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THE LOW CARB HIGH FAT or KETOGENIC DIET

What is the Low Carb High Fat diet?

LCHF or a ketogenic diet is an evidence-based approach to sustainable weight loss that does not depend on deliberate caloric restriction (i.e. being hungry) or high levels of exercise. The only restriction is carbohydrates- usually aiming at less than 25 grams per day. It works- high quality studies have shown that a LCHF diet *without calorie restriction* is as good, if not better than a low fat diet with calorie restriction for weight loss.(1) When calories are also restricted through eating only to appetite twice daily, the benefits are enhanced for the LCHF diet- particularly with patients who are very metabolically challenged (established diabetes or insulin resistance).(2) Hence, the major advantage of a ketogenic diet is that weight is lost more easily and sustainably.

Low carb diets go beyond weight loss. There is both a strong theoretical basis and real-world high quality studies that demonstrate that this simple lifestyle intervention can reverse the underlying cause of many western diseases- which often come under the umbrella of the “metabolic syndrome”.

The metabolic syndrome is simply a cluster of problems that occur when insulin levels are too high. Obesity, high blood pressure, abnormal cholesterol and high blood sugar are all linked to high insulin levels. These problems are strongly connected to the risk of chronic diseases like type 2 diabetes, heart disease, stroke, dementia and even cancer. Most doctors do not believe in any “panacea” for good health, but the fact that one simple lifestyle intervention can address all these problems via their common cause of high insulin is about as close to a panacea as it gets.

IF YOU ARE SHORT OF TIME

THE 4 MOST IMPORTANT PAGES IN THIS DOCUMENT ARE:

Induction- Learning What to Eat (Page 7)

The Low Carb List (Page 8)

Induction Food Diary (Page 9)

The CHECKLIST (Page 10 and following)

Pages 2-5 deal with WHY you would do a low carb diet

Why isn't LCHF considered Mainstream?

While it has clearly been recognised as an effective means of weight loss and reversal of poor metabolic health, (3,4) most patients consult their doctor about it for a few reasons.

IT GOES AGAINST THE CURRENT DIETARY GUIDELINES

The current Dietary Guidelines have inherent conflicts of interest, have ignored important new evidence and clearly have NOT worked. (5) A well-formulated LCHF diet is replete in micro-nutrients. (6)

IT INVOLVES HIGH FAT- STRIKING UP FEAR ABOUT FAT, CHOLESTEROL AND HEART DISEASE

Recent evidence shows that fat intake is not associated with stroke or heart disease- the old theory of fat being deposited in the arteries, called the "Diet-Heart hypothesis" has been debunked.(7) Just because fat is found in plaques that block arteries, doesn't mean the fat is the cause. All the important markers of lipid health improve on a well-conducted LCHF diet, and it has been shown to reverse "metabolic dyslipidemia". (8-12)

IT USUALLY INVOLVES MORE RED MEAT INTAKE- RAISING CONCERN ABOUT BOWEL CANCER

The association between red meat intake and bowel cancer is weak, and based on observational studies of very poor quality.(13,14) This means that many other factors other than red meat intake are not controlled for (poor recall, concomitant alcohol intake, smoking), that could be responsible for the observed slight increase in bowel cancer. High insulin levels far out-weigh red meat intake for increasing cancer risk.(15)

IT MAY INVOLVE A LOWER FIBRE INTAKE- RAISING CONCERN ABOUT CONSTIPATION

Fibre is undigestible food that stays in the gut. Therefore it bulks up stool and provides nutrients to gut bacteria. Contrary to popular opinion, Fibre may actually be a CAUSE of constipation.(16-18) Animal and human studies have shown that Fibre can alter "transit" time for food to get through and be eliminated as faeces. But when fibre intake is studied in human subjects, lower intake has actually been shown to resolve symptoms that people complain of (bloating, constipation, bleeding, straining).(19) Some low carb foods are actually high in fibre.(6)

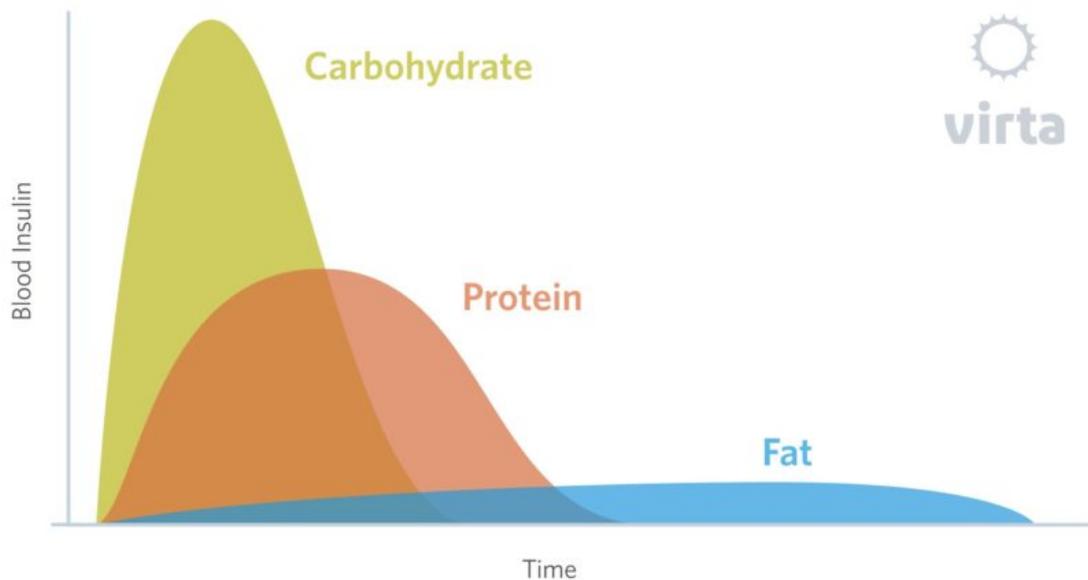
There may be many more questions you have in this space, and these will be addressed with reference to the latest medical science.

