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**DIAGNOSING AND TREATING
CHRONIC FATIGUE SYNDROME
(CFS)**

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Published by **Sarah Myhill Limited, Upper Weston, Llangunllo, Knighton, Powys LD7 1SL**

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30th edition May 2012
reprinted October 2012

Price £12 incl P+P (UK)

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INTRODUCTION

This book contains most of those things which chronic fatigue syndrome (CFS) patients must do to get well (don't miss out bits or you may fail!). All the tests I discuss are also available through my website. My aim is to give all CFS sufferers and their therapists the knowledge and the access to tests to get themselves on the road to recovery. At present I am overwhelmed with new patients and cannot see more. However, I now have an experienced team of secretaries who can certainly advise you on the basic work up and recommend appropriate tests. I can do a detailed letter to your GP explaining what action needs to be taken on the basis of such tests. If your GP is unable or unwilling to help with, say B12, magnesium, thyroid and adrenal function, then I can help by supplying some of the necessary, with the GP's knowledge. Or if you get to the stage when you need further help, such as desensitisation, I can refer you to a suitably qualified local practitioner, a list of whom is at www.ecomed.org.uk Also, you can approach a practitioner directly from a list of [other doctors who specialise in Environmental Medicine](#) or contact one of the [Practitioners trained to treat CFS](#) .

Since 1982 I estimate I have seen and treated over 5,000 patients with CFS. I now know that there is only one way to get well and that entails a whole package of treatment. That package of treatment has to be done in the right order – it is a little bit like building a house – there is no point putting the upstairs windows in until the foundations and walls are in place. Many patients come to me having tried thyroid or B12 injections or whatever, but **unless the diet, sleep, pacing and micronutrients are in place and correct, they won't see benefit**. I ask all my patients to tread this hard path because I know of no other way to get better. This requires a complete change in lifestyle and changes are hard to make, especially when the poor patient lacks the physical, mental and emotional energy to make these changes at all! Each patient has to become his own doctor, detective and psychotherapist to work out the best strategies for recovery. I can point patients in the right direction, provide the tests, information and therapies to get sufferers better, but there is only one person who can actually walk that path.

The basic package of treatment and approach to treatment is the same for everybody, but each person discovers a vital key or keys which really give them a quantum leap in improvement and may even be unique to them. For some people who are poisoned it is the detox regime that makes them better. For others, removing mercury amalgam opens the floodgates to recovery; thyroid hormones for many are an important factor. But there is no point putting the esoterics in place until the basics are done.

Recovery is never a smooth ride because life has a habit of getting in the way and throwing in extra stresses that you can do without. Whenever a hiccup occurs, always go back to the basics. People recover from CFS, firstly by getting their regime as tight as possible (with respect to diet, supplements, pacing, sleep and detox), then they start to feel better and only then should they start to increase their levels of activity. BUT if they get delayed fatigue, then reduce activity. Most people end up with a juggling act between how strict their regime is, how well they feel and how much they can do. The regime is for life – but once in place it substantially reduces risk of heart disease, cancer and degenerative conditions.

WHO AM I?

I have worked in NHS and private practice since qualifying from the Middlesex Hospital Medical School in 1981 (medicine with Honours). For 17 years I was the Hon Secretary of the British Society for Ecological Medicine (renamed from the British Society for Allergy, Environmental and Nutritional Medicine), a medical society interested in looking at causes of disease and treating through diet, vitamins and minerals and through avoiding toxic stress. I help run and lecture at the Society's training courses. I lecture regularly on organophosphate poisoning, the problems of silicone, CFS and so on. I have had many appearances on TV and radio. I am a founder member of OPUS (organophosphate users support group) – a charity to help sufferers of pesticide poisoning.

I am a co-author of a scientific paper “Chronic fatigue syndrome and mitochondrial dysfunction” which has just been published (Jan 2009) in the International Journal of Clinical and Experimental Medicine – see <http://www.ijcem.com/files/IJCEM812001.pdf> This paper supports the fact that the mitochondrial function test is very useful because it gives an objective measure of fatigue which cannot be argued with.

I have two daughters, Ruth and Claire. My hobbies are anything to do with horses! In the winter I hunt, in the Spring and Autumn team chasing, occasional point to pointing and in the summer I go long distance riding. Below is a picture of me team chasing on my horse Mags! Love her!



A QUICK GUIDE TO FINDING WHAT YOU ARE LOOKING FOR

A message from the editor

Throughout the book you will come across links to web pages looking like this: [Malabsorption](#). These are titles of pages on Dr Myhill's website which she considers to be useful and relevant to the topic under discussion. You can get to that page by holding down the CTRL key on your keyboard and clicking on the link. Another way to view these pages is by going to the website www.drmyhill.co.uk and typing the main words from the title of the page in the search box (e.g. "malabsorption"). If you are working from a paper copy of the book and you do not have access to the internet, get in touch with the office staff and ask for a copy of the page you want to be posted to you. There will be a small charge for photocopying and postage.

Similarly, you will come across words looking like this: *Mitochondrial Function Profile*. They denote names of the various tests Dr Myhill discusses and recommends and which can be ordered from her website.

If you are reading this book in its electronic form, then there are certain tools available to you which will make moving around in this long document much easier. They are

- **Table of contents (TOC) and**
- **bookmarks.**

The titles in the **Table of contents** act as hyperlinks to the relevant pages/sections. You need to hold Ctrl button and click on the title of the chapter/section you want and you will be taken to the correct page.

Bookmarks do a similar job, but are even better, because you can jump to the section you want to read from any place in the document. I have already bookmarked for your convenience:

- Table of contents
- The beginning of each of the 6 Parts of the book

You can also add your own bookmarks while reading the book. To do this, position the pointer where you want the bookmark, from Insert menu select Bookmark, write the name of your bookmark (without spaces!) and click Add. Job done!

To use the *bookmarks* that already exist in the text, follow these instructions:

1. On the **Insert** menu, click **Bookmark** (quite low on the list of options).
2. Under **Bookmark name**, click the bookmark you want to go to (e.g. "PartI", "TOC,").
3. Click **Go To**.

"Word" software offers another clever feature for moving around in a long document. It is a little round button on the bottom right hand side of the screen (for the IT initiated, the little button is on the bottom of the vertical scroll bar and is labelled "Select Browse Object" and in the spirit of fair play I need to tell you that in Open Office Writer, it is labelled "Navigation"). When you click on it, a little box pops up with a number of icons. If you click on the box with a horizontal arrow, you can enter the page number you want to move to, and click Go To. Other ways of browsing are also worth exploring by clicking on the other icons.

At various places in the text of the book I have also created cross-references to relevant sections at other places in the book. They appear as **bold page numbers** in brackets and behave as hyperlinks. This means that if you click on such a page number, you will be taken directly to that page. The slight difficulty is with returning to the "place of departure". You need to make a note of the number of the page you are leaving and go back to it by using the "little round button on the bottom right hand side of the screen in the scroll bar".

PART I: THE CLINICAL PICTURE OF CFS



We all have a pot of energy which is available to us to spend over the day. What prevents us spending too much is the symptom of fatigue. Fatigue is the symptom that arises when energy demands exceed energy delivery. We have to spend that pot of energy just to stay alive in "house keeping" duties, but in addition mentally, physically, emotionally or immunologically. In ME/CFS either that pot of energy can be small (because of poor mitochondrial function, poor fuel supply, poor adrenal function, poor thyroid function and so on), or we can be spending energy wastefully. Of course, the business of pacing is all about spending mental and physical energy judiciously. Many have experienced how energy sapping it is to expend emotional energy – many MEs suffer hyper-vigilance. However, I suspect a greatly overlooked cause of wasting of energy is immunological.

Energy must be expended on the body's daily "house keeping" duties. I was intrigued to see the following energy expenditure breakdown in Wikipedia: liver 27%, brain 19%, heart 7%, kidneys 10%, skeletal muscle 18%, other organs 19%. It astonishes me that the liver consumes more energy than the heart and brain combined! Much of this has to do with assimilating and detoxing food from the gut!

Immunological energy

I see the immune system to be like the brain, i.e. it is enormously demanding of energy. We all know this – if a healthy person develops influenza, then he becomes bed-bound for two weeks (she becomes bed-bound for a week.....!). Work done by Caroline Pond has demonstrated that when wild animals put on weight, the first place they dump their fat resources is round lymph nodes, i.e. the immune system. Bone marrow, of course, is very fatty, so this suggests the immune system is not just demanding of energy, but energy in an intensive form i.e. fats and oils.

The immune system spends energy fighting infection, which is, of course, highly desirable. However, if it gets its wires crossed, it may end up fighting the body itself (autoimmunity), or fighting substances which do not cause harm, and this is allergy. However, in ME I suspect there is another immunological waste of energy which has to do with microbes, possibly "allergy" to microbes.

Post-infectious ME

A great many cases of ME follow viral infection and/or vaccination. In these conditions the immune system is switched on to fight the offending microbe. In the short term this is highly desirable. To be effective, all vaccinations contain immune adjuvants which are there specifically to fire up the immune system. When this works in our favour, we call it immunity. However, when it works against us, we call it allergy. Clinically, we know that vaccinations can trigger allergies.

There is no doubt that there are some ME patients who do not recover until they start taking antivirals (see work by Dr Martin Lerner in : [Valacyclovir in the treatment of post viral fatigue syndrome](#))

In these cases, there is often no overt evidence of infection. I suspect what is going on here is that these microbes are present in low levels which would not normally cause harm to the body, but the immune system continues to fight. It is a sort of inappropriate immune activation against microbes or “allergy” to microbes. This is hugely wasteful of energy. Such patients will have a large immunological hole draining their daily energy bucket. See [Energy Expenditure in ME/CFS: Immune wastage of energy and Rituximab](#)

I treat CFS by working out the underlying nutritional, biochemical, immunological, toxic, hormonal, and lifestyle mechanisms that cause the symptoms and signs. A useful analogy in understanding the mechanisms of this illness and recovery is to compare the human body to a car. I will be using this analogy throughout the book.

If the body is a car, to get it to go you need:

- | | |
|------------------------------|-------------------------|
| • Engine | • Mitochondria |
| • Fuel | • Diet/Nutrition |
| • Oxygen | • Lungs |
| • Accelerator pedal | • Thyroid |
| • Gearbox | • Adrenals |
| • Service and repairs | • Sleep |
| • Cleaning - oil | • Antioxidants |
| • Cooling system | • Detoxification |
| • Driver | • The Brain |

Symptoms of CFS

The symptoms of CFS result from poor energy delivery at the cellular levels. The amount of energy available is partly determined by *mitochondrial function*. In Part II of this book I will explain the role of mitochondria, the biochemical processes inside each cell involved in producing energy, and I will show how many of the symptoms of CFS can be explained by mitochondrial dysfunction. Then the references I make here to mitochondria, ATP, ADP, cell-free DNA etc. will become much clearer. First, however, let us look at the clinical picture of the illness.

The two key symptoms in patients with CFS which I believe reflect the *mitochondrial dysfunction* are:

- very poor stamina (mental and physical) – i.e. you can do things, but only for about 5 seconds before tiring. This is due to slow recycling of ATP
- delayed fatigue (mental and physical) – i.e. symptoms persist for 24 - 96 hours if you over-do things. This is because when mitochondria are stressed, all the energy molecules (ATP, ADP and AMP) are drained out and cells have to wait 1-4 days for new energy molecules to be made via the pentose phosphate shunt.

These two symptoms are central to the diagnosis of CFS. The mental fatigue manifests as poor short term memory, inability to follow a line of argument, difficulty reading or watching TV, poor problem solving ability, difficulty dealing with more than one thing at a time – what I call foggy brain. As one of my patients put it: “*Nothing right in my left brain, nothing left in my right brain!*”

In additions to the above, there are common symptoms present in many cases. These symptoms are worsened when the patient overdoes things:

- malaise (i.e. a feeling of illness) – this is caused by damage to tissues when the sufferer overdoes things. In tests this is reflected by a high levels of cell-free DNA, which is a measure of tissue damage. See also [Inflammation](#).
- muscle pain - ditto – also caused by poor antioxidant status, early switch into anaerobic metabolism, or magnesium deficiency. See
 - [Pain](#)
 - [Fibromyalgia](#),
 - [Allergic muscles](#),
 - [Muscle Stiffness](#).
- muscle weakness (including the muscles in the eyes giving episodic, variable, blurring of vision),
- sleep disturbance (whereby the “biological clock” is moved on 1-6 hours and CFSs drop off to sleep late and wake late). CFS sufferers are natural owls.
- tendency to get recurrent infections – see [Viral infections - avoid them and treat them aggressively](#)
- a general hypersensitivity to noise, light, touch, pain, smells etc
- drug and alcohol intolerance – a small drink gives a big hangover. Indeed intolerance of many drugs is common especially to antidepressants, beta blockers, statins and blood pressure medication. This may reflect poor detoxification pathway with stressing of the P450 enzymes and an out-pouring of free radicals. However many of these substances inhibit mitochondria directly or worsen the already struggling low cardiac output. See [Detoxification - an overview](#)
- feeling of “not being with it”
- poor temperature control
- gut symptoms: [Allergy](#), [Hypoglycaemia](#), [Fermentation in the gut](#), [Hypochlorhydria](#), [Malabsorption](#), [Poor pancreatic function](#), [Yeast problems and candida](#)
- headache,
- mood swings – see [Brain in CFS – EDGE EFFECT](#)
- joint pain – see [Nutritional treatment of arthritis](#), [Osteoporosis](#)

There are usually few physical signs. Sometimes there are tender trigger points in muscles and tendons, sometimes signs of inflammation such as swollen tender lymph nodes in the neck or low-grade fever. However, often there are no obvious abnormalities on physical examination – indeed, the patient may look reasonably well.

Depression is not part of CFS but can arise in any patient who has been chronically ill with “no light at the end of the tunnel”. The main cause of depression in CFS patients results from bad treatment by their physicians. It appals me that so many physicians feel able to send their patients away with no coherent sensible management plan or glimmer of hope for the future.

The question can be asked as to what causes mitochondrial malfunction. This may occur for many reasons:

- Genetic – CFS runs strongly in families, usually down the female line. This is because all our mitochondria are inherited from our mothers. I see many mother-daughter, mother-son combinations both with CFS but rarely father-daughter, father-son combinations. An indicator of genetically poor mitochondria comes from asking how one fared at the school cross country run - most of my patients staggered to the school gate and walked the rest looking with disbelief at the others disappearing into the distance! Having said that I also see a group of people who have been serious athletes and get into CFS through over-training.
- Direct damage by viral stress or toxic stress (such as pesticides, carbon monoxide and fumes from burnt hydrocarbons, heavy metals, volatile organic compounds, silicones etc). This includes damage because of recreational drugs and prescription medication, especially the Pill, HRT, statins.
- Inability to resist toxic or viral stress because of poor nutritional and antioxidant status
- Nutritional deficiencies – so the body biochemistry goes slow. Risk factors for this would be a history of anorexia or bulimia, heavy drinking, poor quality diet
- The natural ageing process (which damages mitochondrial DNA). This process, however, can be slowed down with proper nutrition and lifestyle. I expect to suffer fatigue when I am in my eighties or nineties but not before!
- No time for healing/repair - Sleep disturbance, such as shift work, and chronically insufficient sleep is undoubtedly a major risk factor for CFS. [Sleep](#)

Any or all of the above problems can result in:

Acquired metabolic dyslexias – ie we get less good at making certain key molecules such as D-ribose and co enzyme Q 10. – *Mitochondrial Function Profile*

Damage to DNA – the blueprint for making these components is damage – Tests: *DNA Adducts..* [Toxins](#) block mitochondrial function, eg prescriptive drugs, alcohol, pesticides, volatile organic compounds (VOCs), heavy metals. Useful tests: *Translocator protein studies, Microrespirometry studies*

Damage from free radicals – see [Antioxidants](#) *Antioxidant status*

Hormonal imbalances – *Thyroid function profile, Adrenal stress profile*

Poor energy supply – [Stone Age diet](#), [Malabsorption](#), *Short chain fatty acids, Fructose intolerance*

- [Inflammation](#)

REMEMBER: CFS is a symptom and not a diagnosis. CFS is just the clinical picture. Something causes CFS and all its symptoms. Also remember that fatigue is a protective symptom! It prevents you from damaging your body doing too much! We all get this at the end of the day and sleep to recover. You ignore the symptom of fatigue at your peril!

Useful medical tests for investigating the patient who presents with chronic fatigue

One of the things I really dislike about the Medical Profession is their power over patients. The main two ways in which they use that power is firstly by controlling the availability of tests and secondly through the power of prescription. My website www.drmyhill.co.uk allows patients to order any test they see fit. The test result comes to me as the referring practitioner; I can interpret it and write to their GP with recommendations (copy to patient). Secondly, most of my treatments do not require prescription drugs and so are available to all. I can also recommend a local ecologically trained physician who can advise further if necessary.

There is no simple test currently available to diagnose CFS because CFS is not a diagnosis – it is a symptom. Blood tests serve to exclude other diagnoses and can be used to try to identify the underlying causes. Doctors can sometimes be very naughty – they do the routine tests which all come back as normal then turn round and tell their patient that nothing is wrong with them. I believe that the reason so many medical tests are negative in the case of CFS patients is because doctors are looking in the wrong place and asking the wrong questions. The major pathology is inside cells, i.e. in mitochondria. Although cells (and therefore organs) look fine, they do not function properly. It is a bit like having a car with a flat battery – an MRI scan of a car would come back completely normal – but you try and start it and nothing would work!

However, I now believe a major player in CFS is mitochondrial failure. The paper published by Dr Norman Booth, Dr John McLaren-Howard and myself clearly shows that in moderate and severe ME there is a close correlation between mitochondrial function and the level of fatigue. The package of tests show where the biochemical lesion lies and what has to be put in place to correct it. Having said that, various routine blood tests have a place in investigating a patient with fatigue and so let's review them first.

Firstly exclude macroscopical pathology

Most patients, by the time they get to see me, have had all the routine tests done. These tests largely test for macroscopic pathology such as major organ failure (anaemia, heart disease, cancer, liver failure, kidney failure and some gut problems). They do not test for minor organ failures (such as partial thyroid gland failure, partial adrenal gland failure, mild liver damage, poor ability to detox). None of these tests look for poor function of the brain or brain damage, nutritional tests are often absent or limited, hormone tests are usually incomplete and there are virtually no tests of energy delivery.

Having said that, there are often mild abnormalities in standard tests which may not have been picked up on by the GP or consultant, but which are clinically important for the CFS sufferer. Results are given by a figure and there should also be a reference range next to this figure – that tells you if you are inside or outside the reference range. This reference range often varies from one lab to another.

The basic tests that most doctors do for their patients with chronic fatigue are:

- Haematology (full blood count – red cells, white cells and platelets)
- Inflammation in the blood – ESR, C reactive protein, plasma viscosity.
- Biochemistry (liver and kidney function)
- Blood sugar level
- Urine testing (for infection or kidney damage)
- Faecal occult bloods (looking for bleeding from the gut)
- Thyroid stimulating hormone (only looks for primary thyroid failure – most thyroid problems in CFS are secondary to poor pituitary function)
- Ferritin (iron), B12, folic acid and calcium

- Perhaps a serum magnesium – which is a completely useless test! This is because serum levels are maintained at the expense of levels inside cells. A serum magnesium is just an ITU (**Intensive Therapy Unit**) test!
- Autoantibody tests for autoimmunity.

Common abnormalities that can be shown by routine tests

The mild abnormalities I always look for in CFS in the above tests are:

- Low or low normal white cell count – can be a sign of poor immune function which most commonly is secondary to nutritional deficiencies, such as low zinc, low magnesium, low B vitamins, low essential fatty acids.
- Low or low normal platelet count – can be a sign of toxic stress
- Low MCV (mean corpuscular volume) suggesting iron or copper deficiency. Low iron is suggestive of [Hypochlorhydria](#), in which case other mineral deficiencies are also likely.
- High MCV suggesting B12, folic acid or [Hypothyroidism](#)
- A high blood sugar or a low blood sugar suggests there may be a tendency to [Hypoglycaemia - the full story](#) (a pre-diabetic tendency). A normal blood sugar tells you very little! Normal ranges of blood glucose have been changed because so many people now have carbohydrate intolerance. A normal blood sugar should be between 4-6mmol/l. High blood sugar is now associated with toxic stress because chemicals cause insulin resistance.
- Low potassium. Potassium varies according to diet! Low potassium means there is a lack of vegetables in the diet. Bananas may be rich in potassium but they are high glycaemic index, so beware!
- High normal bilirubin – may be Gilbert's syndrome suggesting poor ability to detoxify.
- High normal or abnormal liver enzymes – suggesting liver damage, usually from chemicals, or poor nutritional status.
- High urea or creatinine suggesting dehydration
- Low urea or creatinine suggesting low protein diet
- Low glomerular filtration rate suggesting poor kidney function – could be due to allergy or toxic damage but may indicate poor mitochondrial function.
- A TSH tells you very little about thyroid status! It is essential to see the actual level of thyroid hormones in the blood.
- Low levels of B12 can be due to [Hypochlorhydria](#) or [Malabsorption](#)
- High uric acid can point to poor [Antioxidant status](#). See [Gout](#).
- Raised cholesterol could mean low levels of vitamin D or hypothyroidism.
- Low levels of calcium likely to mean low levels of vitamin D.

The routine tests which I nearly always do initially and which have important implications for management

1. *Mitochondrial function profile* (p. 24) – this is a batch of tests to identify the mitochondrial problem. This test has important implication for treatment; this test includes:

ATP profiles – looks at levels of ATP, how well energy is released from ATP, the rate of production of ATP from ADP and movement of ATP and ADP across mitochondrial membranes (translocator protein function - could be blocked by toxins or pH changes). Also gives us an objective measure of the level of disability.

Plasma cell-free DNA – a measurement of cell damage and antioxidant status in CFS

Red cell NAD levels – a measure of the efficiency of Krebs's citric acid cycle. Levels can be corrected with niacinamide 500mg daily and acetyl L carnitine.

Co-enzyme Q10 levels – the most important antioxidant inside mitochondria. In CFS levels are nearly always deficient

Superoxide dismutase (SODase) – three types measured, indicates levels of zinc, copper and manganese, also gene studies to give an indication of toxic damage. SODase is a major antioxidant in all cells. Glutathione and glutathione peroxidase studies are also included (indicates selenium status).

Red cell magnesium – done as part of the ATP profile or can be done separately.

2. *Thyroid function profile (free T4, Free T3 and TSH).*

More esoteric tests which have implications for management

- *Microrespirometry* - looks in detail at ADP to ATP conversion (see sample result on p. 27)
- **Further investigation of poor** translocator protein function *Translocator protein studies* (p.28)
- Cardiolipin studies **looks at the structure of mitochondrial membranes** (p. 29)
- Calcium studies – calcium levels inside cells often too high.
- *Adrenal stress profile* – salivary levels of cortisol and DHEA over 24 hours
- Salivary *Melatonin levels* – it is common to get poor melatonin production and therefore poor sleep in CFS. This is a further reflection of the inadequate HPA axis in CFS.
- Lactate dehydrogenase studies – if there is evidence of cell damage, this indicates where the damage is coming from eg liver or muscle.
- Red cell *Carbonic anhydrase* – indicates hyperventilation

When gut symptoms suggest tests

- *Gut fermentation test* – to look for evidence of fermentation by bacteria or yeast. Irritable bowel syndrome may be caused by food allergy or gut dysbiosis. Low levels of short chain fatty acids can mean insufficient probiotics in the gut.
- *Salivary VEGF* test for hypochlorhydria – if there are symptoms of poor digestion or “too much acid”.
- **Urine hydrogen sulphide test** – some people ferment food to produce hydrogen sulphide and this can inhibit mitochondrial function. See [Fermentation in the gut and CFS](#)
- *Parasitology* at the London School of Hygiene and Tropical Medicine – detects worms, amoebae, giardia, blastocystis hominis.
- *Comprehensive Digestive Stool Analysis* – ability to digest and gut flora. Parasitology can also be done as part of this test.
- *Short chain polypeptides* – if the result is abnormal, it suggests leaky gut syndrome.
- Early morning *Short chain fatty acids* and/or tests of *Fructose intolerance* – indicate a tendency to [Hypoglycaemia](#)

Looking for toxic stress

- *Fat biopsy* for *pesticides* and/or for *volatile organic compounds* (VOCs). A fat biopsy is very easy to do – easier than a blood test! A green needle and 10ml syringe is used – the green needle is pushed into buttock fat, suction applied with the syringe, then needle withdrawn. The amount of fat inside the bore of the needle is sufficient to do the test.
- Sauna sweat test.
- *Kelmer test* (urine test) for mercury load – anybody with mercury fillings will have mercury on board – the question is how much? How hard does one have to work to get rid?
- Translocator protein **studies**.
- *DNA adducts* – looks to see if toxins have stuck onto DNA – if so, this is a pre-cancerous condition. This is a useful test to work out how much damage has been done to the body as a result of toxic stress and therefore how much work has to be put into a detox regime. If abnormal then it should be repeated following a detox regime to make sure there are improvements.

Looking for sensitivity to chemicals

- *Lymphocyte sensitivity* test for chemicals, heavy metals, silicones, VOCs. This is helpful if you suspect that you are reacting to one/some/all of those substances, in other words you are sensitive to them. I often use this where there is a silicone implant to help decide if it should be removed. Where there is sensitivity, there will be toxicity, and vice versa. Indeed, multiple chemical sensitivity is usually triggered by toxicity.

More recently John McLaren-Howard has developed similar tests to diagnose electrical sensitivity.

Evidence of damage to cells

- *Plasma cell-free DNA* – this is nearly always abnormal in CFS and can be for any one of the following reasons:

There is poor antioxidant status (see *Co-enzyme Q10, SODase*),

There is ongoing toxic stress (such as from pesticides, volatile organic compounds, heavy metals etc),

There is immune activation (as for example in acute infection),

There is very poor mitochondrial function (see mitochondrial function) score but the patient is forced to do some muscular activity just in order to live.

The patient is not pacing well – i.e. pushing too hard and this is resulting in cell damage. However some people who are very disabled have no choice – just the energy required to exist will cause tissue damage.

So people with the worst mitochondrial function score often have high cell free DNAs even though they are doing almost nothing.

This can be investigated further with LDH studies, which tells us where the damage is coming from.

Tests not worth doing either because the result is worthless or the test is unreliable

- Tests for food allergy – at best these are 70% accurate. I never request them.
- B12 – occasionally picks up pernicious anaemia, but regardless of the level I almost routinely prescribe injections to improve fatigue syndromes. B12 provides “instant” antioxidant cover. It has no toxicity. I like to see blood levels above 2000 (at this levels many GPs recommend stopping treatment!).
- Hair analysis – does not reliably detect heavy metal toxicity and can be very misleading with trace elements. Useless for allergies.

There is no point doing the tests I list below before starting nutritional supplements. This is because deficiencies are pandemic!

- B vitamin profile
- Red cell Magnesium
- Essential fatty acids
- Vitamins A, C and E
- Vitamin D3 levels (a bit expensive!)

There is no point doing a test unless it has implications for management – either one needs the test to make the diagnosis or to determine management options. Always ask this question when requesting a test or it is money wasted!

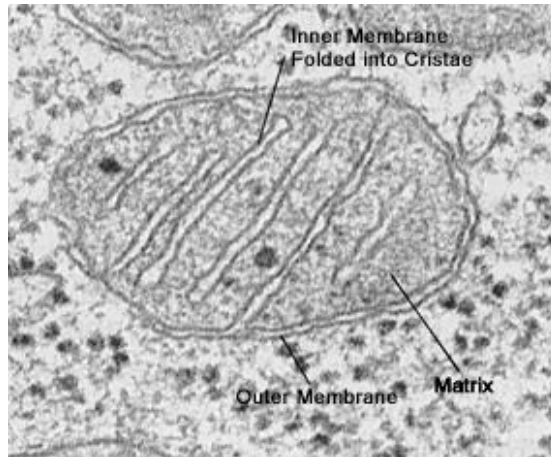
Tests ask very specific questions – there are literally hundreds of tests available, it is a case of picking the right one dependent on the symptoms and signs. If your doctor does not ask the right questions with his tests, then the results will not be relevant to recovery.

Where there are symptoms pertaining to a specific area such as the gut, tests need to be done to exclude ulcer disease, gall bladder disease, cancer and so on.

My general principle for tests of nutritional status is that I always advise sufferers to continue with their usual nutritional supplement programme when doing a test of nutritional status. This way I can assess if the current nutritional regime is adequate or not. I simply need to know what the patient is taking when interpreting such tests of nutritional status.

In CFS the problem is micro-pathology (intracellular, immune and biochemical problems), i.e. problems inside cells and on cell membranes. This is why standard medical tests do not come up with abnormalities.

PART II: MITOCHONDRIA AND CHRONIC FATIGUE SYNDROME



Mitochondria - the engine of the car

THEY SUPPLY ENERGY TO EVERY CELL IN THE BODY. WHEN MITOCHONDRIA GO SLOW, EVERYTHING GOES SLOW!

I think this is one of the most important ideas I have come up with in terms of my understanding of CFS and what to do in order to recover! So please read this very carefully and several times over because for many sufferers it contains the keys to unlock their illness!

We are made up of lots of different cells – heart, blood, muscle nerve cells etc. All these cells are different because they all have a different job of work to do. To do this job of work requires energy. But the way in which energy is supplied is the same for every cell in the body. Energy is supplied to cells by mitochondria. I think of them as little engines which power every cell in the body. Mitochondria are a common biological unit across the animal kingdom. The mitochondria in my dog, my cat and my horse are exactly the same as my mitochondria.

The job of mitochondria is to supply energy in the form of a chemical compound called adenosine triphosphate (ATP). This is the universal currency of energy. It can be used for all sorts of biochemical jobs from muscle contraction to hormone production. When mitochondria fail, this results in poor supply of ATP, so cells go slow because they do not have the energy supply to function at a normal speed. This means that all bodily functions go slow.

Chronic fatigue syndrome, therefore, is a symptom of mitochondrial failure and every cell in the body can be affected.

I believe that it is vital that anyone with chronic fatigue understands how energy is produced in the body and what can go wrong in that process. This understanding will help CFS patients to take control of their recovery. The chain of biochemical reactions which takes place inside each cell and its mitochondria and which results in the release of energy is referred to as cell respiration. These reactions are complex and require oxygen.

Proteins, fats and carbohydrates are digested and absorbed in the gut and largely stored in the liver so that glucose can be released into the blood stream at a moment's notice. Glucose enters cells and is converted into acetate which is shunted into mitochondria by acetyl L carnitine. Acetate, as pyruvate, enters Krebs's cycle. Krebs's cycle generates activated NAD (vitamin B3) as NADH which is used to drive the process of oxidative phosphorylation – this is the process which recycles ATP.

ATP is picked up by translocator proteins which sit on the surface of mitochondria and move it out into the cell where it is needed to energise cell activity. ATP (adenosine with 3 phosphate groups) is converted to ADP (adenosine with 2 phosphate groups) with the release of energy for work. ADP then passes into the mitochondria, courtesy of translocator protein, where it is recycled back to ATP by **oxidative phosphorylation** (i.e. a phosphate group is stuck back on). ATP recycles approximately every 10 seconds in a normal person – if this goes slow, then the cell goes slow and so the person goes slow and clinically has poor stamina ie CFS.

