



THE
FATIGUE
SUPER
CONFERENCE

It's mitochondria not hypochondria

Guest: Dr. Sarah Myhill

Alex: Welcome to The Fatigue Super Conference and I am super excited for this interview where I'm talking with Dr Sarah Myhill.

To give you a bit of background, Dr Myhill worked for the NHS for 20 years before entering into private practice. She was the Honorary Secretary for The British Society for Allergy and Nutritional Medicine for 17 years and has worked with over 5,000 patients with fatigue.

She is the author of the books 'Diagnosis and Treatment of CFS and ME: It's Mitochondria not Hypochondria', 'Preventing and Cure Diabetes' and 'Sustainable Medicine'. She's also the author with colleagues of three scientific studies in The International Journal of Clinical and Experimental medicine showing that the level of mitochondrial dysfunction correlates with the degree of fatigue.

Personally I believe Dr Myhill has done more for those with debilitating fatigue related condition than almost anyone else that's out there. She's one of the practitioners that I personally most admire and Sarah I am very grateful for you making the time to talk with us today.

Dr Myhill: Thank you Alex I'm delighted to be here and I hope I shall spell out my ideas in a way that everybody can get their heads round.

Alex: I'm sure you will. So before we come into a bit more of some of the theories and your work I would love to just start a little bit with what got you interested in this group of patients? I know, as I mentioned in the intro, you were working as a medic in the NHS structures for a number of years, what inspired you, what drew you, what brought you to this point with working with this group?

Dr Myhill: Well it was very clear from my early days in general practice that when people came to see me with whatever problem, and it doesn't matter if it was blood pressure or arthritis or whatever, they wanted to know why it was

that they had that medical condition. They didn't want symptom suppressant medication they wanted to know what they could do to cure themselves. In those early days I can promise you it was a struggle because medical school does not prepare one for that sort of question. Medical school and medical training is all about putting patients into a pigeonhole and then giving them symptom suppressing medication.

So headache would be treated as a paracetamol deficiency, high cholesterol would be treated as a statin deficiency, and depression would be treated as a deficiency of SSRI drugs. Now that is an intellectually miserable place to be. It is not satisfying, it is not correct, there is not other area of profession where problems are dealt in that fashion. I mean my family are engineering background and if you have an engineering problem you want to know why that bridge has fallen down, you want to know what the structural problems that went wrong that led to that and then you come up with a solution. It should be like a detective story and when my girls were little I used to tell them stories about my medicine and I would tell them in a detective way. I would say well those are the clues and we got a bit more clues from the tests and then we put this hypothesis in place and sometimes that patient was better and sometimes they weren't.

I had one of two patients who were wonderful, happy to be experiments and were happy to play with diet, to play with supplements and I discovered that food allergy underpinned so many conditions. Irritable Bowel Syndrome, Inflammatory Bowel Disease, sort out their allergies and they did much better or they were cured. Similarly migraine, we will know there are some migraine triggers it is all a question of sorting out is this an allergy, is this a mineral deficiency, is this an IgE delivery issue, or whatever, and thereby cure that migraine.

Arthritis the same. I can remember I worked with a lovely doctor, Dr Honor Anthony who was a cancer researcher, very interested in allergies herself and in fact ran the Airedale Allergy Centre for 13 years. I remember her telling me all arthritis is allergy and I remember thinking at the time 'no that can't be right'. I know now that she was 100% right and if it's not allergy to foods then it's allergies to microbes, it's allergies to microbes from fermenting gut, and Rheumatoid Arthritis, Psoriatic Arthritis, Ankylosing Spondylitis can all be explained in terms of that.

So of course I worked my way through various diseases but the one condition that was the worst treated of all were the Chronic Fatigue Syndrome patients. They would be written up in the notes as TATT (Tired All The Time). It was the commonest symptom that would be presented in general practice, was fatigue, what can I do to improve my energy, and these patients were getting brushed

off. They would be tired there is nothing wrong with you you're just idle, you need a good nights sleep, there was no proper analysis of the condition and so at that point I stated saying 'well if these diets and if these supplements and if these interventions have helped patients with migraine, Inflammatory Bowel Disease and Arthritis and Cancer and whatever, let's apply the same approach to Chronic Fatigue Syndrome and that's really what ignited my interest in the whole business.

Alex: It's interesting that you were saying that it's dissatisfying for medics because often people think about allopathic medicine as the real frustration being for the patient population but it's interesting you're saying that actually for you as someone that is driven by wanting to understand and to find answers that it was just fundamentally dissatisfying and frustration as a model of which to work with people.

Dr Myhill: Absolutely and worse than that the model that you know the so called conventional doctors are working with at the moment i.e. symptom suppression has resulted in escalating pathology of new diseases because these symptoms have been ignored and if you symptom suppress you actually accelerate the underlying pathology. So, for example, when I was at medical school Alzheimer's disease was pretty much unheard of. I remember the excitement of a neurological outpatient when the consultant said 'oh we've got a very special surprise for you now, it's a rare condition and you can use this name for your finals, you know you all passed with flying colours' we all went home muttering Alzheimer's, Alzheimer's, I mustn't forget that.