One excellent resource to answer questions regarding the evidence-base for LCHF diets and address the potential health concerns raised by opposition to the diet can be found at the Diet Doctor website.

<https://www.dietdoctor.com/low-carb/science>

How does it work?

The concept is that a low carbohydrate diet leads to changes in the release of the hormone **Insulin**, released from the pancreas, which is the major controller of how energy from food is used and whether fat can be burned as fuel. Insulin locks down our fat stores, and is important in times of famine to help us survive. We are very far from famine in modern society, and insulin reduces our ability to lose weight. Therefore to lose weight- we must reduce insulin levels.



By far the strongest stimulus for insulin secretion is carbohydrate intake. If carbohydrates are restricted below a certain level, which differs between people but is generally under 25g/day, the body enters a healthy state of fat-burning known as ketosis.

Calories are NOT counted on a Ketogenic diet because appetite is well controlled by the changes to hormones that create hunger, and by increased ability to burn fat in the state of ketosis.

The first goal to start this diet is to identify the moderate and high carbohydrate foods you eat, and eliminate them. Carbohydrates are more widespread in foods than you might think. (See p7)

Who needs to be on it?

Reducing insulin levels is the absolute priority in people who have the “**metabolic syndrome**”, which is caused by their body’s response to carbohydrates- pumping out higher and higher amounts of insulin. The body becomes tolerant to the effects of insulin (just as we become tolerant to caffeine or alcohol and need more for the same effect). This is called “Insulin Resistance”, which causes patients to:

- Store body fat (especially around the organs and liver)
- Hold on to salt in the kidney, raising blood pressure
- Create an unhealthy profile of circulating cholesterol and fats
- Have a higher risk of stroke and heart disease
- Have a higher risk of many other associated conditions which involve damage from higher blood sugar- including Diabetes, Alzheimer’s Disease (often called Type 3 diabetes) and Osteoarthritis of the joints.

Just like Religion, diet can be a very emotionally-charged topic.

We should promote healthy debate in this field in order to expose the scientific truths of optimal nutrition. Although a low carbohydrate diet will enable most people to maintain excellent metabolic health, there are many clinicians who argue for an “everything in moderation” approach. This approach suits those who are unwilling to consider the scientific evidence demonstrating the effectiveness of LCHF, and it is a very vague statement. You could argue that “everything in moderation” gives us both health and disease in moderation. Health advice shouldn’t be so ambiguous.

All people should aim to avoid a high sugar diet, because the liver has difficulty processing fructose, leading to fat storage or “de novo lipogenesis” and the development of a fatty liver.(20) Once this fat develops, it starts to protect itself and it becomes very difficult to overcome (with a low fat, low calorie diet or even frequent, intense exercise). In fact, once this fat develops, a low carbohydrate diet must be strictly followed because all carbohydrates (including ‘wholesome’ complex whole grains) are seen as simple sugar by the body and cause high insulin levels that again make the body hold on to fat, and cause other problems.

But I am not overweight, why should I consider doing it?

You don’t have to be overweight to have the metabolic syndrome.

There are many people who are “viscerally fat”- where the fat is hidden around their organs. A sad number of people in Australia have the metabolic syndrome- an estimated 1 in 3 over the age of 25.(21)

There may be cases where it is beneficial in people who don’t have the metabolic syndrome. A low carbohydrate diet tends to mean that less processed (i.e. real) food is consumed. It reduces the spikes of blood glucose and the “**Advanced Glycation End-products**” or “AGEs”.(22) This is where glucose binds to proteins and renders those proteins dysfunctional. AGEs also promote inflammatory pathways that can lead to joint, muscle and tendon pains- this is why many people who see a Sports and Exercise Physician need to change their diet as part of the recovery process. It is why many Sports Physicians are prescribing an LCHF diet to themselves and their patients.

Why is it High Fat- isn't fat BAD for us?

The reason it is a "high fat" diet is that there are only 3 main nutrients- carbohydrates, fats and proteins (...sorry but alcohol doesn't count).

Fat is the most satiating of these, and it often co-exists with protein in unprocessed foods (e.g. Eggs, Meats, Cheese). When we eat these foods, fat provides the majority of energy density because it provides about double the calories per gram than either protein or carbohydrates. Protein is important and provides essential amino acids, but the goal is not a high protein intake. Remember that protein ALSO stimulates a moderate insulin surge, and therefore we should be aiming to prioritise fat to control insulin levels.

It is important to realise that fat, including saturated fats, are fine but ONLY if carbohydrates are kept low.