Figure 1 is a simplified illustration of that cycle taking place inside every cell:

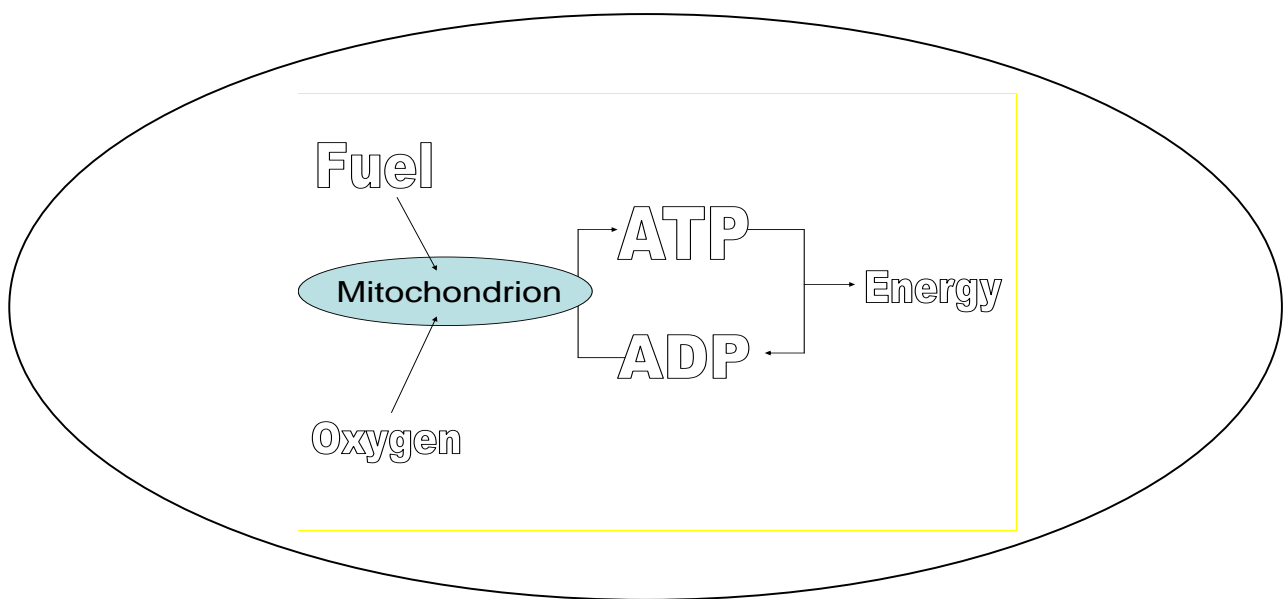


Figure 1

Problems arise when the system is stressed. If the CFS sufferer asks for energy faster than it can be supplied, (and actually most CFS sufferers are doing this most of the time!), then ATP is converted to ADP faster than it can be recycled. This means there is a build up of ADP. Some ADP is inevitably shunted into adenosine monophosphate (AMP -1 phosphate). But this creates a real problem, indeed a metabolic disaster, because AMP, largely speaking, cannot be recycled and is lost in urine.

Indeed, this is the biological basis of poor stamina. In the long term one can only go at the rate at which mitochondria can produce ATP. If mitochondria go slow, stamina is poor.

If ATP levels drop as a result of leakage of AMP, the body has to make brand new ATP. ATP can be made very quickly from a sugar called D-ribose, but D-ribose is only slowly made from glucose (via the pentose phosphate shunt for those clever biochemists out there!). This takes anything from one to four days. So this delay is one possible explanation for the biological basis of delayed fatigue.

However, there is another problem. If the body is very short of ATP, it can make a very small amount of ATP directly from glucose by converting it into lactic acid. This is exactly what many CFS sufferers do and, indeed, we know that CFS sufferers readily switch into anaerobic (i.e. without oxygen) metabolism. However, this results in two serious problems – lactic acid quickly builds up especially in muscles to cause pain, heaviness, aching and soreness (“lactic acid burn”), secondly no glucose is available in order to make D-ribose! So new ATP cannot be easily made when you are really run down. Recovery takes days!

Worse than that, lactic acid has to be converted back to pyruvate in order to repeat the citric acid cycle – but this requires a lot of energy (ATP) and the ATP is not there. So lactic acid hangs about for a long time causing pain. Figure 2 illustrates these processes.

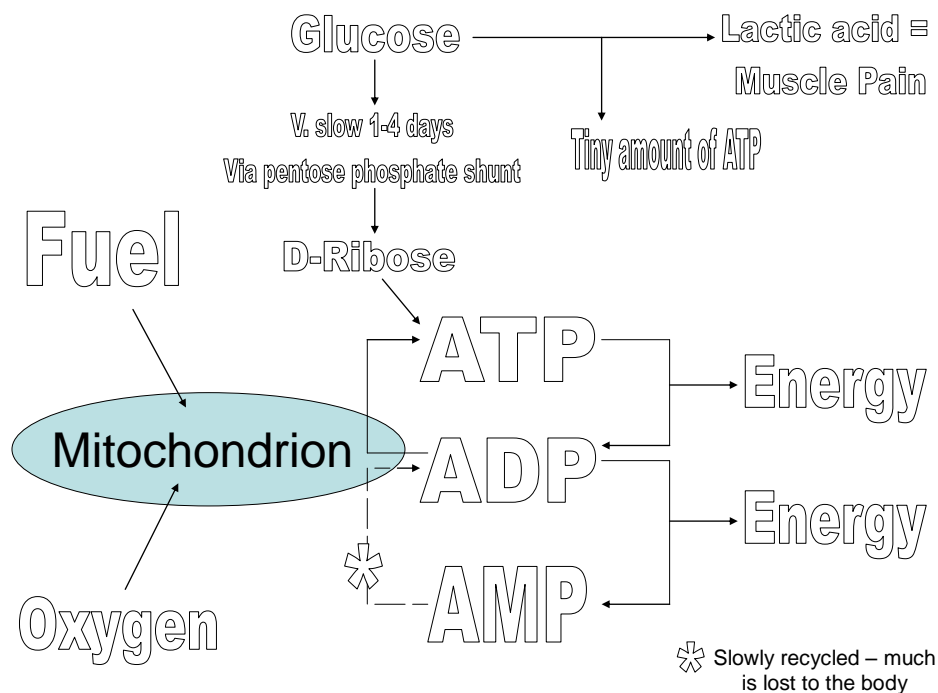


Figure 2

One molecule of glucose, used anaerobically in its conversion to lactic acid, produces 2 molecules of ATP. To convert lactic acid back to glucose needs 6 molecules of ATP (the Cori cycle). CFS patients simply do not have the ATP to do this so the lactic acid burn is very persistent.

The biological basis of treatment is therefore explained:

1. **Pace** – do not use up energy faster than your mitos can supply it. Fatigue is the symptom that tells you how much to pace!
2. **Feed the mitochondria** - supply the raw material necessary for the mitochondria to heal themselves and work efficiently. This means feeding the mitos correctly so they can heal and repair.
3. **Address the underlying causes** as to why mitochondria have been damaged. This must also be put in place to prevent ongoing damage to mitos. In order of importance this involves:
 - 1) Pacing activities to avoid undue stress to mitos

- 2) Getting excellent sleep so mitos can repair
 - 3) Excellent nutrition with respect to:
 - a) taking a good range of micronutrient supplements
 - b) stabilising blood sugar levels
 - c) identifying allergies to foods
 - 4) Detoxifying to unload heavy metals, pesticides, drugs, social poisons (such as alcohol, tobacco, etc.), volatile organic compounds and prescription drugs, many of which poison mitochondria either directly or through creating free radicals.
 - 5) Optimising gut function – [Hypochlorhydria](#), [Pancreatic function](#), [Fermentation in the gut](#)
 - 6) Addressing the common problem of hyper-vigilance which often leads to hyperventilation.
4. **Address the secondary damage** partly caused by mitochondrial failure such as immune disturbances possibly blocking mitochondria with immune complexes, hormone gland failure, slow liver detoxification.

And now for a bit of good news! You will have read (and will read again) that AMP cannot be recycled. Actually, AMP can be recycled, but it happens very slowly. For practical purposes for patients who are very fatigued, this recycling is so slow that it is clinically insignificant. Interestingly, the enzyme which facilitates this recycling ("cyclic AMP") is activated by caffeine! So the perfect pick-me-up for CFS sufferers could be a real black organic coffee with a teaspoon of D-ribose! The two common problems that can arise from D-ribose is the possibility of it being fermented and allergy – D ribose is derived from corn.



Severe CFS is also low cardiac output secondary to mitochondrial malfunction

Three papers have come to my notice recently, which make great sense of clinical observations and also the idea that CFS is a symptom of mitochondrial failure. The two symptoms I am looking for in CFS to make the diagnosis is firstly very poor stamina and secondly delayed fatigue. I think I can now explain these in terms of what is going on inside cells and the effects on major organs of the body.

If mitochondria (the little batteries found inside every cell in the body) do not work properly, then the energy supply to every cell in the body will be impaired. This includes the heart. Many of the symptoms of CFS could be explained by low cardiac output because the heart muscle cannot work properly. Cardiologists and other doctors are used to dealing with low cardiac output due to poor blood supply to the heart itself. In CFS the low cardiac output is caused by poor muscle function and therefore strictly speaking is a cardiomyopathy. This means the function of the heart will be very abnormal, but traditional tests of heart failure, such as ECG, ECHOs, angiograms etc, will be normal.

The point is that the blood supply to the heart is fine (fuel and oxygen adequate) but the mitochondria cannot convert this to ATP, which is the currency of energy for muscle contraction.

Research by Dr Arnold Peckerman www.cfids-cab.org/cfs-inform/Coicfs/peckerman.etal.03.pdf shows that cardiac output in CFS patients is impaired. Furthermore the level of impairment correlates very closely to the level of disability in patients. Dr Peckerman was asked by the US National Institutes of Health to develop a test for CFS in order to help them to judge the level of disability in patients claiming Social Security benefits. Peckerman is a cardiologist and on the basis that CFS patients suffer low blood pressure, low blood volume and perfusion defects, he surmised CFS patients were in a low cardiac output state. To test this he came up with Q scores.

“Q” stands for cardiac output in litres per minute and this can be measured using a totally non-invasive method called Impedance Cardiography. This allows one to accurately measure cardiac output by measuring the electrical impedance across the chest wall. The greater the blood flow the less the impedance. This can be adjusted according to chest and body size to produce a reliable measurement (this is done using a standard algorithm). It is important to do this test when supine and again in the upright position. This is because cardiac output in healthy people will vary from 7 litres per min when lying down to 5 litres per min when standing. In healthy people this drop is not enough to affect function. But in CFS sufferers the drop may be from 5 litres lying down to 3.5 litres standing up. At this level the sufferer has a cardiac output which causes borderline organ failure.

This explains why CFS patients feel much better lying down. They have acceptable cardiac output lying down, but standing up they are in borderline heart and organ failure. CFS is therefore the symptom which prevents the patient developing complete heart failure. Actually, everyone feels more rested when they are sitting down with their feet up! The subconscious has worked out that the heart has to work less hard when you are sitting down with your feet up – so we do so because we feel more comfortable!

Low cardiac output explains the symptoms of CFS

The job of the heart is to maintain blood pressure. If the blood pressure falls, organs start to fail. If the heart is working inadequately as a pump then the only way blood pressure can be sustained is by shutting down blood supply to organs. Organs are shut down in terms of priority, i.e. the skin first, then muscles, followed by liver, gut, brain and finally the heart, lung and kidney. As these organ systems shut down, this creates further problems for the body in terms of toxic overload, susceptibility to viruses which damage mitochondria further, thus exacerbating all the problems of the CFS sufferer.

One result of a low cardiac output state is postural orthostatic tachycardia syndrome. See [Postural orthostatic tachycardia syndrome or POTs](#)

Effects of low cardiac output on the skin

If you shut down the blood supply to the skin, this has two main effects. The first is that the skin is responsible for controlling the temperature of the body. This means that CFS patients become intolerant of heat. If the body gets too hot then it cannot lose heat through the skin (because it has no blood supply) and the core temperature increases. The only way the body can compensate for this is by switching off the thyroid gland (which is responsible for the level of metabolic activity in the body and hence heat generation) and so one could get a compensatory under active thyroid. This alone worsens the problems of fatigue.

The second problem is that if the micro-circulation in the skin is shut down, then the body cannot detox. This is a major route through which toxins, particularly heavy metals, pesticides and volatile organic compounds are excreted. Therefore the CFS sufferer's body is much better at accumulating toxins, which of course further damage mitochondria.

Symptoms in muscles

If the blood supply to muscles is impaired, then muscles quickly run out of oxygen when one starts to exercise. With no oxygen in the muscles the cells switch over to anaerobic metabolism, which produces lactic acid and it is this that makes muscles ache and fatigue so much.

As well as the above problem, muscles in the CFS patient have very poor stamina because the mitochondria which supply them with energy are malfunctioning. When mitochondria go slow, they produce more free radicals which further damage tissues through pro-oxidant stress.

When John McLaren-Howard does translocator protein function tests he often finds lactic acid stuck onto mitochondrial membranes – this illustrates one of the many vicious cycles in CFS – if TL protein is blocked by lactic acid, mitochondria work less efficiently and therefore one is more likely to switch into anaerobic metabolism and produce more lactic acid!

Symptoms in the liver and gut

Poor blood supply to the gut results in inefficient digestion, poor production of digestive juices and leaky gut syndrome. Leaky gut syndrome causes many other problems such as hypochlorhydria, allergies, autoimmunity, malabsorption, etc., which further compound the problems of CFS. See [Malabsorption](#).

If liver circulation is inadequate, this will result in poor detoxification, not just of heavy metals, pesticides and volatile organic compounds, but also toxins produced as a result of fermentation in the gut again further poisoning the mitochondria. See [Detoxification](#).

Effects on the brain

A Canadian physician Dr Byron Hyde has performed many functional scans of the brains of CFS patients. If I had not known the diagnosis, I would have diagnosed strokes. This is because the blood supply to some area of the brain was so impaired. The default is temporary and with rest, blood supply recovers. However, this explains the multiplicity of brain symptoms suffered from, such as poor short term memory, difficulty multi-tasking; slow mental processing and so on. Furthermore, brain cells are not particularly well stocked with mitochondria and therefore they run out of energy very quickly. See [Brain fog - poor memory, difficulty thinking clearly etc](#)

Effects on the heart

There are three effects on the heart. The first possible effect of poor energy supply is disturbance of the electrical conductivity which causes dysrhythmias. Many patients with chronic fatigue syndrome complain of palpitations, missed heart beats or whatever. This is particularly the case in patients with poisoning by chemicals since the chemicals are also directly toxic to nerve cells. Increasingly I believe that dysrhythmias are caused by toxic stress. See [Heart dysrhythmias, irregular pulse, missed beats and palpitations](#)

The second obvious result is weak heart beats. Over 50% of the weight of the heart is made up of mitochondria! . Symptomatically this causes chest pain and fatigue. In the longer term it can cause heart valve defects because the muscles which normally hold the mitral valve open also fatigue.

Thirdly as pressures drop in the heart, the foramen ovale gets blown open causing a right left shunt. Cheney estimates over 90% of CFSs have a PFO – see below.

THIS APPROACH TO TREATING HEART DISEASE IS EXACTLY THE SAME REGARDLESS OF THE CONVENTIONAL DIAGNOSIS.

So patients with angina, high blood pressure, heart failure, cardiomyopathy, some valve defects as well as patients with cardiac dysrhythmias often also have mitochondrial problems and will respond in the same way to nutritional therapies and detox therapies.

Effects on lung and kidney

The lung and kidney are relatively protected against poor micro-circulation because they have the largest renin-angiotensin system, which keeps the blood pressure up in these vital organs. Therefore clinically one does not often see CFS patients with kidney failure or pulmonary hypoperfusion. However I increasingly find a low kidney glomerular filtration rate in CFS which may be symptomatic of poor mito function.

Effects on the eye

The brain requires energy at a rate ten times higher than the body. The retina requires energy ten times faster than the brain, i.e. one hundred times faster than the body! No wonder CFS sufferers have eye symptoms – they simply cannot convert light into electrical signals. Many CFSs are light intolerant and are forced to spend much of their life lying flat with their eyes protected from light.

This effect is magnified by a patent foramen ovale (PFO)

As a foetus, we all have a hole in the heart, which shunts blood from the right to the left side and largely bypasses the lungs. The blood passes from the right atrium to the left atrium via the foramen ovale (PFO), a hole in the heart with a flap so creating a valve – the blood can only go one way. This is ideal because as a foetus we get our oxygen from the placenta. At the moment of birth, the baby takes its first breath, this drops the pressure in the lungs and sucks blood from the right side of the heart - the pressures here drop and the flap over the foramen ovale snaps shut because the pressure on the left side is much higher than that on the right side. In 72% of the population this flap sticks down. But in the rest, it is the pressure difference between the left and the right side which keeps the valve stuck down. This is no problem when the heart beats strongly. Problems occur when the heart beats weakly, the pressure difference falls and minor pressure changes in the chest (such as valsalva) will open up the PFO creating a right/left shunt of blood. This means blood does not circulate round the lungs and oxygen levels fall! This will make energy levels fall precipitously for obvious reasons! See [Patent foramen ovale as a cause of fatigue](#)

Explanation of the fatigue problems in CFS patients

Energy to the body is supplied by mitochondria, which firstly produce NAD (nicotinamide adenosine diphosphate) from Kreb's citric acid cycle and this is used to power oxidative phosphorylation, which generates ATP (adenosine triphosphate). These molecules are the "currency" of energy in the body. Almost all energy requiring processes in the body have to be "paid for" with NAD and ATP, but largely ATP. The reserves of ATP in cells are very small. At any one moment in heart muscle cells there is only enough ATP

to last about ten contractions. Thus the mitochondria have to be extremely good at re-cycling ATP to keep the cell constantly supplied with energy.

If the cell is not very efficient at re-cycling ATP, then the cell runs out of energy very quickly and this causes the symptoms of weakness and poor stamina. The cell literally has to “hibernate” and wait until more ATP has been manufactured.

In producing energy, ATP (three phosphates) is converted into ADP (two phosphates) and ADP is re-cycled back through mitochondria to produce ATP. However, if the cell is pushed (ie stressed) when there is no ATP about, then it will start to use ADP instead. The body can create energy from ADP to AMP (one phosphate), but the trouble is that AMP cannot be re-cycled. The only way that ADP can be regenerated is by making from fresh ingredients, but this takes days to do. This explains the delayed fatigue seen in chronic fatigue syndrome.

So to summarise, the basic pathology in CFS is slow re-cycling of ATP to ADP and back to ATP again. If patients push themselves and make more energy demands, then ADP is converted to AMP, which cannot be recycled and it is this which is responsible for the delayed fatigue. This is because it takes the body several days to make fresh ATP from new ingredients. When patients overdo things and “hit a brick wall” this is because they have no ATP or ADP to function at all.



A vital test in chronic fatigue syndrome

The central problem of chronic fatigue syndrome is mitochondrial failure resulting in poor production of ATP. ATP is the currency of energy in the body and if the production of this is impaired then all cellular processes will go slow. It is not good enough to measure absolute levels of ATP in cells since this will simply reflect how well rested the sufferer is. The perfect test is to measure the rate at which ATP is recycled in cells and this test has now been developed by the brilliant medical biochemist Dr John McLaren-Howard. He calls it “ATP profiles”. It is a test of mitochondrial function.

Not only does this test measure the rate at which ATP is made, it also looks at where the problem lies. Part A measures levels of ATP in the cell. Release of energy from ATP is a magnesium dependent process and the first part of the test studies this aspect (I refer to this aspect of the test as Part A– this corresponds to the labels in Figure 3 below).

The second aspect of the test (Part B) measures the efficiency with which ATP is made from ADP in the mitochondrion. If this is abnormal then this could be as a result of magnesium deficiency, of low levels of Co-enzyme Q10, low levels of vitamin B3 (NAD) or of acetyl L-carnitine. It is also possible that ADP to ATP conversion is blocked and this is also seen on this part of the test.

The third possibility is that the protein which transports ATP and ADP across mitochondrial membranes is impaired and this is also measured (Part C).

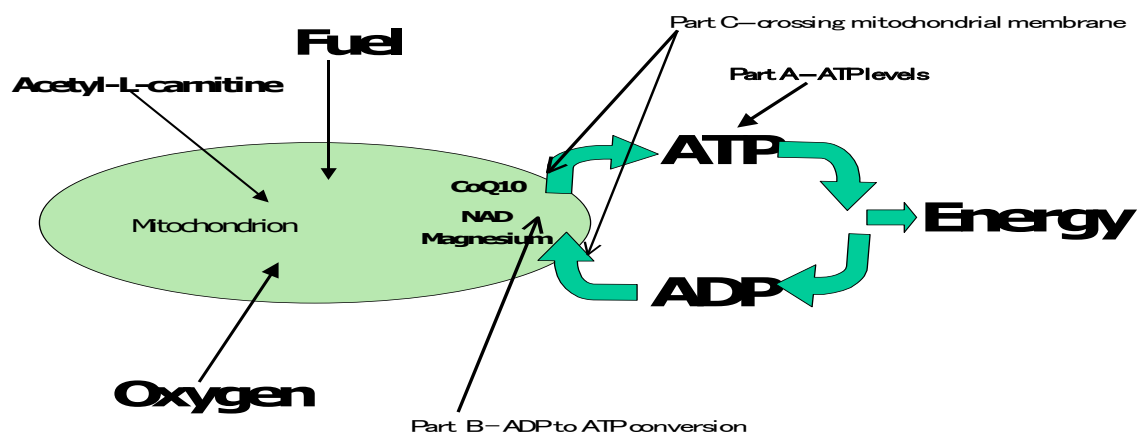


Figure 3

The joy of the ATP profiles test is that we now have an objective test of chronic fatigue syndrome which clearly shows this illness has a physical basis. This test clearly shows that cognitive behaviour therapy, graded exercise and anti-depressants are irrelevant in addressing the root cause of this illness.

To get the full picture I recommend combining this test with measuring levels of the front line anti-oxidants *Co-enzyme Q10*, *Superoxide dismutase* (SODase), and *glutathione peroxidase* together with *NAD* (a functional test of vit B3 levels) and *L-carnitine*. See [Antioxidants](#).

Cell-free DNA is very useful because it measures tissue damage. When cells are damaged and die, they release their contents into the blood stream – cell-free DNA measures the extent of this damage. I believe this equates to how ill one feels – or malaise. The levels which come back are similar to those from patients recovering from major infections, trauma, surgery or chemotherapy – so this test puts CFS firmly in the realms of major organic pathology. Where there is tissue damage, the immune system is activated for healing and repair – this requires energy and can produce distressing symptoms such as [Pain](#) and [Inflammation](#).

SODase is an important antioxidant which mops up the free radicals produced in all the inefficient chemical reactions in the cells. Dr McLaren-Howard also looks at the genes which code for the different types of SODase! It is common to find blockage or polymorphisms typical of toxic stress. See [Inflammation](#).

Dr McLaren-Howard has recently developed a serum L-carnitine test and made it available in September 2009. I have now included it in the *Mitochondrial Function Profile*.

In fact, all of these above blood tests have now been combined as a [Mitochondrial function profile](#) and can be ordered from my practice – To order any test 109.

The cost of the *Mitochondrial function profile*, which now includes the mitochondrial function studies (ATP profiles), levels of Co-enzyme Q10, glutathione peroxidase, zinc copper SODase, manganese SODase and extracellular SODase together with NAD levels, cell-free DNA and L-carnitine is £230, plus £80 for the letter of interpretation to the GP.

One other important co-factor in the production of energy in cells is D-ribose. It is used up so quickly by cells that measuring levels is unhelpful, but low levels of ATP imply low levels of D-ribose. .

John McLaren-Howard now has specialist equipment to refine these tests further, particularly in respect of oxidative phosphorylation. See Practical Details p. 109 should you wish to order any test.

Implications for treatment

Many patients I see get well with my standard work up with respect to **vitamins and minerals, diet, pacing and sleep**, i.e. **the foundations of recovery**. All these things must be put in place to repair and prevent ongoing damage to mitochondria so allowing them to recover. For mitochondria to recover they need all the essential vitamins, minerals, essential fatty acids and amino acids to manufacture the cellular machinery to restore normal function. The mitochondrial function tests then allow us to identify lesions which can be corrected by attention to nutritional supplements, improving antioxidant status, detoxing, hyperventilation or whatever. CFS sufferers have limited reserves of physical, mental and emotional energy and this test allows us to direct those energies into the most fruitful line of approach. (see p. 31 for the interpretation of the mitochondrial function test results)

Examples of some test results

ATP profiles

This patient has low levels of ATP (1), low magnesium (2), poor conversion of ADP to ATP (3) with blockage of the active sites (4) together with poor translocator protein function (5) – no wonder there is severe fatigue!

Acumen PO Box 129, Tiverton, Devon EX16 0AJ
Telephone/voicemail: 077 0787 7175 E-mail: acumenlab@hotmail.co.uk

Acumen: **000007** Patient: **Elaine Jones**
Date of birth: **01/01/1950**
Reported: **06/01/2003** Doctor: **Dr Sarah Myhill**

ATP (adenosine triphosphate), studies on neutrophils
ATP is hydrolysed to ADP and phosphate as the major energy source in muscle and other tissues. It is regenerated by oxidative phosphorylation of ADP in the mitochondria. When aerobic metabolism provides insufficient energy, extra ATP is generated during the anaerobic breakdown of glucose to lactic acid. ATP reactions require magnesium. ADP to ATP conversion can be blocked by environmental contaminants as can the translocator [TL] in the mitochondrial membrane. [TL] efficiency is also sensitive to pH and other metabolic-factor changes. [TL] defects may demand excessive ADP to AMP conversion (not re-converted to ADP or through to ATP). Defects in Mg-ATP, ADP – ATP conversion and enzyme or [TL] blocking can all result in **chronic fatigue – a factor in any disease where biochemical energy availability is reduced.**

ATP whole cells:
With excess Mg added **1.43** nmol/10⁶ cells 1.6 – 2.9
(Standard method of measuring ATP)
Endogenous Mg only **0.82** nmol/10⁶ cells 0.9 – 2.7
(Measured ATP result is lowered during intracellular magnesium deficiency)
Ratio ATP/ATP^{Mg} **0.57** > 0.65

ADP to ATP conversion efficiency (whole cells):
ATP^{Mg} (from above) **1.43** nmol/10⁶ cells (1*) 1.6 – 2.9
ATP^{Mg} (inhibitor present) **0.55** nmol/10⁶ cells (2*) < 0.3
ATP^{Mg} (inhibitor removed) **1.02** nmol/10⁶ cells (3*) > 1.4
ADP to ATP efficiency [(3* - 2*)/(1* - 2*)] x 100 = **54.7** % > 60
Blocking of active sites (2*/1*) x 100 = **38.5** % up to 14

ADP-ATP TRANSLOCATOR [TL] (mitochondria, not whole cells):

	ATP (pmol/10 ⁶ cells)	Ref. range	change %	ref. range
Start	274	290 – 700		
[TL] 'out'	358	410 – 950	30.7	over 35% (Increase) (in-vitro test) reflects ATP supply for cytoplasm
[TL] 'in'	198	140 – 330	27.7	55 to 75% (Decrease) (in-vitro test) reflects normal use of ATP on energy demand

Comments
Low whole-cell ATP. Poor ATP-related magnesium availability.
38% blocking of active sites leading to: Poor ADP-ATP re-conversion.
Low mt-ATP and poor provision of 'new' mt-ATP. Restricted access to mt-ATP secondary to the 38% blocking of translocator sites.

Dr John McLaren-Howard Mrs Mirhane McLaren-Howard
For and on behalf of Acumen

A closer look at oxidative phosphorylation with micro-respirometry studies

Acumen

PO Box 129, Tiverton, Devon EX16 0AJ

Telephone/voicemail: 077 0787 7175

E-mail: acumenlab@hotmail.co.uk

Reference:

Patient:

Date:

Doctor:

MicroRespirometry: Studies of Mitochondria

Background and methodology: Venous white cells are separated on a Histopaque™ gradient and the mitochondria from a standardised number of cells are extracted using molecular sieve material doped with atractyloside. 50ul of washed mitochondrial suspension in a phosphate-medium of known oxygen saturation is placed in the thermostatically controlled, magnetically stirred Strathkelvin Mitocell with software monitoring of oxygen use. A mix of substrates is injected into the chamber and, normally, very little oxygen consumption occurs. The phosphorylation (production of ATP) is **coupled** to requirements. High O₂ consumption at this stage would indicate the presence of a chemical that is **uncoupling** electron transport and oxidative phosphorylation*. With stable conditions established, ADP is added. This condition reflects energy use and the ADP level **should** dictate how much oxygen is used in re-converting the ADP to ATP. Inability to achieve the expected O₂ use and/or a change in the rate of reaction reflects substrate insufficiency (we vary the levels to see what is missing) or the presence of a chemical inhibitor*.

*Further investigation may be needed to establish the nature of any uncoupling agent or inhibitor. Examples: translocator [TL] studies, DNA adducts, screens for toxic substances or the investigation of detoxification mechanisms.

Patient's results superimposed on mean control data (n=48)

— Control mean. Control range.

- A. pH 7.25, PO₄ 100mM
198uM O₂/l (at 37°C).
- B. CoQ10, B3, Mg, Ribose
(normal substrate needs).
- C. ADP (1.5nM/10⁶ cells)
(mimics normal energy use)
- D. ADP fully utilised.
(normal response).
- E. End of monitoring -
around 15% of starting O₂ and
about 14 minutes monitoring.

Patient's results

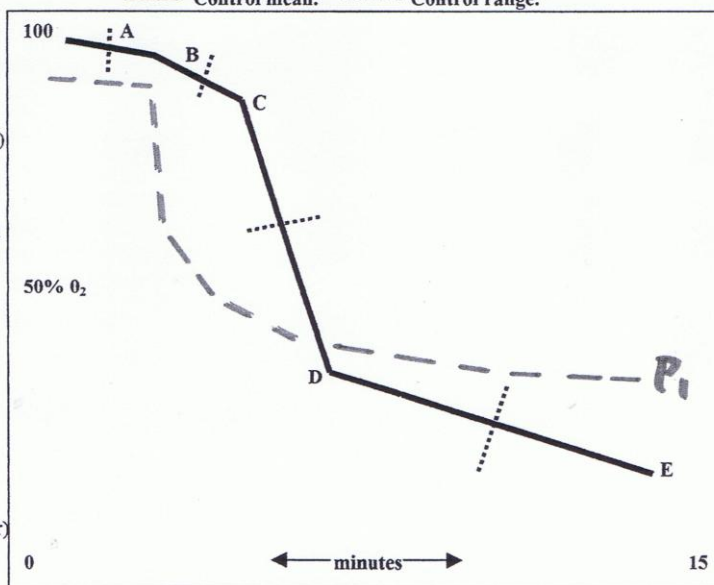
P₁ Additions as B & C above

Substrate changes when indicated by P₁ results:

- P₂ 2mM Mg added
- P₃ 2mM CoQ10 added
- P₄ 1mM B3 added
- P₅ 1mM D-ribose added

Inhibition or uncoupling:

- I 1mmol/l rotenone (inhibitor)
- U 1mmol/l DNP (uncoupler)
(DNP = dinitrophenol)



Note: Clinical application of these research procedures is at the discretion of the requesting doctor.

Comments: P₁ Rapid O₂ use before the addition of ADP showing that electron transport is (at least partly) uncoupled. But O₂ use almost ceases at 45% O₂ availability this is not improved by extra additions as in P₂-P₅? In spite of the uncoupling!

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oxidative phosphorylation is partly inhibited and it does not seem to be a substrate deficiency. *Final*

A closer look at translocator protein studies

Acumen

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E-mail: acumenlab@hotmail.co.uk

Reference:

Patient:

Date:

Doctor:

Mitochondrial membrane TL protein studies [TL]

[TL] scavenges ADP from cytoplasm and returns ATP from re-conversion plus 'new' ATP from oxidative phosphorylation. [TL] can be blocked by xenobiotics and/or partial detoxification products. The site is also pH sensitive and can be affected by local or general acidosis including organic acid accumulation from anaerobic metabolism. [TL] efficiency is also compromised by increases in intracellular calcium. The test sequence examines the white cell mitochondria using phase-contrast, dark field and polarising microscopy. We search for [TL] adducts using a micro-plate array of fluorescence probes. Positive indications are explored at the molecular level. Detailed fluorescence microscopy at extreme magnifications employs de-convolution and Helicon FocusPro™ software. A detailed [TL] technical information sheet is available on request.

