PKHW Chapter 4 Get started, get into ketosis and stay on the wagon.

"In order to get from A to B, you first have to leave A".
Craig's father on numerous occasions!

So, you have to commit, and then you have to start!

- First sort out your pantry (chuck out the temptations) and stock your fridge and freezer. See chapter 6 - the PK pantry.
- Learn to make the PK bread – see chapter 8.
- Purchase a ketone breath meter.
- Allocate a window of time when you are not socialising (if possible, buddy up with another who is going PK)
- THEN just do it.

Purchase a ketone breath meter and learn to use it correctly.

Know you are in ketosis by using a ketone breath meter, symptoms and signs.
Ketones arise through fat burning and that generates three types of ketone:

- Beta hydroxybutyric acid present in and which can be measured in the blood – this is the most accurate measure, but testing strips are expensive. I am mean and a wimp, so I do not use this method.
- Acetoacetate is excreted in the urine. Testing is cheap and easy with urine keto-stix but as the body becomes more efficient at matching ketone production to demand, urine tests may show false negatives.
- Acetone is exhaled and can be measured with breath testing. This is my preferred method as you can easily test after every meal to ensure you have not overdone the carbs.

You must test because everyone is different - there is no 'one size fits all' guidance here. Craig can eat 90grams of carbs a day and happily stay in ketosis whereas I have to stick to 30grams of carbs or less a day. Dammit! Men normally move into ketosis more easily because they have a higher metabolic rate, furthermore women have female sex hormones which are conducive to metabolic syndrome.

- No ketones on breath testing means we are running purely on sugars. Not desirable in the long term.
- Low ketones on breath testing means we are burning some fats. This tells us our glycogen stores are not saturated and blood sugar levels will be completely stable. This is a very desirable state of affairs!

What this means in practice is that the occasional seasonal excursion into Autumn delights, when we slip out of ketosis, will do little harm to our health! "Autumn mode" is fine in the short term but damaging to health in the long term. Long term "Autumn Mode" results in metabolic syndrome. I like to see my patients blowing ketones at least once a day which tells me their glycogen stores are not saturated. A common pattern is no ketones in the morning (when blood sugar levels are naturally higher) but by late afternoon or evening, ketones are present. Being in constant ketosis is absolutely fine but some people feel better with a little more carb in the diet.

Once you have established a state of ketosis, checked by testing, you will learn to 'recognise' when you are in ketosis and will 'know' when you have kicked yourself out of it too! I know if I slip out of ketosis because I start thinking about my next meal. In ketosis I often forget lunch. Craig, for example, knows when he is out of ketosis because mental sharpness declines dramatically and then,

once back into ketosis, he can think with clarity again – it is almost like an electric buzz in his brain. We all have our own individual signs of being in ketosis that you will come to recognise.

Trouble -shooting the ketone breath test.

What to expect normally

If you are sufficiently low carb, expect to blow 2-6 parts per million (ppm) of ketones.
However, the body will always use sugar in preference to ketones. This means that ANY amount of ketones in the breath means that you are in ketosis.
If you blow very high ketones eg up to 10 ppm, this may be for reasons of:

- When stressed, there is an outpouring of adrenalin and this stimulates fat burning.
- Fasting – even on a PK diet you consume some carbohydrates! With fasting you get ALL your calories from fat, so ketones are higher. This illustrates the point that even in mild ketosis you will be using some sugars as a fuel – that is fine!
- Over-dosing with thyroid hormones may cause high levels of ketones.
- Contamination as below

You can get false positive results.

- The mechanism used to measure ketones is the same as that for measuring alcohol. You may see a positive if: you have consumed any alcohol in the past 24 hours (depending on how much!)
- If you have an upper fermenting gut, then this too produces alcohol.
- Any products containing alcohol may give a positive result! I checked this myself with an alcohol wipe (often used for hand sanitising) to clean the mouthpiece and this gave a high reading!
- The meter measure parts per million – it is very sensitive! You only need a tiny amount of contaminant to upset the result. Many household cleaners contain volatile organic compounds which may register on the meter!