Research is now supporting the importance of relatively reducing pro-inflammatory fats called Omega-6 fatty acids (23,24). This involves supplementing with fish oil to tip the balance toward Omega-3 fatty acids, and avoiding seed oils and avoiding farmed fish or grain fed meat where possible.

Fats are also very satiating- meaning they make us feel satisfied and full without having to eat much. Re-learning what it means to be hungry is a very important part of eating your way out of obesity and the metabolic syndrome. Carbohydrates can trick the body into thinking it is still hungry via complex reward pathways in the brain and energy pathways of the hormonal system.

Phases of LCHF dieting- How long do I need to do this to see results?

If done properly, it takes 1-3 weeks to “keto-adapt”. This means that you become very good at eating and burning fat, instead of carbohydrates. Your body starts to be able to use fat for energy, and it can use the by-products of this (Ketones) to fuel the brain, instead of relying entirely on glucose (simple sugars that are released into the blood from the muscle and liver). You can test your Ketone levels using a finger prick test to test whether you are in nutritional ketosis. **Please keep in mind that this is completely different to keto-acidosis, which only occurs in Type 1 diabetes.** If you have any questions or concerns here, please ask your supervising doctor.

1. Induction

The first step is to educate yourself on Low, Medium and High carbohydrate foods. Keep a food diary for a couple of days that allows you to calculate your own carbohydrate intake (page 9).

A good summary of what to eat and not to eat can be found on page 7.

In the first week you will lose water and glycogen (our carbohydrate store in the muscles and liver), which are normally replenished with high carbohydrate intake. After this, once insulin levels are reduced, the hormones and enzymes that normally block fat burning are inhibited. However, during this transition period there can be reduced energy levels until fat burning becomes the predominant source of energy.

2. Weight loss and Insulin Control

Once keto-adapted, your ability to burn fat is enhanced and you will have more energy, as well as more satiety (less hunger). Ketones have been found to suppress appetite and also supply the brain as an alternative source of energy independent of glucose. During this phase, people commonly describe increased endurance, increased mental clarity and are able to eat two meals per day without feeling that they are hungry. This allows many patients to easily use intermittent fasting to enhance their benefit.

3. Maintenance and Choices

Most people take at least 6-9 months on LCHF to achieve their goals, and more insulin resistant patients take longer. Your health goals may include:

- Weight loss (25,26)
- Ceasing medication (for Cholesterol, Blood pressure, Blood sugar) (27)
- Improved insulin sensitivity, reversal of pre-diabetes or diabetes (8,28)
- Sleep quality, snoring and sleep apnoea (29)
- Improved fertility (especially in obesity and polycystic ovarian syndrome) (30)

Once you have achieved your goals, you can choose to either maintain strict LCHF for a ketogenic state (with some flexibility for social occasions) or increase dietary carbohydrates to a level that will suppress ketones but not cause weight gain and insulin resistance to re-develop.

INDUCTION- Learning What to Eat

Aiming for under 25g of carbohydrates daily is all you need to focus on with a low carbohydrate diet. The proportions of protein and fat are less important, but keep in mind that protein will stimulate insulin more than fat. **Use the low carb food diary (p10) to help you get started and identify pitfalls.**



SIMPLIFYING YOUR CHOICES

We can divide most foods into low (<5%), moderate (5-20%) and high carbohydrate (>20%) content. The table below shows some common examples- there are many more. You should aim only to consume low carbohydrate foods, and over the course of one day to accrue to less than 25 grams.

FOOD LABELS

It is important to practice looking at labels to identify the carbohydrate and sugar content of your food. Always use the “per 100g” column to make comparisons between foods and keep it simple. Beware- Sugar comes under many legal names and in many forms.

LIMIT YOUR FRUIT INTAKE

Fruit is seasonal and was not meant to be eaten all year-round. We can access fruit easily and it stimulates a surge of insulin. Some fruits are lower carb and these are outlined below. Fruit juice should never be consumed on a low carbohydrate diet because it is very high in fruit sugar.

ELIMINATE TEMPTATION

It is strongly recommended that you remove all foods that are high carbohydrate, and most foods that are moderate carbohydrate from your home. If you have a family and others do not need to utilise this diet it can be more difficult. In this case you will find you make the best and easiest choices by eating from your fridge, not your pantry.

SNACK IDEAS

A low carbohydrate diet involves intake of more satisfying, fatty foods, which reduces hunger. However, another important method of saving your will-power is having available snacks to prevent hunger from causing cravings and poor food choices. The best choices include:

- Macadamia nuts and almonds (only a handful)
- Deli meats, cheeses, or boiled eggs
- Celery and cream cheese (or other low carb dip), pork crackling, tuna in olive oil (and many more)

EATING OUT

This can make your carbohydrate intake harder to control. All-day breakfast using the eggs and extras menu, meat skewers, open kebabs, bun-less burgers and savoury curries without rice are all reasonable options. Pre-emptively decline bread or chips and ask for food to be cooked in butter instead of vegetable oils. Most sauces and dressings will have added sugar- try to avoid these.