Initial examination:	(L-Normal-H)	Micro electrode:			
Number of mitochondria	N	Outer membrane pH	< 6.8 (low)	6.8 - 7.4	> 7.4 (high)
Mitochondrial clumping	N	Patient's result:		6.9	
Mt membrane structure	N	Outer membrane Ca ²⁺	< 200 norm	200 - 300	> 300 umol/l
Mt-DNA fluorescence	N	Patient's result:			410
Mt membrane binding:-	Proteins	Esterases	Lipids	Dioclein	Aldehydes
L (low), N (norm), H (high)	N	N	N	TRACE	H

(ND = not detected) (# = see additional comments)

Other substances found on [TL] sites:

	Trace	High		Trace	High
Glutathione conjugates	✓		Dichlorobenzene		
Sulphate conjugates			Organophosphate**		
Peptide complexes*			Toxic metal(s)***		
Unusual proteins*			Foreign DNA/RNA		
L = Lactate, K = Keto acids			Immune complexes		
Chlorinated pesticide**			Nitrosamines	✓	✓
Pentachlorophenol			Diamino compounds		
Other chlorinated phenol**			Diazo compounds		
Poly chlorinated byphenyls			Others: DIOLEIN OR A-RELATED, TOHC, FATTY ACID		
Poly brominated byphenyls					✓
#2 MALONDIACALDEHYDE & CROTONALDEHYDE ✓					
* Protein precipitation?	(peptides cannot be pptd)				
** Identity if known					
*** Metal(s) found	(atomic emission analysis)				

Essential elements associated with mt-membranes:

Potassium			Magnesium			Zinc		
Low	Normal	High	Low	Normal	High	Low	Normal	High

Additional comments:

- #1 High intracellular calcium.
- #2 Complex aldehydes - from lipid peroxidation, on membranes generally and also on some TL sites.
- #3 DIOLEIN in membrane lipids on on some TL sites.

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- #4 Traces of nitrosamines - from burnt organic matter (including Smoking?). JMA

Cardiolipin Studies – a closer look at mitochondrial membranes

Acumen

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Reference:

Patient:

Date:

Doctor: Dr Sarah Myhill

Cardiolipin studies in mitochondrial membranes

Fluorescence microscopy methods have been used for the following tests on white blood cell mitochondria. A detailed study titled "Malondialdehyde, [TL]-sites and Cardiolipin" is available from Acumen on request.

Cardiolipin (CL):	Patient	Controls (n = 84)
Percentage of membrane lipids that fluorescence-stain as CL	22	19 to 28%
CDP-diacylglycerol pmol/10 ⁶ mt (CL-synthesis precursor)	194	105 to 230 pmol
CL-Synthase (units/10 ⁶ mt)	72 *1	85 to 130 units
CL-Synthase manganese sites No. per 10nM of mt membrane	18	11 to 24
No. of above occupied by metals other than manganese	10 *2 (metal if identified: SEE BELOW)	Up to 3
CL-binding xenobiotics (identified if possible)*	(NICKEL) *3	Not present
Cytochrome-c oxidase molecules (No. bound to each CL molecule)	2	2
Gating action of cytochrome-c-CL complex (on pH change)	Decrease - Normal - Increase	Normal
Oxidative stress on cytochrome-c CL complex	Normal - Increase	Normal
Malondialdehyde (MDA)		
Concentration pmol/10 ⁶ mt	30	Up to 32
Phosphatidylethanolamine and phosphatidyl choline	The major phospholipids in membranes with cardiolipin in the mitochondria only.	
Semi-quantitative assessment:	PTE: Low - Normal - High PTC: Low - Normal - High	Normal Normal

Additional comments (*including xenobiotics if identified):

- *1 Poor CL-Synthase activity but CL% and precursor concentrations are normal.
- *2 56% (10/18) Mn^{CL}-Synthase sites carry NICKEL or CALCIUM rather than manganese. This is the reason for poor CL-synthase activity.
- *3 Some nickel complex is also bound to CL other than at the CL-synthase (Mn) sites.

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[Signature]

10 MAR 2008

Anti-oxidant studies

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Acumen:

Patient:

Date of birth:

10/04/1974

Reported:

Doctor:

SUPEROXIDE DISMUTASE and GLUTATHIONE PEROXIDASE

A functional test looks at the in-vitro efficiency of the patient's red cell superoxide dismutase (SOD) when their neutrophil superoxide production is maximally stimulated. The activity of the individual forms of SOD are explored. General cell protection from damage by superoxide is provided by intracellular zinc:copper-SOD (Zn/Cu-SOD). Mitochondria are protected by manganese-dependent SOD (Mn-SOD). Extracellular SOD (EC-SOD – another Zn/Cu SODase) protects the nitric oxide pathways that relax vascular smooth muscle.

For each form of SODase, genetic variations are known, mutations can occur during excessive oxidative stress on DNA and polymorphisms may be present. DNA adducts can chemically block these genes.

Glutathione peroxidase (GSH-PX) activity is measured in red blood cells. It is a selenium-dependent enzyme and selenium deficiency is the commonest cause of poor enzyme activity. As poor glutathione (GSH) availability is easily overlooked as an additional reason for poor GSH-PX activity, we also measure total GSH in red cells.

Blood test results:

Test	Result	Units	Reference range
Functional test	34	%	Over 40 (mostly 41 – 47)
Zn/Cu-SOD	178	Enzyme activity (u)	240 – 410
Mn-SOD	242	Enzyme activity (u)	125 – 208
EC-SOD	21	Enzyme activity (u)	28 – 70

Very poor level

Gene studies:

Sod form	Gene(s)	Comments
Zn/Cu-SOD chromosome 21	? Partly blocked	Low enzyme activity
Mn-SOD chromosome 6	Possibly polymorphic	High activity-? Polymorphism
EC-SOD chromosome 4	Normal	Low enzyme activity

Low normal level

Glutathione peroxidase (GSH-PX)

Red cell	Glutathione peroxidase (GSH-PX)	67	U/gHb	67 – 90
Red cell	Glutathione (GSH)	1.52	mmol/l	1.7 – 2.6

Very poor level

Dr John McLaren-Howard

For and on behalf of Acumen

Mrs Mirhane McLaren-Howard

PART III: TREAT THE MITOCHONDRIAL METABOLIC DYSLEXIA



Interpretation of ATP Profiles test and implications for treatment

The ATP profiles test is a measure of mitochondrial function. The only job of mitochondria is to provide energy for cell metabolism in the form of ATP. Whilst all cells of the body are different, mitochondria are the same and so this test has huge implications not just for CFS but also for the pathophysiology of many degenerative diseases such as heart disease, Alzheimer's, Parkinson's and many others. Indeed, it is the rate at which mitochondria slow down and degenerate that determines the natural ageing process. There is now good evidence that the basic pathophysiological defect in chronic fatigue syndrome is slow recycling of ATP and this elegantly explains the symptoms of CFS. "ATP profiles" test can therefore be used to make the diagnosis of CFS, to assess the level of disability objectively, to identify where the biochemical lesion lies and give pointers as to how to further elucidate and correct that biochemical lesion.

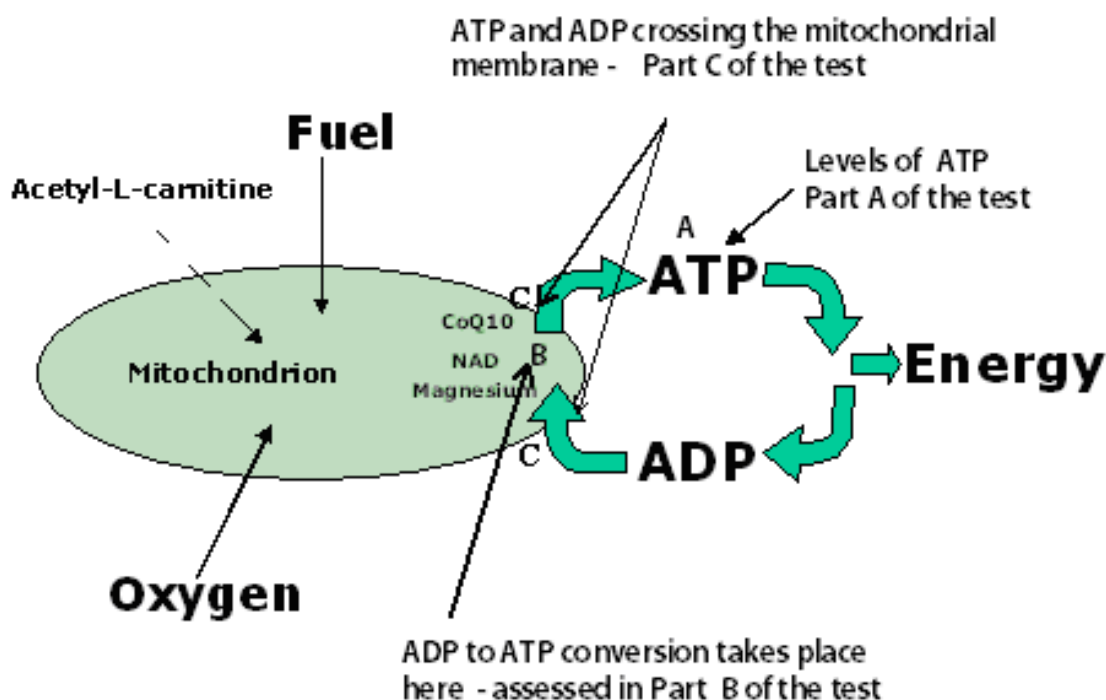
Indeed, there is now good evidence that mitochondria are responsible for the normal ageing process. This means I can tell my CFS patients that once they recovered, if they hold all the regimes in place, they can substantially reduce their risk of cancer, arterial disease, diabetes, neurological disease and other degenerative disorders and greatly increase longevity – "Your best years are ahead of you!"

As we age we acquire what I want to call "metabolic dyslexias" – we become less good at making certain key molecules. Co-enzyme Q 10 and D-ribose are likely to be amongst them because both require complicated biochemistry.

The biochemical lesion may result from a nutritional deficiency, from a stress (which may be endogenous, free radical stress, or exogenous toxic stress) or from a metabolic dyslexia – i.e. some enzyme block which inhibits the production of essential nutrients. The best documented is enzyme blockage by statins, which inhibit the endogenous production of co-enzyme Q 10, the most important acceptor and donor of electrons in the Krebs's citric acid cycle (oxidative phosphorylation). Not only do statins almost invariably worsen fatigue syndromes but probably also accelerate the normal ageing process.

The ATP profiles test looks at levels of ATP (A), rate of oxidative phosphorylation (B) and translocator protein function (C). The letters A, B and C in the diagram below indicate the sites in the cell where the

various biochemical processes take place and correspond to the three parts of the ATP profiles test. For a sample test result see (or click on) p. 26



Part A - Levels of ATP and ATP to ADP conversion

The first thing to look at in the result is the absolute level of ATP. If this is low, then this suggests two things. Firstly, poor ability to make de novo ATP from its raw material, D-ribose. D-ribose in an individual with normal metabolism can be made from glucose via the pentose phosphate shunt. However, if this is malfunctioning, D-ribose is made slowly. Indeed, this probably explains the delayed fatigue in CFS. The treatment is to supplement with D-ribose starting with three teaspoonfuls daily (15gms) and adjusting according to response. Sufferers may see changes within a few days. Clinically I expect to see less delayed fatigue and improvement in muscle pain and aching. D-ribose has a very short half-life and should be taken in small doses throughout the day in drinks (hot or cold). Interestingly caffeine may enhance the effects of D-ribose so I recommend taking with green tea, coffee, tea or whatever so long as these are tolerated. It is worth supplementing D-ribose even with low normal results because I have so much happy feedback from patients taking this supplement.

Some people do not tolerate D-ribose. This may be because D-ribose is derived from corn and small amounts of corn antigen remain to which one may react allergically. Some people with a candida problem (see YEAST and CANDIDA) may convert D-ribose back to glucose so it is fermented by yeast thereby worsening the yeast problem.

Secondly, low levels of ATP may mean that the sufferer is not pacing properly. When one overdoes things, ADP is created faster than ATP can be made. This results in a build up of ADP and some is inevitably shunted into AMP (the monophosphate) which cannot be recycled. Thus the cell has to make de novo ATP from D-ribose.

Release of energy from ATP

Next look to see the rate at which ATP is converted to ADP. This is a magnesium dependent process; therefore if the rate of conversion is slow, it results from magnesium deficiency. I have been interested in fatigue syndromes since 1982 and have found magnesium deficiency to be the knottiest problem I have come across! I now know why. Low intracellular magnesium is a symptom of CFS and a cause of it. This is because 40% of resting energy simply fires sodium/potassium (Na/K) and calcium/magnesium (Ca/Mg) membrane ion pumps. So when energy supply is diminished, there is insufficient energy to fire these pumps, so magnesium cannot be drawn into cells for oxidative phosphorylation to work, so there is a further diminishing of energy supply. This is just one of the many similar vicious cycles in CFS.

Sufferers do not simply replete through taking magnesium supplements – although this must be tried! Some need magnesium by injection to get the desired result. I used to start with 2mls of 50% Evans magnesium sulphate weekly and adjust the dose according to clinical response. But now I find it much less painful to self-inject smaller amounts (say 1/2ml) every day using a fine insulin syringe with a little bit of lignocaine. Also warm the injection to blood heat – this makes it much less painful.

Part B - Oxidative phosphorylation – the recycling of ATP from ADP

This part of the test looks at the rate at which ADP is converted back to ATP. The whole process is done by Krebs citric acid cycle (KCA) (dig out those old “O level” biochemistry books at once!) followed by oxidative phosphorylation. There is lots of potential for things to go wrong here! The bits we know about (and there will be others!) which may make oxidative phosphorylation go slow include:

Vitamin B3 is vital as the raw material to make NAD – most people replete levels on 500mgs of niacinamide, but some people seem to need 3,000mgs daily to get a result. At levels above 500mgs, liver function tests need checking every month for three months, then every 6 months. Low B3 may also be a symptom of poor function of Krebs’ citric acid cycle. This is because NAD is a functional test and it does not just reflect B3 status. The job of KCA is to take energy from acetyl groups and convert it into NADH, which is then of course converted to NAD in the process of driving oxidative phosphorylation. Therefore, to see normal levels of NAD needs not only an adequate supply of B3, but also a functioning Krebs’ citric acid cycle.

Magnesium deficiency – Mg catalyses many reactions in KCA cycle. Mg may have to be given by injection to replete levels.

Acetyl L carnitine - to get fuel for oxidative phosphorylation to burn, it needs to be transported as the acetate across the mitochondrial membrane by acetyl L carnitine. This is normally present in mutton, lamb, beef and pork but generally in not enough amounts to replete the deficiencies in fatigued states. As a routine I recommend taking acetyl L carnitine 1-2 grams daily.

John McLaren-Howard also looks to see if there are any chemical blockages in this process which could point to toxic stress (heavy metals, pesticides, volatile organic compounds etc). Often this is found together with blockage of translocator protein because the same toxin is involved.

However, clinical experience, which I have nicked from the American Cardiologist Dr Stephen Sinatra, is that co-enzyme Q 10 is vitally important as the main shunter of electrons in oxidative phosphorylation. Co-Q 10 is an important antioxidant which prevents free radical damage. Furthermore, poor antioxidant status slows oxidative phosphorylation so I routinely recommend B12 injections when ADP to ATP conversion is slow. B12 is a good scavenger of a major free radical peroxynitrite and effectively gives instant anti-oxidant cover. Again, B12 can be given by sub-cutaneous 1/2ml injections which are well tolerated.

It is possible to see a normal rate of oxidative phosphorylation in someone who is pacing well. However, if that sufferer should push themselves, abnormalities would appear. So just because oxidative phosphorylation

is OK does not mean you can give up pacing! We can look at oxidative phosphorylation in more detail by doing microrespiratory studies.

Part C - Movement of ATP and ADP across mitochondrial membranes

This is dependent on translocator protein which sits in the mitochondrial membrane and shunts ATP and ADP to and fro. Indeed 80% of mitochondrial membranes are made up of TL protein! If this is malfunctioning then it suggests blockage by some sort of toxin. As yet we are not sure which are the most likely toxins involved but this will become apparent with time and experience. Many toxins can do this, they could be endogenous toxins (from free radicals) and they could be exogenous from heavy metals, pesticides, VOCs or whatever. However, these exogenous toxins can all be got rid of by sweating regimes. Exercise is obviously the most physiological method but impossible for CFS sufferers! I would recommend a sweating detox at least three times a week and my preferred technique is with far infra-red saunaing. (See [Far infrared saunaing](#) information).

TL protein function is an area where more research is being done, but another possible reason for TL protein blockage is intracellular acidosis. This can occur with hyperventilation, which, I suspect, is much more common in CFS than realised. Hyperventilation causes a respiratory extracellular alkalosis, and intracellular acidosis – these changes can occur within a few abnormal breaths (see [Hyperventilation](#)).

We now have a new test of translocator protein function, *Translocator protein studies*, which can explore in detail the precise reasons why there is blockage. Clinically I have found this a very useful test.

Secondary damage and antioxidant status

If you burn fuel to produce energy, you make smoke. One cannot create energy without smoke damage in the form of free radicals. Co-Q 10 is a vital scavenger of electrons which prevents secondary free radical damage. So it is well worth measuring Co-Q10 levels and clinical experience is that levels should ideally be above 2.5 umol/l.

However, if oxidative phosphorylation goes really slow, this may be because of poor antioxidant status resulting in excessive levels of free radicals, in particular superoxides and nitric oxide. These two free radicals stick together to make peroxynitrite, which is even more toxic. These quickly use up available antioxidants. So if ATP production is slow, it is worth also measuring superoxide dismutase (*SODase*) and, if necessary, taking mineral supplements to correct deficiencies and ensure the ability to mop up superoxides, having B12 by injection (which mops up nitric oxide and peroxynitrite), measuring glutathione peroxidase and again, if necessary, taking glutathione and selenium and possibly taking vitamin C to bowel tolerance, and vitamins E and A. There are many natural antioxidants in nuts, seeds and vegetables, hence the benefits of a wholefood diet, juicing.

Antioxidants to consider are:

- Superoxide dismutase
- Glutathione peroxidase – this requires selenium 200mcgms daily and amino acids for its synthesis (high protein diet).
- Co-enzyme Q 10 - is the most important antioxidant inside mitochondria (see above)
- B12 – this is an excellent scavenger of the free radical peroxynitrite and may take over some of the function of SODase if this is very deficient – it provides instant antioxidant cover
- Other antioxidants also important as mentioned above – acetyl L carnitine, NAD (especially in the brain). Also vitamins A, C and E are essential antioxidants. Natural antioxidants are also present in vegetables, nuts and seeds.

See [Antioxidants](#) for more information.

Tertiary damage – Cell-free DNA

If free radicals persist, they damage the cell. This may initially just be enzyme damage which makes the cell go slow (and worsens all the above problems) or actual structural damage even resulting in cell death. When the cell dies, it releases its contents into the blood stream. John McLaren-Howard can test for this by measuring cell-free DNA in the blood. Cell-free DNA is a measure of tissue damage. When tissues are damaged, cells rupture and release their contents into the blood stream as fragments. These fragments include DNA, so when this is found not contained within a cell membrane, it is as a result of tissue damage. Cell-free DNA is raised in, for example, tissue damage due to sepsis, trauma, cancer, radiotherapy, chemotherapy and other such pathologies. It is also raised in CFS and accurately reflects the degree of fatigue. A high cell-free DNA therefore tells us something is going very wrong, such as:

- There is poor antioxidant status (see Co Q 10, SODase, GSH-PX),
- There is ongoing toxic stress (such as from pesticides, volatile organic compounds, heavy metals etc),
- There is immune activation (as for example in acute infection),
- There is very poor mitochondrial function (see mitochondrial function) score but the patient is forced to do some muscular activity just in order to live.
- The patient is not pacing well – i.e. pushing too hard and this is resulting in cell damage. However some people who are very disabled have no choice – just the energy required to exist will cause tissue damage. So people with the worst mitochondrial function score often have high cell free DNAs even though they are doing almost nothing.

All these issues need addressing!

The cell-free DNA test puts chronic fatigue syndrome firmly in the camp of serious organic disorders.

There are several problems with high levels of cell damage:

- It takes time for new cells to be made and this may partly also explain the delayed fatigue in CFS.

The immune system may react against these bits of cell floating about thereby switching on allergies. In trying to deal with these bits, the immune system damages even more cells if their superoxide dismutase is low. This becomes a serious vicious cycle.

- The immune system may react against these bits of cell floating about thereby switching on autoimmunity.

THESE ARE DISEASE AMPLIFYING EFFECTS! You make yourself worse if you don't pace. Exercise regimes are positively dangerous! Fatigue is the symptom that protects the body from itself!

The Mitochondrial Function Score

I am now able to score the mitochondrial function tests in order to give an energy score. I have now done well over 500 of these tests since 2005, and the mitochondrial energy score accords closely with the level of disability. This score takes into account the levels of ATP, how well it releases energy (a magnesium dependent process), how efficiently oxidative phosphorylation works as well as translocator protein function. This gives me an objective measure of the level of fatigue – that is to say, I can tell you how fatigued you are! In the paper "Chronic Fatigue Syndrome and Mitochondrial Dysfunction" published in January 2009 and available by a link from the News page on my website www.drmyhill.co.uk you will find my graph of the mitochondrial function scores against the level of disability. There is a very close correlation. It also tells you how I calculate this score.

If the score does not fit clinically, then this may well be because of tissue damage. Many CFS sufferers push themselves to do things at the expense of damaging their tissues. So they can choose between feeling better and doing very little, or having a life and feeling terrible. Most do the latter. So the mitochondrial function score is a measure of how much energy they have got to spend and the cell-free DNA a measure of how well they feel.

In CFS there is a balancing act between energy levels and cell damage – most people get this wrong, overdo things and end up with tissue damage, which is a disease amplifying effect. Pain and fatigue are the symptoms which protect the body from over-doing things!



Correcting the biochemical blocks is just one part of recovery

A running team can only go as fast as the slowest runner. The same is true in biochemistry. If one corrects one aspect of what is going wrong, one may not see improvements because suddenly another rate limiting step becomes apparent and the sufferer is slowed for another reason. So it is vital to keep the regime tight and in place as long as possible. For example, it is no good getting the biochemistry perfect if you aren't sleeping! That alone would cause fatigue. So as well as putting in place all the nutritional supplements, it is vital to continue with [Pacing](#), [Diet](#) and [Sleep](#).

TO SUMMARISE AT THIS STAGE

Because the nutritional regimes seem complicated, it is helpful to understand why the different nutrients are important the overall treatment plan. It is simply like getting a car engine to work. It is no good just filling the tank with fuel, or just unblocking the fuel pipe, or doing any one of the necessary jobs such as cleaning the spark plugs, unblocking the air filter, filling the engine with oil, unblocking the exhaust pipe etc on its own – one has to do all these bits in order to make it run. I have to say I have had such happy feedback from patients able to complete the regime that it is really well worth working hard at. The above recommendations have to be done in conjunction with my basic work up for all CFS sufferers with respect to:

- [Pacing](#) (see p. 38),
- [Micronutrients](#) – multivitamins, multiminerals, EFAs, vit C and D (see p. 49),
- [Sleep](#) – aim for 9 hours between 9.30pm and 6.30am (see p. 52)
- [Diet](#) (low GI diet which avoids the major allergens - see p. 57) and PROBIOTICS (see p. 66)

Once these “cornerstones” of recovery are in place, one should then introduce the other elements of the overall regime in order of priority i.e.

- Correcting mitochondrial function - D-ribose, Mg injections, NAD 500mgs, acetyl L carnitine, meat, Co Q 10.
- Addressing poor antioxidant status - B12, Co Q 10, SODase, glutathione peroxidase
- Detox regimes where appropriate – eg FIR sauna, chelation therapy
- Correcting secondary hormonal lesions, in particular secondary hypothyroidism, secondary hypoadrenalism and poor melatonin levels.
- Identifying chronic allergies/infections – these may arise from the fermenting gut or possibly presence of microbes which the immune system reacts inappropriately to. See [Valacyclovir in the treatment of post viral fatigue syndrome](#)

I know I am asking for much to be done and it maybe there is insufficient energy to put in place all the interventions required at once. Furthermore some of my very tender flowers do not tolerate all the interventions at once and so one has to progress slowly. I like to see patients get the regime in place and get the regime as tight as possible with respect to all the problems identified. Then I like them to be feeling well at rest. Then, and only then may they risk trying to do a little more, but this must be on the proviso that any loss of stamina or delayed fatigue and they must pull back again. What often gets in the way is allergy – it is deeply frustrating when the sufferer does not tolerate the very supplements they need for recovery.

The Energy Balance in CFS

John McLaren-Howard points out that it is vitally important for treatment to recognise that all patients with CFS are in some sort of energy equilibrium, which is a very delicate one. Indeed, it is quite shocking from the

results seen so far how critical that situation is. It is a marvel of human metabolism and the human spirit that patients with these very severe results manage to exist at all! For example, the cell-free DNA results give similar results to patients on cancer chemotherapy – and everyone knows how ghastly they feel and how little they can do!

Pacing

One final word about pacing, and this also applies to people who do not suffer from CFS. If you push your mitochondria too much, you will cause a disproportionate amount of damage because of the secondary and tertiary effects – just because you feel better, do not be tempted to do too much – or you will simply create damage elsewhere and postpone your recovery further! If my horse has worked hard during a long day hunting, she has complete rest in the field with lots of good food for four days before being ridden again. That way she stays fit and healthy! So the key is:

The road to recovery is:

1. **GET THE REGIME TIGHT**, then
2. **FEEL WELL AT REST**. You must feel well at rest for some weeks before you dare try increasing your level of activity. If you do too much too soon, you will simply trigger a biochemical and clinical collapse. Then
3. **GRADUALLY INCREASE ACTIVITY SO LONG AS THERE IS NO DELAYED FATIGUE**. Once you get to a level of normal activity and feel well, then you can start to relax the regime!

In practice nobody does it this way because life has a nasty habit of getting in the way! But this is the shape of recovery that should be borne in mind at all times. See [Pattern of recovery](#)

Actually this package of treatment is a blueprint for normal good health! Once this lot is in place, you will be highly protected from Western degenerative diseases such as heart disease, cancer and neurological nasties.

Further Implications for Treatment - details

If the body is functioning normally and has access to all essential minerals, vitamins, essential fatty acids and amino acids, it can make all these essential ingredients, in particular co-enzyme Q 10, acetyl L-carnitine and D-ribose. Magnesium must be supplied from the diet or supplements. This explains why most patients get well on my standard work up of treatment because this supplies all the essential ingredients for the body to heal itself.

However, for those who do not get well, it is likely that there is some sort of metabolic defect which prevents them from manufacturing these essential ingredients. I call this metabolic dyslexia! It may well be that genetically poor mitochondrial function alone is the problem, or there may be toxins or pesticides stuck in the system which stop the mitochondria functioning properly. It may well be that once the patient has dropped below a certain critical level, all cellular processes are going so slow that the sufferer is unable to manufacture the very things required to restore health. With age, our metabolism becomes less efficient anyway and we may need more raw materials in order to maintain the status quo.

Incidentally this helps explain why some CFS sufferers have such problems with drug medication and indeed this may help to point towards treatment. All my CFS patients feel much worse on statins because these stop the body from making its own Co Q10. Beta blockers, tricyclic antidepressants and phenothiazines also block Co Q10 synthesis and interfere directly with mitochondrial function – they must be used in small doses and with great care and preferably not at all!

Sources of supplements

Co-enzyme Q10 100-400mgs daily. This must be in a hydrosoluble or oil form or it is not well absorbed. Co Q10 is fairly widely available.

Acetyl L-carnitine 2gms daily – this is an amino acid with highest levels in meat. This may explain why vegetarians are at risk of CFS. It also partly explains why my CFS patients do best on high protein diets. I can supply in 120g packs . Also eat red meat (the word carnitine comes from carne – meat) or take 2 g on the day when you have not eaten red meat.

D-ribose 5-15gms daily – needs to be taken throughout the day. I can supply.

Niacinamide 550mgs available from Solgar 01782 634 744. Also see www.puritan.com. I can also supply this.

Magnesium in Mineral Mix.

For prices of all the nutritional supplements, please contact the office.

How long before you see improvement?

This takes some months. If you are not improved in this time then look for other causes.

What is important is that these interventions are done in combination with all my other recommendations with respect to diet, micronutrients, pacing, sleep, detoxing, etc. Firstly get the regime tight, then start to feel better and then start to increase activity. Below is a typical daily regime of nutritional supplements for patients who have done the mitochondrial function test and require the whole package of supplements!

Daily regime of nutritional supplements

This daily regime of nutritional supplements comprises my standard supplements that all patients should have regardless of their problems, with the mitochondrial support as a bolt-on extra and the antioxidant support also as an extra as dictated by the tests that have been done. Some supplements have more than one function e.g. Co-Q 10 is essential for mitochondrial function and also an important antioxidant. *Supplements in italics go into drinks*

• Also see VITAMINS AND MINERALS p. 49

Standard for all

In ½ to 1 pint of water/
some fruit juice dissolve:

Ascorbic acid 1 g (1 small scoop)

(Or BioCare Vit C 1 g = 2x 500mg caps)

MINERAL MIX 2 grams (2 small scoops)
drops) (SODase)

Mitochondrial support

M o r n i n g

Acetyl L-Carnitine 1 gram
(1 small scoop)

D-ribose 2.5 grams (1/2 teaspoon)

Extra Anti-oxidants

Copper 1mg (4

Swallow before breakfast with
the above solution:

BioCare Adult multivitamins x 1 capsule

VegEPA 4 capsules

Vitamin Research Vit D3 x 2 caps

Dessertspoon of hemp oil

Puritan's Pride

L-Glutathione 250mgs (GSH-Px)

Co-Enzyme Q10 100mg x 1 capsule

Niacinamide 500mg x 1 capsule

By injection

Magnesium sulphate ½ ml

B12 ½ ml

Mid morning

D-ribose ½ a teaspoon in
tea or coffee

Midday – lunchtime

Dissolve in ½ pint of water

MINERAL MIX 1gram 1 scoop
drops) (SODase)

D-ribose ½ a teaspoon

Manganese 5mgs (4

Swallow:

Co-enzyme Q10 100mg x 1 capsule

Mid – afternoon

Dissolve D-ribose ½ a teaspoon in tea or coffee

Evening

Dissolve in ½ to 1 pint of water/
some fruit juice:

Ascorbic acid 1 gram

(Or BioCare Vit C 1 g = 2x 500mg caps)

MINERAL MIX 2 grams

(or adjust to complete your daily dose)

With the above solution swallow

the following caps with food:

VegEPA

After 1 months stop evening dose of VegEPA

Acetyl L-carnitine 1 gram

Zinc 30mgs (8 drops)

D-ribose ½ a teaspoon

Co-enzyme Q10 100mg 1 capsule

Magnesium – treating a deficiency

I have struggled for over twenty years to try to make sense of red cell magnesium results. It seems that they are almost invariably low in patients with chronic fatigue syndrome. Furthermore, so many patients with chronic fatigue syndrome do benefit from magnesium by injection. You could argue that I have been a bit naughty in the past by using a low intracellular magnesium as an excuse for trying magnesium injections! This is really to encourage GPs to use the injections because clinically they are so helpful, although often paradoxically when I repeat a red cell magnesium, it is only marginally better, but magnesium injections often afford marked improvement clinically.

I actually now believe that a low red cell magnesium is a symptom of mitochondrial failure. It is the job of mitochondria to produce ATP for cell metabolism and about 40% of all mitochondrial output goes into maintaining calcium/magnesium and sodium/potassium ion pumps. I suspect that when mitochondria fail, these pumps malfunction and therefore calcium leaks into cells and magnesium leaks out of cells. This, of course, compounds the underlying mitochondrial failure because calcium is toxic to mitochondria and magnesium necessary for normal mitochondrial function. This is just one of the many vicious cycles we see in patients with fatigue syndromes.

For detailed information on magnesium see [Magnesium](#)

Injections of Vitamin B₁₂ – rationale for using

Over the last 22 years of treating over 3,000 patients with chronic fatigue syndrome, I have developed a programme of treatment which I believe all patients must do as the foundation before proceeding to other treatments. Vitamin B₁₂ by injection I see as an integral part of this programme and it is effective for many, regardless of the cause of their chronic fatigue syndrome.