Alex: That's extraordinary, wow.

Dr Myhill: Because now the commonest cause of death in Westerners – Alzheimer's/Dementia. It's also being called Type 3 diabetes because it's a sugar problem in the brain, it all boils down to diet. But do you know what do we hear on the news about Alzheimer's disease 'oh well let's screen people to pick it up early, let's find new drugs to treat it'. Nonsense, we're just back to our old ways of symptom suppression instead of really grasping the metal and asking what the route cause of the problem is.

Alex: Yes and you were saying that one of the things that drew you to the fatigue population was just how under supported and misunderstood that group was and I know that you've played a tireless role as an advocate for that population, at times through significant inconvenience to your own life (laughs) to put it politely.

You talk about why that condition has been so misunderstood being the name, the blame and the shame. So maybe just talk a little bit about that.

Dr Myhill: The worst thing that has been done for patients with Chronic Fatigue Syndrome is for them to be dumped into the psychiatric dustbin. They are told that the problem is in their brain and the culmination of this, as you know, has been the PACE study that was published in 2011. The PACE study purported to demonstrate that these patients could be effectively treated with Cognitive Behaviour Therapy and worse Graded Exercise Therapy. Now practitioners like you and me who are in the know new that could not be right because a condition that is defined by exercise intolerance is hardly going to be menial to treatment by exercise. It's an intellectual oxymoron and therefore I was part of a group, we applied to the information commissioner for the raw data on which that study was made. It was resisted, the authors of the PACE study defended that and it cost them £200,000 to defend it but they lost. So we then had the raw data on which that study had been based and Dr Keith Gerahty re-analysed the data and came up with a result that actually it's a badly designed study, they moved the goal posts, the patients were misinformed, there had been no long term benefits, the whole thing was a complete fraud.

On the back of that I reported the authors of the PACE study to the General Medical Council for scientific and by implications for financial fraud. Now of course the General Medical Council is part of the establishment, they want to keep Chronic Fatigue Syndrome and ME a psychological condition. Why? Because it's the patients fault. Now I see lots of CFS/ME patients triggered by exposure to poisonous chemical, for example Gaforth Syndrome, for example, the 911 fireman syndrome, for example with silicon breast implants. These are all powerful chemical triggers for CFS and ME. But if the establishment admits to such then of course the potential for compensation claims are just going to through the rough for very real reasons. People have been poisoned, people have been made ill, and it's a physical condition that needs physical therapies.

Of course the response from the General Medical Council is to dismiss my complaint and say it has no basis. I asked the General Medical Council for the evidence based for their decision and they have refused to give that to me.

Alex: I did find myself chuckling out loud when I was revisiting your book CFS and ME because you were talking about some of the interactions, let's say, that you've had with the GMC over the years and that you'd managed to some of the email correspondence and to paraphrase it says something like 'the problem we have is that her patients seem to be getting better'.

Dr Myhill: And none of the people complain about her.

Alex: (laughs) Exactly, exactly.

Dr Myhill: I mean the reason I am pursuing this PACE complaint is because we have to throw out Graded Exercise Therapy as a treatment for ME patients because it makes them worse. I have literally hundreds of letters, many of them have gone to the GMC, of people who have been given graded exercise therapy and not just made worse, made permanently worse. Now that is abuse of power.

Alex: Yes. I think that really is the damaging thing and I think of course one of the challenges we have here is that we have a kind of cultural relationship to the medical establishment where people tend to feel that the power all lies there and it's almost like a kind of parent child relationship where one goes in and they're told to do something and even though it feels completely against everything their instincts are telling them, and sometimes even more frustratingly or the people around that person, but they don't want to feel that they're not trying to get better and they're not following the advice that they're being given that it actually takes a significant amount of courage and strength within patients to actually self advocate and stand up for what instinctively they know to be true for them.

Dr Myhill: Yeah that is absolutely right and what I've been trying to do increasingly in my writings is to give people, as I call it, the ruled of the game and the tools of the trade, so that they can do it themselves because the bottom line is there are not enough therapists out there to treat all the vast numbers of ME and CFS patients that we have. But more importantly people will get better results if they take the control of their health into their own hands because your best doctor is yourself. The word doctor, it comes from the Greek, it means 'to teach', I have to teach my patients how they can cure themselves. I cannot micromanage them from day-to-day as to which supplements to take and when, what diet to eat, what to eat and when, they have to work it out for themselves. But if they can understand what's going on, and I do try to keep my explanations at a level that I can get i.e. simple, straightforward, biologically plausible, understandable, de dah, de dah, then they can work it out for themselves.

Now I don't say it's a smooth ride, it's a very bumpy ride because things get in the way, which we can talk about, but the basics principles of how people can get themselves out of the hole are very simply and I'd love to go through them.

