still high, but a significant overall saving.

What about lactose intolerance?

Lactose is a type of sugar found in milk. Virtually all children are able to tolerate lactose well, but as children grow and mature some cease producing the enzyme lactase which is necessary to digest lactose. They then become lactose intolerant and suffer with gastrointestinal problems like wind and diarrhoea if they drink milk.

If you are lactose intolerant and must avoid dairy foods then it is important to have other foods in your diet that are also high in calcium. Examples include: green leafy vegetables (such as broccoli and cabbage), soya beans and tofu (soya bean curd), soya drinks with added calcium, nuts, bread and anything made with fortified flour (which has calcium added to it), and fish where you eat the bones (such as sardines and pilchards) (NHS, 2012).

Should we consume dairy foods at all?

Some claim that dairy foods are unhealthy for humans to eat and they should be avoided completely. The two main reasons given for this are that milk contains too little magnesium in ratio to calcium, and that 'milk is intended for baby cows, not people'.

Regarding the first point, the fact that milk does not contain much magnesium does not diminish its value as a source of calcium and protein. Magnesium is plentiful in dark green vegetables which should be eaten as part of the food plate anyway.

Regarding the second point, milk may be intended for baby cows, but this does not automatically make it bad for humans. In fact, unless someone is clearly diagnosed as lactose intolerant, then there is evidence for the positive health benefits for dairy products – particularly fermented foods or ‘probiotics’.

Probiotics

Probiotics are fermented foods such as cottage cheese, pickles, natural yoghurt or yoghurt-based drinks containing live cultures of ‘friendly’ bacteria. In principle, if you have enough of these products, the friendly bacteria become established in your large intestine, thus displacing more harmful bacteria or fungal infections, stopping them from proliferating and causing ill health. Probiotics can also act to prime your immune system, making it harder for bad bacteria to cross from the gut into the blood.

The effectiveness of probiotic products is the subject of ongoing research, but evidence is mounting that they can benefit health, particularly if you have been on a course of antibiotics, which can destroy existing intestinal bacteria. But probiotic drinks are expensive, so if you notice no difference to your health after several weeks of taking them, you are probably wasting your money.

8. Healthy fats

We should aim to eat 2–3 portions per day.

Examples of portions include: 2 teaspoons of olive oil, oily fish (size of a deck of cards), ½ an avocado, 2 tablespoons of nuts or seeds.

Healthy fats play an essential part of any diet, with many important functions:

- Fats provide energy in a compact, easily digestible form
- Fats are important for taste, texture and flavour of foods. A diet entirely devoid of fats is extremely bland and unpalatable
- Fats are integral to cell membranes and are important for growth and repair of body tissues
- Fats are a major constituent of brain tissue and insulation of nerves
- Fats and oils contain the fat-soluble vitamins A, D, E and K
- Omega 3 and omega 6 fats, essential fatty acids (EFAs), are vital for a wide range of functions
- Body fat offers insulation and protection, and it is a store of energy that we can call on when the energy in our daily diet is not sufficient
- Body fat is particularly important in women for production and regulation of hormones

This is quite a list, so it is not surprising that, if you follow a very low fat diet, you may experience ill health such as poor skin and hair condition, reduced vitamin status and hormonal deficiencies. Fats are vital, but they have to be healthy fats and they have to be eaten in the right quantity.

How can I tell healthy fats from unhealthy fats?

The easiest rule to follow is whether the fat is liquid or solid at room temperature. Fats that are mainly liquid at room temperature are classified as unsaturated. Examples include: sunflower oil, olive oil, nuts, seeds and oily fish like mackerel or salmon. Unsaturated fats are therefore mainly vegetable oils and fish oils. Unsaturated fats are generally classified as ‘good’ fats because they have a beneficial effect on blood lipoprotein (‘cholesterol’) levels and they also contain good levels of omega 3 and omega 6 EFAs. Unsaturated fats can be further subdivided into monounsaturated and polyunsaturated, but the distinctions start to get too complicated for our purpose here.

Fats that are mainly solid at room temperature are classified as saturated. Examples include: butter, lard, cheese, suet and fat on meat such as bacon and steak. Saturated fats are usually animal fats, although tropical fats – palm oil and coconut oil – are exceptions to this rule. Pizza and cheese are the biggest food sources of saturated fat in the diet, and other dairy products and meat products are also major contributors (Harvard School of Public Health, 2012).

Saturated fats are generally classified as ‘bad’ fats because they have a harmful effect on your blood lipoprotein levels.