Those patients who respond to B₁₂ are not obviously deficient in B₁₂, indeed blood tests usually show normal levels. The “normal” levels of B₁₂ have been set at those levels necessary to prevent pernicious anaemia – this may not be the same as those levels for optimal biochemical function. B₁₂ has a great many other functions as well as the prevention of pernicious anaemia. However what is interesting is how B₁₂ is beneficial in so many patients with fatigue, regardless of the cause of their CFS, and suggests that there is a common mechanism of chronic fatigue which B₁₂ is effective at alleviating.

Many of the symptoms of CFS are caused by poor antioxidant status. Normal cell metabolism constantly produces free radicals. That is to say you cannot live without producing free radicals. These are highly reactive potentially very dangerous unstable molecules (because, for the chemists amongst you, they have an unpaired electron). Happily the body has evolved many systems for mopping up these free radicals before they cause too much damage. Inside mitochondria the most important are co enzyme Q 10 and manganese dependent superoxide dismutase, outside mitochondria we have zinc copper dependent superoxide dismutase, glutathione peroxidase, acetyl L carnitine (it does more than one job!), as well as vitamins A, C and E and lots of other natural antioxidants found in nuts seeds and vegetables. Where there is poor antioxidant status, high dose vitamin B12 takes over many of their functions. This is why the effect of B12 injections is often so obvious and running out of B12 equally obvious.

General mechanism by which B₁₂ relieves the symptoms of CFS

Professor Martin Pall has looked at the biochemical abnormalities in CFS and shown that sufferers have high levels of nitric oxide and its oxidant product peroxynitrite. These are free radicals. These substances may be directly responsible for many of the symptoms of CFS and are released in response to stress, whether that is infectious stress, chemical stress or whatever. B₁₂ is important because it is the most powerful scavenger of nitric oxide and will therefore reduce the symptoms of CFS regardless of the cause.^{1, 2, 3, 4, 5, 6}

Nitric oxide is known to have a detrimental effect on brain function and pain sensitivity. Levels are greatly increased by exposure to chemicals such as organophosphates and organic solvents⁷. When sensitive tests of B₁₂ were applied (serum methylmalonic acid and homocysteine) before and after B₁₂ therapy, the following symptoms were noted to be caused by subclinical B₁₂ deficiency: parasthesia, ataxia, muscle weakness, hallucinations, personality and mood changes, fatigue, sore tongue and diarrhoea.⁸

B₁₂ in fatigue syndromes

The “foggy brain” with difficulty thinking clearly, poor short term memory and multitasking are often much improved by B₁₂.^{9, 10, 11}. Mood and personality changes, so often a feature of patients with chemical poisoning, can be improved by B₁₂.¹². The physical fatigue and well being are often both improved.

A study

Twenty eight subjects suffering from non-specific fatigue were evaluated in a double-blind crossover trial of 5 mg of hydroxocobalamin twice weekly for 2 weeks, followed by a 2-week rest period, and then a similar treatment with a matching placebo. The placebo group in the first 2 weeks had a favourable response to the hydroxocobalamin during the second 2 week period with respect to enhanced general well being. Subjects who received hydroxocobalamin in the first 2-week period showed no difference between responses to the active and placebo treatments, which suggests that the effect of vitamin B12 lasted for over 4 weeks. It is noted there was no direct correlation between serum vitamin B12 concentrations and improvement. Whatever the mechanism, the improvement after hydroxocobalamin may be sustained for 4 weeks after stopping the medication. "A Pilot Study of Vitamin B12 in the Treatment of Tiredness," Ellis, F.R., and Nasser, S., British Journal of Nutrition, 1973;30:277-283.

Practical Details

Do not bother to measure blood levels of B12 to monitor treatment. These are irrelevant. The idea is to get high levels, i.e. >2000.

Vitamin B₁₂ has no known toxicity and B₁₂ surplus to requirement is simply passed out in the urine (which may discolour pink). It is theoretically possible to be allergic to B₁₂ but in the thousands of injections that I have sanctioned this has only ever occurred after several injections and causes local itching, redness and swelling (although the commonest cause of redness and swelling is poor injection technique). It does not seem to matter whether hydroxocobalamin or cyanocobalamin is used. Again the most painless injections are done using insulin syringes and giving ½ ml daily, then adjust the frequency according to response – some patients will respond straight away, some need several doses before they see improvement. I would do at least 6 weeks of injections before giving up.

I was interested to hear that the top chess players inject themselves daily with B12 when they are competing because it helps their concentration and performance!

References:

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What to do if your GP refuses to give the B12 and magnesium injections

This is a real bore. Magnesium and B12 injections are so helpful that it is pointless progressing onto other things without trying these first. Therefore a way must be found to get this done. Some GPs are unwilling to prescribe the magnesium and B12 but prepared to inject them. In this event I can supply the magnesium and B12 and the GP's practice nurse should be able to inject.

The next possibility is that the GP refuses to have anything to do with magnesium and B12 injections. In this event either you need to find a local nurse, physio, health visitor or mid-wife or whoever who can do the injections for you. I am very happy to write a covering letter so that I take clinical responsibility, send that person instructions as to how to inject B12 and magnesium and I can supply the wherewithal.

The third possibility is that I teach you to inject yourself. This has great advantages because the timing of the magnesium and B12 depends on your clinical symptoms. Some people know exactly how long the injections last and if they are going through a good phase they last longer, shorter with a bad phase. Sometimes more benefit is got from the B12 than magnesium or vice-versa and the injections can be adjusted accordingly. However you really need to come and see me so that I can teach you to inject yourself, or alternatively be taught by a competent local practitioner such as a doctor or nurse. Many of my patients do end up injecting themselves simply because this saves the effort of travelling down to their GP's surgery on a regular basis and risk picking up nasty infections in the waiting room.

I am now getting fairly confident that the magnesium by nebuliser works as well as magnesium by injection, so I would probably go for this. I have yet to try B12 by nebuliser, but I am trying some patients on high dose oral supplements to see if I can get the same effect as injections.

Early feedback from patients doing the mitochondrial regimes and implications for future treatment

March 2012

I have been collecting data and Dr Norman Booth has been analysing it. Together with Dr John McLaren Howard we hope to publish shortly. What we find is that the package of treatment recommended improves mitochondrial function reliably well and this is paralleled by clinical improvements. If there is not clinical improvement then this means there must be another cause of fatigue that has not been addressed.

The response to this package of treatment takes months, not weeks. However, what is interesting is that improvement seems to continue during the ensuing months, i.e. it is ongoing and progressive. This is very exciting for me – many sufferers have got back to regular exercise and some to part time work.

What most often gets in the way is allergy or intolerance of supplements then there are some wrinkles that can be tried. One is to rotate them – that is to say on a Monday have the D-ribose, Tuesday, Acetyl L-carnitine, Wednesday Co-Q10, Thursday magnesium etc. This helps to avoid new allergies developing. Intolerance of Co-enzyme Q10 can sometimes be got round by giving it through the skin rather than taking it by mouth. Another way forward is to use EPD (Enzyme Potentiated Desensitisation) to switch off allergies and reduce the sensitivities generally.

Another possibility is the fermenting gut. Mitochondria are derived evolutionarily from bacteria – so mitochondrial supplements may feed microbes in the gut and make a fermenting gut worse. See [Fermentation in the gut and CFS](#)

The key point to remember about chronic fatigue is that it is a symptom, not a diagnosis and if the mitochondrial package is not working then one needs to look for other causes! See [Chances of recovery](#)

PART IV: SOLID FOUNDATIONS FOR RECOVERY AND GOOD HEALTH



I have to confess that I started this book with the account of the biochemical processes involved in producing energy in our bodies, the exciting news of the detailed tests looking at how efficient or inefficient these processes are in the CFS patient's cells and finally a discussion of the supplement regime to correct problems with energy production. These recent developments in our understanding of chronic fatigue syndrome mean that the search for safe, targeted and effective treatment for this dreadful illness is within reach of all sufferers.

However, there is a very important message that CFS sufferers need to always remember. Just as a house without solid foundations cannot be expected to be safe and last very long, regardless of how expensive the window frames are and how thick and expensive the roof timbers are, so chronic fatigue syndrome cannot be overcome and the recovery cannot be sustained without the “foundations” on which the mitochondrial supplement regime rests. These foundations for chronic fatigue sufferers, and in fact for anybody who wants to keep their good health, are:

- Rest and pacing
- Stone Age diet
- Nutritional supplements
- Adequate sleep
- Chemical clean-up

Although this chapter follows recommendations for the treatment of mitochondrial dysfunction in CFS, the foundations of recovery and continued good health ideally need to be in place before that mitochondrial package is introduced. You will find these principles on the website under “Your Very Good Health”.

Rest and pacing: Drive your car kindly, and then it lasts much longer!

Rest is the single most important factor in allowing CFS sufferers (CFSs) to get better. An invariable feature of the history is that exercise (either mental, physical or emotional) makes the symptoms worse. Indeed this distinguishes CFS from depression - exercise tends to improve people who are simply depressed. In CFS the desire is there but the performance lacking. However, all CFSs tend to push themselves to their particular limit every day and therefore do not give themselves a chance to get better. This means they have one day doing as much as possible, then three days to recover. Whilst you are on this roller coaster ride of activity and dives, you cannot hope to improve overall.

Fatigue and pain are the symptoms that prevent the body from damaging itself. Ignore these at your peril! Usually it is years of stress and push that pre-date the onset of CFS. People get things done at the expense of sleep, holidays and diet and end up feeling tired with the progressive cell damage that goes with that. Then a virus or toxic stress pushes one finally over the edge.

Energy has to be carefully rationed so that every day is about the same. This is the most difficult aspect of treating CFS because this is the very personality that makes people get CFS in the first place.

We now know why CFSs get delayed fatigue – it is because when they use up energy (ATP) faster than they can make it, there is a build up of ADP. Some is shunted into AMP, which is only recycled very slowly, if at all. Cells have to make brand new de novo ATP from D-ribose, but this only happens very slowly, 1-4 days. In the meantime, cells can get a small amount of ATP directly from glucose via anaerobic metabolism, but this produces lactic acid, which causes many of the muscle symptoms.

Most CFSs compare themselves to what they were like before their illness began. This is hopeless. It is vital to work out exactly how much you can or can't do in a day - and then do less.

Imagine that a normal healthy person has £1,000 worth of energy to spend in a day. The CFSs only have £100. What is more, this has to be spread out throughout the day in such a way that they have £20 "change" at the end. This will then allow recovery to occur. Furthermore you are only allowed to spend a few pounds in one session – then rest. If you start to get symptoms then you are over-doing things. Often this means you have initially to do LESS – but with careful pacing you will end up doing MORE!

I also like all my CFSs to have a sleep in the day, even on a good day. Homo sapiens evolved in hot climates where it is normal to have a siesta in the afternoon. Most people experience an energy dip after lunch. Young babies and older people return to this more normal sleep pattern and ill people should do the same. An afternoon sleep is normal! I do!

You have to pace sufficiently so that you feel OK at rest. This may also need other interventions, but feeling unwell means tissue damage!

Resting in the day

By resting, I mean complete rest from exercise, visitors, telephone calls, reading, computers, talking, child minding, noise and TV. All the above count as activities which have to be carefully rationed through the day. When you rest, lie horizontal because this reduces the work of the heart (it is much harder work pushing blood round a vertical body, up hill and down dale, than when horizontal and everything is on the flat). Interestingly caffeine helps the body scavenge AMP, so small amounts in green tea, coffee or dark chocolate can be helpful.

The second point is to have a proper rest, when you actually go to bed, regularly in the day, EVEN ON A DAY WHEN YOU FEEL WELL. The fatigue in CFS is delayed. If you push yourself one day, expect to

"pay" for it 12-36 hours later. So just because you feel well one day, don't overdo things or you will be worse off the next.

Thirdly, do things in short bursts. You will be more efficient if you do things for 10-40 mins (whatever your window of time is) then rest for the same length of time. I had one patient who could only walk 30 metres, but by walking 15 metres and resting, then going on again, she got up to walking a mile a day!

Fourthly, vary your activity. This applies to the brain as well as the body – listening to the radio or music uses a different part of the brain to watching TV. Washing up (sitting on a high stool please) uses different muscles to walking.

As you recover

The first step is to reduce the amount of physical and mental work each day until all days are about the same. At the same time you will be putting in place all the necessary interventions to allow recovery – [Nutritional supplements](#), [Stone Age diet](#), [Sleep](#) etc. Get the regime tight until you get to a stage when you feel absolutely fine doing absolutely nothing! The level of activity is then very slowly increased each day on the proviso that you continue to feel well. The key here is to vary activity. Different parts of the brain and body have to be exercised. One of the most active areas of the cortex is that which is concerned with vision. Processing information from a television for example requires much more activity than listening to music. Television needs to be rationed. Similarly physical exercise should be done using as many different muscle groups and initially should be limited to simple stretching exercises without weights.

The level of physical and mental exercise is very gradually increased. It may well take several months before significant changes are seen. To adjust the level of activity to what is appropriate you have to judge things by the next day. If there is delayed fatigue then you have overdone it. There is a very fine “window” between too much and too little. Straying either way makes CFS worse!

One of my patients, Lydia Noor, has developed a useful technique for rest. Every activity is scored as to whether it is energy giving (e.g. sleep, lying in bed in a darkened room, meditation), energy taking (e.g. dressing, walking, talking, cooking, cleaning etc) or energy neutral (easy reading, easy TV, having a massage etc). Each day is scored in terms of time spent doing each activity and balanced out so energy input equals energy output. Everybody has their own balance. But one can quickly see if too much has been done on any one day, in which case a balancing is necessary. Doing it like this, on a chart, takes the guilt out of resting. It simply becomes a necessity like eating or drinking.

I can recommend Calibre - The Cassette Library, a registered charity providing tapes of books to the blind and print disabled (CFS patients qualify on many scores!). The service is free, the voice on the end of the phone extremely friendly. Contact Calibre Library on: 01296 432 339.

Once you get to the stage when you have good levels of activity and feel fine, then, and only then, dare you relax the regime. This of course is a council of perfection – actually nobody does it this way because life has a nasty habit of getting in the way. There is usually a trade off between how you feel and how much you can do. But the business of feeling ill is a disease amplifying process – it can actually make you worse as cells are damaged – so do work hard at pacing.

Work and pacing

There is a whole spectrum of CFSs from those professional athletes who cannot do their marathons in less than 2 hours 12 mins, to those who are bed-ridden. Some CFSs can manage full time work, but very often are operating "on adrenaline" and crash when they give it up. This crash can last several weeks or months. Many can do some part-time work - in which case late afternoon work is the best. Don't try to change the job you are in - never resign or you will lose valuable rights. I am happy to give sick notes, write to companies/bosses, do letters for early retirement and fill in disability living allowance forms etc for my patients. I never used to charge for these letters, but because there is so much paper work now, I make a charge reflecting admin/time

costs. The mitochondrial function test results are very useful to include in these letters because these give us an objective measure of fatigue.

If you work to your limit, then you should do very little outside work - spend the evenings and weekends resting.

Get organised

The people who get CFS are those who "burn the candle at both ends". They hold down a demanding job, care for a family and are often active sportsmen/women. I see many top athletes with CFS - professional footballers, England cyclists and swimmers, decathletes, many county badminton, hockey, cricket and squash players and several quality marathon runners. These people are the very ones who find it difficult to ask favours of others.

Ask other people to do things. Stop being house-proud. Get a cleaner and dish washer. Simplify your life. Accept offers of "meals on wheels" from others. Standardise shopping lists so you don't need to think each time. Arrange for as much food to be delivered as possible - e.g. have a standing order at the green grocer for fruit and vegetables a week, with the fishmonger, with the butcher, Mr Tesco etc. Many city areas have organic food delivery. Have standard menus every week so you don't need to think about what to eat. Choose foods requiring minimal preparation. Use the internet to order from supermarkets so that foods are delivered to the house directly – a weekly standard “shopping basket” takes energy to set up but takes the mental and physical effort out of shopping thereafter. Take advantage of a washing machine and drier. Give up ironing - a nonsensical, energy sapping waste of time and energy. Ironing came into fashion to kill nits and fleas in the seams of clothes and had a purpose once! I don't iron, but then I always was a scruff!

Do things by the clock. We are creatures of habit and the physical body likes things to happen on a regular basis – you ask any farmer who keeps animals – they thrive on routine. Sleep and eat at regular times and pace activities so you do about the same every day and during the same time slots. I know that life has a habit of getting in the way of this ideal, but as a general principle, stick to it.

I always think life is all about going from one crisis to the next. If every bit of your energy is taken up every day, then you don't have any left in reserve for the crises. This is another good reason not to constantly push yourself to your limit.

THE TEN COMMANDMENTS FOR REDUCING STRESS

1. Thou shalt not be perfect or try to be.
2. Thou shalt not try to be all things to all people.
3. Thou shalt leave things undone that ought to be done.
4. Thou shalt not spread thyself too thin.
5. Thou shalt learn to say “NO”.
6. Thou shalt schedule time for thyself, and for thy supporting network.
7. Thou shalt switch off and do nothing regularly.
8. Thou shalt be boring, untidy, inelegant and unattractive at times.
9. Thou shalt not even feel guilty.
10. Thou shalt not be thine own worst enemy, but thine own best friend.

Vitamins and minerals – what to take and when - *the fuel in the tank*

I believe that if you wish to stay healthy, or recover from almost any illness, then taking nutritional supplements is essential. My reasons are given below. What you should take daily for optimum health is as follows:

Morning

- **BioCare multivitamin/mineral one daily** (this contains B vitamins which can cause insomnia, so don't take in the evening). Contains vit A 2,000 i.u, B1 25mg, B2 25mgs, B3 50mgs, B5 100mg, B6 as its active form pyridoxal-5-phosphate 25mg, B12 30mcg, inositol 12mg, PABA 10mg, biotin 35 mcg, folic acid 400mcg, magnesium ascorbate 243mg (vit C), Vit D₂ 250i.u, Vit E 75i.u. (50mg). Also magnesium 22mg, calcium 6mg, potassium 8.9mg, zinc 8.5mgs, molybdenum 98.7mcg, manganese 300mcg, chromium 50mcg, iodine 37.8mcg, selenium 50mcg
- **Vitamin C 1,000mgs** - the best value source is ascorbic acid. When mixed in water with the Mineral Mix, the minerals convert to the ascorbate, which enhances absorption of the minerals. For two grams of minerals (two scoops) add one gram of vitamin C (one scoop) in a pint of water. With time you may tolerate this in half a pint of water. If ascorbic acid is not tolerated then use the neutral magnesium or calcium ascorbate such as BioCare Vitamin C 500 (as magnesium ascorbate) 2 caps
- **VegEPA** - 4 capsules for one month, then maintenance dose of 2-4 capsules daily
 - ✓ N.B. VegEPA **CONTAINS FISH OILS** SO IF YOU ARE VEGETARIAN, USE: **BioCare MicroCell Essential Fatty Acids** one capsule – contains 173mg linseed oil (provides 95mg of ALA) and 108mg borage oil (providing 43.2mg of GLA) (2 caps Essential Fatty Acids provide the equivalent amount of GLA as 1,000mgs of evening primrose oil).
 - ✓ Hemp oil one dessertspoonful – contains the right balance of omega 6 to omega 3

Evening

- **Vitamin C 1,000mgs** – as above
- **VegEPA** – 4 capsules for 1 month (and then only the morning dose)
 - ✓ or **MicroCell Essential Fatty Acids** one capsule as above

THROUGHOUT THE DAY DRINK MY MINERAL MIX (MM)

This is a mix of minerals which you make up in water or fruit juice, all essential for human metabolism which increasingly are lacking in modern food supplies. It contains minerals in the correct proportion for human requirements – the amounts given below are elemental weights of the pure mineral. These amounts are those considered desirable from modern nutrition research and are mostly above the “Recommended Daily Amount”. If better preparations come available or I learn more about essential minerals then the composition of Mineral Mix may change.

Per one gram of MINERAL MIX

Calcium (as calcium chloride) 60 mgs
Magnesium (as magnesium chloride) 70 mgs
Potassium (as potassium chloride) 40 mgs
Zinc (as zinc chloride) 6mgs
Iron (as ferric ammonium chloride) 3mgs
Boron (as sodium borate) 2 mgs
Iodine (as potassium iodate) 0.3 mgs
Manganese (as manganese chloride) 0.2 mgs
Copper (as copper sulphate) 0.2 mgs

Molybdenum (as sodium molybdate) 40 mcg
Selenium (as sodium selenate) 40 mcg
Chromium (as chromium chloride) 40 mcg
Vitamin B12 1,000 mcg
Vitamin D (as cholecalciferol) 1,000 iu

I have omitted some 4 elements for the following reasons: **vanadium** is not permitted in UK. **Sulphur** is not biologically available as the mineral – it is available in sulphur-containing amino acids (eat protein) and in glucosamine sulphate or MSM or N acetyl glucosamine or from boiling bones and using the stock in soups and stews; **phosphorus** is plentiful in meat, is often used as a food additive and is not in the Mineral Mix; and **silicon** - cannot be used by the body as an inorganic mineral. Organic silica and strontium are in my arthritis mix.

Dosage

The daily dose of Mineral Mix is one gram (one small scoop in ½ pint water) per two stone of body weight (sorry – don't do metric!) to a maximum of 5 grams (5 small scoops made up in 3 pints of water and taken throughout the day). **Start off with just a half a pint of mix daily and build up slowly to allow your stomach to adjust to the changes, otherwise it may cause nausea and loose bowel movements. Use with ascorbic acid to optimise absorption. This it does firstly by combining with the minerals to form ascorbates - the most soluble form, and secondly by acidifying the mix – minerals need an acid environment for their absorption.** With 10% fruit juice this is palatable. It also makes one drink water, something many people forget to do! Mineral Mix is suitable for all age groups including babies and pregnant women. The dose is not critical as there is a very wide margin of safety for all essential minerals! The mix is 100% minerals with no additives, colourings, flavourings or any excipients. The formula is completely stable and will last for many years. **However, it is vital that the lid is tightly screwed on to the jar to prevent absorption of moisture from the air.** The mixture may change as I learn new things about nutritional science. Mineral Mix is supplied in 405gm containers sufficient for 3 months supply of all minerals for someone weighing 9 stone. Please order Mineral Mix from Upper Weston, Llangunllo, Knighton, Powys LD7 1SL, or e-mail: helen@doctormyhill.co.uk

For minerals to be absorbed they require an acid stomach – see [Hypochlorhydria](#).

I have been experimenting with delivering minerals and vitamins through the skin rather than by mouth to avoid problems with gut fermentation. For lots of ideas, please see [Minerals and vitamins in creams](#) and [Transdermal micronutrients](#)

SSSS

Some people do not tolerate the Mineral Mix because it is so rich in magnesium, calcium, potassium and iron. For these, change to SSSS (Sarah's Solution for Sensitive Stomachs), which provides 60mgs calcium, 60mgs magnesium, 40mgs potassium per daily dose and contains no iron. 100g (sufficient for 100 days adult dose).

Sunshine

is necessary to make vitamin D. Vitamin D deficiency is extremely common and partly responsible for our epidemics of immune disorders (allergy and autoimmunity), osteoporosis, cancer and heart disease! Vitamin D is extremely safe and I now include it in the Mineral Mix at the rate of 1,000iu per gram. So the maximum daily dose of 5 grams Mineral Mix gives 5,000iu of vitamin D3. Sunshine is the best way to increase vitamin D levels. Thirty minutes of good sunshine on skin exposed by swimming costumes will give us about 5,000iu of D3. It is impossible to get adequate vitamin D from sunshine in UK, hence the need to supplement. If you are not taking Mineral Mix, then you need to take 5000 i.u. of Vit D3 a day.

See [Vitamin D and sunshine](#)

Salt - if you are not eating processed foods, then you will need some salt. Use sea salt which also contains small amounts of very rare trace elements which are also likely to be essential for normal metabolism. I suggest ¼ tsp. daily on food.

If you think of the human body as a language, then vitamins and minerals are the alphabet. With the letters of the alphabet one can make words, sentences, paragraphs, chapters, books, libraries and a whole culture. All the letters are necessary for complete health. Actually you could go a long way with a language without the letter X. But without X there's no sex and the human race would rapidly become extinct! All micronutrients are essential and we all need to be taking a bit of everything.

Everybody can benefit from taking nutritional supplements regularly. I do. My reasons can be found at:

[Nutritional supplements - why we all need them](#)

You must sleep - *time for service and repair*

All animals, even bacteria, need a time to shut down normal metabolism for the processes of healing and repair. All higher animals do this during sleep. If you get insufficient sleep, your health will gradually ratchet downhill as there is more time for damage to take place and less time for healing and repair.

Humans evolved to sleep when it is dark and wake when it is light. Sleep is a form of hibernation when the body shuts down in order to repair damage done through use, to conserve energy and hide from predators. The normal sleep pattern that evolved in hot climates is to sleep, keep warm and conserve energy during the cold nights and then sleep again in the afternoons when it is too hot to work and hide away from the midday sun. As humans migrated away from the Equator, the sleep pattern had to change with the seasons and as the lengths of the days changed.

Get the hours of sleep

People needed more sleep during the winter than in the summer in order to conserve energy and fat resources. Furthermore during the summer humans had to work long hours to store food for the winter and so dropped the afternoon siesta. But the need for a rest (if not a sleep) in the middle of the day is still there. Therefore it is no surprise that young children, elderly and people who become ill often have an extra sleep in the afternoon and for these people that is totally desirable. Others have learned to “power nap”, as it is called, during the day and this allows them to feel more energetic later. If you can do it then this is an excellent habit to get into – it can be learned! The average daily sleep requirement is nine hours, ideally taken between 9.30pm and 6.30am, i.e. during hours of darkness, but allow for more in the winter and less in the summer. An hour of sleep before midnight is worth two after – this is because human growth hormone is produced during the hours of sleep before midnight.

To show how important the balance of hours of sleep and rest are, divide the day into 12 hours of activity and 12 hours of rest. If you have one extra hour of activity (13 hours), you lose an hour of rest and sleep (11 hours). The difference is two hours!

Sleep when it is dark

Light on the skin prevents the production of melatonin, which is the sleep hormone essential for a good night's sleep. Therefore, the bedroom should be completely blacked out and quiet in order to give the best chance of quality sleep. Even people who are born blind still have a day night rhythm – it is light landing on the skin which has the effect – just closing your eyes will not do it! A study done in 1907 before electricity was available showed that people went to bed when it got dark and rose when it got light. On average through the year they got 9 hours sleep, more in winter, less in summer. Nowadays we average 7 and a half hours of sleep – we are losing on average 550 hours of sleep a year! Loss of sleep is a major risk factor for heart disease, cancer and degenerative conditions! We damage our cells during waking hours, and heal and repair during sleep – get the balance wrong and one ratchets downhill with time with not enough time to heal and repair the damage created during wakeful hours!

Sleep is essential for life

After the First World War a strain of Spanish ‘flu swept through Europe killing 50 million people worldwide. Some people sustained neurological damage and for some this virus wiped out their sleep centre in the brain. This meant they were unable to sleep at all. All these poor people were dead within 2 weeks and this was the first solid scientific evidence that sleep is more essential for life as food and water. Indeed all living creatures require a regular “sleep” (or period of quiescence) during which time healing and repair takes place. You must put as much work into your sleep as your diet.

The desire for sleep does not come up and up slowly through the evening. It comes in waves. We get a sleep wave every 90 minutes. Work out from when you do drop off to sleep when your wave occurs, e.g. if you drop off now at 11pm, you have missed the 9.30 wave. Once you start to look for the wave it is very obvious!

Again, if you nod off in front on the TV at 8pm, then that tells you when your sleep wave has come. Get into bed before the sleep wave, recognise it, lights out, then “ride the wave” with your sleep dream.

We are all creatures of habit and the first essential is to get the physical essentials in place.

- A regular pre-bedtime routine – your “alarm” should go off at 9pm, at which point you drop all activity and move into your bedtime routine.
- A regular sleep time so you ride the sleep wave.
- Learn to recognise the sleep wave.
- A busy day with the right balance of mental and physical activity.
- Not having a bed fellow who snores.
- Small carbohydrate snack just before bedtime (eg nuts, seeds) helps prevent nocturnal hypoglycaemia, which often manifests with vivid dreams or sweating or waking in the night.
- Perhaps restrict fluids in the evening if your night is disturbed by the need to pee.
- No stimulants such as caffeine or adrenaline inducing TV, arguments, phone calls, family matters or whatever before bedtime! Caffeine has a long half life – none after 4pm.
- Dark room – the slightest chink of light landing on your skin will disturb your own production of melatonin (the body’s natural sleep hormone) – have thick curtains or blackouts to keep the bedroom dark – this is particularly important for children! Do not switch the light on or clock watch should you wake.
- A source of fresh, preferably cold, air.
- A warm comfortable bed – we have been brainwashed into believing a hard bed is good for you and so many people end up with sleepless nights on an uncomfortable bed. It is the shape of the bed that is important. It should be shaped to fit you approximately and then very soft to distribute your weight evenly and avoid pressure points. Tempur mattresses can be helpful (if expensive) as are water beds.
- If your sleep is disturbed by sweating then this is likely to be a symptom of low blood sugar.
- Another common cause of disturbed sleep is hyperventilation which often causes vivid dreams or nightmares. See my section on [Hyperventilation](#) – this can now be tested for by measuring a *red cell carbonic anhydrase*. However, I often use a benzodiazepine such as diazepam 2-5mgs at night which reduces the sensitivity of the respiratory centre.
- If sleep is disturbed by pain then one must just take whatever pain killers are necessary to control this. Lack of sleep simply worsens pain.
- If one wakes in the nights with symptoms such as asthma, chest pain, shortness of breath, indigestion etc then this may point to food allergy being the problem with these withdrawal symptoms occurring during the small hours.
- Some people find any food disturbs sleep and they sleep best if they do not eat after 6pm.
- If you do wake in the night do not switch the light on, do not get up and potter round the house or you will have no chance of dropping off to sleep.
- Learn a “sleep dream” to train the subconscious to switch on the sleep button!

THE COMMONEST CAUSE OF DISTURBED SLEEP IN THE NIGHT IS HYPOGLYCAEMIA. Once the [Stone Age diet](#) is established, this often helps considerably with sleep, but in the meantime have a snack last thing at night (e.g. nuts and seeds with a small piece of fruit) and, if sleep still disturbed, maybe eat again in the night.

Recognise the sleep wave

Actually sleep does not gradually creep up on us during the evening – it comes in waves. There is a sleep wave about every 90 minutes and you will get to sleep most efficiently if you learn to recognize and ride the sleep wave. Often there is a lesser one earlier in the evening when people drop off to sleep in front of the telly, or they jump and make a cup of tea to wake themselves up because “they are not ready to go to bed” – actually they are! My sleep wave comes at 9.20 and I like to be in bed reading well before this – it is immediately recognizable now I have learnt to expect it!

Get the brain off to sleep

Getting the physical things in place is the easy bit. The hard bit is getting your brain off to sleep. I learned an astonishing statistic recently which is that throughout life, the brain makes a million new connections every second!! This means it has a fantastic ability to learn new things. This means it is perfectly possible to teach your brain to go off to sleep, it is simply a case of pressing the right buttons. Getting off to sleep is all about developing a conditioned reflex. The first historical example of this is Pavlov's dogs. Pavlov was a Russian physiologist who showed that when dogs eat food, they produce stomach acid. He then "conditioned" them by ringing a bell whilst they ate food. After two weeks of conditioning, he could make them produce stomach acid simply by ringing a bell. This of course is a completely useless conditioned response, but it shows us the brain can be trained to do anything.

Applying this to the insomniac, firstly, he has to get into a mind-set which does not involve the immediate past or immediate future. That is to say if he is thinking about reality then there is no chance of getting off to sleep – more of this in a moment. Then he uses a hypnotic (see below) which will get him off to sleep. He applies the two together for a period of "conditioning". This may be a few days or a few weeks. The brain then learns that when it gets into that particular mindset, it will go off to sleep. Then the drug is irrelevant. However, things can break down during times of stress and a few days of drug may be required to reinforce the conditioned response. But it is vital to use the correct "mind-set" every time the drug is used, or the conditioning will weaken.

