

## **Dr. Jim McCarters presentation från Vail 2016**

It's a very short talk

and it's really about empowering the person rather than being a passive patient.

The quantified self movement was begun in 2007 by Gary Wolf and Kevin Kelly of Wired Magazine, it was some casual gatherings in San Francisco, and it's really grown in the last decade.

Quantified self now has over 100 chapters in various cities in 23 different countries, many of those with hundreds or thousands of members.

We started one a few years ago in St. Louis that now has over 400 members.

And what brings these people together is a love of knowledge creation and the opportunity to share that knowledge,

create knowledge to self tracking or N=1 types of experiments and then share that knowledge with the broader community.

So whether it's daily life logging or tracking EKGs or EEGs,

or using wearables or tracking sleeping or nutrition,

this is a group of early adopters

that are up for trying new technology, trying new ideas.

And I think there's an opportunity as a great audience that is receptive to ideas like low carbohydrate nutrition and ketosis.

So this is a story that I shared with them.

For some of you it will be a review of things you already know,  
but perhaps you'll learn a few new things along the way.

So this story for me began back in 2012.

When I tell friends that I've given up sugar and starch  
and get 80% of my calories from fat the first question is, "Why?"

So this is my family - that's my sister next to me in the back row on the right.

I've joined a venture capital group within a crop protection company  
and my sister had said to me that some of that corn you're growing  
gets turned into high-fructose corn syrup and "Why is that a good thing?"

So this got me reading about corn syrup

and while I found that it's no worse than sugar,

I learned that the health effects of sugar were something that I should be concerned with  
and the more I read, the more concerned I became.

The average American consumes 150 pounds of sugar annually.

Together with starch is not just empty calories that negatively impacts biochemistry.

So I used to have a toast and banana and jelly for breakfast.

That's 75 g of carbs that spike my blood sugar and spike my insulin,  
which then crashed my blood sugar and made me hungry again  
and it also blocked energy from fast insulin, stops fat mobilization.

So I've become convinced that carbohydrate overconsumption  
is behind many of the diseases of civilization.

As this cartoon says, "The high carbohydrate diet I put you on 20 years ago  
gave you diabetes, high blood pressure and heart disease. Oops."

So in 2013 I began reducing my carbs and tracking along the way

and in 2014 I went further adopting nutritional ketosis  
where most calories come from fat and tracking the outcomes.  
So speaking of those outcomes, let's start with ketones.  
So ketone bodies are natural metabolites that we all have in our blood,  
most people at low levels  
and they derive from fat metabolism  
and rise when fat is the primary fuel, either from food or body fat  
and they are an alternative supply to glucose.  
During fasting ketones can supply 60% of the brain's energy.  
They are also a clean-burning fuel that reduces oxidative stress.  
So there are well-documented benefits to ketosis.  
Clinical trials show that blood pressure generally drops,  
blood triglycerides decline and HDL-cholesterol rises,  
which are all good things.  
Markers of chronic inflammation also drop and hunger diminishes resulting in fat loss.  
I've observed all these changes in my data  
and I'll also discuss challenges from cholesterol to muscle cramps  
to progress I've made in hacking these.  
So to tap fat as fuel I've driven insulin down by restricting carbohydrates.  
I've decreased my carbs from the typical US levels of 350 g  
to only 20 a day mostly coming from vegetables.  
I avoid sweets, grains and fruits  
and I try to keep my protein intake moderate about 120 g a day.  
Because too much protein can raise blood glucose by gluconeogenesis.  
So I've been logging my meals and here are some examples.

One of the things that I've learned from the process of doing this is that many of these meals, especially early and as I was doing this had just too much protein.

So for instance if you have an 8 ounce filet mignon that's 60 g of protein and you add eggs, cheese, nuts - that can be enough to block ketosis.

And so the solution I found to that is to find ways to add fat that doesn't come along with a lot of extra protein.

So olive oil and butter and coconut oil.