THE LOW CARB LIST

LOW- EAT FREELY	MODERATE- LIMIT INTAKE	HIGH- DO NOT EAT
<p>MEATS FISH/SEAFOOD (fresh/canned) BEEF and LAMB PORK AND CHICKEN</p> <p>EGGS</p> <p>FULL CREAM DAIRY EXCEPT MILK- high in lactose (milk sugar) ALL varieties of cheeses Yoghurt- full fat unsweetened</p> <p>VEGETABLES- ABOVE GROUND Cauliflower Broccoli Spinach Avocado Asparagus And more...</p> <p>FRUITS Tomato, Cucumber, Avocado</p> <p>NUTS including Macadamia Almond Hazelnut</p> <p>FATS and OILS Butter, lard and ghee, extra virgin olive oil</p>	<p>CRUMBED MEATS E.g. Schnitzel</p> <p>FRUITS Tart Berries Raspberries, Blackberries best</p> <p>ALCOHOL Dry wine Spirits Low carb beer</p> <p>DARK CHOCOLATE >85% cacao</p> <p>NUTS highest carb are: Pistachio and Cashew</p>	<p>SUGAR The worst carbohydrate Lollies, chocolate, soft drinks, cookies, breakfast cereals, sweetened yoghurt</p> <p>COMPLEX CARBOHYDRATES Pasta Bread Rice Porridge/muesli/ cereals Other whole grains</p> <p>VEGETABLES- BELOW GROUND Potato Sweet Potato Carrots Beetroot</p> <p>FRUITS Highest carbohydrate fruits are Blueberries, Bananas, Stone Fruit</p> <p>Lentils, Corn and Beans</p> <p>OMEGA-6 RICH FATS Vegetable (seed) oils Pro-inflammatory including Canola, sesame, safflower oils, margarine</p>



Image Source: Dietdoctor.com

The LCHF Pitfalls and Checklist

1. Set up your environment based on the *Low Carb list*
2. Counting carbohydrates- Aim <25g/day (*Food Diary*)
3. Cut out sugar
4. Increase Salt intake to 7.5-15g/day
5. Eat to Appetite
6. Drinks- enjoy water, watch the milk, reduce alcohol
7. Measure Ketones, not just weight
8. Forgive lapses but learn from them
9. Regular medication review
10. Consider Adjuncts once established

ADJUNCTS THAT MAY HELP ONCE NUTRITIONAL KETOSIS ESTABLISHED

- Intermittent fasting- under medical supervision
- Exercise and Fuelling performance
- Supplements (and whole food alternatives)
- Increased Omega-3 intake (Reduced Omega-6)
- Metformin- an insulin sensitising medication

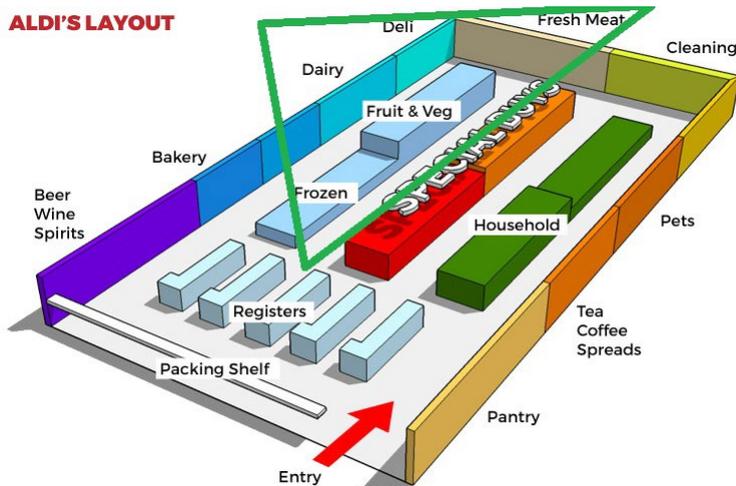
Please use all the resources available to you to do this properly. Wait until you feel that you can set up your environment and fridge to be able to do this by the book. If your house and your cafes/ dining spots are suitable for low-carb, it saves your will power for hard times like parties (which are mostly beyond your control).

1. SET UP YOUR ENVIRONMENT TO SAVE YOUR WILL-POWER

Habit formation and management is very important in changing diet behaviour.

We are all programmed by habits, which form as quickly as a few weeks. After this time period, LCHF food choices become automatic, however you may still need to manage old habits and cravings. Neurobiological research tells us that the best way to do this is to identify common triggers for bad eating habits, and then aim to replace them with new behaviours to re-set your neural circuitry.

Shopping is actually much easier on a LCHF diet. This is an example of the ALDI store layout, but other grocery stores have a similar, if not more complex layout. This demonstrates that you get to avoid all the middle aisles when shopping- and simply stick to refrigerated foods plus some limited fruit and vegetables (and yes, who can resist the “special buys” section).



Will power is a limited resource. Saving your will-power means eliminating as many temptations as you can. Will power can be impaired under times of stress or sleep deprivation. It is recommended that sleep hygiene and stress relieving principles be applied to improve your will power and success on this diet (p11). This means that if you are going to do this diet, you must have the support of those in your household. You must set up food choices based on the Low Carb List (including snack and eating out ideas) and eliminate temptation (remove high/moderate carbohydrate foods from your home).

2. COUNTING CARBOHYDRATES -Aim under 25g/day (Food Diary)

You need to be honest and scientific about your carb intake. Calculating your carb intake using internet searches and the “Induction Food Diary” is a great way to transition to LCHF. The diary will help you find any carb traps and do LCHF properly, your way. Common traps are seen in the next few points.