I do not pretend this is easy, but to allow one's mind to wander into reality when one is trying to sleep must be considered a complete self-indulgence. It is simply not allowed to free-wheel. Treat your novelty seeking brain as you would a naughty, recalcitrant, undisciplined child.

Find a sleep dream that suits you

Everyone has to work out their best mind-set. It could be a childhood dream, or recalling details of a journey or walk, or whatever. It is actually a sort of self hypnosis. What you are trying to do is to "talk" to your subconscious. This can only be done with the imagination, not with the spoken language. The following is lifted from a book on self hypnosis which works for some:

"We know that the hypnotic state is characterized by extreme responsiveness to suggestion. You can use this information for conditioning yourself in self hypnosis. Here is a standard procedure to follow. Lie down in bed, ready for sleep initially with your eyes open (the room needs to be dark). Mentally give yourself the suggestion that your eyes are becoming heavy and tired. Give yourself the suggestion that as you count to ten your eyes will become very heavy and watery and that you will find it impossible to keep your eyelids open by the time you reach ten. If you find that you cannot keep them open and have to close them, then you are probably under self- hypnosis. At this point deepen the state by again slowly counting to ten. Between each count mentally give yourself suggestions that you are falling into a deep hypnotic state. Give yourself suggestions of relaxation. Try to reach a state where you feel you are about to fall asleep. Give yourself the suggestion that you are falling more deeply down into sleep. Some may get a very light feeling throughout the body; others may get a heavy feeling.

Let us assume that your eyes did not become heavy. Then repeat the procedure. You can count to one hundred if you need this period of time to assure an eye closure. The closing of the eyes is the first sign you are in a receptive frame of mind. Let us assume that you get the eye closure. Take a longer count to get yourself in the very relaxed state. Once you achieve this you should be able to respond properly. The difficult bit is not allowing your brain to wander off into other areas. You must work hard at concentrating on the counting and the responses that achieves.

If you respond properly, give yourself the "post-hypnotic suggestion" that you will be able to put yourself under later by counting to three, or using any specific phrase you desire. Continue using it every day and give yourself the post hypnotic suggestion every time you work with it, that at each succeeding session you will fall into a deeper state and that the suggestions will work more forcefully with each repetition.

Each time that you work towards acquiring the self-hypnotic state, regardless of the depth that you have achieved and whether or not you have responded to any of the tests, give yourself the following suggestions:

“The next time I hypnotise myself, I shall fall into a deeper and sounder state” You should also give yourself whatever suggestions you desire as though you were in a very deep state of hypnosis. You may ask “If I’m not under hypnosis, why give myself the suggestions?” You do this so that you will begin to form the conditioned reflex pattern. Keep at it. One of the times that you work at achieving self-hypnosis the conditioned response will take hold.....you will have self hypnosis from that time on. It is like learning to drive a car with a clutch. At first you must consciously go through the process of putting your foot on the clutch and shifting gears. Usually there is a grinding of the gears and you feel quite conspicuous about this, but gradually you learn to do this almost automatically and you gain confidence in your driving ability. The same is true of hypnosis. As you work at your task, you gradually get the feel of it and you achieve proficiency in it.

Use medication to reinforce the sleep dream

I instinctively do not like prescribing drugs. However, I do use them for sleep, in order to establish the above conditioning and to restore a normal pattern of sleep, after which they can be tailed off or kept for occasional use. Indeed, viruses can cause neurological damage (for example polio) and this could involve damage to the sleep centre. So often CFS patients get into a bad rhythm of poor sleep at night, which means they feel ill for the day, which means they get another bad night. They are half asleep by night and half awake by day. Furthermore, their natural time for sleep gets later and later. They go to bed late and if they have to get up at the usual time, chronic lack of sleep ensues. Indeed there is now evidence that the biological clock is dependent on normal adrenal function – and we know this is suppressed in CFS.

So often some medication is needed to facilitate sleep. Most CFS patients react badly to drugs in normal doses. I like to use combinations of low dose herbals, natural remedies and prescribed drugs to get the desired effect. Everybody works out his or her own cocktail which suits. This may have to be changed from time to time. I like to supply a “starter pack” which has a selection of hypnotics to try. Once you have worked out your best combination you can either order it from me, or your GP or whatever is easiest. **Please note that I am only able to prescribe the sleeping drugs, and any other medication listed in this booklet to my patients and not members of the public.** But anybody can purchase and use melatonin (from www.pharmwest.com), valerian and Nytol.

I am always asked about addiction. My experience is that this is rare, especially if drugs are used as above to develop a conditioned reflex. One has to distinguish between addiction and dependence. We are all dependent on food, but that does not mean we are addicted to it. We are all dependent on a good night’s sleep for good health and may therefore become dependent on something to achieve that. This does not inevitably lead to addiction. Addiction is a condition of taking a drug excessively and being unable to cease doing so without other adverse effects. Stopping your hypnotic may result in a poor night’s sleep but no more than that. This is not addiction but dependence.

Natural preparations and prescription drugs to help sleep

These all work differently and so I like to use low dose combinations until you find something that suits. Choose from the following, and start with:

- Melatonin 3mgs (one tablet). Some people just need 1mg. CFS patients have a poor output of hormones from all their glands namely the hypothalamus, pituitary, adrenals, thyroid and also the pineal gland. The latter is responsible for producing melatonin, the natural sleep hormone. It seems logical to me therefore to try this first. One or two of my patients have become depressed with melatonin, so be aware of this. On the container it also states melatonin should be avoided in autoimmune disorders, but I can find no reason why this should be so.
- Valerian root 480 mg 1-4 capsules at night. This is a herbal preparation which is shorter acting and can be taken in the middle of the night.
- Nytol (diphenhydramine 50mg). This is a sedating antihistamine available over the counter. This is longer acting – don’t take in the middle of the night or you will wake feeling hung-over.
- Nytol (herbal) – also has some herbs!

If there is no improvement with a combination of the above, or if there are intolerable side effects, then I would go on to a prescribed drug. I usually start with one of the sedating antidepressants such as:

- Amitriptyline 10mgs - 25mgs. I would start with 5mg initially. Most CFS patients are made worse and feel hung-over with “normal doses”.
- Dothiepin - I do not prescribe dothiepin now because a study suggested that this had an increased risk of cardiac dysrhythmias compared to other tricyclic antidepressants.
- Surmontil 10-30mgs at night.
- Short acting temazepam 10mgs. This is useful but recently has been made a controlled drug so doctors are understandably twitchy about prescribing it. It is controlled because some drug addicts were taking the gel and injecting it into themselves. Nowadays I tend to use instead zaleplon (Sonata) or medium acting zopiclone (Zimovane) 7.5mg.
- Diazepam is helpful if sleep is disturbed either because of hyperventilation (it reduces the respiratory drive) or for muscle spasms (it is a good muscle relaxant).

Different people will respond to different combinations of hypnotics. For example, one person may take a melatonin and two valerian at night, plus a zaleplon when they wake at 3.00am. Somebody else may be best suited by 10 mg amitriptyline at night with a Nytol. Don't be afraid to try combinations - there are no serious side effects that I am aware of with any of these used in combination. However, don't change more than one thing at any time otherwise you (and I) will get confused!

I like to supply a “starter pack” to my patients – this contains melatonin, valerian and Nytol – and try the various combinations.

One of my patients has found Sea Band (Isocones) very helpful – this uses an acupuncture technique by applying a wrist band – this is available from Boots. See www.sea-band.com.

My standard herbal “starter pack” consists of :

- Nytol (herbal) one a night 8 tablets
- melatonin 3 mgs 20 tablets
- Valerian complex 30 tablets

If you find your dose of hypnotic is gradually creeping up, then this may be because you have become less disciplined about establishing the conditioned reflex. Go back to the basics as above.

The deal is that every time you take a tablet for sleep you must work hard on the self hypnosis methods in order to condition yourself to sleep! We all are given the gift of sleep as babies, then unlearn it! It is perfectly possible to relearn sleep!

When your normal sleep pattern has been restored you can begin to reduce or tail off completely your hypnotic medication but only if good quality sleep can be maintained. Use the hypnosis “sleep dream” techniques every time you try to go to sleep, even when your sleep is disturbed by the need to pee – eventually your brain will learn! If your sleep begins to suffer, you must go back on the medication that worked before because the need to sleep is of paramount importance in CFS patients. Every time you have a bad night you “unlearn” how to sleep. It is vital to keep working on the sleep dream every time you go to sleep.

Other causes of poor sleep: Get the right hormonal balance

1. High levels of DHEA mean low levels of melatonin. Check this with an *Adrenal Stress Profile*.
2. [Hypothyroidism](#) can certainly present with insomnia
3. [Hyperventilation](#)
4. [Hypoglycaemia](#) is the main cause
5. Menopausal sweating – I am increasingly coming to the view that this is a symptom of low blood sugar – see [Hypoglycaemia](#).

Diet - the fuel in the tank!

Our gut evolved in harmony with the environment

Human beings evolved over millions of years eating particular foods. Neanderthal man was a carnivore and only ever ate meat, fish and shell fish. More recently Paleolithic man expanded the diet to include root vegetables, fruits, nuts and seeds which he could scavenge from the wild. It is only in the last few thousand years since the Persians, Egyptians and Romans that we began farming, and grains and dairy products were introduced into the human diet. A few thousand years from an evolutionary point of view is almost negligible. Many people have simply failed to adapt to cope with grains and dairy products and it is very likely that these foods cause a range of health problems in susceptible people.

Modern studies on ancient tribes who continue to eat a Stone Age (paleolithic) diet show that these people do not suffer from diabetes, obesity, heart disease or cancer. If they can survive the ravages of infectious diseases, childbirth and war wounds, then these people live healthily to a great age.

I am coming to the view that whatever your medical problem may be, or even if you simply want to stay well, we should all move towards eating a Stone Age diet based on vegetables, nuts, seeds, meat, fish and eggs. Recent Western diets get 70% of their calories from wheat, dairy products, sugar and potato and it is no surprise that these are the major causes of modern ill health such as cancer, heart disease, diabetes, obesity and degenerative disorders.

The principles and the practice of the Stone Age diet

There are five aspects of modern Western diet and gut function which commonly cause symptoms from irritable bowel syndrome to fatigue. These are:

1. High carbohydrate intake - this is probably the largest single cause of modern diseases such as hypertension, obesity, syndrome X, heart disease and cancer
2. Food allergy
3. Toxins in the diet (lectins naturally present in foods; artificial additives, colourings, flavourings; artificial sweeteners; pesticide residues, plasticiser residues, etc) social chemicals (alcohol, caffeine, tobacco etc), toxins from burnt fats in cooking.
4. Fermentation of food instead of digestion – see [Fermentation in the gut](#)
5. Poor digestion of food due to low stomach acid ([Hypochlorhydria](#)) and poor pancreatic enzyme production [Pancreatic function](#).

The Stone Age diet tries to address the top three problems at the same time, since they often co-exist in the same patient. This is the diet I like all my patients (including me) to eat long term. This is because it is the evolutionarily correct diet and by eating this we can avoid long term health problems and postpone degenerative conditions. I would settle for getting my Parkinson's disease when I am 120!

As a general principle it is important to remember that:

Carbohydrates (CHO) tend to cause fatigue, even in "normal" people. We should be eating protein and fat in the day and saving carbohydrate until the evening, when it helps sleep. At present Western diets are completely upside down because we eat cereals and toast at breakfast, sandwiches at lunch and meat in the evening - it makes you feel tired in the day and wakes you up at night!

Food allergy is a common cause of many symptoms such as irritable bowel, asthma, mood swings, headache, arthritis, allergic muscles and of course fatigue. The commonest offenders are grains, dairy, yeast and toxins in the diet.

Chemicals in the diet inhibit enzyme systems and slow up metabolism - this applies to drugs as well as food additives and pesticide residues, hormone residues, antibiotic residues etc.. Inshore seafish can be expected to have a mercury load. Avoid additives, colourings, flavourings etc, avoid plastic wrappings (especially if heated!) on food and try to switch to organic foods wherever possible.

Gut dysbiosis and **poor digestion** of foods, whereby foods are fermented instead of being digested, can also cause these symptoms.

This diet, therefore, has foods of low glycaemic index (GI) in the day and moderate GI index in the evening, it avoids the common allergens, avoids mouldy foods and foods of high fermentable substrate and is as free from chemicals as possible. Actually, in the long term I see this as a diet for life. My view is that we should be mimicking Stone Age principles. The following is the evolutionarily correct diet. Once the diet is established, we do not have to follow it slavishly, but it should make up our staple diet and ultimately the forbidden foods should become treat foods and not staple foods.

Allowed foods in the Stone Age Diet

The following foods are allowed both in the day and the evening

Any **meats**: choose from chicken, beef, lamb, pork, turkey, duck, 'game' meats such as venison, pheasant, goose etc. Bacon and ham. Salami. Liver, kidney and offal are fine too.

Eggs - an excellent source of lecithin (eat soft yolks).

Any **fish**: salmon, mackerel, cod, haddock (care with smoked fish which often contains dyes). Tinned fish in brine or olive oil is fine. Tinned shrimps, prawns, mussels, cockles etc.

All **green vegetables**.

All **salads**: avocado, lettuce, tomato, cucumber, celery, peppers, onion, cress, bamboo shoots etc.

French dressing: make your own from olive oil, lemon juice, garlic, mustard.

Any **low CHO fruit**: apple, pear, orange, grapefruit (no sugar!). Berries are excellent.

Seeds: sunflower, poppy, sesame.

Nuts: peanut, brazil, hazel, cashew, pistachio, walnut etc.; nut butter spreads, tahini (sesame seed spread).

Use **cold pressed nut and seed oils** liberally such as sunflower, olive, sesame, grapeseed, hemp, linseed, rape and so on.

Soya products

Oats and oatcakes (do not eat for breakfast as it is likely to create CHO craving)

Spices and herbs: chilli, cumin, ginger, coriander, pepper, cloves etc

Herbs, salt (ideally Solo - a sodium reduced sea salt), olives, pork scratchings

Allowed drinks in the day

Bottled or filtered water

Herbal teas: redbush ("rooibosch", "11 O'clock tea"), rosehip tea.

In the evening you can eat all of the above, plus modest amounts of higher GI foods

Rice and potato e.g. rice cakes or puffed rice from health food shops.

Root vegetables - carrots, parsnip, turnip, celeriac

Specific grains: millet, buckwheat, sago, quinoa.

Some high carbohydrate fruit: banana, grapes, melon

Dried fruit: sultana, apricot, prune, raisin, fig, date etc

Pulses: lentil, butter beans, chick peas, flageolet etc

Mixture of nuts, seeds, dried fruits

Arrowroot flour: for thickening gravies

Diluted fruit juice: Grape juice, pineapple juice, apple juice, tomato juice.

Most foods from packets and tins will have **hidden additives**, so avoid these. Be careful with sausage which contains rusk. **ALL OTHER FOODS ARE FORBIDDEN!!!** - this means no tap water, tea, coffee, chocolate, alcohol, wheat (bread, biscuit, cake, pasta, pastry), rye (Ryvita), corn, dairy products (milk, butter, cheese, yoghurt, dried milk), vinegar and sugar. Try to avoid drugs and medicines, many of which contain fillers of corn, lactose, colourings etc.

Getting worse on the diet

This is almost to be expected. The reasons for worsening are as follows:

- Hypoglycaemia - this is the commonest reason for worsening and may take weeks to settle. There are some nutritional interventions which help greatly (see [Hypoglycaemia](#) – it is not just about diet!)
- Caffeine withdrawal - again a common problem. Usually results in headache, which clears in four days.
- Food allergy withdrawal may cause many different symptoms. Some people report feeling 'flu like. Typically this lasts four days, but symptoms like eczema, arthritis, allergic muscles and fatigue can take weeks to clear. One patient with prostatism took 4 months to clear!

Meal suggestions

Breakfast

Bacon, eggs, fried tomato.

Smoked fish (kippers, mackerel with lemon juice).

Nuts and seeds with soya yoghurt (see Probiotics - we should all be taking these all the time and double the dose following antibiotics and gastroenteritis)

Lunch

Cold meat, fish (tinned fish in olive oil is fine), prawns, salami, smoked fish, rusk free sausage (ie 100% meat), avocado.

Salad (lettuce, cucumber, tomato, celery, peppers etc), French dressing.

Green vegetables with nut/seed oils

Home-made soup (made from meat stock, not cubes, only with allowed vegetables).

Nuts and seeds with soya yoghurt

Oatcakes

Supper

Meat, fish or eggs, potato or rice, any vegetable.

Fruit, soya yoghurt.

Muesli made from rice flakes, millet flakes, nuts, seeds, dried fruit, fresh fruit etc (some health food shops do "gluten free" muesli with the above ingredients). Use soya milk or fruit juice to wet the dry cereal. Puffed rice or rice cakes with soya margarine, nut butter. Oatcakes.

Buckwheat flakes.

Always remember: breakfast like an emperor, lunch like a king and supper like a pauper!

In practice, make the Stone Age diet your staple diet, but relax the rules when you socialise.

What to do if you are no better on the diet

Stick with it! This is the evolutionarily correct diet and greatly reduces your risk of heart disease, cancer and degenerative conditions! The three common reasons for not improving are:

- Because of multiple allergies to foods (i.e. there is something on the diet that you continue to react to). In this case consider a rotation diet, or starting on desensitisation [Enzyme potentiated desensitisation \(EPD\)](#)
- Because of a gut dysbiosis - i.e. the wrong bugs in the gut. Consider a gut fermentation test or Comprehensive Digestive Stool analysis to look for parasites, bacterial overgrowth or yeast overgrowth. [Fermentation in the gut and CFS](#).
- Poor digestion of foods [Hypochlorhydria](#), [Pancreatic function](#)
- Because you trigger a detox reaction.

Recommended reading:

- "The Complete Guide to Food Allergy and Intolerance" Brostoff and Gamlin, £9.99.
- "Not All In The Mind" - Richard Mackarness
- "The Food Intolerance Diet Book" Workman, Hunter and Alun Jones.
- "Dr Atkins Diet Revolution" - Dr Robert C Atkins.
- "The Detox Diet" - Dr Paula Baillie-Hamilton 0-718-14545-3 from www.penguin.com

If you wish also to lose weight

As a general principle I don't like my CFS patients dieting because cutting calories makes you tired, cold and depressed and you can do without those things! However, if you are extremely strict with CHO, the body switches into a state of ketosis. To burn fats in the body is a two stage process - the first stage is conversion of fats to ketones, the next is ketones to carbon dioxide and water. Both stages release energy for the body to use. However, the second stage requires some CHO - if there is none then ketones are excreted in the breath and in the urine - one literally pees out calories. This is very good for morale when every time you pee you lose calories and weight! To do this diet properly you really need to get the book "Dr Atkins Diet Revolution", which goes into detail of exactly which foods you need. Also I can supply ketostix which measure ketones in the urine and tell you if you are doing the diet correctly. Atkins permits dairy products but I recommend avoiding these. He also permits various artificial sweeteners which should be avoided. I recommend the use of Stevia, an extract of a South American plant.

Also see [Being overweight and losing it!!](#)



Rotation Diets

The idea behind a rotation diet is that one continues to react to foods that are in the gut for possibly up to three days. So no food is eaten within that time. Day 1 has a group of foods you are allowed to eat, then a completely different group of foods for days 2, 3 and 4 before repeating the cycle. You can find an example of a 4 day rotation diet on the website (it could be worse – there are 7 day rotation diets! If it's Wednesday it must be parsnip!!!). Or phone the office for a hard copy. Obviously avoid any foods which you know you are allergic to.

Very Restricted Diets eg lamb, pear and rice

I used to give patients very restricted diets (such as lamb, pears and rice) to sort out their allergies. I no longer do this for two reasons. Firstly I found a few patients got stuck on a very restricted diet and were unable to expand it. However I do occasionally do a rare foods diet for a limited period of time – say two weeks. Secondly I now have a technique called EPD ([Enzyme potentiated desensitisation](#)), which turns off food allergies without one having to know what those allergies are. It can do this because all the different food

antigens are represented in the vaccine. I use EPD if I am convinced that a patient has food allergies but is not responding to the elimination or rotation diets.

The supermarkets are now catching on to the demand for grain free, dairy free and yeast free products and there is a much better choice of foods than ever before.



The Problem of Addiction

These days I find myself talking more about addiction than allergy and there is no doubt carbohydrate addiction is a major cause of tiredness. It results in hypoglycaemia and maybe you can identify with the following scenario.

I estimate that over 90% of people who consult me are addicts. Addiction usually starts off in life with sugar, but then moves onto carbohydrates generally, chocolate, caffeine, nicotine, alcohol and maybe onto other hard drugs. There is a carbohydrate addiction gene which switches on when the carbohydrate content of the diet exceeds 4%. This makes one endlessly crave carbohydrates when carbohydrates are available. This does not make sense until you think from an evolutionary point of view. Protein foods such as meat, fish and shellfish, were available throughout the year, but every so often there would be a bonanza when, for example, the banana tree would ripen. The only way man could store this food source was to eat it and store it as body fat. So once carbohydrate appeared in abundance and he started to eat it the carbohydrate gene was switched on to create a craving Homo Sapiens who ate to excess, put on weight and was thereby able to store it in his body for leaner times ahead. The problem in modern times is that carbohydrates are now freely available and we continue to crave them and continue to put on weight. Furthermore, once you put on weight, the imperative to use your brain and your body to seek new food declines and so you become sluggish and lethargic. The converse of this is true. If you wish to lose weight then eat a very low carbohydrate diet such as the Atkin's diet and often you will see an immediate improvement in your mental and physical energy levels.

The reason we become addicted is because consuming the addictive foods has a direct effect on brain neurotransmitters causing the release of happy hormones such as serotonin, adrenaline, noradrenaline, endogenous opiates and possibly others. These have the combined effect of giving energy (both physical and mental) as well as a calming effect (everybody recognizes comfort foods – or reward foods). These are highly desirable in the short term, but you can't have an upper without a downer, and soon, levels of happy hormone start to decline. We recognise the symptoms, start to crave again and go for another shot of addiction. Sometimes we vary the addiction and switch from one addiction to another.

In the long-term chronic addictions lead to chronic fatigue!



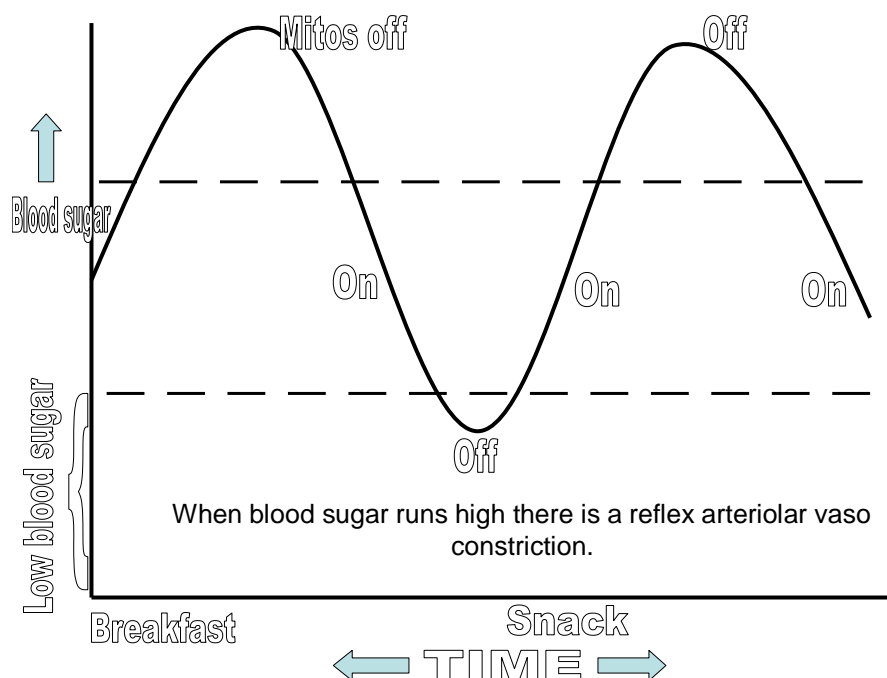
Hypoglycaemia – symptoms, test, treatment

It is critically important for the body to maintain blood sugar levels within a narrow range. If the blood sugar level falls too low, energy supply to all tissues, particularly the brain, is impaired. However if blood sugar levels rise too high this is very damaging to arteries and the long term effect of arterial disease is heart disease and strokes – this is probably caused by a local reaction in peri-arteriolar fat resulting in release of pro-inflammatory cytokines causing damage to arteries.

Normally the liver controls blood sugar levels. It makes the sugar from energy stores inside the liver and releases sugar into the blood stream minute by minute in a carefully regulated way to cope with body demands, which may fluctuate from minute to minute. This system of control works perfectly well until we

upset it by eating the wrong thing. Eating excessive sugar at one meal, or excessive refined carbohydrate, which is rapidly digested into sugar can suddenly overwhelm the liver's normal control of blood sugar levels. We evolved over millions of years eating a diet that was very low in sugar and had no refined carbohydrate. Control of blood sugar therefore largely occurred as a result of eating this Stone Age diet and the fact that we were exercising vigorously, so any excessive sugar in the blood was quickly burned off. Nowadays the situation is different - we eat large amounts of sugar and refined carbohydrate and do not exercise enough in order to burn off this excessive sugar. The body therefore has to cope with this excessive sugar load by other mechanisms.

When food is digested, the sugars and other digestive products go straight from the gut in the portal veins to the liver, where they should all be mopped up by the liver and processed accordingly. Excessive sugar or refined carbohydrate overwhelms the liver, which simply cannot mop up the amount of sugar which is there and the sugar spills over into the systemic circulation. This results in high blood sugar, which is extremely damaging to arteries. If one were exercising hard, this would be quickly burned off. However, if one is not, then other mechanisms of control are brought into play. The key player here is insulin, a hormone excreted by the pancreas. This is very good at bringing blood sugar levels down and it does so by shunting the sugar into fat. There is then a rebound effect and blood sugars may well go too low. Low blood sugar is also dangerous to the body because the energy supplied to all tissues is impaired. It is when the blood sugar is low that this is called hypoglycaemia. Subconsciously people quickly work out that eating more sugar alleviates these symptoms, but of course they invariably overdo things, the blood sugar level then goes high and one ends up on a rollercoaster ride of blood sugar going up and down throughout the day.



Symptoms of hypoglycaemia

The problem is that when the blood sugar is high people feel "normal", indeed maybe slightly boosted by this high level of blood sugar. This is because they have good energy supply to their muscles and brain albeit short-term. The problem arises when blood sugar levels dive as a result of insulin being released and energy supply to the brain and the body is suddenly impaired. This results in a whole host of symptoms - the brain symptoms include difficulty thinking clearly, feeling spaced out and dizzy, poor word finding ability, foggy brain and sometimes even blurred vision or tinnitus. The body symptoms include suddenly feeling very weak

and lethargic, feeling faint and slightly shaky, rumbling tummy and a craving for sweet things. The sufferer may look as if they are about to faint (and indeed often do) and have to sit down and rest. The symptoms can be quickly alleviated by eating something sweet - if nothing is done then the sufferer gradually recovers. These symptoms of hypoglycaemia can be brought upon by missing a meal (or one's usual sweet snack top up such as a sweet drink), by vigorous exercise or by alcohol. Diabetics may become hypoglycaemic if they use too much medication.

When blood glucose levels fall for any reason, glycogen stores in the liver may be mobilised to prop them up. The trouble is that these are probably already rather poor in people with increased carbohydrate intake, where insulin is relied on heavily. Another rapid and very effective way in which the body repletes the low glucose is by hepatic conversion of short chain fatty acids to glucose. In a healthy person on a good balanced diet the only time this is of importance is during the night because of the long break between food intake. Short chain fatty acids are then used to prop up circulating glucose and prevent a fall below whatever that person's usual fasting glucose level is. Short chain fatty acids are made in the gut by bacteria fermenting fibre (and such starch as escapes small intestinal digestion). Production is maximised from about 3 hours after food intake. That is to say, short chain fatty acids are highly protective against the dips we see in blood sugar.

Therefore, a key symptom of a hypoglycaemic tendency is disturbed sleep. This occurs typically at 2 – 3 am, when blood sugar levels fall and there are insufficient short chain fatty acids to maintain a blood sugar. Low blood sugar is potentially serious to the brain, which can only survive on sugar and, therefore, there is an adrenalin reaction to bring the blood sugar back, but this wakes the sleeper up at the same time.

Common symptoms of hypoglycaemia

SOURCE www.hypoglycaemia.asn.au

- *Nervousness*
- *Irritability*
- *Exhaustion*
- *Faintness*
- *Dizziness, feeling "spaced out" or faint*
- *Tremors or feeling "shaky"*
- *Cold sweats*
- *Depression*
- *Migraine headaches*
- *Insomnia*
- *Digestive disturbances*
- *Forgetfulness*
- *Mood swings*
- *Anxiety*
- *Aggression*
- *Violence*
- *Anti-social behaviour*
- *Sugar addiction*
- *Epilepsy and Convulsions*
- *Drug addiction and alcoholism*
- *Mental confusion*
- *Limited attention span*
- *Learning disability*
- *Lack of sex drive in women and men*
- *Lack of concentration*
- *Itching and crawling sensation on the skin*
- *Blurred vision*
- *Nightmares*
- *Phobias*
- *Fears*
- *Neurodermatitis*
- *Nervous breakdown*
- *"Foggy" brain (such as in chronic fatigue syndrome)*
- *Blurred vision*
- *Tinnitus (ringing in the ear) Suddenly feeling weak or lethargic*
- *Bedwetting and Hyperactivity (ADHD or ADD) in children*

Test for hypoglycaemia

Measuring blood sugar levels is not a terribly useful test for hypoglycaemia, partly because they fluctuate so much and partly because by the time one gets the symptoms of hypoglycaemia, the blood sugar levels have started to correct. A much better test would be to measure short chain fatty acids in blood collected in the morning before breakfast. The test should be done as follow:

- It is important to continue your usual diet – indeed, there are no special dietary instructions for the test, but the blood sample must be taken between 9 –12 hours after a meal;
- 2 ml of blood taken into a fluoride oxalate tube and posted off in an envelope to Acumen.

There is a final twist to the hypoglycaemic tale which complicates the situation further. When one becomes stressed for whatever reason, one releases stress hormones in order to allow one to cope with that stress. Insulin is such a stress hormone and has the effect of shunting sugar in the blood stream into cells. This produces a drop in blood sugar levels and also causes hypoglycaemia. Therefore, hypoglycaemia can be both a cause of stress and the result of stress, indeed, another one of those vicious cycles that are so often seen in disease states.

Treatment of hypoglycaemia

Treatment is to avoid all foods containing sugar and refined carbohydrate and take extra supplements – see below. The problem for the established hypoglycaemic is that it may take many weeks or indeed months for the liver to regain full control of blood sugar and therefore the symptoms of hypoglycaemia may persist for some time whilst the sufferer continues to avoid sugar and refined carbohydrate. This means that when you change your diet you will get withdrawal symptoms and it may take many weeks of a correct diet before these symptoms resolve. This type of addiction is very much like that which the smoker or the heavy drinker suffers from.

One needs to switch to a diet which concentrates on eating proteins, fats and complex (and therefore slowly digested) carbohydrates. Initially I suggest doing a high protein high fat diet, but include all vegetables (care with potato), nuts, seeds, etc. Fruit is permitted but rationed, since excessive amount of fruit juices or dried fruits contain too much fruit sugar for the liver to be able to deal with. I suggest one piece of fruit at mealtimes.

I now consider taking high dose probiotics an essential part of controlling low blood sugar. This is because probiotics ferment carbohydrates to short chain fatty acids – these have no effect on blood sugar and are the preferred fuel of mitochondria. The best and cheapest way to do this is to brew your own – see section on [Probiotics](#) and [Kefir](#)! Probiotics also displace yeast, which worsen the hypoglycaemia problem.

With time the regime can be relaxed, but a return to excessive sugar and refined carbohydrate means the problem starts again.

Finally, many sufferers of hypoglycaemia may need something sweet to eat immediately before and during exercise, until the body learns to fully adapt.