Fats, cholesterol and heart disease

Blood cholesterol level is considered to be a major indicator for developing heart disease and you will probably have had your cholesterol measured by your doctor as part of a regular health check. The term 'blood cholesterol level' is commonly used, but not really correct. Rather it is the *carriers* of cholesterol in the blood that are being measured, and these are called lipoproteins. Increased levels of LDLs in particular are linked with fatty deposits clogging the insides of arteries, eventually leading to a blockage. If a blockage happens to build up in the vital coronary arteries that supply the heart with blood, then angina or even a heart attack can result. This is the concern with saturated fats: they are the ones that increase your LDLs, encouraging clogging of the arteries, leading to heart disease. Unsaturated fats don't seem to increase LDLs; in fact they may actually reduce levels.

At this point you may be thinking: why don't I eat all unsaturated good fats and eliminate all saturated bad fats from my diet? Although this is an obvious conclusion, this is not actually possible because all foods contain a mix of both types of fat. Even 'good' fats in fish, nuts, or olive oil contain some saturated fat, though they are much lower than cheese or meat. Similarly, saturated fats like cheese, butter or lard all contain some unsaturated fat too. The categorisation in the first place is made based on which type of fat is the higher percentage.

Advice about good and bad fats has been the standard for many years now, but the links between dietary fats and heart disease have never been certain. Official advice is still to reduce saturated fats in favour of unsaturated fats (British Heart Foundation, 2014), but do not be surprised if these guidelines are modified in the future. Realistic practical advice is not to try and eliminate, but to shift your balance of fats from cheese, meat and dairy to fish, nuts and oils. And when you do eat animal fats, choose better quality products, not processed.

Which is healthier: butter or spread?

From the preceding argument, it should be clear that butter, with a high saturated fat content (around 66%) is an unhealthy choice compared to spread with a much lower saturated fat (around 27%). In addition, many brands of margarine will offer:

- A 'light' option that has reduced total fat content and roughly halves the calories
- A 'cholesterol-lowering' option containing plant sterols. These are chemicals found naturally in vegetable oils, fruits and vegetables that reduce the amount of cholesterol absorbed by your gut, hence reducing levels of LDL (bad) cholesterol in your blood
- An 'omega 3' option with added omega 3 essential fatty acids

Yet even with all these arguments, there are still some positive points for butter. It certainly tastes better, no question. It is more stable at high temperature and therefore more suitable for cooking. Butter naturally supplies significant amounts of omega 3 EFA, and it has minimal processing compared with spread and therefore contains no harmful 'trans' fats (see section 9).

Omega 3 and omega 6 EFAs

Omega 3 and 6 EFAs are specific types of fat found predominantly in unsaturated oils from fish, seeds and nuts.

An adequate intake of omega 3 EFAs reduces blood clotting, having the effect of ‘thinning the blood’ and helping to lower blood pressure. This in turn reduces your chances of getting a blocked artery or suffering a heart attack. There are also anti-inflammatory effects which can be beneficial to your joints, and there may be an association between dietary omega 3 and alleviating depression.

Omega 6 EFAs are vital for healthy structure and functioning of cell membranes and particularly important for healthy skin. They may also reduce (bad) LDL levels.

A typical diet in today’s developed countries is plentiful in omega 6 because of widespread use of vegetable oils. In contrast, omega 3 consumption is more limited and authorities agree that we would benefit from a higher intake. The most effective way to do this is to include 2–3 portions of oily fish like mackerel or salmon in the diet each week. If you don’t like the taste of oily fish, or your budget and culinary skills won’t stretch to having 2–3 servings per week, then there are other options. Seeds and nuts also contain significant quantities of omega 3, but in the less potent ‘short chain’ form found in vegetable sources. Many products like spreads, yoghurts, bread and eggs now have omega 3 added as part of the production process (extra omega 3 in eggs comes from mixing flax and hemp seeds into the chicken feed). And if none of this tempts you, then fish oil supplements such as traditional cod liver oil can be a convenient alternative. If you find the fish flavour too unpleasant then capsules with a tasteless coating are now widely available. It should be noted that large doses of omega 3 EFAs can have a significant effect on blood clotting times. Anyone already taking blood thinning medication should consult their doctor before using fish oil supplements.

The main points from this section are:

- Limit your total portions of healthy fats to 2–3 per day
- Shift your balance of fats from cheese, meat and dairy products to fish, nuts and oils to reduce intake of saturate fats and increase your intake of unsaturated fats
- Regularly eat fats that are a good source of omega 3 and 6 EFAs. Oily fish like salmon and mackerel are particularly good for Omega 3

9. Unhealthy fats and refined sugars

The smallest segment of the food plate is for foods high in unhealthy fats and refined sugar. We should aim to eat them in only small quantities – 1 portion per day – or not at all.