3. CUT OUT ALL SUGAR

There are lots of different names for sugar and food labels can sometimes obscure the true sugar content this way. Remember that curries are often heavily filled with palm sugar (e.g. Thai curries, some Indian curries). Most fruits contain fructose sugar, and the worst choices are bananas and stone fruits (tropical). Tart berries a good choice in small quantities (strawberry, raspberry, blackberry). Blueberries, Apples and oranges also have a high total carb load. Treat fruit as natural “candy”, that still needs to be eaten sparingly. Always, always read the label and look at the total carbs per 100g section.

4. INCREASE SALT INTAKE

You may find you get headaches or become lightheaded with exercise or getting up too quickly when you are on the LCHF diet. Dry eyes and constipation may occur. This is because your kidneys start to adapt to lower insulin levels, which leads to more salt being lost in the urine. With this salt loss, more water is lost in the urine, which leads to reduced blood volume. If you are on blood pressure medications you should be seeing a doctor to monitor this, as it may mean you no longer need them.

This is called the Atkins Flu. It is highly predictable and entirely avoidable, if anticipated in the early stages by increasing salt intake.

Common methods include Miso soup or other broth and eating saltier meats, aiming for an intake of 7.5-15g salt per day (equivalent to 4-6g of sodium).

5. EAT TO APPETITE

The signals our brain and gastro-intestinal system provide us when eating a high carbohydrate/ sugar diet can easily cause a state of confusion between cravings and hunger, which are very different.

The reduction in appetite that occurs in a “low-insulin” state whilst eating low-carb is the reason for reduced calorie intake, and hence the weight loss that is seen. Therefore to harness this reduction in appetite, it is important to respond to know the difference between hunger and cravings. If you would eat a savoury, low carbohydrate food, then you are hungry. If you would only eat a sweet food (e.g. fruit/ candy), then you are experiencing a craving. With this in mind, **on a ketogenic diet it is completely healthy to eat only when you are hungry, rather than to a schedule.** Most people can eat twice daily on a low carbohydrate diet and accelerate their success. You may find that even when you are hungry, you can stave off eating for longer without mood swings and tiredness.

6. DRINKS

Drink water. Not coconut water. Definitely not Juice, Gatorade or “diet” drinks. Sparkling water and mineral water may make it more interesting and palatable- but learn to enjoy water.

If you drink tea or coffee, the milk you have with these can add up. Milk is 10% carbohydrate so if you have 500mL of milk (50g), then you have easily blown your carb budget for the day. Good options include black tea, short coffees or just add cream instead of milk (or try “Bulletproof” coffee).

Your body will burn ALCOHOL as a fuel, before it burns fat. So excess alcohol intake will sabotage your progress. The Australian Guidelines say men should drink less than 10 standard drinks, and women less than 8 standard drinks per week (with 2 alcohol free days per week). BUT there is no lower limit that is considered safe (any alcohol increases the risk of many health conditions including cancer).(31,32)

If you are going to have a drink- low carb options include red wine, scotch, gin and soda (not tonic) and very low carbohydrate beers.

7. MEASURE YOUR KETONES, NOT JUST WEIGHT

Your ketones will help keep you honest because ketones are EXCLUSIVELY produced from the breakdown of fat.

Everybody is individual, and some people have a higher or lower carbohydrate threshold before they start having high insulin levels and gaining weight. But virtually everybody will be able to achieve ketosis by staying under 25g per day in the initial 4-6 weeks to achieve “**keto-adaptation**”.(28) Once you are keto-adapted, you will burn fat as your primary fuel, and you will make ketones. If you are in the induction phase, it is recommended that you invest in a ketone monitor or try the new innovative

breath monitor called “Keyto”. A blood ketone meter is very helpful in monitoring your body’s adaptation and response to this diet. Measuring an hour after dinner produces the highest and most consistent levels. The ketone target is OVER 0.5 mmol/L, but over 0.3 is still considered good. Go to www.ebay.com.au and invest in Abbot Freestyle monitor and some ketone strips and lancets.

In the first week you will lose water and glycogen (in the muscles), which are replenished with high carbohydrate intake. Therefore this weight loss is less important than the fat loss you will achieve if you stay on the diet for months. Don’t be worried if you don’t keep losing lots of weight after the first couple of weeks, because the fat loss may be offset by some muscle gain. The important thing is that you check your overall health markers- waist circumference and blood markers of health. (8)

8. FORGIVE LAPSES BUT LEARN FROM THEM- How to Change Habits

You are human and your brain is wired to seek reward from pleasurable things.

The brain’s reward pathways are found in a place called the “Ventral Tegmental Area”. The reward pathways explain sugar cravings and addiction. The nerve cells (neurones) here are intimately linked with the parts of the brain that serve pleasure, memory, action and vision. They produce a neurotransmitter called dopamine which strengthens the associations between all these areas. All of these linkages mean that when you eat something pleasurable, your brain remembers the context of that situation and aims to seek it out again. For example, if you go to the beach on a sunny day and eat an ice-cream, the next time you are at the beach on a sunny day- you may find yourself craving and instinctively looking for ice-cream. These associations become triggers for cravings or seeking out food.