Hypoglycaemia is usually accompanied by micronutrient deficiencies. You should also take nutritional supplements. My experience is that chronic hypoglycaemia is a very common cause of fatigue in CFS sufferers.

To tackle hypoglycaemia one needs to do a diet based on foods of low glycaemic index. The GI is a measure of the ability of foods to raise one's blood sugar levels. Sugar (i.e. disaccharides) has arbitrarily been given a GI of 100. High GI foods are the grains (wheat, rye, oats rice etc), root vegetables (potato, sweet potato, yam, parsnip), alcohol, sugars, and fruits, dried fruits and fruit juices. But expect to see withdrawal symptoms which can persist for weeks.

Hypoglycaemia is not just about diet!

Low blood sugar is an extremely common problem and I find myself talking about this subject more than any other! The body has a very difficult balancing act with respect to blood sugar. If levels drop too low, then this will cause unconsciousness and then death. On the other hand, if the blood sugar level goes too high, glucose will stick onto many other substances to create advanced glycation end products. This effectively causes an accelerated ageing. So the body goes to a great deal of trouble to keep the blood sugar tightly controlled between about 3mmols and 6mmols per litre. The mechanisms that achieve this are complicated and therefore there is great potential for things to go wrong.

This is complicated by the fact that the brain likes sugar. Running a high blood sugar allows the brain to function efficiently and also releases the happy neuro-transmitters such as GABA and serotonin which have a calming effect. We all recognise this because the comfort-eating foods are carbohydrates. The second problem is that we have a “thermostat” for blood sugar (this is, if you like, a measure against which blood sugar levels are compared and controlled), which I suspect gets set upwards if blood sugars run consistently high. I believe this because I’ve seen several people with diabetes who run consistently high blood sugar levels but feel hypo if their blood sugars drop below 7 or 8. So whatever interventions one makes to control high blood sugars must be done slowly so that this “thermostat” can be gradually reset.

What makes blood sugar go up?

“Diet” is the most obvious answer! Carbohydrates are broken down into sugars which increase the blood sugar levels. Foods have been given a measure of this and it is called the “glycaemic index”. It’s a measure of the ability of a food to raise blood sugar levels. This can be affected by many factors, not just the food itself. Foods that are cooked will be more rapidly digested and therefore have a higher glycaemic index. Foods that are finely divided such as flours, again are more rapidly digested and therefore have a high glycaemic index. Carbohydrates that are very soluble such as sugars and alcohol again are rapidly absorbed. Any carbohydrates that are consumed should therefore be unrefined complex carbohydrates which are slowly digested, if possible eaten raw (although this is obviously impossible with some carbohydrates such as potato).

Foods should be slowly eaten. What causes insulin to be released is the rate at which the blood sugar level rises. A quick rise will produce a pulse of insulin which then hangs around for a long time and causes subsequent hypoglycaemia. So eat foods slowly, don’t gobble them, and mix carbohydrates with high fibre foods, vegetables, meat and fats so that the absorption of carbohydrate is slowed.

It is easy to identify the carbohydrate addicts – they like their carbohydrates highly refined such as sugar, sweets, crisps, white bread, pasta and refined breakfast cereals and fruit juice. They tend to gobble their food. They are not content with a normal meal of meat and vegetables without the sweet sticky pudding to follow!

Alcohol – the commonest symptom of alcohol causing hypoglycaemia is sleeplessness. Initially alcohol helps one to go to sleep, but then it wakes one up in the small hours with rebound hypoglycaemia.

Which other factors affect blood sugar levels?

Stress

One of the stress hormones is insulin. This is because insulin drives sugar in the blood inside cells so it can be ready for immediate use. This means blood sugar levels will fall resulting in hypoglycaemia.

Poor digestion of foods

If proteins are not completely broken down into amino acids this may result in long chain polypeptides getting from the gut into the blood stream where they can have insulin-mimicking effects. This can be tested for by requesting *Short chain polypeptides*. Also see [Hypochlorhydria](#), [Exocrine pancreatic function](#) and [Malabsorption](#).

Probiotics

Having the right bugs in the gut means that fibre in the diet can be broken down into short chain fatty acids such as acetates, butyrates and propionates. When blood sugar levels run low, the body switches to short chain fatty acids for fuel. It is this which protects us from hypoglycaemia between meals especially where there is a long gap, for example at night. We can test for short chain fatty acids by measuring levels of acetate, propionate and butyrate in the blood first thing in the morning before breakfast. Low levels suggest a tendency to hypoglycaemia. See [Probiotics](#) and [Kefir](#)

Candida and yeast problems

A yeast overgrowth in the gut means that any sugars, or carbohydrates which get digested to sugars, are then fermented by yeast. This produces carbon dioxide (and so bloating) together with alcohol. Alcohol is a high GI food, further destabilises blood sugar so rebound hypoglycaemia occurs. This makes the sufferer crave carbohydrate – a clever evolutionary ploy by candida to make the host eat the very food the yeast wants most! See [Yeast problems](#).

Good micronutrient status

Vitamins, minerals, essential fatty acids, vitamin C and D are all involved in blood sugar control. Two which seem to be particularly helpful are high dose niacinamide and chromium. I recommend taking them for two months. Both these supplements have a profound effect on blood sugar levels to stabilise them but sometimes have to be given in high doses initially to kick start the necessary mechanisms. By this I mean niacinamide 500mgs, 3 daily at mealtimes and possibly double this dose. Rarely, niacinamide in these doses can upset liver enzymes but this is accompanied by nausea – so if you feel this symptom, reduce the dose to 500mgs daily. Niacinamide is a really interesting vitamin – it shares the same action as diazepam (Valium) to produce a calming effect which is not addictive. I suspect it works because so much anxiety is caused by low blood sugar and niacinamide helps prevent this.

I also suggest 2mgs of chromium daily. The usual daily requirement would be a tenth of this but with severe hypoglycaemia there is often severe chromium deficiency. Niacinamide and chromium work together synergistically.

Allergies to Foods - this can certainly cause hypoglycaemia – the top three allergens are grains, dairy products and yeast. But one can be allergic to any food! See [Stone Age diet](#).

Thyroid

Hypothyroidism - Can certainly cause hypoglycaemia. See [Hypothyroidism](#)

Adrenal Problems and Cortisol

The job of the adrenal gland is to produce the stress hormones to allow us to move up a gear when the stress comes on. Cortisol raises blood sugar levels. It is largely excreted during mornings and declines as the day progresses - this is why we should feel at our best early in the day, and blood sugar problems get worse as the day progresses. Often people compensate for this by eating more as the day goes on and explains why many hypoglycaemics do not need or eat breakfast with supper being the largest meal of the day. Changing all of the above will help. But it may be appropriate to do an adrenal stress profile and actually measure output of the stress hormones cortisol and DHEA since a small supplement may be very helpful. See [Adrenal problems](#).

Sex hormones, The Pill and HRT

These hormones all have the effect of raising blood sugar levels. Indeed this is the mechanism which is responsible for gestational (pregnancy) diabetes. The problem is that stopping these hormones then causes hypoglycaemia and one gets withdrawal symptoms. I suspect it is part of the mechanism that makes these hormones so addictive. See [PILL AND HRT](#).

Toxins and Pollutants

There was a fascinating paper in the Lancet that showed that the biggest risk factor for diabetes (and this is the end product of years of hypoglycaemia as insulin resistance results) is the level of pollutants in the body (pesticides, volatile organic compounds and heavy metals). The paper showed that chemical pollutants were a greater risk factor than being overweight! It was suggested that the overweight problem reflected a larger chemical burden as the body tried to “dump” chemicals where they would be out of the way. When people who have the highest levels of POPs in the blood were compared to the people with the lowest levels of POPs in the blood, they were found to be 38 times more likely to be diabetic.

The chemicals literally get in the way of many biochemical processes and prevent the body functioning normally. So for some people doing detox regimes is very helpful – ie far infra red sweating/saunaing and improving liver detox with vitamins and minerals. We can easily test for pollutants in fat by doing a fat biopsy – this is a simple test, easier than a blood test! See [Detoxification](#).

Nickel toxicity

Nickel toxicity is a very common problem and nickel is a substance often found stuck onto DNA (See *DNA adducts*). Nickel biochemically looks very much like zinc and so enzymes which normally incorporate zinc into them, in the presence of zinc deficiency, will take up nickel instead. This prevents the enzyme or the hormone from functioning normally. Clinically nickel toxicity often presents with hypoglycaemia. (See [Nickel](#)).

Fructose intolerance

Fructose is fruit sugar generally perceived to be a healthy alternative to glucose. No problem if one is tolerant of fructose or if it is taken in small amounts, but problems in either of these departments can result in hypoglycaemia. This is because the control mechanisms that apply to glucose are bypassed if the system is awash with fructose. In fructose intolerance (aldolase type B deficiency), fructose-1-phosphate builds up because it inhibits glycogen phosphorylase which is essential for the provision of glucose from glycogen and it also inhibits fructose-1,6-bisphosphatase which is essential for provision of glucose from protein and fat. This combination can result in severe hypoglycaemia because it means effectively the body cannot mobilise glucose from stores in the liver for when blood sugar levels fall. This combination can lead to severe hypoglycaemia.

Even if the enzyme works perfectly well, excessive fructose intake will stress the same pathways. Sugar stores in the liver cannot be mobilised. Because the liver uses up short chain fatty acids for the production of glucose to try to avoid this hypoglycaemia, this tendency can be measured by looking at short chain fatty acids in the blood and also measuring levels of fructose-6-phosphate which gets induced in this situation. These three metabolic problems i.e. levels of *short chain fatty acids*, levels of *fructose-6-phosphate* and *LDH isoenzyme* (indicative of liver damage), can help diagnose this problem. Each of these tests can be ordered individually. However, if you order all three together as one profile (called *Fructose investigations*), the price is discounted and you get a *cell-free DNA* free of charge.

GI rating for some common carbohydrates

A Glycaemic Index of less than 55 is considered Low, 56 to 69 Medium and greater than 70 is High. Values will vary depending on brand, variety, ripeness, preparation etc.

All Bran 43	Ice cream 61	Potato (boiled or mashed) 74
Apple 37	Jelly beans 80	Potato (jacket baked) 72
Apple juice (clear) 44	Kidney beans 28	Potato crisps 54
Apricot (dried) 30	Kiwi fruit 53	Potato: new 62
Apricot (jam) 55	Lentils 28	Puffed Wheat 80
Apricot (tinned) 64	Mango 56	Raisins 64
Baked beans (tinned) 46	Mars bar 65	Rice Crispies 83

Banana (ripe) 58	Milk (full fat) 27	Rich Tea biscuits 57
Banana (unripe) 30	Milk (skimmed) 32	Rye bread 65
Beetroot 64	Mixed grain 49	Shredded Wheat 70
Butter beans 31	Muesli 58	Sourdough 57
Carrots 51	Oat bran 50	Soya beans 20
Cashews 22	Orange 44	Spaghetti (white) 43
Cherries 22	Orange juice 55	Spaghetti (wholemeal) 39
Chickpeas 33	Parsnips 68	Special K 54
Chocolate 49	Pineapple 66	Split peas 32
Cornflakes 81	Peach 42	Strawberry 32
Croissant 69	Peanut butter 29	Sultanas 57
Dark rye bread 76	Peanuts 22	Swede 72
Dates (dried) 72	Pear 36	Sweet corn 55
Digestive biscuit 60	Peas 48	Sweet potato 54
Doughnut 76	Pineapple juice 46	Table sugar 65
French baguette 68	Pinto beans 40	Tomato juice 38
Fructose 46	Pitta bread 58	White bread 70
Glucose 100	Plums 32	Wholemeal bread 69
Grapefruit 25	Popcorn 55	Yoghurt (low-fat, sweetened) 33
Grapes 48	Porridge 46	Yoghurt (low-fat, unsweetened) 14
Hazelnuts 33		

Glycaemic Load

While GI is a very useful concept, it cannot be taken as the sole predictor of the effects of eating a particular type of carbohydrate. That is because blood glucose response is also determined by the amount of food eaten. A more reliable rating system is the 'glycaemic load' (GL), which takes account of both the quality (GI value) of a given carbohydrate and the amount consumed, so more accurately predicting its effects on blood sugar. The glycaemic load, in units, of a portion of carbohydrate is expressed as:

- $\text{GI rating} \times \text{grams of carbohydrate in portion size} / 100.$

Note that each unit of GL produces the same effect on blood sugar as eating 1g of pure glucose.

- A 120g banana contains around 24g of carbohydrate, which has a GI value of 58. The GL is: $(58 \times 24) / 100 = 13.92$ units.
- 120g of chocolate provides 75g of carbohydrate, which has a GI value of 49. The GL is: $(75 \times 49) / 100 = 36.75$ units.

By totalling up the GL units for foods you eat during the day, you can arrive at an overall GL for the day. A Glycaemic Load of less than 80 units is considered Low, 80 to 120 units is Medium and greater than 120 units is High.

Finally glucomannan is helpful to stabilise blood sugar levels by reducing the blood sugar peak after food and preventing the rebound hypoglycaemia.

Why sugar and fast carbs are so bad for energy levels – a possible explanation

Yudkin et al explains all in the Lancet May 2005! Too much sugar in muscles is very damaging to muscles. The arterial control of the blood supply to muscles is by tiny collar of fat which wraps itself round tiny arteries (arterioles). If the blood sugar rises, this collar of fat releases a cytokine which makes the arteriole

contract. This has the metabolically desirable effect of preventing too much sugar getting to muscle and damaging it. However, the blood supply to the muscle will be impaired as well, so the muscle cannot work properly. Also the cytokine released by the fat causes inflammation and damages the arteriole wall. This is also probably the basis of high blood pressure and arterial disease. And don't forget in CFS we see high levels of cytokines. The general presumption is that these come from immune activity as a result of viral or toxic stress. BUT they could be produced by fat cells as a result of too much carbohydrate in the diet!

Reference: Yudkin JS, Eringa E, Stehouwer CD "Vasocrine" signalling from perivascular fat: a mechanism linking insulin resistance to vascular disease. Lancet 2005; 365:1817-20



Allergy

Allergy is the great mimic and can produce almost any symptom. However, by the time allergy has produced fatigue it has also caused other problems. Suspect an allergy problem if any, or a combination of the following, are present:

1. **The onset of fatigue is pre-dated by PIMS** (Psychological, Irritable bowel syndrome, Migraine and headaches). Allergies to foods which hitherto have produced either
 - a) mood swings, depression, PMT,
 - b) wind, gas, bloating, abdominal pain, alternating constipation and diarrhoea,
 - c) migraines or headaches; if undiagnosed and not avoided, often go on to produce fatigue.
2. **There are other obvious allergic disorders** (which often present in childhood) such as asthma, eczema, urticaria, rhinitis and catarrh, colic etc. which are often due to food allergies.
3. **There is a tendency to go for a particular food.** One of the interesting aspects of allergy is that sufferers often crave the very food to which they are allergic. This was illustrated by one patient who told me that when he died he wished to take a cow to heaven with him. It was dairy which was his main problem!
4. **Symptoms change with time.** Often the allergen is the same, but the symptom changes through life, starting with colic and projectile vomiting as a baby, followed by toddler diarrhoea, catarrh and recurrent infections, growing pains, headaches, depression, irritable bowel syndrome, PMT, asthma, arthritis etc. and eventually fatigue.
5. **There is a positive family history.** So often it is not so much problems which run in families but answers to problems. I have yet to find a patient who is dairy allergic who does not have a first degree relative (parent, sibling, child) who also has symptoms caused by dairy products!

A book by Branahan, an America Immunologist, states that 50% of unexplained symptoms are caused by food allergy.

Tests for food allergy are notoriously unreliable and at the end of the day one has to do an elimination diet. I use a [Stone Age diet](#) which cuts out the major allergens. It is a "best guess" diet and will not identify every allergic simply because some people are multiply intolerant. However, for those people I do not like them to do a more restricted diet because if they cut out too much they risk ending up eating nothing. These allergics I start on desensitisation sooner rather than later.

CFS and the fermenting gut

CFS and the fermenting gut are commonly found in association. The fermenting gut can cause problems for three common reasons:

1. There is production of toxins such as alcohol, D-lactate, hydrogen sulphide etc, which inhibit mitochondria directly.
2. Upper gut microbes (bacteria and yeast) are as hungry for micronutrients as human cells – that will result in micronutrient deficiencies.
3. It is possible to sensitise to gut microbes – this may results in chronic low grade inflammation, thereby punching an “immunological hole” in one’s energy bucket.

The fermenting gut is an area where I have a lot more good questions than answers, so please, see the website for the latest ideas!

[Fermentation in the gut and CFS](#)



Detoxification - the oil filters, catalytic converter to keep the car clean

As part of normal metabolism, the body produces toxins which have to be got rid of, otherwise they poison the system. Therefore, the body has evolved a mechanism for getting rid of these toxins and the methods that it uses are as follows:

- Antioxidant system – for mopping up free radicals. See [Antioxidants](#)
- The liver – detoxification by oxidation and conjugation (amino acids, sulphur compounds, glucuronide, glutathione, etc) for excretion in urine. The liver uses 27% of all the energy generated in the body! Clearly detoxification is important!
- Fat soluble toxins can be excreted in the bile – the problem here is that many of these are recycled because they are reabsorbed in the gut.
- Through skin – many toxins and heavy metals can be lost through the skin by getting hot. Toxins are literally “boiled off” onto the lipid layer on the surface of the skin – which then needs to be washed off. Th showering after is as important as getting hot. It not necessary to sweat for this technique to be effective.
- Dumping chemicals in hair, nails and skin, which is then shed off.

This system has worked perfectly well for thousands of years. Problems now arise because of toxins which we are absorbing from the outside world. This is inevitable since we live in equilibrium with the outside world. The problem is that these toxins may overwhelm the system for detoxification (such as alcohol), or they may be impossible to break down (e.g. silicone, organochlorines), or they may get stuck in fatty organs and cell membranes and so not be accessible to the liver for detoxification (many volatile organic compounds).

We all carry these toxins as a result of living in our polluted world. However, much can be done to get rid of them or release our load and the mechanisms that we can employ are as follows:

Stone age organic diet – reducing the toxic load from pesticides or food additives is obviously essential. Increasing the fibre content of food and the bacterial numbers in the gut also facilitates detoxification. Just not being constipated is helpful!

Vitamins and minerals – if the body becomes deficient in a mineral such as zinc, it will grab hold of another mineral that looks a little bit like zinc. Typically nickel or cadmium fits the bill. If one is deficient in selenium, then mercury or aluminium is “used” by the body instead. So being deficient in an essential micronutrient will encourage the body to accumulate toxic ones. Vitamin C strips out many heavy metals. Vitamins and minerals also act as essential co-factors to allow liver detoxification - see [Nutritional supplements](#).

Avoid constipation - Taking prebiotics (vegetable fibre) encourages the good bacteria which have lived in harmony within the gut for thousands of years and facilitate detoxification of chemicals and production of essential nutrients.

Exercise – mobilises toxins from fat through generation of heat and through generation of far infrared light. This literally shakes up the molecules so that those not well stuck on are mobilised and diffuse out onto the lipid layer on the surface of skin where they can be washed off.

Spa therapy, showers and washing – this is an essential part of exercise or far infrared saunaing. Having mobilised toxins from subcutaneous fat onto the surface of the skin, they then need to be washed off. However, beneficial minerals can be absorbed through the skin and this is the basis of spa therapy. People

have worked out from practical experience over hundreds of years which spas are suitable for different medical conditions. For example, Epsom spa, which is full of Epsom salts (magnesium) is an excellent treatment for arthritis and joint pains. See [Treating magnesium deficiency](#)

Sauna – I have now done several tests on tens of people before and after saunaing where the tests prior to saunaing demonstrate the toxic load of either pesticides, volatile organic compounds, heavy metals, or whatever. When I have re-tested, in every single case every parameter has been improved. This only applies currently to eighteen patients, but because the results are so positive, I can now be confident that saunaing is a good way of detoxing. The important thing to remember is that saunaing does not just get rid of the nasty toxins, it also gets rid of beneficial minerals, so it is very important to re-hydrate with water containing these minerals. See [Far infrared sauna](#)

Chelation therapy – in chelation a large molecule such as DMSA, DMPS, or EDTA is used either orally or intravenously to chelate out toxic minerals. There is no doubt that this technique is effective at increasing urinary excretion of these metals. Some people do not tolerate the chelating agent very well, although most do. There have been concerns about chelation therapy that perhaps it is mobilising metals from outside the brain into the brain, which is obviously undesirable. However, I have no evidence to support this assertion; it is just something to be mindful of. This is why more recently I have moved over to saunaing instead of chelation therapy. See [Mercury toxicity and detoxification](#)

Lipid exchange – the idea here is to replace contaminated fats in cell membranes and fatty organs with clean fats. This technique has been pioneered by Patricia Kane in America, who uses intravenous organic phospholipids in patients with problems such as Parkinson's disease, autism, motor neurone disease, or whatever to flush out neurotoxins stuck in fats in brain cells. She sees remarkable success. Similar results can be achieved by taking fats by mouth, but they are not quite so dramatic. Oral therapy would include high dose organic phospholipids such as lecithin and egg yolk, combined with essential fatty acids from the Omega 3 and 6 series. I use VegEPA. See [Lipids, fats and essential fatty acids](#) (Fats, Membranes, the Healthy Brain and Mitochondria), [VegEPA](#)

Colonic irrigation – this will have a marked short term benefit of reducing the toxic load in the gut for obvious reasons.

Methylation cycle – also centrally involved in detoxification! Chronic Fatigue Syndrome is a symptom, not a diagnosis, and the name of the game is to identify the underlying causes. In fatigue syndromes we don't see macro-pathology, we see micro-pathology – that is to say the problems are bio-chemical and occur at the molecular level.

There are several cycles, which I now know to be centrally important in causing fatigue. All these cycles interlink with each other like Olympic rings and getting one cycle going will drive another. The important cycles which I know to be major players include blood sugar wobbles, allergy problems, sleep cycles, mitochondrial function, anti-oxidant status, the NO/OONO cycle, thyroid and adrenal hormones cycles and de-toxification. I am greatly indebted to Rich van Konynenburg for updating me on a new player which interlinks with many of the above, namely the [methylation cycle](#).

Probably others!

How can one test for toxic load?

Many of the functional biochemical tests I do regularly show evidence of toxic stress, which we can then investigate by other means. For example, when measuring levels of *superoxide dismutase*, it is common to find the gene that codes for SODase is blocked. This can be investigated further by doing DNA adducts.

- *DNA adducts* looks at a whole range of chemicals that may be stuck onto DNA – this is an important thing to know because a chemical stuck onto DNA is potentially a pre-malignant condition.
- Tests of *mitochondrial function* often show blockage to translocator protein. This can be investigated further by looking at chemicals stuck on to *translocator protein*.
- *Fat biopsy* – this is an extremely useful way of looking at what may be stuck in one's fat and can pick up a whole range of pesticides and volatile organic compounds. It is a very easy test to do – just the fat contained in the bore of the sampling needle is sufficient for analysis.
- *Kelmer test (DMSA provocation test)*– this is a challenge test to look for heavy metals in urine. The problem with sweat tests and hair tests is that some people are poor detoxifiers, do not dump heavy metals efficiently in sweat and hair, or even urine and therefore these tests are misleading. A Kelmer test is a useful way of getting around this problem. The idea here is to take a substance which binds metal atoms (a chelating agent such as DMSA), or a therapeutic dose of selenium or zinc in order to displace heavy metals. This can give one an idea of metal toxicity. Anybody who has any amount of dental amalgam filling will test positive for mercury with a Kelmer tests.
- *Sweat tests* – this can be a useful way of picking up heavy metals, but some people who are poor detoxifiers do not seem to get rid of heavy metals in sweat, so this can be unreliable.
- *Hair analysis* – this can be a useful way of picking up heavy metals, but some people who are poor detoxifiers do not seem to get rid of heavy metals in hair. Again, this may be unreliable.

Some substances cannot be tested for easily because they get into the body, cause damage and then leave the body. Obvious examples are formaldehyde, fluoride, noxious gases, carbon monoxide, sulphur dioxide, nitrous oxide and radiation damage. Drugs of addiction such as heroin, cannabis, ecstasy can all be detected by drug screening in a person who has recently imbibed such a drug. My website does not offer these tests.

Many toxins such as alcohol and prescription medications cause damage, but are not looked for or do not come up in routine tests. Silicones cannot be detected because they are so closely related to glass; furthermore, silicone is universally used in sampling equipment such as needles.

John McLaren-Howard now has a new tool which looks at the infra-red spectrum which emanates from molecules which allows him to identify them. This means he can now identify many more substances than previously possible and allows us to further hone treatment.

Which toxins are found regularly

There is no one test for all chemical poisoning. However, having now done many hundreds of these tests I am beginning to get a feel for what comes up more often than others. Obviously it depends to what somebody is occupationally exposed, for example organophosphates come up very commonly in farmers with sheep dip flu, but rarely in others. What I find most commonly are as follows:

- Nickel and other metals such as mercury (dental amalgam), cadmium (smoking).
- Polybrominated biphenyls – known carcinogens used as fire retardants in soft furnishings.
- Lindane – and other organochlorines used as timber treatment in houses and gardens.
- Molecules indicating poor antioxidant status – such as malondialdehyde and other lipid peroxides.
- Nitrosamines result from smoked food or smoking.
- Hair dyes – it is frightening how often diazole hair dyes turn up stuck on to DNA.
- Triclosan – a commonly used disinfectant.
- Toxic fats – e.g. transfats or fats that have resulted from cooking at high temperatures such as Diolein.
- However many toxins cause damage and then leave such as formaldehyde and other noxious gases – Sox NOx COx.

The major causes of toxicity, in my opinion, in order of importance:

- Dental amalgam
- Air pollution – from polluting industry. This is a very major cause of asthma and respiratory disease, heart disease, cancer and birth defects.
- Indoor air pollution – fire retardants, formaldehyde and other such volatile organic compounds, cosmetics (especially hair dyes and aluminium containing deodorants), wash powders and cleaning agents.
- Cooking – nickel from stainless steel saucepans, transfats from poor quality of food, or burnt food.
- Pesticide residues in food.
- Smoking – nitrosamine and cadmium.
- Plasticisers and phthalates in plastic wrappings
- Occupational exposure in farmers, Gulf War veterans, firemen with 9/11 syndrome, aeroplane industry (see www.aerotoxic.org)
- Silicone prostheses – breast implants
- Traffic pollution – benzene. Other pollutants such as noxious gases are not picked up in these tests.

Good nutrition is highly protective against toxic stress – this is further reason to take nutritional supplements – we all have nasty toxins on board which cause on-going damage to the body. Good levels of antioxidants (vitamins ACE and selenium) help protect, good levels of B vitamins help detoxify, good levels of protein, essential fatty acids and other minerals help to repair the damage.

A good example of this in action came out of the research into thalidomide. This drug prescribed to women in pregnancy as a “pregnancy safe hypnotic” caused serious birth defects if the women took it between the 38th and 42nd day of pregnancy. But not all babies were affected. This drug was tested in rats – no offspring were abnormal. This was a mystery to researchers, until someone had the bright idea of putting the rats onto nutritionally depleted diets. Then they started to get the foetal abnormality of phocomelia (“flipper limbs”). It was a combination of toxic stress (the drug) and nutritional deficiency which caused the problem to become apparent.

Antioxidants - *the cleaning system*

What allows us to live and our bodies to function are billions of chemical reactions in the body which occur every second. These are essential for the production of energy, which drives all the processes of life such as nervous function, movement, heart function, digestion and so on. If all these enzyme reactions invariably occurred perfectly, there would be no need for an antioxidant system. However, even our own enzyme systems make mistakes and the process of producing energy in mitochondria is highly active. When mistakes occur, free radicals are produced. Essentially, a free radical is a molecule with an unpaired electron, it is highly reactive and to stabilise its own structure, it will literally stick on to anything. That “anything” could be a cell membrane, a protein, a fat, a piece of DNA, or whatever. In sticking on to something, it denatures that something so that it has to be replaced. So having free radicals is extremely damaging to the body and therefore the body has evolved a system to mop up these free radicals before they have a chance to do such damage and this is called our antioxidant system.

In recent years even more stress has been placed on our antioxidant system because we are increasingly exposed to toxins, which often exert their malign influence by producing free radicals. Therefore, it is even more important than ever to ensure good antioxidant status.

Free radicals effectively accelerate the normal ageing process and antioxidants slow the normal ageing process. The best example that we have all seen is the effects of smoking - cigarette smoking produces large amounts of free radicals and people who have smoked for many years have prematurely aged skin as well as dying younger from cancer or arterial disease – problems one expects to see in the elderly. Conversely, people who live and eat in a healthy way age more slowly.

The Normal Antioxidant System

There are many substances in the body which act as antioxidants, but the most important three frontline antioxidants are superoxide dismutase (zinc and copper SODase inside cells, manganese SODase inside mitochondria and zinc and copper extracellular SODase outside cells), glutathione peroxidase and Co-enzyme Q10. These molecules are present in parts of a million and are at the frontline. When they absorb an electron from a free radical they are effectively neutralised, but they re-activate themselves by passing that electron back to second line antioxidants such as vitamins A and beta carotene, some of the B vitamins, vitamin D, vitamin E and vitamin K. These are present in parts per thousand. Again, these are neutralised by accepting an electron, but that is then passed back to the ultimate repository of electrons, namely vitamin C, which is present in higher concentrations. Most mammals can make their own vitamin C, but humans, fruit bats and guinea pigs are unable to do so. They have to get theirs from the diet and Linus Pauling, the world authority on vitamin C, reckons we need vitamin C in gram doses everyday. I recommend a minimum of 2 grams of vitamin C daily and for some patients up to six grams. Pauling himself advocated larger doses. For acute infections some people need tens of grams a day.

There are many other antioxidants present in vegetables, nuts, seeds and fruits which the body takes advantage of when they are present there in the diet. Other substances such as melatonin also have profound antioxidant properties.

Vitamin B12 is an excellent antioxidant and if I have a patient with particularly poor antioxidant status then I often recommend B12 by injection. Effectively this provides instant antioxidant cover and protects the patient from further damage whilst they take the necessary micronutrients to heal and repair their own antioxidant system.

The reason that so many medical trials do not appear to show any benefit from taking antioxidants is because the whole chain of antioxidants has to be up and running for the system to work. It is no use just giving vitamin E or A or C and expecting to see a result! See [Antioxidants](#)

Have I got a problem with poor antioxidant status?

All the above antioxidants can be measured and almost routinely now I measure frontline antioxidants, namely Co-enzyme Q10, superoxide dismutase(SODase) and glutathione peroxidase.

The second and third line antioxidants are largely provided by doing a good [Stone Age diet](#) and taking my standard recommendations for [nutritional supplements](#).

Co-enzyme Q10 is the most important antioxidant inside mitochondria and also a vital molecule in oxidative phosphorylation. Co-Q10 deficiency may also cause oxidative phosphorylation to go slow, but interestingly not invariably. My experience is that levels are almost always down and that they can be corrected by taking Co-enzyme Q10 300mg daily for three months, after which continue with a maintenance dose of 100mg. Since mitochondria are responsible for the ageing process, one could argue that Coenzyme Q10 is the most important anti-ageing molecule!

Superoxide dismutase (SODase) is the most important super oxide scavenger in muscles. Deficiency can explain muscle pain and easy fatigability in some patients. SODase is dependent on copper, manganese and zinc and I would expect this to be maintained in people taking my physiological mix of minerals (Mineral Mix). However, when there is a deficiency, these minerals are taken separately. Experience shows that the best results are achieved by copper 1 mg in the morning, manganese 3mg midday and zinc 30 mg at night. Low dose SODase may also be caused by gene blockages and these are also looked at when the SODase test is done. Blockages are most often caused by toxic stress, such as heavy metals and pesticides.