Examples of portions include: 1 biscuit, 1 slice of cake, 1 can of soft drink, 25 g (1 oz) bag of crisps, 1 small bowl of chocolate pudding, 125 ml glass fruit juice or smoothie.

Here are some examples of common foods containing high levels of unhealthy fat, refined sugars, or both. Notice how many of them are processed products which are cleverly marketed to us using massive advertising budgets.

- Foods high in unhealthy fats include: processed meats, processed cheeses, pies, chips, crisps, deep fried foods, and many ready meals or takeaway meals
- Foods high in refined sugar include: jam, marmalade, sugar in tea and coffee, and fruit juices (if you have more than 1 portion per day). Commercial breakfast cereals and cans of soft drink are a major source of refined sugar in the average diet
- Foods high in both unhealthy fats and refined sugar include: cakes, doughnuts, flapjacks, muffins, pastries, puddings, biscuits, ice cream and chocolate. The combination of fat and sugar is particularly hard for us to resist. They feed our natural cravings and stimulate the same areas of the brain as addictive drugs, although whether they are truly addictive lacks clear evidence

We are advised to eat such foods sparingly because they are very high in calories that are easy to digest (very ‘fattening’) but often low in vitamins, minerals and fibre. However, we find it hard to follow this advice because they are so tasty and so widely available. No wonder it is so easy to gain weight. Some self-discipline is called for.

Processing, hydrogenation and ‘trans’-fats

Processing of fats in particular can have health implications. More than 100 years ago, food manufacturers worked out how to make vegetable oils more solid or spreadable by a factory process called hydrogenation. This is useful to the manufacturer because vegetable oils are inexpensive compared to animal fats, so products like cakes and biscuits can be made more cheaply. Hydrogenation also increases the stability of the fat, improving the shelf life of the product in the supermarket. However, the hydrogenation process results in some harmful ‘trans’-fats being present in the food. Trans-fats have just a slightly different molecular arrangement to unprocessed fats, but this is enough for your body to treat them in a different way, leading to increased (bad) LDL and possibly a number of other health consequences. You are well advised to eliminate trans-fats from your diet.

Food products that may contain trans-fats are: cakes, biscuits, ready meals, chocolate, fries, crisps and ... spreads. A good rule is to be cautious with any highly processed products. But it is hard to tell for certain. The best way to tell is to look for ‘hydrogenated vegetable fat’ or similar on the list of ingredients. Trans-fats are sometimes, but not always, identified specifically on the nutrition label.

Governments and food producers have long been aware of the problems with trans-fats and, to a large extent, have changed laws and manufacturing processes to reduce them to negligible levels. Most premium brand spreads sold today contain only tiny amounts. But cheaper brands can still be a concern. Check the label to be sure.

Is sugar to blame for health problems and obesity?

Many people have speculated as to whether sugar is more damaging to our health than fat, and whether sugar is the main culprit in the modern epidemic of obesity and type-2 diabetes. The idea was first proposed over 40 years ago (Yudkin, 1972), and is gaining momentum once more due to popular publications (Lustig, 2012). The basic arguments are as follows:

- Sugar is now added to many foods – particularly processed foods, drinks, confectionary and low fat products where sugar is used to replace flavour lost through the removal of fat. Although it is not addictive in the strict sense, sugar has an addictive quality, making it hard for us to resist
- Sugar is a refined product that digests quickly and raises blood sugar quickly (high GI). It therefore stimulates a large insulin release and, if sugar is used excessively, the body will become obese, insulin resistant and eventually type-2 diabetic
- High-fructose corn syrup (HFCS) in particular has been identified as a problem, although the research to date suggests its effect is no different to usual sugar (sucrose), which is a blend of glucose and fructose anyway. HFCS is cheap to produce and the high fructose content makes it very sweetening, hence it's an obvious choice for soft drinks manufacturers. Fruit juice is also very high in fructose, and despite its healthy image, really is no more than another source of refined sugar
- Fructose is metabolised primarily by the liver, and large amounts arriving at once from a refined, sweetened product, can make it hard for the liver to cope. Non-alcoholic fatty liver disease (NAFLD) is caused by a build-up of fat within the liver cells. It is usually seen in people who are overweight or obese (NHS, 2014). NAFLD is now quite common in the UK and links are being made between the condition and high intakes of refined sugars – particularly fructose
- Although fruit contains fructose, it is naturally combined with lots of fibre when eaten as the whole fruit as nature intended, and the fibre slows the release of fructose so that your liver can metabolise it comfortably

It is hard to say to what extent such arguments are true or how significant the effect might be. Research continues, with the current general consensus indicating there is indeed a problem with eating too much sugar (Tappy & Le, 2010).