This can be demonstrated on functional MRI, as all of these parts of the brain light up when people are shown images of sweet, sugary foods. Every time these parts of the brain fire together and produce dopamine, they strengthen their association. This is called neuroplasticity- which works very much like water flowing down a sand mound to produce a turret. The more water that flows, the deeper the turret becomes and this becomes the path of least resistance. We cannot easily disrupt this process, but we can create a new pathway and redirect the flow.

Each time you have a lapse on the low carbohydrate diet, follow this process to help yourself re-wire.

Was there a <i>Trigger</i> for the food choice?	Time, Location, Mood, Tiredness, Hunger, Company, Activity, Life Events
What did I eat and where did I get it?	
What <i>Alternative Action</i> will I take the next time this trigger arises?	Examples- Go for a walk, Eat a few nuts, Drink water, Listen to music etc.

9. REGULAR MEDICATION REVIEW

If you are on medication, particularly for diabetes or high blood pressure, you will need a regular review of these to prevent side effects such as low blood sugar or low blood pressure. This can be done in collaboration with your GP or with the doctor supervising you on this diet.

10. ADJUNCTS (ONCE ESTABLISHED)

Once you have the hang of the LCHF diet, there are a few other helpful tools that can be used without adding too much extra effort or stress. This is because your insulin levels will be reduced and your appetite will follow. You can consider intermittent fasting (summarised below) or an aerobic or resistance training exercise regime (also below). Medications and supplements should only be used as professionally directed. Metformin is one of the only weight loss medications that legitimately supports this diet because of its effects on promoting insulin sensitivity and therefore reducing insulin levels further (especially in pre-diabetic or diabetic patients).

OTHER NOTES-

ARTIFICIAL SWEETENERS- SHORT-TERM ONLY

Artificial sweeteners (such as stevia) are okay, but still stimulate the parts of the brain that trigger reward sensations and reinforce and stimulate your “sweet tooth”. Studies have shown that they are associated with weight gain.(33,34) In other words, use them instead of sugar but beware that they might stimulate your desire for sugar and carbs. Ideally, you should wean off them in the long-term as your palate becomes more savoury, but they are still much better than sugar.

A FINAL NOTE ON CHOLESTEROL

If you are worried about cholesterol, you must sit down and speak with a doctor who is competent in prescribing and supervising this diet. Cholesterol is poorly understood by many health professionals, and many patients are given conflicting information on this diet, which is why we have a network of doctors who understand LCHF. Your total cholesterol is likely to increase, but total cholesterol is not associated with cardiovascular disease. The most important markers of heart health on a blood test are:

-HbA1c (an estimate of your average blood sugar over a 3 month period)

-High Density Lipoprotein (HDL)- a protein that carries cholesterol and may keep it out of vessels

-Triglycerides- dissolved fats in the blood- which appear to predict heart disease strongly

ALL of these markers, as well as markers of inflammation, are seen to improve on an LCHF diet. (8,28)

Please watch the lecture from my colleague Dr Mason “Blood tests on a ketogenic diet”

CHOLESTEROL IS ONLY DANGEROUS IN THE PRESENCE OF SUGAR (i.e. Carbohydrates)

We understand that this goes against traditional wisdom. We have been told for the last 50 years that fats are unhealthy. However, the best quality largest scale research on fats shows us this is wrong.(7,10,35–39)

In summary, there are a few places you can trip up a Low Carb High Fat diet, but if you have the metabolic syndrome, this is the most evidence-based diet to get you out and keep you out of trouble.

ADJUNCTS THAT MAY ASSIST

Intermittent Fasting

Once your body is burning-fat and you are keto-adapted, appetite reduces relative to your energy intake.(40) While the LCHF diet works by reducing insulin levels because fat only causes a minimal rise in insulin, not eating is the most effective way of reducing insulin levels. This is because the overall time spent in a fat-burning versus a fed state increases.

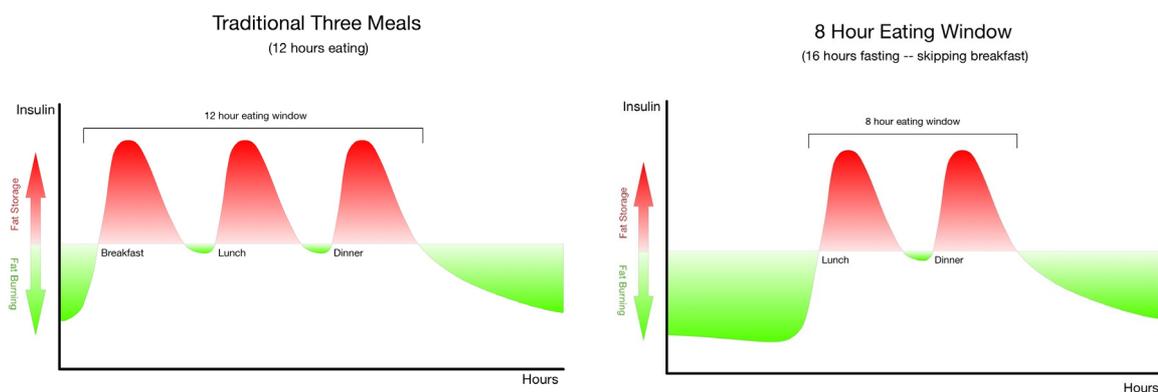
The 5 and 2 diet, popularised by Dr Michael Mosley, is a diet that restricts calories on only 2 days of the week and allows liberal consumption on all other days. Dr Mosley proposes that it works by increasing the time that the body is in a fat-burning, low-insulin state.