Alex: Yep, yep. Well before we come a bit more into that because one way that I think you have of conceptualizing I think is super helpful is you talk about the analogy of a car, but I just want to make a distinction before we come to that, which is that there's obviously a spectrum of fatigue related conditions

from a kind of at one end people which are able to just about function in their lives but their energy is not what it should be, down to the other end of the spectrum where someone might be completely bed bound, light and sound sensitive.

Several of the labels that tend to get used of ME and Chronic Fatigue, and also we have Fibromyalgia and various other versions, you make a very interesting distinction between ME and CFS, which tend to get used interchangeably, tends to be more in the U.K you'll get an ME diagnosis, in the US a CFS diagnosis, but you make a distinction between those. Maybe say a bit more about that, I think that's very helpful.

Dr Myhill: The only point of diagnosis is to help us to manage and so many diagnoses are not diagnoses they're clinical pictures.

Alex: (laughs) That's right.

Dr Myhill: Oh Fibromyalgia oh aching muscles, Chronic Fatigue oh tiredness, a diagnosis has got to infer what we do for management. Now with the Chronic Fatigue Syndrome, the pure Chronic Fatigue Syndromes are the ones that have poor energy delivery mechanisms and as you mentioned I use the car analogy and to have good energy delivery you've got to have the right fuel in the tank, i.e. diet and micronutrients, you've got to have the right engine of the car, so the mitochondria have got to be functioning well, and then the control systems of the thyroid, accelerator pedal, and the adrenal gearbox have all got to be in place. That will ensure good energy delivery.

Then we have the other side of the equation, how does the body spend energy. Now an enormous amount just goes on staying alive. It's energy we have to spend on basal metabolism and that takes up about two thirds of all that energy generated. So just the business of existence requires a lot of energy and then about a third of that energy we have on top, which we can spend on physical energy, we can spend on mental energy, we can spend on emotional energy.

But I see two important holes in that energy bucket and the biggest hole of all is the immunological hole, it's when the immune system is busy. Now the immune system is of course an essential part of staying alive, it's our standing army and, you know, standing armies are very important part of the survival of the country. Well we want our standing army to be quiet, we don't want it to be playing at Civil War, for example. And what is Civil War? Civil War is food allergy, Civil War is autoimmunity, Civil War is action against things that are benign, that we shouldn't be fighting against. Then of course the immune system can be busy because it's fighting an infection and that infection may

be a low grade infection that doesn't manifest with, you know, a boil or pneumonia, or shivers and shakes or obvious flu like things. It can be a low grade, stealth infection as we call them, that the immune system is chuntering away in the background, fighting that infection and draining our energy reserve.

Now if the immune system is busy then we have symptoms of inflammation and inflammation is characterized by heat, redness, fever, pain and loss of function. So that gives us two very useful diagnostic pictures, if you like. I see Chronic Fatigue Syndrome as the people who have fewer poor energy delivery mechanisms and we have to look at their diet, their mitochondria, they thyroid and the accelerator pedal.

If they have inflammation symptoms, and inflammation symptoms are characterized by redness, heat, pain, arthritis, joint pain, then they have Chronic Fatigue Syndrome plus inflammation and they are the ME patients. So just knowing if you've got Chronic Fatigue Syndrome or chronic Fatigue Syndrome plus inflammation and ME has implications for management because it tells us where we need to concentrate our fire.

Alex: That's an incredibly helpful distinction. So you mentioned briefly this analogy if a car, let's break that down a little bit more because I think it's a really helpful way of thinking about it and I know that I've seen other practitioners that have started to borrow this analogy in different ways and it seems to really resonate with the patient population as well.

So, yeah, break that down a bit more and maybe explain particularly some of the key pieces like mitochondrial function, which we can come to in deeper detail in a bit, but explain a bit more about those different elements.

Dr Myhill: Yeah. As I was saying there are four big players to think about and in order of importance. Number 1 is diet.

Now the human beings are almost unique in the mammal world because we can run on more than one fuel. It's a little bit like a car on petrol and a car that can run on diesel. We don't have one of course but if I put petrol in my diesel car guess what it ain't gonna go. It might chunk along for a bit but then it's going to break down. But we have bodies that are designed to run on fat and fibre, that is the correct fuel for human beings. Now we can run on carbohydrates and we do run on carbohydrates for a short window of time during the autumn because during the autumn we have a carbohydrate bonanza. We have fruits, we have root vegetables, we have pulses, we have breads. When we run on those foods we get fat, why because it spikes blood sugar, insulin spikes and we lay that extra fuel down as fat.

Now that is a wonderful evolutionary tool to get us through the winter because in the past fat people survived the winter because they were insulated and they had a food supply. But primitive man didn't run on carbohydrates all throughout the whole year, he just had that window of time. What made him eat carbohydrates is addiction, carbohydrates switch on an addiction gene and it would have made primitive man, that gene that desire, eat bananas until he couldn't eat anymore, eat potatoes until he couldn't eat anymore, and get fat.