Whatever the truth is about fat and sugar, and which one is the main cause of our modern dietary ills, it doesn't actually change healthy eating advice, which is to reduce both to a minimum anyway. In fact, it may be the combination of sugar and fats found uniquely in processed foods that is ultimately found to be the key player in driving obesity.

Artificial sweeteners

Artificial sweeteners are commonly used in 'diet' soft drinks. There are also sweeteners that can be used in coffee and tea, or sugar substitutes to sprinkle on your breakfast cereal. These products can certainly be useful to cut down sugar and calorie intake whilst still satisfying a sweet tooth. Just be aware there is some concern whether they interfere with natural appetite control. The theory is that your body expects calories from the sweetness it tastes, but actually receives none. The brain then re-calibrates your appetite, asking for more sweet food until it gets the calories it expects. A sensible approach is to use artificially sweetened products in moderation.

10. What to drink

A healthy guideline is to drink about 1–1.5 litres (6–8 glasses) of plain water each day, enough to prevent thirst.

Your body naturally loses fluid each day just through natural processes and functions. Most fluid is lost as:

- Sweat
- Urine
- Faeces
- Water vapour in breath

There may be other less significant fluid losses from tears, bleeding, mucus, etc. On a typical day these daily losses total about 2–2.5 litres, so it follows that you need to replace this quantity of fluid to remain hydrated. Of course, factors such as larger body size, hot weather, exercise or illness can increase this fluid loss, so consider 2–2.5 litres as a baseline. You may need considerably more.

However, note that food itself contains water. So even if you drank nothing in a day you would still obtain about 1 litre of fluid just from eating; more if you consume high quantities of fruit and vegetables. Hence we arrive at the general guideline of drinking 1–1.5 litres (about 6–8 glasses) of plain water each day.

Drinking more water than you need has no additional benefits. You will simply excrete it as urine a while later and it does no harm. Be aware that there are extreme circumstances usually associated with illness or endurance races, where too much water can dilute the sodium in the blood causing a serious condition called hyponatraemia. Consult a dietician if you have any concerns.

If you don't like the idea of drinking just plain water, remember that most drinks consist mainly of water and, contrary to received wisdom, will rehydrate to some extent. This includes tea, coffee, cans of cola, beer, milk or fruit juice. They may not be ideal, because of their caffeine, sugar and alcohol content, but they do all contribute to fluid intake and can keep you hydrated.

How can I tell if I am fully hydrated?

Keeping hydrated is important for most bodily functions including circulation, cell metabolism, digestion, temperature regulation and elimination of waste. If you become dehydrated, then it will affect the efficiency of all these processes. Your body will detect mild dehydration and this will make you feel thirsty, which will prompt you to have a drink and rehydrate. If you are losing larger volumes of fluid as sweat because of exercise or humidity, you will feel thirstier and drink more – a simple feedback loop that has served humans well for thousands of years.

If you don't drink and dehydration becomes more severe, it starts to affect blood circulation, saliva production and urine volume. You will notice symptoms such as headache, nausea, dry mouth and darker coloured urine (clear or pale 'straw coloured' urine is a

reliable indicator of hydration). But usually you will feel thirsty and drink long before these symptoms appear. Severe dehydration is more commonly the result of illness, excessive alcohol consumption or extreme circumstances when no water is available.

So if you don't feel thirsty and your urine colour is clear or pale yellow, you can be confident you are fully hydrated (note: if your urine is bright yellow after taking a vitamin supplement, don't worry, it's side effect of vitamin B₂ not dehydration).

Can sports drinks help me to rehydrate?

Sports drinks labelled as 'isotonic' or 'hypotonic' may be able to hydrate you a little faster than water. This is because they contain small amounts of sugars and salts (electrolytes) that help absorption of the water from the stomach into your blood and cells. The sugar content also supplies some energy if you are training. However, it is debatable whether the small advantage they give is significant for most exercise sessions unless they last longer than 1 hour.

Some sports drinks come under the heading of 'energy drinks' because of their high sugar content. Although they do supply energy, the greater sugar content slows absorption of fluid from your stomach and their ability to rehydrate you quickly is reduced. Most energy drinks contain significant amounts of caffeine.

What about caffeine drinks?