The advantage of LCHF is that it addresses hunger via neuro-hormonal mechanisms and makes fasting a lot easier. Although many people on LCHF find they naturally need to eat less frequently and do not need formal fasting, the option of adding intermittent fasting can accelerate your results for weight loss and insulin sensitivity.

Social pressure to eat around the clock clearly does not help with this process.

Eating twice per day to your appetite, is completely normal and acceptable.

The most common way to do this is leverage your overnight fast by missing breakfast. Coffee will often help substitute this on a habitual/behavioural level (see “How to Change Habits”). However, whatever works for you is fine.



Misconceptions about Fasting-

All of the following are untrue, particularly if you are “keto-adapted” on an LCHF diet

-Breakfast is the most important meal of the day- eat to appetite, not to the clock.

-Fasting reduces your resting metabolic rate and slows weight loss- the opposite occurs during fasting.

-You should eat small, frequent meals- blood sugars stabilise on LCHF, so this is unnecessary.

-Fasting leads to low blood sugar (hypoglycaemia)- blood sugars stabilise, ketones can fuel the brain. In diabetics, fasting can lead to low blood sugar, and medical supervision is required.

-It leads to burning muscle instead of fat- when keto-adapted, fat is burnt as the primary fuel and muscle protein breakdown only occurs with very heavy aerobic exercise. Resistance training (exercise that fatigues muscles) can *increase muscle mass at the same time that fat is lost*.

EXERCISE on a low carbohydrate diet

In the Induction phase of this diet, formal exercise is not strongly recommended. The main reasons are:

- many patients will have a problem or pain that is impeding them
- energy levels often drop in the early phase of adaptation, compromising performance
- the focus needs to be on learning the diet and individual response to the diet

This does not mean you should do no exercise. Avoid being inactive, but don't expect to feel as energetic when exercising in the first few weeks of starting a low carbohydrate diet.

Once you are burning fat preferentially as indicated by your ketones and appetite, exercise can help promote insulin sensitivity. The slightly higher protein intake can help support more muscle growth and therefore it is important for us to measure other indices of body composition (not just weight). You can lose fat and gain muscle mass at the same time. All of this results in improved insulin sensitivity.

At the 2nd visit, you will be given your blood test results, further resources and recipes, individualised advice and referral for follow-up with one of our Physiotherapists or Exercise-Physiologists for a personalised **resistance training program** that you can use to accelerate your results. The aims of this program are to **give you the best value for your effort**; with straight-forward, achievable exercises.

The consumption of MCTs (Medium Chain Triglycerides) before exercise can provide significantly improved energy levels, because MCTs can be used readily by muscle tissue. "Bulletproof" coffee (either using MCT oil, butter or coconut oil) is one common way to get MCTs before a bout of exercise, but needs to be started slowly to avoid stomach upset.

Do athletes use this diet? Can I improve my performance with LCHF?

There are many athletes who use the science of this diet to achieve their goals, including teams like the Port Adelaide Power, LA Lakers, members of the Australian Cricket team and many endurance athletes.

Endurance athletes who run out of supplies of glucose and become unwell are said to "hit the wall". This is because their muscles and brain run on glucose as fuel, and when this runs out they can't function. Therefore LCHF has become popular among endurance athletes because it allows them to use both fuel systems- fat (the "lipolytic" system, which provides *days* of energy, but burns slower) and glucose during the race (the "glycolytic" system, which supplies *hours* only, but can burn faster when required to go faster).

Keto-adapted athletes upregulate how quickly they can burn fat (up to twice as fast).(41) But since fat burns more slowly overall than glucose, and there is a low glucose supply in athletes on LCHF diets, supplementation with dietary forms of rapidly accessed energy such as Medium Chain Triglycerides and Ketone Esters can give these athletes an advantage. Also, the body never forgets how to burn glucose, so when supplemented during a race with carbohydrates (e.g. U-can), these keto-adapted athletes can still produce enormous power outputs. Lastly, muscle gain and fat loss used to be considered mutually exclusive (they could not occur at the same time). However, through upregulation of anabolic pathways in these athletes, LCHF can allow muscle gain at the same time as fat burning.(42)

The major criticism of scientific studies rejecting LCHF for sporting performance is that the study designs do not allow athletes to properly keto-adapt before they are put to the test. Due to logistical barriers in these difficult studies, most study protocols last a total of 2 weeks, where athletes will still be in the induction phase and would be feeling low in energy. The decades of work of Dr Stephen Phinney and Dr Jeff Volek is published in "The Art and Science of Low Carb Performance" and

summarises the benefits in athletes with well-conducted studies that take keto-adaptation into account.

Optimising Sleep Hygiene and Stress Management

A good night's sleep has the potential to improve physical and cognitive performance. There are 3 aspects- sleep duration, quality and circadian rhythm (body clock).

Sleep Duration

Aim for more than 8 hours per night. You cannot control your waking time easily, but you can teach yourself to sleep at the same time every night. If you haven't finished something- save it, make a list and come back to it feeling refreshed.