But the problem now is we have that addiction gene, we have those foods all year round. We eat them all year round because we can and OK it might be very delightful but from a health point of view it is a disaster and we now know that those high carbohydrate diets are driving our epidemics to Alzheimer's disease, as we mentioned earlier, of cancer because cancer cells can only run on sugar's and carbohydrates, and of heart disease and arterial disease because they're very prone for that.

So what this means is that the starting point to treat almost everything, but especially Chronic Fatigue Syndrome, is a Ketogenic diet. We have to cut out those carbohydrates, they're cheap, they're addictive and they're making us fatigued. Now in parallel with that I also know that many conditions are allergy driven and the three allergens that come up time and time and time and time again are dairy product, gluten grains and yeast. So the Paelo / Ketogenic diet is cutting out those three major groups of antigen and Ketogenic so that you're running on fat and fibre.

Now this sounds awfully simply but it's the single most difficult thing that I ask my patients to do. I spend more time talking about diet, cooking, what to eat, how to eat, what reactions to get, than everything else put together and I have to say these days I don't do deals with patients anymore.

Alex: (laughs) There will be no negotiation.

Dr Myhill: (laughs) They say to me 'oh if I give up the dairy products can I have a bowl of fruit at the end of the of the day?' the answer is 'No, I don't do deals' (laughs). Yes it sounds very tough but without that in place, if you're constantly putting the wrong fuel into your tank, you will never get well.

Now there are common stumbling blocks here. One stumbling block is that in order to fat burn you need carnitine and so I recommend that almost routinely with Ketogenic diets, and there's another clue here because in order to be able to fat burn you need either adrenal hormones or you need thyroid hormones. Now there's a key point here, people tell me, and I'm sure you

recognise the symptoms of hypoglycemia, you eat carbohydrates, your blood sugar goes up, insulin is poured out, blood sugar comes crashing down and you get all the symptoms of low blood sugar. Shakiness, irritability, anxiety, a craving, got to have something to eat. Those are not symptoms of low blood sugar, those are adrenalin symptoms.

Now a very common problem is people do the Ketogenic diet, you expect to get into ketosis quite quickly, and then the key to adapt in maybe a couple of weeks. Those people who cannot run on low carbohydrate diets are usually hypothyroid and so this is a common stumbling block because if they're underactive for the thyroid they cannot use thyroid hormones to fat burn, they use adrenalin to fat burn instead, and so they get all the symptoms of low blood sugar because they are adrenalin driven. And you know what does adrenaline do, it disturbs sleep, guess what, if you can't get a good night's sleep forget it you're never gonna get well. So the Ketogenic diet is critical for good quality sleep, it's critical for good energy delivery mechanisms and you know I reckon that once you're well keto adapted you only have to eat twice a day and you don't need to snack. It's a way I test myself everyday that I'm in Ketosis. I have a jolly good breakfast, which is a good old fashioned fry up, you know bacon and eggs and sausage and PK bread, and there's a recipe for that, fried bread, and left over vegetables from last night, and then that's it. Nothing throughout the day, water yes, maybe a coffee mid morning, and I have a good evening meal. By doing that I never get hungry, I don't run out of fuel in the afternoon and I sleep well at night. It's hard to get there but that absolutely is the starting point.

Alex: And in many ways what you're saying is, that really a measure to be able to do that and sustain that, is a measure of how well the system is functioning. So that's the fuel into the car, so let's maybe come to perhaps the engine next in terms of mitochondrial function.

Dr Myhill: Yes. Now the engine of the car, I started getting interested in this in the 1990's and I worked very closely with the most brilliant biochemist in the world by a mile, called John McLaren Howard. I said to him 'you know I just have this idea that mitochondria have to be important in people with fatigue syndrome'. We learn about mitochondria in biochemistry at medical school, I learnt about this in the 1970's, and what you do is you learn enough to get through your biochemistry exam and promptly forget it and the clinical application. I said to John I want to measure mitochondrial function and he experimented measuring respiratory enzymes and levels of various vitamins and we didn't really find good correlation. And then he came up with the most illuminating test, ATP profiles.

Now this is a test that measures how ATP is generated in cycle. Now the whole point of mitochondria, what they do, is they generate a molecule called ATP and I think of ATP as money. With ATP you can buy any job in the body, you can contract a muscle, you conduct a nerve impulse, you can make a hormone or whatever. ATP is our central currency function, without ATP we can't work.

He developed this test that shows how fast mitochondria generate ATP, how efficiently that molecule of ATP is moved from the mitochondria into the cell where it's needed to do some work, how well that ATP can be used by the cell and how efficiently the product for that ATP is recycled back into the mitochondria. So this is a functional test and the joy of this test is we could measure the different parameters and see how efficient each bit was and multiply that to give is an energy score.

Now this was the first paper that John McLaren Howard and I and Dr Norman Booth published in 2009 and we took 71 patients, I agreed how ill or how well they were with that patient, the bloods went off to Acumen laboratories, well it was Biolab then, for John to do the test, the results of that then went to Norman Booth. So I didn't know what the mitochondria energy score was, the lab didn't know what the patient energy score was and Dr Norman Booth did the number crunching because he's a physicist and awfully good at that.