Drinks such as coffee, tea, and cola all contain caffeine. Caffeine is a stimulant drug that occurs in the seeds (e.g. coffee beans) and leaves (e.g. tea leaves) of some plants. It is also added to cola and most energy drinks. Caffeine acts on our central nervous system, making us more alert, feel more energetic and improving athletic performance, so it is not surprising that most of us like to have our daily 'fix'. Along with alcohol, caffeine is the most widely consumed drug in the world.

Individual tolerance to caffeine varies widely. Some people will feel little effect, whereas others experience sleep disorders and anxiety. Your own experience makes you the best judge here. However, the stimulant benefits from caffeine also have a downside:

- It is a known diuretic. In other words, caffeine stimulates increased urine production, which may lead to dehydration. However, the significance of this is debatable. Caffeine drinks like coffee, tea or cola contribute to fluid intake because they are mostly water anyway, and this intake typically exceeds the fluid loss from the diuretic effect. Also, regular consumers of caffeine seem to develop a tolerance to its effects, making fluid loss virtually negligible
- Like any stimulant drug, a caffeine dependency can develop and withdrawal can be hard. People who stop taking in caffeine typically experience headache, fatigue, lack of concentration and lethargy. If you have a few days with nothing important to deal with, it can be revealing to try going 'cold turkey' and find out how dependent you might have become

- Excessive caffeine intake is, along with many other things, associated with an increased risk of heart disease

So the sensible advice with caffeine drinks is to have them regularly in moderation or not at all. If you regularly drink coffee, tea or cola, 2–3 a day is acceptable, and they will contribute some useful fluid to keep you hydrated (though not as much as if you drank plain water). Alternatively, decaffeinated coffees and teas are widely available.

Should I drink alcohol?

There is absolutely no need for humans to drink alcohol. It serves no nutritional purpose, it is toxic and if you drink enough alcohol it can kill you. In the short term, alcohol is a diuretic and will dehydrate the body. Compare the symptoms of dehydration (headache, nausea, dry mouth, etc.) to those of a hangover and you find they are very similar. Alcoholic drinks are also high in calories and contribute significantly to gaining body fat. Then there is a whole range of other associated problems:

- Decreased sexual performance, especially for men
- Increased risk of cancer of the throat, oesophagus or larynx
- Increased risk of breast cancer in women
- Increased risk of stroke, heart disease and heart attack
- High blood pressure
- Liver disease such as cirrhosis
- Pancreatitis
- Reduced fertility

Having said all this, alcohol in moderation can actually have some positive health benefits. It can help people to cope with stress, relax, unwind and be more sociable, there is a small but noticeable blood thinning effect, and certain drinks like red wine, beer and stout contain vitamins, minerals and antioxidants. So if a daily glass of wine or beer is important to you it isn't essential to give it up. Instead, the key phrase here is: in moderation.

What is a moderate alcohol intake?

The easiest way to check that you are keeping to a moderate intake is to stay within your 'lower risk guidelines' per day (NHS, 2012).

- Women should not exceed 2–3 units per day. This is roughly equivalent to a 175 mm glass of wine
- Men should not exceed 3–4 units per day. This is roughly equivalent to a strong pint of beer, lager or cider

There are now various websites and phone apps to help you check how many units you are drinking. The men's guideline is higher than women's simply because of a larger average body size. Alcohol affects each individual differently depending on circumstances, amount of food in the stomach (which slows absorption) and even genetics. Note also that staying within the lower risk guidelines does not guarantee you are legally safe to drive.

11. Reducing salt intake

If you would like to avoid having high blood pressure (hypertension), one dietary change you should try is to eat less salt. This has been shown to give modest reductions in blood pressure for most people, which in turn will decrease your risk of health problems such as heart disease and stroke.

The sodium in salt (sodium chloride) is important for fluid balance within your body. If you eat too much salt your body tends to retain more water, which leads to an increased blood pressure. The problem is that salt is a common ingredient in foods. It is a traditional preservative used in canned products, and we seem to crave the flavour and taste. Much of the salt we eat is already in foods such as bread, breakfast cereal and microwave meals. Current guidelines suggest we should eat just 6 g of salt per day, which is about a teaspoon full. But unless you are particularly careful about your intake already, you are likely to be eating double that amount at around 11 g per day (NHS, 2012).

How can I cut my salt intake?