Glutathione peroxidase (GSH-Px) is made up of glutathione, combined with selenium. There is a particular demand in the body for glutathione. Not only is it required for GSH-Px, which is an important frontline antioxidant, but it is also required for the process of detoxification. Glutathione conjugation is a major route for excreting xenobiotics. This means that if there are demands in one department, then there may be depletions in another, so if there is excessive free radical stress, glutathione will be used up and therefore less will be available for detoxification and vice versa. Of course, in patients with chemical poisoning or other such xenobiotic stress, there will be problems in both departments, so it is very common to find deficiencies in glutathione.

If there is a deficiency of GSH-Px, then I recommend that patients eat a high protein diet (which contains amino acids for endogenous synthesis of glutathione), take a glutathione supplement 250mg daily, together with selenium 200mcg daily (which is present in my physiological mix of minerals Mineral Mix). Blood levels correct reliably well on this regime.

PART V: OTHER IMPORTANT BITS OF THE CAR TO LOOK AFTER



Avoid viral infections and treat them aggressively

Obviously one cannot avoid all viruses, but do your best. There tends to be a mini-epidemic of colds at the start of every school term as every virus acquired is shared around! Don't travel to exotic locations and risk picking up some horrible bug. Vaccinations can certainly trigger flares of CFS – some are probably essential and less likely to cause CFS such as tetanus and oral polio. Most other vaccinations have the potential to flare CFS.

My view is that influenza vaccination is so poor at protecting against influenza that it is not worth having. It is also very good at triggering CFS. Vitamin D is of proven benefit in protecting against viral infections – we should all be taking at least 2,000iu daily, probably more. If in doubt get your D3 levels measured – ideally run above 100nmol/l.

The best defence against viral infections is a healthy body and healthy immune system. Indeed I believe that if you have a perfect immune system you should never get a cold. Getting a cold is a symptom of a poorly functioning immune system.

For detailed information see:

http://www.drmyhill.co.uk/wiki/Viral_infections

Common hormonal disturbances in CFS – hormones are the controllers - in this case the accelerator pedal and the gearbox!

It is now quite clear there is a distinct hormonal disturbance in CFSs with a general suppression of the hypothalamic-pituitary-adrenal axis. It is the hypothalamus-pituitary which is the “conductor of the endocrine orchestra”. If the pituitary is malfunctioning then this has knock on effects for the thyroid gland, adrenal gland, sex hormones, growth hormone and possibly the pineal (produces melatonin for normal sleep).

In practice I invariably measure thyroid hormones (TSH, free T4 and free T3), often prescribe melatonin and often check adrenal function. I very rarely use sex hormones. Many CFSs are substantially improved by correcting thyroid hormones and I insist all my CFS patients get fully tested. A useful book on the subject is *The Thyroid Solution* by Prof Ridha Arem ISBN 0-345-42920-6.



Underactive thyroid gland

Low levels of thyroid hormones in the blood means the “accelerator pedal” is set slow so the body will go slow. This can be underactive for three reasons – either the gland itself has failed (primary thyroid failure), or the pituitary gland which drives the thyroid gland into action is under-functioning (secondary hypothyroidism), or there is failure to convert inactive hormone T4 to active T3. The symptoms of these three problems are the same.

- In primary thyroid failure, the blood tests show high levels of thyroid stimulating hormone (TSH) and low levels of T4 and T3.
- In pituitary failure, the blood tests show low levels of TSH, T4 and T3.
- In conversion problem, TSH and T4 may be normal, but T3 is low.

There is another problem too which is that the so-called “normal range” of T4 is probably set too low and TSH set too high. I know this because many patients with low normal T4 often improve substantially when they are started on thyroid supplements. Indeed Dr Skinner, who is a consultant virologist at Birmingham, has shown how many patients with CFS have low normal levels of thyroxine (T4) and do well when their levels are increased to average levels. The laboratory I use has a normal range of 12-22 pmol/l and I am finding many levels coming back at 9-14. In these patients there is an indication for trying T4, especially if symptoms suggest this.

Furthermore, the normal range for TSH is set too high. In UK the normal range is up to 4.4mIU/l and often higher. In America anyone with a TSH above 3.0 is now started on thyroid hormones – this is because a high TSH is a risk factor for arterial disease.

Symptoms and signs of an underactive thyroid

Chronic fatigue syndrome may be a symptom of hypothyroidism – that’s why all sufferers need their thyroid checking!

Other symptoms: weight gain, lethargy, sensitivity to cold, heat intolerance, fluid retention, mood swings and depression, poor memory and concentration, hair loss, joint pains and morning stiffness, skin problems and tendency to infections, headaches, vertigo and deafness, hypoglycaemia, constipation, menstrual problems, pre-menstrual tension, digestive problems, infertility and loss of libido.

Signs: puffy face, puffy eyes, hair loss (classically the outer third of the eyebrows), cold extremities and dry skin, rashes, eczema and boils, enlargement of the tongue, hoarse voice, soft pulse or bradycardia, goitre, slowed Achilles tendon reflex. Further useful information is the basal body temperature. Use a mercury thermometer to take the temperature in the armpit over 10 minutes immediately on waking. Temperatures consistently below 97.8°F (36.6°C) indicates slow metabolic rate, which may be due to hypothyroidism.

Treatment of an underactive thyroid

This depends on the bloods tests and the clinical symptoms.

If the T4 is low and T3 commensurate with a low T4 - I would start with thyroxine 50mcgms (25mcgms for a small person or child or someone very debilitated) and increase in 25mcgms increments every month up to 100mcgms (or 75 mcgms in a small person or child or debilitated person) at which point the blood needs retesting. The aim is to get into the middle or upper half of the “normal” range. If I had a patient who was very small or very debilitated I might even start with 12.5mcgms.

If the T3 is low, and T4 normal, then I would use generic thyroid, which is a physiological mix of T4 and T3. I would start with ½ grain daily for one month, then ½ grain twice daily for one month, then 1 grain plus ½ grain daily for the third month at which point the blood need retesting. Take the second dose not later than 4pm or it may interfere with sleep. Some people like to take the second dose at lunch time to get an afternoon boost.

If the dose of thyroid was too high, then side effects would develop - hotness and sweating, fine tremor and palpitations. In this event, stop the thyroid supplement immediately. Taking additional thyroid will clearly make this situation worse. If in doubt, please phone in. Some of my patients do seem to get the symptoms of over-activity despite the blood levels being normal. This may be due to receptor hypersensitivity. In this event cut the tablet into smaller doses and build up slowly.

Thyroxine is only available on prescription and I am able to supply if your GP is not happy to prescribe. However I do insist on the patient being seen by a doctor to ensure there are no signs or symptoms of thyrotoxicosis and obviously I need to write to the GP to tell them what I am prescribing. Once stabilised I like to check levels once a year. Obviously, your GP needs to be informed.

If you are taking thyroid supplements at any time, it is always possible that you could become thyrotoxic – not through any fault of the tablet but because the thyroid gland suddenly decides to. This is unusual! If you suspect this because you develop symptoms of toxicosis such as hotness and sweating, anxiety, fine tremor, palpitations and possibly sleeplessness, then stop the thyroid supplement immediately and get your levels rechecked.

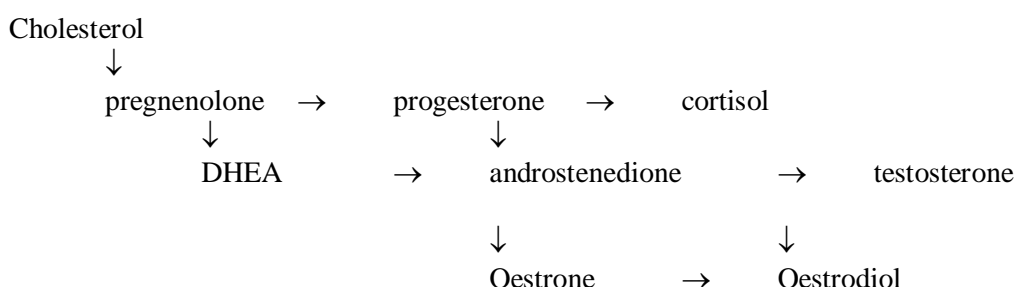
Treatment with thyroid hormones is nearly always for life.

For more information see: “Understanding thyroid disorders” by Dr Anthony Toft;
ISBN: 1 903474 19 1, available from <http://www.familydoctor.co.uk/>

Also see: [Thyroid - the correct prescribing of thyroid hormones](#)

Underactive Adrenal Gland (DHEA and cortisol) – *the gear box of the car*

The adrenal gland is responsible for the body's hormonal response to stress. It produces adrenaline, which stimulates the instant stress hormone response (fight or flight reaction). It also produces cortisol and DHEA, which create the short and long term stress hormone responses. Cortisol suppresses the immune system, breaks down tissues and has a generally catabolic effect. However, these effects are balanced out by DHEA, which has the opposite effect – activating the immune system and building up tissues. All these hormones are made from cholesterol – just one reason why running a low cholesterol is not necessarily a good thing! The sequence of events is as follows:



Both cortisol and DHEA are essential for life – too little cortisol causes the life threatening disease Addison's disease, too much causes the debilitating condition Cushing's syndrome. Then name of the game is to get the right balance. To achieve this both hormones must be measured. This can be done with the adrenal stress index (ASI) test. By measuring and supplementing within the physiological range, with biologically identical hormones, one is not going to get any unpleasant side effects i.e. we are trying to copy Nature and restore normality.

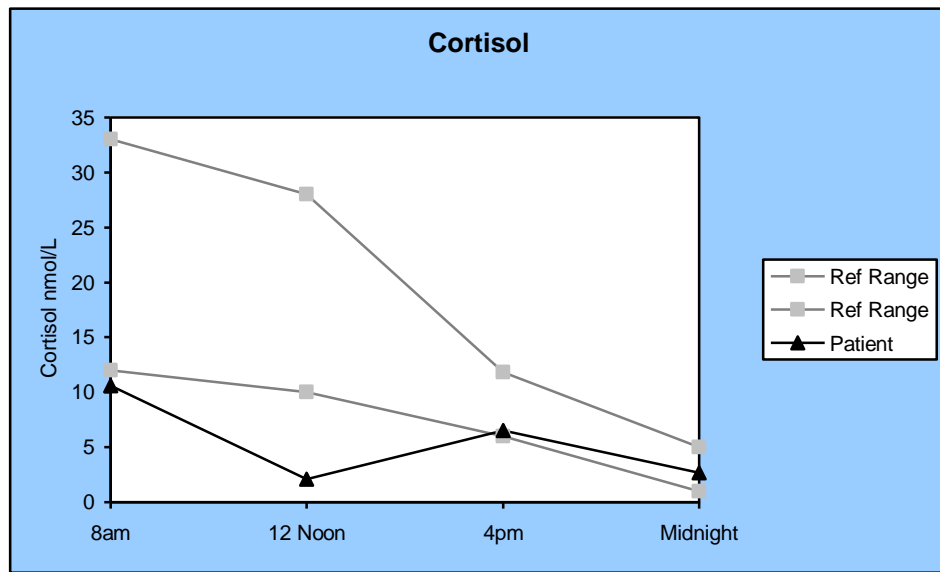
The ASI test looks at cortisol and DHEA levels over 24 hours. This test entails taking salivary samples through the day (yippee, no needles!). Indeed, salivary sampling is felt to be the most accurate way of assessing steroid hormone levels.

An abnormal result may be a symptom of other problems or it may cause problems in its own right. The response of the body to stress (any stress – infectious, nutritional, emotional, physical etc) is to increase the output of stress hormones. This gears the body up for action by raising blood pressure, increasing heart rate, improving mental alertness (which can cause anxiety), increasing energy supply and so on. It is actually metabolically very inefficient because it uses up lots of energy, but totally desirable if one has to fight for one's life! This reaction is essential for short term stress, but unsustainable long term. So time for rest and recovery is equally essential.

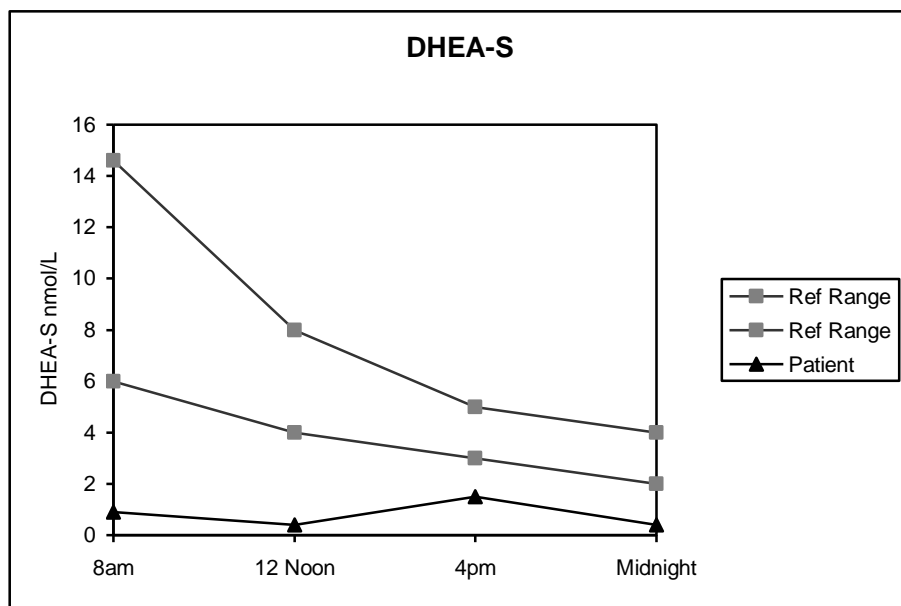
Problems arise when the stress is unremitting because eventually the output of the adrenal gland will reduce making one far less able to tolerate stress. Indeed this is often a complaint of my CFS patients – they simply do not tolerate stress at all well.

The pattern of the result from the adrenal stress test gives some idea where one is along the stress response time line.

A typical CFS adrenal stress profile test result showing low levels of cortisol and DHEA.



(DHEA-s stated reference range is age and gender related)
(Female 55-64)



Interpretation of the Adrenal Stress Index test for DHEA and cortisol levels

Levels of DHEA and cortisol vary according to the level of stress and for how long that stress has been applied. Increasing cortisol production is the normal response to stress and is highly desirable, so long as the stress is removed and the adrenal glands can recover. On-going, unremitting stress means the adrenal gland and the whole body is in a constant state of alert, does not get time to recover and eventually packs up. So, there are several stages of adrenal function gradually leading to failure:

1. Normal levels of cortisol and DHEA. Normal result. Normal adrenal gland
2. Raised cortisol, normal DHEA. This indicates a normal short term response to stress.

3. Raised cortisol and raised DHEA. The adrenal gland is functioning normally but the patient is chronically stressed. So long as the stress is removed, the adrenal gland will recover completely.
4. High levels of cortisol, low levels of DHEA. The body cannot make enough DHEA to balance cortisol. This is the first sign of adrenal exhaustion. This is the first abnormal response to chronic stress. The patient needs a long break from whatever that chronic stress may be – the commonest chronic stress is [Hypoglycaemia](#), but also consider insomnia, mental, physical or emotional overload or whatever. DHEA can be supplemented to make the patient feel better, but it must be part of a package of recovery without which worsening can be expected.
5. Cortisol levels low, DHEA levels low. The gland is so exhausted it can't make cortisol or DHEA. By this time patients are usually severely fatigued.
6. Cortisol levels low, DHEA borderline or normal. This probably represents the gland beginning to recover after a long rest. DHEA may be used to help patients feel better whilst they continue their programme of rest and rehabilitation.

In Addison's disease there is complete failure of the adrenal gland not because of chronic stress but because of autoimmunity. This too is a life threatening disorder and the patient is severely ill. The main clinical symptom is severe postural hypotension and chronic hypoglycaemia. Addison's disease is tested for by a short synacthen test in which cortisol levels are measured before and after an adrenal gland stimulant ACTH. Many patients with CFS are given this test, which is found to be normal resulting in the patient being told their adrenal gland is fine and no action is required. The problem with this test is it only shows where the adrenal gland is completely non-functioning, it does not diagnose partial adrenal failure or adrenal stress and no measurements of DHEA are made. This makes it potentially misleading.

Treatment

The idea with treatment with cortisol and DHEA is to stay within physiological ranges. By doing this there are no side effects in the short or long term. Many doctors and patients recoil at the prospect of taking steroid hormones. Remember all the side effects of steroid hormones are created by the dose. Using physiological as opposed to pharmacological doses avoids all these problems.

A normal adrenal gland produces about 10-50mgs of DHEA daily and 20-25mgs of hydrocortisone daily. Steroid side effects would appear after a few weeks of 100mgs a day or a few months at 50mgs a day.

DHEA is available over the counter in the USA, where the FDA has classified it as a food supplement up to a daily dose of 25mgs. It is also available from www.pharmwest.co.uk. It is better absorbed taken sublingually – ie allow it to dissolve in the mouth. I start my patients on 12.5mgs for small people and 25mg for larger people of DHEA a day taken in the morning. I like to recheck a single DHEA after 3 months to make sure I am staying within physiological ranges and because a few patients need 50mg.

Cortisol again needs to be used in sub-physiological doses – ie. up to, but not more than 10mgs a day. (Please note that the usual steroid most often used is prednisolone. 5mgs of prednisolone is equivalent to 20mgs of hydrocortisone). Both these are prescription only drugs.

After 3 – 6 months if the patient wishes to continue taking DHEA then levels need to be re-checked by doing a single sample salivary DHEA (you can order this test from my website – “DHEA (saliva) single”. Cortisol levels replete reliably well and it is not necessary to recheck levels.

As the patient improves, usually hydrocortisone can be stopped typically after 1-2 years. I suspect DHEA is an acquired metabolic dyslexia – that is to say as we age we get less good at making it. Young people can often stop DHEA as they improve and maintain levels, but older people often benefit from taking DHEA long term.

A New Hydrocortisone Trial

Another randomised, controlled, crossover trial of low-dose hydrocortisone treatment for CFS has recently been published. 32 participants, fulfilling both the Oxford and CDC 1994 criteria, completed this short-term trial. Participants received 5mg or 10mg of hydrocortisone for 28 days and placebo for 28 days.

The results revealed modest, statistically significant improvements in fatigue with this low-dose hydrocortisone treatment compared with placebo. The degree of disability was also reduced with hydrocortisone treatment but not with placebo. There was no significant difference in changes in fatigue score when 5mg and 10mg doses were compared. The authors suggest that, in view of the lack of dose response in this study, 5mg is a sufficient low dose of hydrocortisone.

Participants who responded to this hydrocortisone treatment did not differ from ‘non-responders’ in terms of their pre-treatment cortisol levels. Although none of the participants in this study had a current psychiatric illness, those who responded to hydrocortisone treatment had fewer psychiatric symptoms prior to treatment.

Based on the results of the insulin stress test, this short-term, low dose hydrocortisone treatment was not found to cause significant suppression of adrenal gland function. None of the participants dropped out of the study and only minor side effects were reported.

The authors conclude that this low-dose hydrocortisone treatment resulted in “significant reduction in self-rated fatigue and disability in patients with chronic fatigue syndrome”.

Comment

This study sheds interesting light on the possible role of low cortisol levels in the disease processes involved in CFS. Caution is required, however, in interpreting the results. Participants’ baseline cortisol levels could not predict their response to hydrocortisone treatment and participants appeared to have baseline cortisol levels within the normal reference range.

In another randomised controlled trial of hydrocortisone therapy (see Interaction 29, page 21 for a review), McKenzie at al., used a higher ‘low-dose’ hydrocortisone treatment of 25 - 35mg daily. They found that this dose was associated with some improvements in symptoms but caused significant adrenal suppression. Neither of these research teams currently recommended the use of hydrocortisone as a treatment for CFS. The present study assessed the effects of hydrocortisone treatment in the short-term only. As the authors point out, further studies, involving longer durations of treatment and follow-up are required to assess the long-term effectiveness and safety of this treatment.

Reference: Cleare et al; The Lancet, 1999, Vol. 353 February 6, p455-458

Also see: [Human growth hormone](#)

The Pill and HRT – don’t take female sex hormones

A question that most of my female patients ask me at some stage is - what about the Pill and HRT? In the last few years I have become increasingly unhappy about prescribing the Pill and HRT for my patients and I am now at the stage when I actively discourage patients from using either. Essentially the Pill, especially progesterone, suppresses the immune system. Progesterone is the pregnancy hormone (pro, in favour of, gesterone, pregnancy). There is a very particular immune problem in pregnancy – 50% of the growing baby genetically belongs to the father. What should happen immunologically is that the mother should reject this baby as a foreign body. Obviously this is undesirable and to get round this the mother produces lots of sex hormones to turn off the normal immune reaction. Women are only meant to have high levels of progesterone in pregnancy. Pregnancy is a potentially dangerous time with greatly increased risk of blood clotting, high blood pressure, cancer, mental disturbances, weight gain, hormone swings and immune suppression – women largely survive because it only goes on for nine months. With the Pill and HRT there are unremitting high levels of these hormones with all these complications. Those which most concern the CFS sufferer are the

immune suppression, hormone disturbances, nutritional deficiencies (these hormones induce B vitamin deficiencies, essential fatty acid deficiencies, raised copper and low zinc).

I also see many women whose CFS has followed fertility treatments when drugs such as clomephene have been used. Essentially this drug gives the pituitary a large kick. We know that in CFS there is a general suppression of the hypothalamic-pituitary-adrenal axis and this may be the last straw that tips one over into a CFS. Remember that infertility is often a symptom of poor nutritional status, toxic stress, poor adrenal and thyroid function – ie all the factors which also predispose to CFS.

Oxygen supply – your car needs a good oxygen supply to work

In order for mitochondria to be able to burn fuel to make energy they require a good oxygen supply. There are several ways in which this might be impaired:

Diagnoses which conventional medicine should pick up on:

Poor oxygen carrying capacity of the blood i.e. **anaemia** – this is usually picked up by standard medical tests.

Respiratory failure – usually obvious – the lungs have been damaged by disease such as from smoking, emphysema, chronic asthma, oedema from heart failure, pulmonary fibrosis, pulmonary embolus or whatever. Again this should be picked up by conventional medicine.

Heart failure

Severe atherosclerosis (arterial disease) – blood vessels narrowed so blood supply impaired.

Diagnoses which conventional medicine usually does not pick up on:

The low output state of the heart when affected by **mitochondrial failure**

Autonomic neuropathy – which may result in low blood pressure and **postural orthostatic tachycardia syndrome (POTS)**. This has been greatly researched in CFS and is no doubt a problem. But I think that this is not the cause but a symptom of another problem – ie the low cardiac output state we see in patients with very poor mitochondrial function. In this event the heart does not contract powerfully because it does not have the energy supply to allow it to do so. This means the blood pressure falls despite the body's efforts to maintain it – ie vasoconstriction. Clinically we see low blood volumes (secondary to vasoconstriction) and fainting or severely low blood pressure when the patient stands up because the heart cannot beat powerfully enough for long enough to sustain blood pressure whilst in the vertical position. It is much less work for the heart to maintain blood pressure lying down! [POTs](#)

Hyperventilation – the idea here is that for whatever reason, the patient over-breaths. One cannot increase the oxygen carrying capacity of the blood this way, so oxygen levels are not increased, but carbon dioxide is washed out. This changes the acidity of the blood in such a way that oxygen sticks more avidly to haemoglobin. So oxygen is not released to the mitochondria where it is required and so mitochondria go slow, so cells go slow and this results in fatigue. See [Hyperventilation](#). This is a common problem especially in people with a tendency to anxiety. The changes in acidity can also have an adverse effect on translocator protein function, ie mitochondria work less well and this further compounds the problem. Hyperventilation is a very common problem, so do read the further information on the website. We can test for hyperventilation by measuring a *Carbonic anhydrase in red cells*.

Carbon monoxide poisoning also results in oxygen sticking more avidly to haemoglobin and has the same effects as hyperventilation. CO poisoning from exogenous factors such as poorly ventilated heaters is well recognized – indeed it is estimated that one in twenty heating appliances leak carbon monoxide. However CO poisoning may also result from the **body's own endogenous production of CO**, when stress enzymes are induced. Again this is associated with symptoms of hypersensitivity which can be to light, noise, touch, pain, chemicals or electromagnetic radiation. See [Carbon monoxide and multi-sensitivity](#), (MUSES syndrome). Further information from: [CO-Gas Safety](#), Station Building, The Parade, Claygate, Surrey KT10 0PB Tel: 01372 466112/466135 A support group for survivors of CO poisoning has been launched recently, called CO Awareness. Their website address is: www.co-awareness.co.uk

Brain fog - poor memory, difficulty thinking clearly etc

Foggy brain is symptomatic of poor energy delivery to the brain. The brain is enormously demanding of energy! For detail see:

[Brain fog - poor memory, difficulty thinking clearly etc](#)

Some fine tuning of brain function can also be found at:

[Edge effect - the brain in CFS](#)



Psychological aspects of treating CFS – *the driver of the car ctd.....*

CFS Psychological or Physical?

This seemed such a stupid question that I never bothered to consider it. I estimate I must have now seen over 4500 patients with CFS and it is clear CFS is primarily a physical disorder. It is only when patients have been ill for several months and been told by their physicians that nothing is wrong they get secondary psychological problems. The only place where CFS does not exist is in the brains of small-minded doctors.

The reason the "physical or psychological" debate continues is because the usual tests for pathology come up showing normal results. GPs find ill patients, do the usual screening tests which come up "normal" and feel this allows them to turn round to patients and conclude there is nothing physically wrong. If, however, the screening tests included SPECT scans; sensitive tests of the hypothalamic-pituitary-adrenal axis; T cell subsets; tests to look at mitochondrial abnormalities, mitochondrial function tests, antioxidant status and tests of xenobiotic loads; enterovirus sequences in muscle and brain; trace element levels, vitamins, essential fatty acids and amino acid profiles, then lots of abnormalities would be found. Doctors would diagnose serious metabolic and hormone problems and patients would be taken more seriously.

The psychological issues which need addressing are as follows:

Personality – the type of person who gets CFS is the goal driven, perfectionist, workaholic. She has spent her life juggling the responsibilities of a job and family, as well as running the local community, pursuing hobbies and taking evening classes! Usually she has done this at the expense of her sleep and diet. Dopamine and acetylcholine are the ON switches for the brain, GABA and serotonin are the OFF switches. It is no surprise that most of my CFS patients are dopamine or acetylcholine types! (see [Edge effect - the brain in CFS](#)). The very personality that gets someone into CFS does not help to get them out of it! The first step is to undergo a personality change – not easy!

Being pissed off – doctors often do not distinguish between the tears of frustration at not being able to do things from the tear of depression. One has to learn to be happy with less. Not being able to do things amounts to a bereavement. Dealing with this frustration is a major problem for many.

Get selfish – most CFS sufferers have spent their lives supporting others. It does not come easily to be on the receiving end of support networks. To get well you have to look after number one.

Psychological skeletons – we've all got these. Sometimes addressing them can be helpful. But sometimes not! People who have been abused either physically, mentally, emotionally or sexually are at greater risk of CFS later on in life. This is partly because they do not feel in control of their lives and this makes it even

harder to make the necessary changes to recover from their CFS. However once one restores ones energy, including mental energy, one is much better able to cope with psychological skeletons!

Learned responses – these can be a real problem because sometimes when one has identified and corrected enough of the underlying physical problems so that the person should be able to recover, the body has “learned” how to be ill and one may need to use psychological techniques for getting out of this particular rut. Indeed this can be a real problem in allergy. When one sensitises to a food or a chemical the brain “learns” the response. Then even when it is physically switched off by say EPD, the brain and immune system goes on producing the response even when the allergy is switched off. This can be very difficult to deal with! See [Plastic rose syndrome](#).

Depression – anybody who has been ill for any length of time can get depressed, but depression is not a feature of CFS. The CFS patients I see are remarkably un-depressed, especially given their circumstances! See [Brain in CFS - edge effect](#).

A CFS patient is burnt out - usually by overstressing him/herself with work, sport, family commitments combined with insufficient rest, poor quality food, allergies, acute or chronic infections, excessive alcohol/smoking/sugar, chemical overload etc. He/she has lost the ability to produce stress hormones and is stuck in first gear. Increasing stress (accelerator pedal) simply makes the engine scream without going faster. Furthermore the patient often does not sleep well and this compounds the problem. I could stock a good Olympic team with CFS sufferers - top athletes stress themselves hugely and put themselves at greater risk of getting CFS.

With any illness there is a psychological component, but with CFS this is secondary to a physical illness. I am always amazed how well adjusted are my CFS patients and depression is not a common feature. The difference is that CFSs want to do things, but if they do they feel ill. They also tend to wake late. With depression, patients don't want to do anything, but if you push them to exercise, they actually feel better. Usually they have early morning wakening. I suspect this is why the "stimulating" antidepressive drugs seem to make CFS worse - they increase the desire without improving the performance and therefore worsen the frustration.

Anxiety – sometimes this is a problem as patients start to get better. When they are so ill they are often housebound. As they recover they lose the confidence to get out into the world again and this stops them from doing things rather than the fatigue. In these situations drugs for anxiety can be very helpful – such as diazepam 2-5mgs. If used on an occasional basis when the sufferer feels she is not going to cope with a potentially threatening situation just “to take the edge off things” there is no risk of addiction. The drug allows the sufferer to cope with the situation and so gain confidence in their ability to do this in the future. With time and growing confidence the need for diazepam lessens. I have one patient who used about 30 tablets a year – just the knowledge that she can use them should she feel the need is enough to allow her to cope with most situations – the human equivalent of an escape lane! Remember much anxiety is often caused by [Hypoglycaemia](#).

Recommended reading: Hans Selye "The Stress Of Life", McGraw-Hill Book Co, first published 1956, ISBN 0-07-056212-1



Exercise - the right sort in CFS

My view is that CFSs are on the same energy spectrum, but the opposite end, to elite athletes. The processes and principles for improving energy efficiency apply equally to both.

In CFS the first step is to put in place all the necessary dietary, nutritional and detox mechanisms so that your mitochondria are working efficiently. At this point clinically you should be feeling absolutely fine doing absolutely nothing. Until this point is achieved one dare not exercise because this will just cause massive tissue damage! Indeed, we already know this – CFS is characterised by running a high *cell free DNA* which is a measure of tissue damage. See p. 35

However, once you feel absolutely fine doing very little and your mitochondrial tests, cell free DNA and antioxidant status are all improved (ideally normalised), together with any other problems that you know about, then the principles of a graded exercise regime should be as per: [Exercise - the right sort](#)

These exercises are about increasing the numbers of mitochondria. This is equivalent to upgrading your car from a 500cc Deux Cheveaux to a 4 litre Rolls Royce! So first you have to get your mitochondria working well, and then you need to increase their numbers.

PART VI: TOXIC AND VIRAL CAUSES OF CFS

ORGANOPHOSPHATE POISONING, GULF WAR SYNDROME, AEROTOXIC SYNDROME, 9/11 SYNDROME (FIREMEN), SILICONE POISONING, CARBON MONOXIDE POISONING, HEAVY METAL POISONING SUCH AS MERCURY FROM DENTAL AMALGAM, AND OTHERS



Chemical poisoning

Chemical poisoning is good at triggering a chronic fatigue syndrome. Clinically, a chemically induced CFS looks just like a virally induced CFS. One difference is multiple chemical sensitivity (MCS), in which exposure to chemicals which smell (aerosols, air fresheners, perfumes, vehicle fumes etc) results in unpleasant symptoms. MCS is triggered by chemical toxicity. Where there is poisoning there is sensitivity and vice versa. This simply reflects the ability of the immune system to “remember” things. With a virus, the immune system “remembers” and we call it immunity. With MCS the immune system “remembers” the poisoning and reacts again when it “sees” the chemical, or a relative of that chemical.

Chemical poisoning may cause problems in several ways. They may inhibit mitochondria directly (eg organophosphates inhibit oxidative phosphorylation), many chemicals get stuck onto translocator protein so inhibiting the movement of ATP out and ADP in to mitochondria. They may disrupt neurological or hormonal control. They may make the available energy potential smaller.

Or chemicals may switch on multiple chemical sensitivity which results in an immunological hole in the energy potential so energy is wasted.