The results were breathtaking. What they showed is that those patients with the worst mitochondrial function, had the lowest energies, had the lowest clinical score and those patients with the best mitochondrial function had the best energy levels and this was compared with a control group. It really was a groundbreaking paper.

We subsequently published two more papers which looked at the response to treatment and the treatment regimes that we put in place we could demonstrate objectively were highly affective. Now people of course now want to know well what do I have to do to get my mitochondrial function right because we don't have enough space in the laboratory for everybody to be tested.

Essentially mitochondria can go slow for one of three reasons. They can go slow because they don't have the raw materials to function and for mitochondria to function they've got to have magnesium, they've got to have Coenzyme Q10, they've got to have Acetyl L-carnitine, they've got to have Vitamin B3 and if they go very slow then some Ribose helps. They are the common micronutrient, rate limiting steps. So even if you can't get the tests done you could take that package of supplements, the details are in the books, to improve the raw materials.

Then of course mitochondria can go slow because they're blocked by something, there's some sort of toxin getting in the way, and it might be heavy metal, it might be pesticide residue or bits of silicon, it might be a viral co-protein, I suspect that the products of fermenting gut also inhibit mitochondria. So by taking good history, maybe doing tests in toxic metals, tests looking for other things, you can get a pretty good idea what it is that's blocking mitochondria and again in the books are simple detox regimes that anybody can do. You don't have to go to an expensive clinic in South America to detox or whatever, everybody can do all this stuff in their own home, in their own time, relatively cheaply.

The third possibility is mitochondria might be going slow because the control mechanisms are wrong. It's the thyroid accelerator pedal that's essential and again you could have a Ferrari car, a perfect engine, perfect fuel, but if the accelerator pedal is set at 5 miles an hour it ain't gonna win Grand Prix's. The interesting about thyroid hormones is not only do they determine how fast the mitochondria go, they also determine the number of mitochondria. So they make the difference between a little engine and a big engine and guess what you know your Ferrari, it's only a dash below 500cc it ain't gonna go but if you've got 5 litres in there you've got some power.

So in order of importance we have to get the fuel in the tank right i.e. the diet and basic micronutrients, then we have to sort out the mitochondrial engine and then we fine-tune it using the thyroid and the adrenal gland. A very helpful measure to look at the sum total of all those is your core temperature because if it's all running perfectly you'll be nice and warm and if your energy delivery mechanisms are not good then you are going to be running rather cold. By using core temperatures, as I call it, we can fine-tune the Chronic Fatigue syndrome orchestra, we can adjust the dose of the thyroid and we can adjust the dose of adrenal to get it just so.

Alex: So there's a lot of pieces there and I think for people that haven't had that explained that way it makes an enormous amount of sense. One piece that I wanted to explore a bit more, I remember back in I think it was about 2006, when Niki Gratrix who I was working with came across the work that you guys were doing on mitochondrial function. I seem to remember at the time, dare I confess at this point that Biolab were not letting non doctors do the testing, so we had a very friendly doctor sign off our testing so we were able to use the tests, but I remember the thing that was so staggering at that point that for the first time really there was an explanation of the delayed fatigue response, which people with Chronic Fatigue experience. Up until that point that was kind of a mystery as to why somebody would be able to do something on a particular day, and it might be a stretch from what they would

normally, they would kind of be OK the day after, they might be a bit buzzy the adrenals might be a bit over stimulated, and then the second or the third day they would suddenly crash. This was something, and of course it is something, that many, many people with Chronic Fatigue particularly but also fatigue will experience and for the first time there was an explanation.

So maybe you could say a little bit about the mechanism of how that happens?

Dr Myhill: Of course. Now as I said the job of mitochondria is to produce the energy molecule which is ATP, it's called ATP because it has three phosphate groups on it; adenosine, triphosphate and in releasing a shot of energy it is converted into adenosine di-phosphate i.e. two phosphates on there, and then its ADP which is recycled back into mitochondria.

If energy demand exceeds energy delivery, and that would happen in an emergency situation, for example, if a saber tooth tiger jumped out at you, the body can make an extra bolt of energy from two ADP molecules. Two ADP molecules can combine together to make one ATP and one ANP i.e. $2+2 = 3+1$. So that gives us another ATP that gives us another bolt of energy but the problem is ANP, the single phosphate model, that can't be recycled, mitochondria can't deal with that. That is effectively a waste product, it has to be thrown away. So if you really push the system beyond that which is can generate you suddenly start throwing away that core molecule ATP.

Now to recover from that situation the body has to make a brand new ATP. It can make that from a sugar molecule, it can make that from glucose, which is a 6 carbon molecule, there's a nasty bit of biochemistry called the pentaphosphate shunt that's necessary to chop carbon out and make it into a 5 carbon molecule and from that 5 carbon molecule the body can then make new ATP, but that takes time. That doesn't happen instantly, that takes hours and possibly days depending on how low you run your energy resources down. I think that that is the only explanation for the delayed fatigue that we see in patients with Chronic Fatigue Syndrome because they are always pushing themselves to their particular limit and they are always very close to overdoing things and burnout.