A few simple steps can help you to reduce your salt intake. Firstly, don't add salt when cooking, or if it is essential to the recipe, keep it to a minimum. Next, don't add extra salt to your food at the table. If you have developed a taste for salt and find this hard, then cut down gradually over a number of weeks. If you really can't kick the habit of adding salt to your food, one further option is to use a low sodium alternative that has the same taste, but only one third of the sodium. Lastly, avoid foods that are obviously high in salt, such as anchovies, bacon, cheese, crisps, ham, olives, pickles, salami, salted nuts, salt fish, smoked meat and fish, soy sauce, stock cubes and yeast extract. Foods containing monosodium glutamate (MSG), a flavour enhancer used in savory dishes, should also be avoided. These simple measures will make a significant difference to your salt intake. However, to really cut down, use the nutrition labels on food packaging. Salt is in so many everyday foods where you might not expect it. By reading the labels you can select lower salt options reliably and stay within the 6 g per day limit.

12. Shopping, cooking and eating out

So far we have outlined the key principles of healthy eating. But they are no use unless you can apply them easily on a daily basis – which brings us on to shopping, food preparation and eating out.

What do I look for when shopping?

Food manufacturers and supermarkets are very good at selling us products that are not necessarily healthy, so when you go shopping you need to be prepared. Have a list based around balanced meals and whole foods and then apply a little discipline to stick to your list. Remember, what you buy will fill your refrigerator for the next week and forms the basis of what you will eat.

Healthy foods actually look like proper food. You can tell they came from something that was once living: fruit, veg, cereal grains, nuts, fish, meat and poultry. They are fresh (or possibly frozen) and naturally coloured. Dieticians use the phrase ‘good food goes off quickly’ – emphasising the importance of freshness and the lack of processing and preservatives. In contrast, unhealthy foods look processed, packaged and artificial. They are likely to be high in processed fats and refined sugars, and they probably contain salt, trans-fats, chemical preservatives, colourings and flavourings to make them more appealing and prolong shelf life.

Most supermarkets follow a similar floor plan, with the freshest food kept on the shelves closest to their storerooms, because they have to restock them regularly throughout the day. You can check next time you are there. Soon after the entrance you will encounter fresh produce – fruit and vegetables. Then if you stay to the perimeter shelves, you will find fresh fish, meat and poultry, dairy, eggs, usually finishing with the bakery and frozen foods just before the checkout. Frozen vegetables are good in terms of freshness because of the speed with which they are frozen and preserved following harvesting. Items with an extended shelf life, such as tinned foods, breakfast cereals, biscuits, sugary drinks, sweets and snacks tend to be in the middle of the supermarket because they need restocking less frequently.

So an easy rule when shopping is to prioritise fresh food from around the outer shelves and counters of the supermarket. Better still, if you have the time, buy your food from a local market.

How do I use food labels?

Food labels can be useful for checking specific details. For example, the list of ingredients will tell you if the product contains hydrogenated fats, added sugar or salt. If you have an allergy to a particular food then you can check the ingredients to make sure you don’t eat that food by mistake. Staple foods such as wheat, eggs and milk are in many products where you might not expect them.

The nutrition label can be used to check exact amounts of energy, fats, carbs and proteins in the product and whether it supplies significant amounts of calcium, salt, fibre, etc. Other labelling codes using a ‘traffic light’ colour system or a ‘guideline daily amount’ (GDA) system can be useful for comparing the calories, total fat, saturated fat, sugar and salt

content of different products. There could also be other helpful information such as the GI of the food, or specific health claims such as 'can help to lower cholesterol'.

All of this information can be useful to help you select healthier options when shopping. But if you feel overwhelmed with the mass of figures, and don't want to carry a reference book and calculator around the store with you, then not to worry – it's not essential. Just stick to the rules about buying fresh whole foods and eating according to the food plate and the figures will take care of themselves.

What are the healthiest cooking methods?

Once you have stocked your cupboards and refrigerator with healthy foods, a little thought needs to be devoted to how you prepare them. For example, it is wise to choose a cooking method that does not add unnecessary fat. Grilling meat with just a drizzle of olive oil is a more sensible choice than deep frying or roasting which results in a much higher fat content. Deep fried foods are a known source of damaging free radicals, caused by the frying oil being oxidized when it is repeatedly heated at high temperature. If you do occasionally fry food it is actually best to use a solid, saturated animal fat like butter or lard because they are much more stable at high temperature and less likely to oxidise compared to unsaturated oils.

The cooking method you choose is also important for preserving the vitamins, mineral and phytochemical content of the food. Contrary to popular belief, eating all raw vegetables is not necessarily the healthiest choice. Boiling vegetables for a long time will certainly destroy some of the vitamin C content because it is unstable and easily degraded through exposure to heat. But other vitamins, such as beta carotene (which your body converts into vitamin A) can actually be made more accessible from cooking. A sensible compromise is to lightly steam or stir fry veg. If you boil veg as part of a meal, use the water to make a stock or gravy. Microwave cooking is actually quite good for preserving vitamin and mineral content of foods. However, this should not be used as an excuse to eat lots of microwave ready-meals.