You can get false negative results.

- If you have anything to eat or drink, other than water, in the preceding 20 mins then that may affect the test. For example, I know if I have a sip of coffee then that may be followed by a negative reading.

Breath ketone levels may not square with blood levels. This does not matter.
Again, breath ketones may not square with urine ketones. It is not unusual to see ketones present on a breath test, but the urine test is negative.
With time, the body gets better at matching energy demands to delivery, so less ketones are "wasted" through urinary losses.

Being in ketosis is NOT dangerous. Most doctors do not know or understand physiological ketosis. They only know about diabetic ketoacidosis and may panic if you tell them you are in ketosis!

When ketosis is a problem

Ketosis is ONLY a medical problem if you are diabetic and your blood sugars are running high (either because your medication is insufficient OR you are consuming too many carbs). For example, a blood sugar above 10mmol/l and/or the presence of sugar in your urine then YES THIS IS A MEDICAL EMERGENCY.
Bear in mind that the DIY home tests for blood sugar rely on a test that employs glucose oxidase. Vitamin C cross-reacts – so if you are taking vitamin C to bowel tolerance your blood will be saturated with vitamin C and this may give false highs. You can test for this with urine dip sticks that

measure vitamin C. My experience is that the DIY blood sugar measurements may be 2-3mmols/l higher than the actual blood glucose. That is to say an apparent reading of 7-8mols/l equates to a real reading of 4-5mmol of glucose. If any doubt, then trot down to your GP for a laboratory test.

As you get into ketosis you will benefit from some or all of the following:

What	Why
In the short term after 1-2 weeks	It takes some days to burn up your saturated glycogen stores and switch into ketosis.
Energy levels improve	Mitochondria run more efficiently on ketones. The heart and brain run up to 25% more efficiently burning ketones compared to sugar. See our book "Diagnosis and Treatment of Chronic Fatigue Syndrome and Myalgic Encephalitis – it's mitochondria not hypochondria" Once keto-adapted the blood sugar can run as low as 1pmol/l without symptoms arising.
Mental performance is improved	The preferred fuel for the brain is ketones. The newborn baby runs entirely on ketones with the brain using 60% of all energy production! The ketogenic diet is the starting point to treat all brain pathologies from mental disease and dementia to epilepsy and malignant tumours.
Physical and mental endurance ability is better	The glycogen pantry only last for 1,700Kcals (about 16 miles for marathon runners at which point they "hit a wall". US athletes call this "bonking"). The fat pantry, even in a lean athlete, can last 140,000Kcals! The world record for the furthest distance run in 24 hours is held by keto adapted athlete Mike Morton. He ran 172 miles.
	Dr Ian Lake, GP and type I diabetic, with 7 friends ran 100 miles in five days from Henley to Bristol between the 19th and 23rd September 2020 whilst fasting.
You stop constantly thinking and obsessing about food	There is a constant and reliable fuel available to the body. The brain is not consumed by that next carb fix.
Blood sugar levels stabilise because the body is fat burning	Levels of insulin and adrenalin remain constant. (Adrenalin spikes as blood sugars fall in someone not keto-adapted – low blood sugar "hypoglycaemia" symptoms are largely adrenalin symptoms – see "Diabetes")
You feel calmer once in established ketosis. Mood swings greatly reduced.	I suspect the symptom of stress arises when the brain knows it does not have the physical, mental or emotional energy to deal with Life's challenges. Being in ketosis increases the energy available in all departments. A ketogenic diet also increases levels of the calming neurotransmitter – GABA
You can miss a meal without getting an energy dive	One can survive on fat burning for weeks (depending on the size of your fat store!). Indeed, windows of time of fasting stimulates new brain neurones to grow and this makes us cleverer. See chapter 23 on fasting
Sleep quality is better. You may need fewer hours of sleep	The commonest cause of disturbed and poor-quality sleep is nocturnal hypoglycaemia because of the adrenalin spike associated with such. Perhaps the next commonest cause is snoring due to obesity, then allergy, typically to dairy products.
You may lose 1-2kgs of weight very quickly	Carbohydrates are stored in the liver and muscle as glycogen. This has an osmotic pressure - -ie it holds water. Once glycogen is used up prior to fat burning this water is peed out. This is one reason why endurance