Now one of the interesting little pieces that comes from that is D-ribose can be very helpful for people who have really overdone things because D-ribose is the 5 carbon molecule, which is the raw material from which we can make brand new ATP. So by giving people D-ribose you can short circuit that process and you can prevent that delayed fatigue. Now I love D-ribose, it's a fantastically useful supplement, the problem is it is a sugar and I think there is potential for it to be fermented in the gut. The way I like people to use it is

as an emergency rescue molecule, so have your D-ribose ready, but if there's a danger you've really overdone things and you've really overcooked it and you know you're going to pay for it the next day that's the time to take D-ribose. Then very often people find they can prevent that delayed fatigue and thereby not waste another day of their lives.

Alex: Very, very interesting. Something I just wanted to break down a little bit more is that, you are saying about the three things that key within mitochondrial function, you were saying getting the raw ingredients in and then you were talking about blockages in the mitochondria. Maybe say a little bit more about what might be some of those blockages that people experience.

Dr Myhill: Well as you can imagine the business of making ATP is a finely tuned process. You need all the right enzymes, in the right position, at the right time to generate ATP. Just one example of how incredibly efficient this is, you know when the body is using energy fast a molecule of ATP will recycle every 10 seconds. If you measured all the ATP or if you weighed all of the ATP that was being generated in a day it would exceed your body weight. So it's a massively efficient system, it's incredibly busy to generate the energy, and if you're throwing a poison, like some heavy metals, like some pesticides, volatile organic compounds, cleaning chemicals, hair dye or whatever, it's like throwing a handful of sand into a finely tuned engine. Is it a good idea to chunk some sand into your Ferrari, I don't think so, it's going to really mess it up in unexpected ways. You throw these chemicals in and they will block the whole business of ATP synthesis, which we call oxidative phosphorylation, it will cover the membranes of mitochondria and thereby the carrier proteins that move ATP from the mitochondria into the cell where it's being burned, all those carrier proteins that ingramming ADP and flicking it back into mitochondria, they will be blocked.

In fact if you look at the membrane of a mitochondria it's about 80% translocated protein, it literally sits there grabs, flicks it out, grabs ATP, flicks it back in again, grabs ATP flicks it out, grabs ATP flicks it back in again, you know they are incredibly busy, incredibly active, working hard all the time and it doesn't take much to block up those delicate works.

Alex: So what are some of the things, so obviously if one knows that for example hair dye or whatever are things, which are causing it one, would remove those things, but what are some of the other ways that you would deal with those blockages? If there's something historic, which is in the system, how might you help work with that?

Dr Myhill: Essentially there are two important ways to detox and to reduce your toxic load and if people can't afford the tests sometimes they just do this.

The commonest things it's caused from it like hair dyes, antibiotic residues, pesticide residues and so on, you can get rid of with heating regimes. Now I've done some tests of toxicity before and after in many patients now and I know these heating regimes work reliably well and I don't think it matter what heating regime you use. Now if you are a top class athlete, and believe you me I do have Olympic athlete's coming to consult me because they want to improve their energy delivery mechanisms, then simply running, sweating and showering off will do the business.

The point here being is that many of these toxins concentrate in fat and of course we have skin and under skin is subcutaneous fat that is where they will be. They'll also be also be in the brain and they'll also be in fat in other places in the body. But if we get hot we physically boil those toxins off from the subcutaneous fat onto the lipid layer on the surface of the skin and then you can wash them off from there. And of course if you reduce the concentration of fat the fat then they will redistribute from other parts of the body into that fat and be drawn out.

I now know from experience that approximately 50 heating regimes, which might be saunas, it might be far infrared saunas, it could be sunbathing, it could be a hot bath with maybe Epsom salts in there, 50 of them will halve out our toxic load.

Alex: Wow.

Dr Myhill: Then you have another 50 and it halves it again so the number come down exponentially so you never get to zero, you never get to zero because we live in a toxic world. We're being poisoned all the time and with the best will in the world you can't avoid that but you have to get that at a sufficiently low level that your body can deal with that, and they work remarkably well.

Then we have to have techniques of getting rid of toxic metals and there are lots of ways that we can do that. We can do that with good nutrition, I mean the problem here is we become poisoned very often not just because of exposures but because of micronutrient deficiencies. So, for example, if you have an enzyme in the body that needs zinc, if that person is zinc deficient and as you know zinc deficiency is incredibly common, if that person is zinc deficient it will grab something that'll look like zinc, which might be lead. Therefore, these nasty toxic metals get incorporated into the body where they really shouldn't be so very often the body can continue to accumulate those things.