You should wash fruit and veg thoroughly before eating them. Sometimes peeling is recommended (NHS, 2012). This ensures they are safe to eat by reducing the chances of bacterial infection or food poisoning. It may also be important to wash fruit and veg because of the pesticide residues. However, in most cases the presence of the residues found would be unlikely to have had any effect on your health (HSE, 2012).

What about eating out and takeaways?

It can be hard to follow a healthy eating plan when eating out or ordering a takeaway. But there are some simple rules you can follow to help:

- At the restaurant, have two courses, not three. This could be a starter then a main, but miss out dessert. Or alternatively, skip the starter if you particularly look forward to dessert
- Order a side salad with the main course. This is a great way to help meet your veg intake
- Avoid dishes that are deep fried

- If someone asks 'do you want cheese with that?' just say no
- Avoid creamy sauces on your steak or pasta dishes, or mayonnaise on your sandwich
- At the pizzeria, choose a traditional Italian-base pizza. This has much less fat than a deep pan or stuffed crust version
- If the dish is served with a choice of fried, boiled or mashed potatoes, avoid the fried option to help reduce fat

And finally, remember that eating out should be a pleasurable, sociable occasion, so if you lapse a little it doesn't matter. Just get back on track the next day.

13. Effective weight management

Finally we will look at how to manage weight long-term without resorting to the latest trendy idea or diet. There is no need for a system or secret or fad when it comes to losing fat and maintaining a healthy body weight. On the contrary, it is just a matter of following the principles we have already discussed in the previous sections.

What is a healthy body weight?

Aside from looking in the mirror, you can use body mass index (BMI) to check if you are a healthy weight. The calculation is as follows:

$$\text{BMI} = \text{weight (kg)} \div \text{height}^2 \text{ (m)}$$

For example, if you weigh 87 kg and your height is 1.81 m, your BMI is:

$$87 \div (1.81 \times 1.81) = 87 \div 3.276 = \underline{26.5}$$

Then compare the figure to the table:

BMI	Category
Less than 19	Underweight
19–25	Healthy weight
25–29	Overweight
More than 30	Obese

So a BMI of 26.5 falls in the ‘overweight’ category. If you lost 7 kg (roughly one stone) then the BMI would reduce to 24.4 and be in the ‘healthy’ category, leading to decreased risk of high blood pressure, heart disease, type-2 diabetes and arthritis in your knees and hips as you get older. Note that BMI calculation doesn’t work too well for trained people who carry a lot of their weight as muscle instead of fat.

Waist measurement

Another useful measurement is your waist circumference. This is particularly indicative of whether you store fat centrally, around the vital organs. Position the tape measure midway between the bottom of your ribs and the top of your hips. The table that follows gives guidelines:

	Increased health risk if your waist circumference exceeds:	High health risk if your waist circumference exceeds:
Women	80 cm (31.5 inches)	88 cm (34.5 inches)
Men	94 cm (37 inches)	102 cm (40 inches)
(NHS, 2012)		

If you do have a larger waist circumference than recommended, then it is a further indication that you need to make some lifestyle changes and gradually start to lose some weight.

Losing weight gradually

We know from the energy balance equation that, to maintain weight, calories eaten must equal calories expended, not necessarily exactly every day, but certainly over the long term. To lose weight it follows that we need to create an energy deficit, with less being eaten than is being expended. But if this energy deficit is too severe (i.e. if you go on a strict diet) then there are lots of negative health consequences. Moreover, a severe deficit is not sustainable. Instead, your aim should be a modest reduction in calories, giving steady weight loss, but avoiding all the problems of dieting and then relapsing again.

What is the easiest way to reduce calorie intake?

A modest reduction in calories can be easily achieved using the following measures:

- Use portion control. Become familiar with portion sizes and stick to the food plate as a guide to how many portions should be eaten
- Use a smaller dinner plate. A simple way to implement portion control is to replace the large 30 cm (12 inch) dinner plates in your cupboard with smaller 23 cm (9 inch) ones. This measure has been shown to reduce the quantity of food prepared and served, and therefore reduce how much we eat on a daily basis
- Limit your intake of foods high in processed fats and sugars. This is where a majority of excess calories are consumed. If you don't cut your intake of these 'junk' foods it is hard to stick to your calorie count for the day. Have them as the occasional treat

Reading this you will probably argue, with some justification, that removing high fat and sugar foods will make you feel hungry all the time. But there are several steps you can take to help to control your appetite.