	athletes see a rapid improvement in performance—the power weight ratio is instantly better.
You cure your fermenting mouth and stop dental decay. Teeth become glassy smooth	Dental plaque gives teeth a rough surface. Dental plaque is the biofilm behind which teeth rotting bacteria, namely streptococcus mutans, hide. These microbes can only ferment sugar and starches. The ketogenic diet starves them out. Dental decay ceases. Hallitosis is often cured (halitosis may also derive from the fermenting gut and/or airways infections (chest, throat and sinus).
Clean tongue	Tongues become dirty and discoloured because of bacterial colonies sticking to and fermenting on the tongue. Tongues should be pink and free from surface crud. Gum disease (gingivitis) is driven by sugar and starches. You can speed this process up by gargling with hydrogen peroxide 3% mouthwash
You cure your upper fermenting gut	Because you deprive those fermenters of substrate. Symptoms of burping, reflux, acidity, indigestion, bloating, pain and irritable bowel disappear. You greatly reduce your risk of bowel disease from inflammatory bowel and gall bladder disease to diverticulitis and cancer
In the longer term – months to years	
You cure metabolic syndrome and reverse diabetes	Because you stabilise blood sugar levels and reverse insulin resistance. Blood pressure comes down. You correct your cholesterol. For much more detail see out books “Diabetes” and “Ecological Medicine”
You improve immune function	All microbes love sugar! Metabolic syndrome is a major risk factor for infection including covid 19 For much more detail see our book “The Infection Game”
Any problem associated with inflammation	The ketogenic diet is anti-inflammatory. Furthermore, many conditions I suspect are driven by allergy to gut microbes. These include polymyalgia rheumatica, many arthritides (eg rheumatoid arthritis, ankylosing spondylitis) venous ulcers, auto-immune conditions, intrinsic asthma, psoriasis, chronic urticaria, interstitial cystitis, many psychiatric conditions, inflammatory bowel disease, nephritis and many other possibilities. See our book “Ecological Medicine”
High fat diets improve the quality of skin and mucous membranes	Dry skin, dry eyes, dry mouth, dry perineums (vulva and vagina) may result from low fat diets.

And we leave you with a Mathematical Aside, known as The Speed Paradox, about getting from A to B [and back again].
You can see Dr Robin Wilson [ex tutor of Craig, and son of the Prime Minister Harold Wilson] describe it here - https://www.youtube.com/watch?v=ZIO-ExZVkdw

Or here it is laid out:
You drive from Oxford to Cambridge at 40mph
You then drive from Cambridge to Oxford at 60mph
What is your average speed for the entire journey?

Many people say 50mph – wrong!
The actual answer is 48mph.
And this works for any journey between any two places where one travels one way at 40mph and the other at 60mph.

The Maths

Here are the calculations – let's assume the distance from Oxford to Cambridge is d miles – it is actually irrelevant what the distance is. Then we use the equations
Speed = Distance DIVIDED by Time and
Time = Distance DIVIDED by Speed

So, the time taken from Oxford to Cambridge is
Distance [d] /Speed [40] = d/40
and the time taken from Cambridge to Oxford is
Distance [d]/ Speed [60] = d/60
So, the total time taken is
d/40 + d /60 = d/24
And you have driven a distance of 2d – from Oxford to Cambridge and back again.
So, your average speed is
Distance [2d] DIVIDED by Time [d/24] or 48mph

The Lesson

This just goes to show that journeys can be more complex than you first thought and so be prepared but do stick with it! It is worth it, as Craig and I can attest to! Just do it!