So that gives us a two-pronged approach to getting rid of heavy metals. First of all supply the body with lots of zinc so that when that enzyme is made again it can grab hold of the zinc instead of grabbing hold of lead, and then supply it with sulphur molecules like glutathione, heavy metals love sticking on to sulphur groups, which can then detox it. So then just simply taking a good micronutrient together with glutathione would help to reduce your load of heavy metals.

Another very useful way is to use clays in the gut because the heavy metals get excreted in bile, the clays in the gut, it doesn't matter if you use benzonite or zeolite they are all much of a muchness, will grab those heavy metals and pull them out through the feces. I like to use DMSA or cater, which anybody can get online which is oral chelation therapy that works reliably well and if you want to you can test that very easily by measuring toxic metals in urine with DMSA to see what it pulls out.

These are all describes in the books, the techniques, they're simple, accessible and available to everybody and work reliably well.

Alex: Fantastic. I'd like ot go in a slightly different direction for a bit. You touched on earlier the role of fermentation in the gut and obviously you can be eating the perfect diet, having all the things that you need to have in there and actually not be breaking down and absorbing.

So say a little bit around why the guts important but also particularly the role of fermentation as part of this.

Dr Myhill: OK well again if I spend most of my time talking about diet the next amount of my time is talking about the gut. Let's just talk about what constitutes a normal gut because again humans are almost unique in the mammal world because we can eat such a wide range of foods. We can eat vegetarian foods, we can eat meat, you know if I fed my dog vegetables she wouldn't thrive, if I fed my horses a couple of steaks a day they wouldn't thrive either, but we can do both.

We do both because we have a two part gut. Now the upper gut should be a near sterile, acidic, digesting gut to deal with meat and fat and that's where we get most of our nutrition. For that we need good stomach acid, we need good enzyme production from the pancreas and we need bile salts from the liver to emulsify that. Then as we go down the gut into the small intestine that absorbs most of the goodness from food and then we get into the large bowel. The large bowel is a vegetarian department and that's where we ferment fibre and from fibre we get more energy and we get lots of good things like Vitamin K and Serotonin and good things like that and we have friendly bacteria which

help to programme the immune system. So think of the gut in two parts and they are very different and unique.

The problems arise when we start to eat too much sugar and too much carbohydrates in the upper gut because if we overwhelm our ability to sterilize the upper gut, and of course that depends on stomach acid we need lots of acid in the stomach to sterilize the gut. If we overwhelm that then the bacteria and yeast will move in and they will happily ferment and the cardinal symptoms of the upper fermenting gut would be reflux, burning, esophagitis, very often patients are told they've got the hiatus hernia which I think is a nonsense of a diagnosis. They feel full, they get bloated, maybe get stomach pain, colic, those are all cardinal symptoms of upper fermenting gut. That brings a lot of problems.

First of all some of those products of fermentation are toxic, you know what do we ferment to produce alcohol, D lactate. D lactate acidosis in cattle clinically looks exactly like BSE, it sends them bonkers. Hydrogen sulfide, which again is extremely toxic and the poor liver then has to deal with this fermenting nastiness that's coming from the gut so that's the first problem.

The second problem is that we are taught at medical school that we have bacteria in the gut, we have yeast in the gut and there they remain, not so. We now know that many of those bacteria, a small percentage of them, can get across the gut into the bloodstream, it's called bacterial translocation. If you Google it you will find lots of stuff on it. Now the point is if they are friendly bacteria that the body has been living with for billions of years, we've learnt to cope with them, no difficulty at all. But if they are unfriendly upper gut fermenters then the immune system is activated, it thinks it's being invaded by a foreigner, it thinks it's getting septicemia and wherever those bacteria end up you will get inflammation.

(50.59)

So the commonest manifestation is probably arthritis, joint pain, Fibromyalgia because get what connective tissue, we are largely comprised of connective tissue. But what's more intriguing is there's some lovely work done by a Japanese researcher called Mishi Hara and he has demonstrated that if you've got fermenting microbes in the gut you have got fermenting microbes in the brain and in the brain there is potential for them to ferment substrates like adrenalin, like noradrenaline, like serotonin into amphetamine like substances and LSD like substances and we now know that the whole of psychosis could be explained in the terms of fermenting brain, as I call it. And guess what do we know from the naturopathic doctors, much better doctors have gone from years before me like Abram Hoffer, like Carl and the Ketogenic diet is the starting point to treat all psychosis. And guess what you can cure

epilepsy with the Ketogenic diet, you can cure brain tumors with a Ketogenic diet and you can cure psychosis with a Ketogenic diet.

So the third problem of course we get from the upper fermenting gut is that all the goodness in food, vitamins, the minerals that you're trying to feed, they go to feed these wretched microbes that are flourishing in the gut. So the zinc supplements that you're taking are feeding these microbes that are fermenting so you think you're doing yourself a lot of good by giving yourself some B Vitamins and some Zinc and some Magnesium's and Selenium; not so you are just feeding the bacteria in the gut and making the problem worse.