Appetite control

Much has been discovered recently about what controls our appetite and what makes us hungry. The results are surprisingly complex, with factors such as habit, emotions, stomach fullness, blood sugar levels and hunger hormones all playing a part. Without delving too deeply into the science, the following measures can help to control appetite and calorie intake:

- Have a structured meal plan to include breakfast, lunch and dinner each day. In particular don't miss breakfast. Missing meals triggers various hunger hormones which in turn cause you to crave high fat and sugar calories at the next meal. A healthy snack between meals can help to control appetite, but avoid snacking all the time
- Eat some protein at each meal. Adequate protein seems to suppress hunger and is another key to controlling appetite
- Choose unrefined complex carbohydrates. They are relatively bulky foods that help to fill the stomach, and they are also low GI which helps to keep you feeling fuller for longer
- Eat at least 5 portions of fruit and vegetables per day for the same reasons as above

- Take a normal meal and blend it with some water to make a soup. This blending into a soup makes the same meal slower to digest. It stays in the stomach, keeping it distended for longer. This leaves you feeling fuller for longer and less likely to snack before your next meal time
- Drink some water before each meal. You may have heard the idea that the body can 'mistake hunger for thirst' and that if you feel hungry, drink a glass of water and your hunger will subside. Whilst there is little evidence for this specific claim, it does seem that drinking a glass of water (500 ml) before meals reduces subsequent calorie consumption in that meal. This is not a massive effect, but the technique may help as part of an overall weight loss plan

Remember that this is all about steady fat loss, leading to a healthy body weight that is sustainable in the long-term. If you want to lose weight quickly then there are any number of diets that will work – but you do need to be prepared for the inevitable weight gain once the diet is finished. Of course, the other key part of weight control is to increase energy expenditure. Any activity or exercise will expend calories and can help on the 'debit' side of the energy balance equation. Also, as discussed in section 2, a resistance training programme will help to maintain muscle mass and boost metabolism, ensuring you lose fat, not lean tissue. If you would like to know more details about exercise and fat loss this is covered more extensively elsewhere in this series of guides.

14. Summary of main points

We began the 'need to know guide' by looking at the ways that a healthy diet can benefit your health. Now we are at the end, a little summarising might be useful to draw together the information covered, and to make good on the various claims made in the introduction.

Health benefit	Main aspects of healthy eating that help
Controlling your body weight in the long term	<ul style="list-style-type: none">• Portion control and timing of meals, so you eat the right amount of energy for your needs• Minimising processed foods high in fat and sugar• Choosing low GI unrefined carbohydrates• Moderating alcohol intake
Having more energy, better mood and concentration, and coping with the effects of stress	<ul style="list-style-type: none">• Portion control and timing of meals, so you eat the right amount of energy for your needs• Choosing low GI unrefined carbohydrates• Eating fruit and veg for the vitamins, minerals and phytochemicals
Having a stronger immune system to fight infection	<ul style="list-style-type: none">• Eating fruit and veg for the vitamins, minerals and phytochemicals• Including probiotic foods
Having a healthier heart and circulation, with normal blood pressure and blood lipoprotein ('cholesterol') levels, and less chance of a heart attack or stroke	<ul style="list-style-type: none">• Minimising processed foods high in fat and sugar• Reducing salt intake• Choosing healthier unsaturated fats• Moderating alcohol intake• Eating fruit and veg for their cardio-protective qualities
Reducing insulin production, controlling your blood sugar level and preventing type-2 diabetes	<ul style="list-style-type: none">• Portion control and timing of meals, so you eat the right amount of energy for your needs• Reducing frequency of meals and snacking between meals• Minimising processed foods high in sugar• Choosing low GI unrefined carbohydrates• Eating balanced amounts of proteins, fats and carbs at each meal• Talk to your GP about an intermittent fasting approach to eating
Reducing levels of the hormone IGF-1 and reducing your risk of getting certain forms of cancer	<ul style="list-style-type: none">• Reducing frequency of meals and snacking between meals• Avoiding excessive quantities of protein• Eating fruit and veg for their cancer-protective qualities• Talk to your GP about an intermittent fasting approach to eating

And finally, if you try and change everything about your diet all in one go you are likely to fail; it is much better to just make one small change and stick to it. A favourite starting point

is to eat one or two additional servings of vegetables or fruit each day; nothing else. The point is that it's just one thing to think about – one focus for the mind – rather than worrying about meeting a long check list. Changing just one thing increases your chances of success, and success then motivates you to make the next small change when you are ready.

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