Sleep Quality

Go to bed in a good mood- positive imagery and visualisation is often helpful.

If you tend to worry before bed, make a list of things to do the next day.

If you have difficulty getting to sleep (sleep latency), continue to work on your bedtime routine and be patient. Get up for non-stimulating activity for 20 minutes (e.g. a jigsaw or crossword) and try again.

If you have nightmares, try imagine a new and better ending. This works in about 90% of cases.

The strongest trigger for wakefulness is light. Shut out light using adhesive blinds for maximal darkness.

Noise can impair sleep quality, even if you do not wake up. Shut out noise using mouldable ear plugs.

Sleep Phase

This refers to whether your circadian phase (body clock) matches the available time for sleep in your lifestyle. For example, parents with young children have interrupted sleep because of a difference in their body clocks. If they fail to sleep when the children sleep they also accumulate sleep debt, which impairs performance.

This requires planning and sacrifice to work out how you can meet the needs of your individual body clock.

Sleep Hygiene

Avoid computers/screens/iPhones for 60 minutes before sleep. Blue light filters are helpful to reduce the strong stimulus from screen-time. Use dim light only after 8pm.

The bedroom is for sleep and sex only. There should be NO TV in the bedroom.

Develop a routine for bedtime. There is evidence that a shower or bath, as well as the scent of lavender reduce sleep latency and increase sleep quality.

Sleep Apnoea

If you are a heavy snorer, or people have noticed you stop breathing at night, you may have sleep apnoea. This impairs sleep quality and sufferers are often unaware. Weight loss regularly improves sleep quality and often averts the need for invasive investigations and treatments.

Other Tips

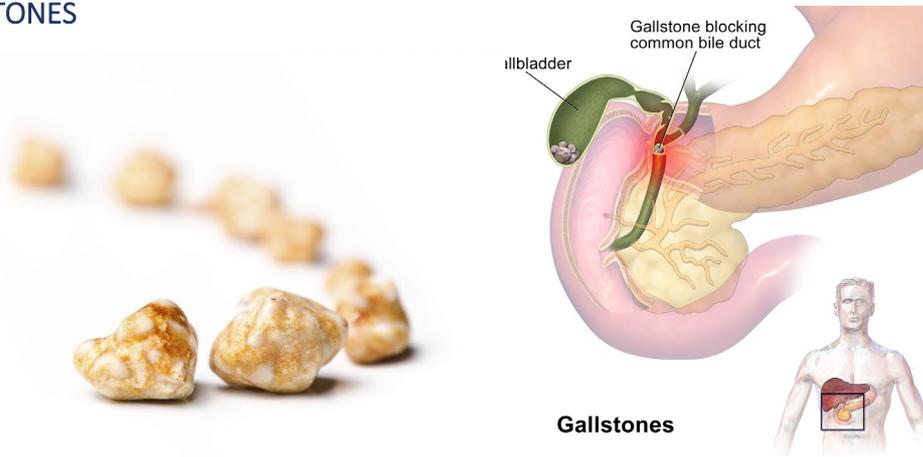
Avoid caffeine after midday, because caffeine has a 'half-life' (time for half of it to be eliminated) of around 6 hours. The contraceptive pill doubles this, which can lead to poor quality sleep.

Alcohol may help sleep initiation but impairs the quality of sleep in the later phases, which are known to be more refreshing.

The best medication to take (prescribed and monitored by a doctor) is Melatonin, particularly for jetlag but also for sleep phase disorders.

Regular exercise and mindfulness strategies can help keep you in the moment and help separate you from any thoughts or worries. Smiling Mind and Headspace are both excellent apps to guide you.

GALLSTONES



The Gall Bladder has the job of putting bile (a kind of soap that our body makes to breakdown fat) into the first part of the small intestine. This dissolves and emulsifies fat to allow us to digest and absorb it.

A gallstone is a mass of cholesterol, pigment and other minerals (mainly calcium) that forms in the gall bladder. Up to 80% of people with gall stones never have symptoms from them. Symptoms occur when a stone gets trapped in the bile duct that connects the gall bladder to the intestine. This causes cramping like pain in the upper abdomen, and other problems like inflammation of the gall bladder, and even infection may occur. Much of the time the pain settles and the stone either falls out of the bile duct or dissolves without the need for surgery, but monitoring is required.

Some people live with recurrent attacks of gall stones (cholecystitis) for years and do not have surgery to take the gall bladder out. The major reason that gall stones are thought to develop is the incomplete emptying of the gall bladder (often with a low fat diet). In fact, a recent high quality study showed that the two most effective treatments to resolve gall stones were a high fat diet, and a very expensive medication that dissolves bile, called Ursodeoxycholic Acid (UCDA).(43)

A high fat meal results in a stronger contraction of the gall bladder, and leads to more complete emptying. However, even though this helps resolve gall stones, when you already have gallstones, changing to a LCHF or ketogenic diet can increase the risk of *pre-existing* gall stones getting stuck in the outlet of the gall bladder. This is why you will be asked and examined for signs gall stones before starting the LCHF diet.

If this does occur, you need medical attention and advice, but rest assured that not everyone needs their gall bladder taken out, and the low carbohydrate diet (possibly in combination with medication) is your best chance of resolving the problem long-term.

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