So the upper fermenting gut is a major, major problem and we have to deal with it and I again have a very simple way to deal with that. First of all don't feed them, don't give them the carbohydrates and sugars that they love to ferment, i.e. Ketogenic diet. Secondly kill them and what is the best way to kill them, good old Vitamin C. Vitamin C is one of those wonderful tools that multitask and take Vitamin C for bowel tolerance, another incredibly useful tool that I use almost routinely in my patients with fatigue syndromes and almost any form of inflammation.

Alex: Do you see a role for taking things like digestive enzymes or hydrochloric acid as part of that process as well?

Dr Myhill: They may well be. If you have upper fermenting gut or allergies very often you have pancreatic insufficiency or insufficient bile tox, we can test for that very simply by doing a comprehensive diagnostic stool analysis, or whatever, we have good tests that give reliable answers. And yes we must give in the short term the digestive aids the gut needs in order to be able to digest foods.

Now the good news is you don't have to take those digestive aids forever because the body recovers and a study done at Biolabs in mid 1990's by Stephen Davies and John McLaren Howard again showed that about a year of supplements, whether that's acid, enzymes, a bile tox, bicarbonate, and digestion will correct. So usually thankfully it's a short term need for those digestive aids but yes they can be absolutely vital in the recovery programme.

Alex: Fantastic. I'm mindful of time, maybe just to kind of wrap this up and bring this together, for people that are watching or listening to this, and I'm sure this will be a lot of people, been inspired by and impacted by what you're saying, one of the things you're saying that pretty much anyone can do it a Paleo / Ketogenic diet. What are some of, beyond the protocol specific stuff that we've explored, what are some of the other core fundamentals that you

would encourage people to do? Perhaps things like pacing, sleep, that sort of thing.

Dr Myhill: The way to think about energy is what I call the Mr Micawber quote from Charles Dickens, where he says income 20 shillings, outgoing 19 shillings, result happiness, you know, income 20 shillings, outgoing 21 shillings result misery. You have to maintain a reasonable energy gap. We know when that energy gap is closing because we get symptoms. We get symptoms of fatigue, of stress, I think stress is the symptom the brain gives us when it knows it doesn't have the energy to deal with demand, anxiety, depression. Depression is another symptom the brain gives us when it knows it doesn't have the energy to use the brain and depression makes people not spend energy.

The point being that if energy demand exceeds energy delivery then we die. So we have to have these extremely nasty and extremely unpleasant symptoms, like fatigue, stress, depression, anxiety, to stop us spending our last drop of energy and that's where pacing is so important. It's terribly boring, really I am not person to lecture on pacing because I don't think I could do it myself but it is essential and you will get better faster if you pace. Why? Because if that energy gap gets too low we switch into anaerobic metabolism, we start making a load of ANP and draining the energy bucket and the whole thing spirals down. So pacing is a vital part but dead boring.

But what I can tell my patients is that you put all this stuff in place and you won't have to pace forever, you'll be able to have more energy to go out and have a life with because spending energy is all about having fun.

Alex: Fantastic. Sarah this has been an absolute treasure trove of information. I want to mention one of your books particularly, 'Diagnosis and Treatment of CFS and ME: It's Mitochondria not Hypochondria', I think very accessibly given the level of kind of complexity that's being explored, a book that a lay person with fatigue can still follow and get a lot of benefit from.

Maybe if you could just mention your website, which is also an amazing resource of information for people?

Dr Myhill: Yes. The website, again from very early on I wanted to make all this information free to anybody that wants to access it, and much of this stuff that is there is on the website. It's not as up-to-date as I would like it to be because these days I tend to write books and my publisher would go nuts if I put all that information free on the website, but the core stuff is all there and as I come up with fresh ideas, for example, about fine tuning the Chronic Fatigue Syndrome, the important stuff is up there but not every chapter of

that book is there in that format. All the information is basically there, how to do the detox, so if people really can't stretch to buying the book it's all there on the website. Just Google Dr Myhill and it comes up, I think it's had 16 million hits since I put it up there 10 years ago.

Alex: Yeah it's a fantastic resource your website and also before practitioners who want to find out more, I know from time to time you do lectures and pieces, what would be the best place for them to track the different ways they can access you?

Dr Myhill: Ooh crumbs. I do quite a lot of podcasts and webinars for the Academy of Nutritional Medicine, for the British Society of Ecological Medicine, like your good selves, so I'm ashamed to say I don't have a formal training of people because what I try to do is write, for example in the book 'The Infection Game' came out last year and essentially that is how to treat any infectious aspects of people with fatigue syndromes and ME and all the details are in there, the tools of the trade like Vitamin C, like heat, like light, like sunshine, like iodine. They're all there, how we can treat infection using natural remedies and yes sometimes we need antibiotics in order to really get ahead of the game, but the starting point is all there in 'The Infection Game' for the infectious aspects of any condition.

Alex: Fantastic. Sarah thank you so much, not just for this interview but also for being an inspiration and for being such a leader in this field for so many years. Thank you very much.

Dr Myhill: My pleasure, thank you Alex.