Unfortunately we've been told for generation that these fats are dangerous, but new analyses, meta-analysis have shown that there's not an association between dietary saturated fat and disease.

So one of things that I do is to measure ketones.

And I've been measuring those over the course of the year through beta hydroxybutyrate in the blood, through a fingerprick twice-daily.

So in most people on a high carbohydrate diet they would register perhaps a 0.1 mM or less, so I'm roughly 20 fold higher than that.

Around 2 mM in the morning and 1 mM at night, shown in red which is a seven day moving average.

So measuring the ketones is a very helpful device for tracking diet, because it provides immediate feedback to know the nutritional content of meal, without having to do all of the logging of the macronutrient composition of those meals.

And so I can flag for instance various events in life from eating out at Hodak's restaurant or Juniper restaurant

to Thanksgiving and moving and business trips...

So benefits of ketosis - so one is just weight loss.

So I'm about 25 pounds lighter than I was at my heaviest,

I'm about 12% body fat by DEXA

and then the benefit of not being tired and hungry after meals.

I can sustain longer stretches of concentration

without post-breakfast munchies or post lunch food coma.

And then there's athletic stamina and this has been very noticeable for me.

Particularly as I've kind of dialed in on how best to do this,

but sustained intense workouts are really extraordinary.

When I do trail runs, I'm limited in speed by the footing on the path

rather than the cardiovascular fitness.

Anti-inflammatory - so indications that I've been having

of chronic inflammation that come with getting older,

I had a sore shoulder and a sore hip and all that went away

when I started doing carbohydrate restriction and ketosis

and I was able to confirm that with a low level of C-reactive protein.

One of the more dramatic changes that I saw was blood pressure.

This had been something that had been kind of creeping up over the years

and was running around 136 over 90 in recent physicals

before I started restricting carbohydrates.

And I've gotten that down to, you know, 110/70 or 112/72.

I used a scanner device to track that for several months

and I was able to get multiple blood pressures daily

and they corresponded with what I was seeing in my physicals.

So the lipids-- so the responses that many have seen were triglycerides dropped substantially, HDL rose, and then also as many people see with LDL I saw a rise and well, LDL is called the bad cholesterol.

These carriers are not one class, but range from benign large buoyant particles to atherogenic small dense particles. And carbohydrate restriction generally shifts LDL from small dense to large buoyant and this is what I've seen in my NMR lipoprofile and my particles are benign and large and buoyant.

So other challenges along the way have been muscle cramps, slow workout warm-up time and cold sensitivity.

So I knew that cramps could be an issue, so insulin signals the kidneys to retain salt and when insulin drops the kidneys release salt and water follows. I've been using cramping as an indicator of this electrolyte imbalance so I get calf cramps and I have a bullion cube.

But what I realize is these cramps are actually a late indicator.

For me cold sensitivity and soreness early in a workout are more sensitive symptoms.

So for example there's a scene in the "Avengers" movie where the AI program Jarvis is under assault from Ultron, the blue hologram and for me that's like representing the water in a cold workout in the spring, so the water's freezing and I know what's coming.

The cold will begin with my fingers and creep toward my core.

But this time this past spring I feel warm like I'm wearing a wetsuit and the reason is simple.

It's that I've preloaded with salt about a half an hour before the workout.

So getting a full 5 g of sodium a day has been the solution to the remaining issues that I've had in maintaining nutritional ketosis.

So one question is, "Is this much salt safe?"

The recommended daily allowance for sodium is 2.3 g, but a 2014 study found that the lowest cardiovascular risk actually occurs with higher intake in the range of 4-6 g of sodium daily, which is right where I'm aiming.

So in conclusion I've learned that the benefits of ketosis are substantial and make me want to continue with this way of living.

So getting rid of the sugar was the easy part.

More challenging has been moderating protein and getting enough fat and salt and that requires contradicting conventional wisdom about nutrition, as many of us have learned in our own personal journeys.

So thank you very much.