Chemical exposures are an almost inevitable part of modern life. The sort of activities and events which result in chemical exposure include:

Pesticides

- sheep dipping,
- spraying agricultural chemicals (farming, market gardening),
- being sprayed by tractor or helicopter and spray drift (adjacent homes),
- insect control “squeeta betas”,
- contamination of water supplies,
- working in a chicken farm (fumigation, control of parasites),

- working in the sea of factory farmed salmon in Scotland (where chemicals are used to control fish lice),
- repeated head lice treatments,
- house fumigations for flea control or bed bugs,
- insect control in hot countries with DDT, OPs etc,
- control of sand flies (Gulf War Syndrome),
- greenhouse fumigations,
- working in a research plant centre where chemicals were weekly used to prevent cross contamination,
- 'A' level student doing a biology project with pesticides,
- carpet factory where fleeces are washed after sheep have been dipped,
- lorry driver delivering OPs to farmers,
- Government Inspectors in sheep markets,
- dairy farmers daily exposed to OPs for fly control in the milking parlour,
- poisoning through exposure to dumped cans of sheep dip,
- welders working in a factory which was manufacturing OPs,
- timber treatments in houses,
- treatment of external parasites in dogs, cats, cows (OP pour ons) and so on,
- firefighters poisoned by burning chemicals,
- formaldehyde leaking from cavity wall insulation
- flower industry (lots of chemicals on flowers),
- timber treatments and handling treated timbers,
- airline pilots exposed to organophosphates used in engine oils (which allow oils to work at high temperatures) see www.aerotoxic.org
- cabin staff on airplanes using pesticides to prevent inadvertent import of foreign insects,
- DDT used to treat infestations (possibly misdiagnosed as polio).

Volatile Organic Compounds (VOCs)

- Poisoning from un-burnt hydrocarbons such as oil, gas, coal and wood. Free standing gas heaters are a particular hazard! These poisonings goes under the misnomer carbon monoxide poisoning. Actually the carbon monoxide is just a small part of the problem – yes – this certainly causes acute symptoms, but the long term poisoning arises from the toxic VOCs from unburnt hydrocarbons!
- Aerotoxic syndrome – this arises because cabin air is pulled in over the engines and possibly contaminated with unburnt fuel and organophosphates used as oil improvers. See www.aerotoxic.com
- Vehicle exhaust fumes
- Solvents used in carpets – new carpets are particularly pernicious! This together with poor ventilation is probably the main cause of sick building syndrome.
- Paints
- Glues
- Printing inks
- Cleaning agents - bleach
- Disinfectants – these often include formaldehyde or other such related compounds.
- Sterilising agents – “Milton”
- Perfumes
- Cosmetics – many are toxic especially hair dyes

Heavy metals

- Mercury from dental amalgam is the biggest single problem!
- Nickel we often see blocking biological enzymes (from stainless steel saucepans, jewelry, surgical materials, stents)
- Vaccinations are a particularly pernicious mixture of heavy metals with viral/bacterial particles and are good at triggering CFS
- Lead, cadmium antimony, arsenic – increasingly these are seen in provocation urine tests for heavy metals
- Depleted uranium in the Gulf War Veterans

Prescription Drugs

Many prescription drugs inhibiting mitochondria directly – the best example are beta blockers – nearly all my CFS patients are made worse by these.

Statins are a particular hate! They inhibit the body's own production of co enzyme Q 10 – the most important anti-oxidant in mitochondria.

Many drugs are metabolised in the liver and this imposes extra strains on liver detox, so for example many CFS sufferers are made ill by “normal” doses of antidepressants.

Chemicals created or released from within the body

From immune activity – the way that the immune system kills bugs is by shooting free radicals at them. These free radicals have to be mopped up by a good anti-oxidant system otherwise the body is damaged by “friendly fire”. Free radicals damage mitochondria. Indeed it is possible this is the mechanism by which viruses switch on chronic fatigue syndromes.

From gut fermentation – food should be digested. In CFSs we often see a fermenting gut. This produces toxins such as alcohols, right handed sugars (eg D-lactate), noxious gases (eg hydrogen sulphide) all of which have to be detoxified in the liver. If liver detox is impaired, these toxins spill over and poison, amongst other things, mitochondria.

Neurotransmitters and hormones – many have to be detoxified in the liver with a view to recycling.

When we do detoxification regimes! In the short term, the body can “hide” toxins by dumping them in fat. As we detox we mobilise these into the blood stream and this causes acute poisoning. Levels in fat are 100-1,000 times higher than those in blood.

Social toxins

- Alcohol – this is consumed in gram amounts and places a heavy burden on the liver. Most CFSs do not tolerate alcohol and this probably reflects the fact that their liver detox is already overwhelmed by the above factors.
- Artificial sweeteners can be particularly toxic. Aspartame for example is broken down in the liver to formaldehyde – a known neurotoxin.
- Nicotine
- Caffeine

Silicone

This is in a league of its own. With silicone I am not just looking for the obvious breast implant or silicone injections - many other prostheses have biologically active materials. Examples include testicular implants, lens implants, Norplant contraceptive device (silicone rods), TMJ work, facial contouring, meshes for hernia repairs etc. In the veterinary world reactions to suture materials are well documented – not so in the medical world.

Silicone itself is pretty inert. The trouble is that it “out-gasses” from implants, is picked up by the white cells and spreads into the rest of the body. In susceptible people it acts as an immune adjuvant and switches on the immune system causing widespread inflammation wherever it ends up. It cannot be stripped out by the usual detoxification techniques.

In practice it is often a combination of the above toxins and/or viral stresses which tip the balance and trigger the CFS

How do chemicals damage the body?

- By overwhelming the liver's P450 detox system causing a release of pro-inflammatory free radicals which inhibit mitochondria and mess up cell metabolism generally.
- By inhibiting mitochondria directly. For example organophosphates inhibit oxidative phosphorylation for obvious biochemical reasons.
- Blocking translocator protein function so ATP and ADP cannot be moved in and out of mitochondria
- Sticking onto DNA so genes cannot be used to make new molecules
- Sticking on to DNA, interfering with growth control mechanisms and switching on cancers.
- Sticking on to DNA to cause birth defects
- By mimicking body hormones and neurotransmitters. Organochlorines are oestrogen mimics and cause gender bending, breast cancer and birth defects.
- By blocking the action of hormones and neurotransmitters. So for example we know that persistent organic pollutants (POPs) cause insulin resistance and contribute to our current epidemic of hypoglycaemia and diabetes.
- By interfering with communication between normal immune cells so switching on allergy and autoimmunity.
- Heavy metals "mimic" essential trace elements and replace them in enzyme systems which then malfunctions. Nickel for example may displace zinc. This situation is made worse where there is zinc deficiency.
- Sticking onto proteins and distorting them - indeed there is evidence that many prion disorders result from poisoning with heavy metals and pesticides. Prion disorders include Alzheimer's disease, Parkinson's disease, motor neurone disease and CJD.
- By interfering with normal healing and repair – we know organophosphates cause osteoporosis, as does heavy metal poisoning.
- And many other possibilities as yet unidentified!

Therefore chemicals are implicated in many diseases of "civilised" Man who eats modern diets and live with 21st century technology!

The clinical picture of chemical poisoning

If there is acute poisoning there may be acute symptoms such as streaming eyes, nose, cough, wheeze, vomiting, diarrhoea, sweating – all attempts by the body to get rid of the toxin. In severe cases, there is loss of consciousness and death.

In moderate poisoning – some of the above symptoms followed by a flu like illness which may persist for days.

In chronic "low dose" poisoning, chronic fatigue syndrome develops as mitochondria go slow. In the long term, there is an acceleration of the normal ageing process and sufferers get diseases before their time and die prematurely. Poisoning is like throwing a handful of sand in a finely tuned engine!

Clinically we see

- Chronic fatigue syndrome because of mitochondrial failure
- Organ failures (such as low cardiac output resulting in POTS) secondary to mitochondrial failure
- Hormone resistance with increased risk of diabetes (insulin resistance)
- Damage to the heart – particularly the electrical conduction system producing dysrhythmias
- Damage to nerves – Central nervous system (psychological problems, psychiatric, sleep, brain fog etc) autonomic nervous system (sweating, temperature control, hyperventilation, etc) and peripheral nervous system (numbness, tingling etc).
- Gut damage – poor digestive function
- Damage to muscles – stiff muscles and painful muscles
- Damage to bones – osteoporosis

- Damage to the immune system – allergies, autoimmune disorders and multiple chemical sensitivity. Tests often show immune damage.
- Damage to the endocrine system – abnormalities of the hypothalamic-pituitary-adrenal axis, thyroid damage, adrenal fatigue, sex hormones low with loss of libido
- Probable damage to the liver
- Cancer, birth defects (damage to the unborn baby), and damage to sperm causing low sperm counts and infertility.
- Increase in prion disorders

How to test for chemicals

Most of the tests below are available thanks to the skill of John McLaren Howard working at Acumen.

Fat biopsy for pesticide and volatile organic compounds – this is a very easy test – one just has to push a hollow needle (as used for taking blood) into the fat and the amount contained within the bore is sufficient.

ATP studies – tell us if oxidative phosphorylation and translocator protein are blocked (in addition to other information)

Mito-respirometry studies – a closer look at oxidative phosphorylation – it could be uncoupled by chemicals so energy demand does not match energy supply and mitochondria work very inefficiently.

Translocator protein function – looks at what is stuck onto mitochondrial membranes

Gene studies – part of the testing for SODase looks to see if the genes coding for SODase are blocked,

DNA adducts – looks at how such chemicals and/or heavy metals have stuck to DNA.

Levels of toxic metals can be measured in blood or fat tissue. Hair analysis not very reliable.

Kelmer test – measures heavy metals in urine before and after a chelating agent

Lymphocyte sensitivity tests – these look at whether white cells have been sensitised to particular chemicals. This occurs when they have been poisoned and represents immune memory of such a poisoning. Thus chemical sensitivity and poisoning are found together. These tests can be done for almost any substance.

Gut fermentation tests – look for alcohols, D lactate, hydrogen sulphide ie abnormal chemicals from the gut.

Principles of treatment of chemical poisoning and MCS

In order of priority:

AVOID further exposures of the offending chemical

REDUCE LOAD – of all chemicals

IMPROVE NUTRITIONAL STATUS – so the body copes better with chemicals

DETOXIFICATION by as many different methods that can be done. My preference is for FIR saunaing.

DESENSITISATION

Also see handouts:

[Chemical poisoning - general principles of diagnosing and treatment](#),
[Multiple chemical sensitivity \(MCS\) - Principles of Treatment](#),
[Detoxification - an overview](#),
[Enzyme Potentiated Desensitisation \(EPD\)](#),
[Organophosphate Poisoning - symptoms and treatment](#),
[Aerotoxic syndrome](#),
[Gulf War Syndrome](#),
[Mercury - Toxicity of Dental Amalgam](#)

What can you expect from your GP?

The problem with GPs is that they are not trained to look for toxicological (poisoning) as a cause of illness. You may be referred to the Poisons Units (now called Medical Toxicology Units). The Poisons units have not

made a single diagnosis of chronic organophosphate poisoning in the last ten years, I suspect because funding for the Poisons Units comes from the chemical companies. This is an issue I have written about in the Journal of Nutritional and Environmental Medicine, which the Poisons Units have failed to refute.

You can expect your GP to do a series of blood tests and tell you there is nothing abnormal and therefore nothing wrong. The next step might be referral to a neurologist, who again will trot out the party line – “chronic chemical poisoning does not exist”. The next port of call is usually the psychiatrists who do not have a “toxicological” diagnostic pigeonhole and will squeeze you into the next nearest fit, ie chronic depression. The treatment of this, namely anti-depressants, will make the poor sufferer, worse, he will refuse to take them and be discharged as an uncooperative patient. The OP afflicted farmer is left to sort out his life as best as he can and usually ends up with declining health, having to sell his farm or rent out his fields. His marriage usually founders because he can’t pull his weight. No wonder that a significant proportion commit suicide.

Fortunately most people are intelligent and realise the above state of affairs. But the lack of street credibility and help from Government Agencies make chronic chemical poisoning a social and financial disaster area.



Chronic infections in CFS – is this allergy?

Whilst there is no doubt that an acute infection is a common trigger for CFS, the question is: to what extent does chronic infection perpetuate the fatigue? I have struggled with this question for years! There is a body of evidence pointing to chronic infections such as Lyme disease, borreliosis, mycoplasma, HHV, Epstein Barr, cytomegalovirus etc. present in CFS patients, together with various trials showing benefits from anti-microbials. The trouble is the diagnosis is difficult, the treatments often expensive and all carry potential for harm from toxic drugs.

We are all exposed to infections, but only a few get chronic problems. The difference has to do with individual susceptibility – as Pasteur famously said “*The microbe is nothing, the terrain is everything*”.

What we perceive going on in the body is not what is really going on in the body, but it is what the brain tells us is going on in the body! The brain has a complete map of the body, which includes sensory and motor functions. (Ref “Phantom Limb Syndrome” by Dr Ramachandran). It is possible that this could explain the mechanism by which healing and touch therapies such as Bowen therapy, Reiki, Kinesiology, etc. work. These techniques are literally re-mapping the brain to perceive things quickly, or direct motor actions correctly.

It is possible that the immune system has a similar mapping process. I think of the immune system as having a “map” of what should and should not be present in the body. I imagine it “sniffing” about the place looking for foreigners. There are many good doctors who have experimented with many different types of immunotherapy, such as neutralisation, enzyme potentiated desensitisation and, of course, homeopathy; and it may well be that they are having their beneficial effects because of this re-mapping of the immune system. All these mechanisms are characterised by extremely low levels of molecules or antigens being applied with profound effects that cannot be explained by conventional pharmacology.

Treatment of badly educated B lymphocytes

Immune mapping probably takes place in B lymphocytes. They start life in the bone marrow, move into the blood stream and are educated by the thymus gland and lymph nodes. This takes a few months. The mature B lymphocytes become the decision makers for immune attack or immune tolerance (war or peace!). Post-infectious ME patients may have B lymphocytes constantly at war. These white cells have been badly educated, their wires are crossed.

This, therefore, gives us a model for treatment. Either we can re-educate these B lymphocytes or we can kill them, or we can try to reduce the things they are inappropriately reacting against, which may be foods (diet) or microbes (with antimicrobials which could be drug or herbal, change the gut flora with probiotics).

Re-educate B Lymphocytes with immunotherapy

Perhaps desensitisation with neutralisation, EPD or homeopathy are techniques directed at re-educating these B lymphocytes to respond appropriately by remapping the immune system? In the case of neutralisation the result may be immediate. With EPD (and I know much more about this because I have been using EPD for 25 years!) the result is often delayed by a few months, it lasts weeks to months and then patients may need a top up of the treatment. Although these desensitisations are largely directed at foods, inhalants and chemicals, some microbial antigens are also included. See [Enzyme Potentiated Desensitisation \(EPD\) - how it works](#)

Kill B Lymphocytes with Rituximab

This drug is a monoclonal antibody specifically effective against the CD20 receptor on B lymphocytes. It specifically depletes B lymphocytes, i.e. it kills off the standing army – if this army is involved in civil war, then its depletion is a very desirable action! Rituximab is primarily used in cancer chemotherapy. By pure chance a patient who had severe ME received this drug as part of a treatment for her lymphoma and her ME

symptoms disappeared. She was delighted! Her daily energy bucket was no longer being immunologically drained!

This prompted a study by her Norwegian oncologists, Prof Olag Mella and Dr Oystein Fluge at Haukeland University Hospital, Bergen, to conduct a placebo controlled double blind trial into the effectiveness of Rituximab in ME. This was done with 15 patients receiving the active preparation and 15 the placebo. This study is not yet published but results were presented at the ME conference in London May 2011. Rituximab had a highly significant beneficial effect.

What was so interesting about this effect is that it took 2-4 months to start, it lasted for 2-6 months, then some patients relapsed but some were cured! This fits very nicely with the time scales I see in my EPD patients – again there is a delayed start, improvement, then top ups required according to the clinical response.

Another way to tackle this problem of inappropriate activation against microbes would be to use therapeutic agents which may be herbal, or prescription medication, to try to reduce the level of microbes so much that the immune system stops reacting. It may be that this approach explains the success of Dr Martin Lerner's work with antivirals, treatments with antibiotics for Lyme disease and with antifungals for chronic yeast problems.

It is the old story - we have a lot more good questions than good answers, but at least we are asking the right questions!

Also see [Chronic infections in CFS](#)

PART VII: THE PRACTICAL DETAILS – WHAT TO DO WHEN AND WHERE TO GET MORE HELP



In practice I treat CFS patients in the following order, starting with the things that everyone should do all the time then add on the extras if they do not recover with this simple package of treatment.

The order of importance!

Practically speaking (instead of logically speaking) this is the chronological order of recovery:

Observe seven fundamental rules

This applies to all CFS sufferers – most people “cherry pick” and do the easy things. I spend more time talking about diet and sleep than all other issues put together. This is because these are the two most important factors to put right for recovery.

- i) **REST** - 80% rule, pacing, mental and physical rest. Get organised. Accept help. Arrange for deliveries to house. Delegate work. Prioritise. List the 10 most important things in your life, and then ignore the last five. You can't do everything. Look after your mitochondria!
[Getting enough rest - an essential part of managing CFS](#)
- ii) [NUTRITIONAL SUPPLEMENTS](#) - it takes at least 6 months for body stores to replete. Supplements are for life.
- iii) **YOU MUST SLEEP** - quality sleep is essential to life. Don't be afraid to use tablets to restore the normal day/night diurnal rhythm.
- iv) [STONEAGE DIET](#) - Humans evolved over thousands of years eating a Stoneage diet. We should all move towards eating such a diet made up of foods of low glycaemic index which avoids the common allergens (grains, dairy, yeast, artificial food additives). I now also recommend routine use of [DIY PROBIOTICS](#) such as [KEFIR](#).
- v) **TREAT THE MITOCHONDRIAL METABOLIC DYSLEXIA** which may include some of the following:
 - a. Correcting levels of
 - D-ribose

- Antioxidants (Co-enzyme Q10, Acetyl-L-carnitine, B12, glutathione)
- Magnesium (injections)
- Niacinamide

b. Detoxing

c. Tackling hormonal imbalances

d. Tackling hyperventilation

vi) **DETOX** – reduce your chemical load by:

- Avoiding alcohol, care with caffeine, many prescription drugs (especially statins, diuretics, beta blockers, antidepressants, Pill and HRT) make CFS much worse. We now know why – they inhibit mitochondria. Don't take the Pill or HRT – they worsen CFS in the long term and certainly predispose to getting CFS because they suppress the immune system and induce nutritional deficiencies. Many IUCDs (coils) also contain hormones. Depot injections are the worst! Fertility treatments often disastrous for CFS. [Chemical Poisoning and MCS - how to reduce the body load](#)
- Do a good chemical clean up of your environment – throw out all the smellies in your house, keep the house well ventilated, avoid sprays, polishes, aerosols, new paints, new carpets, gas cookers and heaters etc. [Chemical Poisoning and MCS - how to reduce your daily exposures](#)
- Consider detoxing with a “sweating regime” such as FIR. These gets rid of all toxins – heavy metals, pesticides and volatile organic compounds but it is important to rehydrate with beneficial minerals since these too are lost in sweat. Actually it is not essential to sweat for FIR to be effective – fat soluble toxins are mobilised onto the lipid layer of the skin and then can be washed off. There are many ways which one can detox – see [DETOXIFICATION](#).

vii) **AVOID INFECTIONS** whenever possible

- Do not permit visitors who have a cold!
- Improve nutritional status – especially vitamins D and C.
- Check for [Hypochlorhydria](#)
- At the first sign of a cough, cold or sore throat use high dose micronutrient such as vitamin A (not if pregnant), vitamin C, zinc, selenium and propolis. Don't be afraid to take high dose vitamin C to bowel tolerance – if you take too much the worst that can happen is diarrhoea. I need 10-20 grams in 2 hours to stop a cold. You may need more. With infections your need and your tolerance of vitamin C increases markedly.
- Also use the neutral form of vitamin C (eg magnesium ascorbate) to dissolve in the mouth to kill microbes in there.
- Consider heat and sweating to get rid of viruses – they are quite temperature sensitive!

Allow time for recovery

FIRST, GET THE REGIME TIGHT. THEN FEEL WELL DOING VERY LITTLE. THEN GRADUALLY INCREASE ACTIVITY SO LONG AS YOU CONTINUE TO FEEL WELL

(by which I mean no loss of stamina or delayed fatigue). Feeling ill results from useless inflammation in the body causing a high cell-free DNA, which has the potential to switch on allergies and/or autoimmunity. Feeling ill can make you more ill, it is a disease amplifying process. See [Pattern of recovery](#)

It is possible some of the above interventions will make things worse.

[Getting worse on the regime of Stone Age diet and micronutrient supplements when these interventions should make you better!](#)

If after doing the above you are not better, move on to:

Do the other things which address the mitochondrial dysfunction such as B12 injections, magnesium injections/nebuliser, etc. Do as many of these things at the same time as you can. By the time you have been ill for several years, more than one thing will be wrong – you need to tackle them all at the same time to see improvement. The priority is to get well. Once you are better, these things can be knocked off, (ie the regime can be relaxed), one at a time to find out which is important. In order of importance:

1. ANTIOXIDANT STATUS - see 34. The cell-free DNA (part of the mitochondrial testing) is a measure of damage to cells which may be caused by poor antioxidant status. The important antioxidants to consider are:

- Superoxide dismutase (there are two forms – one dependent on zinc/copper, one on manganese),
- Co enzyme Q10 (most important inside mitochondria)
- Glutathione peroxidase. These are routinely measured as part of the mitochondrial function testing.

If these levels are poor then it is well worth using B12 by injection. B12 works well clinically because it instantly improves anti-oxidant status and takes over the function of some of the other antioxidants which may be failing. Don't waste money measuring B12 levels – that is irrelevant – it is the response to injections which is important. I like to see people running blood levels above 2,000. Make sure you are on a multivitamin containing folic acid when you have injections. There are many other molecules which also have antioxidant function such as:

- NAD levels (part of CFS profile)
- Acetyl L carnitine
- Melatonin (another reason to get a good night's sleep!)
- High dose vitamin C helps to recycle all the above antioxidants. Our physiological requirements are probably for 2-4grams daily.

Many foods contain natural antioxidants such as vegetables, nuts and seeds – tuck in! See also [Antioxidants](#)

2. COMMON HORMONAL PROBLEMS:

- [Underactive thyroid](#)
- [Adrenal gland insufficiency](#) (DHEA and cortisol)
- [Human Growth Hormone](#)

3. FOOD ALLERGIES – if, despite doing the Stone Age diet, you still have a long symptom list you are likely to be multiply allergic. Consider either a single food meal diet (such as five meals a day made up of single foods) or even a rotation diet or a rare foods diet (chose 10 foods rarely consumed and eat nothing but for two weeks). About one in ten patients who see me with CFS end up needing desensitisation for multiple allergies. Indeed it is allergy which most commonly messes things up because sufferers do not tolerate the interventions necessary to get well. See [Enzyme potentiated desensitisation](#).

Tests for food allergies are notoriously unreliable and at present there are no particular tests that I would recommend. The only reliable test is neutralisation/provocation – see www.ecomed.org.uk for practitioners.

4. GUT PROBLEMS – are usually caused by ALLERGIES and HYPOGLYCAEMIA, GUT DYSBIOSIS and/or HYPOCHLORHYDRIA and POOR PANCREATIC FUNCTION. Also see MALABSORPTION, GUT DYSBIOSIS (wrong bugs in the gut), FERMENTATION IN THE GUT. Getting gut symptoms right is central to getting the CFS right. Consider:

- fungal type dysbiosis (candida), see YEAST PROBLEMS
- bacterial type gut dysbiosis, helicobacter pylori,
- gut parasites (eg symptoms following travel abroad).

Or a combination of these three.

5. **HYPERVENTILATION** can cause fatigue. This is often overlooked. Indeed, it is almost an inevitable part of CFS that one ends up with a hyperventilation problem. By night hyperventilation causes vivid dreams and non-restorative sleep. It is often driven by hypoglycaemia, food intolerance, gut dysbiosis, low magnesium levels and stress. Can certainly be helped by breathing retraining.

6. **AUTOMMUNE PROBLEMS.** One of the risks of running a high cell-free DNA is that the cellular debris swilling around in the blood stream may switch on an antibody response. If you are unlucky this could result in autoimmunity because by chance, the antibodies against the cellular debris cross react with one's own tissues. This is a good reason to feel well – feeling ill (malaise) is caused by high cell-free DNA and may switch on allergy and autoimmunity, i.e. this is a disease amplifying problem – something you can do without! Autoimmunity may also be switched on by leaky gut in which large antigenically interesting molecules leak into the bloodstream where they may induce an antibody response - see **AUTOIMMUNITY**.

7. **PSYCHOLOGICAL ASPECTS OF TREATING CFS.** The personality who gets CFS is the high achieving, workaholic, goal seeking, perfectionist. These people continue to work at the expense of their health. In order to work longer hours and achieve they eat junk food, are natural addicts (sugar, carbohydrates, caffeine, alcohol, nicotine), miss sleep, don't rest when they are tired and don't take time off when they are ill. To recover from CFS they have to let go of this personality – this means making fundamental changes, which are not easy. If they do not let go, once improved, they simply put back all the things which caused them to get CFS is the first place and simply relapse back into CFS.

Most CFS patients are not depressed, just pissed off and frustrated that they cannot do more. The difference between CFS and depression is that in CFS the desire is there but the performance is lacking. In depression there is no desire, but if the depressed sufferer is kicked into exercise they often feel much better for it.

The basis of cognitive behaviour therapy (CBT) is that the patient is “frightened” to exercise because that exercise will make the patient worse and that “fear” has to be addressed. During the acute phase, when the physical causes have not been addressed, the patient is right! The trouble is that they are often not believed by their doctors! This is where the mitochondrial function test is useful because it gives an objective measure of disability either by a poor mitochondrial function score or high cell-free DNA showing cell damage or both. CBT is only relevant in the recovery process once all the underlying physical problems have been addressed and the patient can exercise without becoming ill. At this stage it is not unusual for anxiety to become the rate limiting step – actually the patient can exercise but is so conditioned that he dare not, almost amounting to agoraphobia. This anxiety is often driven further by hyperventilation and hypoglycaemia. Psychotherapy and tranquillisers can sometimes help get over these psychological blocks. Recommending CBT for CFS without addressing the underlying physical disorders is akin to beating up the driver of a car when the car won't go.

Use of anti-depressant medications – can be helpful but because most antidepressants block mitochondrial function, one has to use very small doses and build up gradually.

8. **TACKLE TOXIC PROBLEMS** – the commonest problems are:

- mercury in dental amalgam as a cause of fatigue is not unusual. Test for with a Kelmer test (also called DMSA urine provocation test) which measures mercury levels in urine before and after taking a chelating agent
- pesticide levels – easily tested for by fat biopsy (easier than a blood test)
- volatile organic compounds – again fat biopsy
- heavy metals – a hair analysis or sweat test can be misleading. Nickel seems to come up very frequently as a problem. Again a DMSA urine provocation test will pick up common heavy metal problems. Lymphocyte sensitivity tests measures sensitivity to metals, sensitivity does not come without toxicity, ie positive sensitivity testing also indicates toxicity.

Other useful tests for toxicity problems:

Mitochondrial function tests often show blockage of translocator proteins which often results from toxic stress. This can now be investigated as a separate test.

DNA adducts – looks to see if chemicals or heavy metals are stuck onto DNA – this is a pre-cancerous condition. This is a very useful test which I often request.

Detoxification profile – looks at how efficiently the liver detoxifies chemicals

9. CHRONIC LOW GRADE INFECTIONS – this is difficult because the tests are not reliable and often one has to resort to a trial of antibiotics. Antibiotics are a two edged sword because of the risk of flaring a yeast problem! Mycoplasma (Lyme disease) may be much more common than is believed but at present I do not know how to diagnose it reliably nor treat it reliably. I have a few patients with a typical history who have responded well to high dose long term doxycycline. It may be that the problem we are dealing with is not infection but allergy to microbes. See [Valacyclovir in the treatment of post viral fatigue syndrome](#)

10. PAIN CONTROL – pain, like fatigue, is just a symptom of something going wrong and one should try to work out the cause. The commonest issues are:

- General pain: Failure to pace activity properly!
- Low pain threshold is a feature of CFS
- Muscle pain (limbs, trunk or chest pain) – see new section on muscle pain
- Trapped Nerves – think of osteoporosis
- Useless inflammations (poor antioxidant status, auto-immunity)

See [Pain](#), [Inflammation](#) , [Arthritis - Nutritional treatments](#) , [Osteoporosis](#), [Muscle Stiffness](#), [Allergic muscles](#)



If despite all of the above you are still stuck!

Whilst people are improving and continuing to improve (either feeling better, or increasing their activity levels) then I would not suggest any further intervention. However, if you get stuck then the first thing to do is to go back to square one and examine objectively how strict your regime is. It is all too easy to get sloppy, relax the diet too much, become undisciplined about sleep, forget to take the supplements, not stick to the pacing rules carefully and stop making progress as a result. It is much more important to do the basic things really well than spend a fortune on the esoterics! Getting better from chronic fatigue syndrome is extremely hard work and takes a huge amount of personal input. However, if you are really stuck at this stage, then this is the point at which you need to consult another doctor.

Indeed, I have come to the stage where I need a band of trained advisors who can help interpret these concepts and test results to the uninitiated! I shall call this band of trained advisors my barefoot doctors who can help move things on for sufferers and point in which direction to go. See [Practitioners trained to treat CFS](#) .

Think of either multiple allergies or unusual allergies

At this stage I consider the possibility that there is something in your house, or the environment in which you live which is making you ill. The two major players are moulds and chemicals. Ideally, I would put you into an environmental unit which was free from chemicals and moulds, but the last unit in UK (the Airedale Allergy Centre in-patient unit) closed when “fund holding” stopped. The next best thing is to move to a hot dry climate for at least 2 weeks – preferably longer. These climates, such as the Mediterranean, are free from most chemicals. Unfortunately, most of our houses are contaminated as a result of heat saving measures (central heating, carpets, cavity wall

insulation, double glazing etc). Furthermore, where the humidity is below 40%, no moulds can survive. Neutralisation/provocation can be useful to diagnose mould allergy.

Other clues that the environment is a problem:

- Feel better away on holiday
- Feel better out of doors
- Feel better in the summer than the winter (no central heating, windows open)
- Feel better at the Coast (where prevailing winds are on-shore and so free from moulds and pollution)
- Feel better for environmental clean up – getting rid of smellies and chemicals in the house, avoiding cosmetics, eating organic food, air filtration system, dehumidifier. The Healthy House has an excellent range of products to help you do this – see www.healthyhouse.co.uk tel. 0845 450 5950 (and from a mobile phone, call on 01453 752216).

Some of my patients have to move house in order to recover – this is especially true if they live near polluting industry, pesticide spray drift, near a busy road, in a damp area.

Get mould allergy tested – either by skin tests (reasonably reliable but skin scratch tests unhelpful – must do this by intradermal injection i.e. neutralisation) or by going abroad to a warm dry climate ideally for one month, but two weeks may give you an idea. Make sure that place is chemically clean – not easy. Reduce moulds in the environment with a dehumidifier – measure humidity – get down to below 40%

MCS - Multiple chemical sensitivity - Suspect if symptoms better out of doors, better in the summer, better away on holiday. Do chemical clean up. Eat organic where possible. Check with the QEESE questionnaire. Test by *Lymphocyte sensitivity tests*.

Consider desensitisation such as neutralisation or my preferred technique enzyme potentiated desensitisation (EPD) for foods and possibly chemicals. EPD does not work so well for mould allergy.

For severe mould and/or chemical sensitivity the only answer may be to move to a hot dry climate.

Electrical sensitivity. There is no doubt that for some people this is a major problem. We can now test for this thanks again to the brilliance of John McLaren-Howard. Again he uses LYMPHOCYTE SENSITIVITY tests but does these within and without an electrical field. Those people with electrical sensitivity have their allergies to chemical greatly enhanced. Healthy House supply a number of very useful products to identify where the electrical stress is coming from together with materials which block it.

There are some treatments which work occasionally and are worth considering:

- Healing - Local healers can be found from The Healing Trust, website <http://www.thehealingtrust.org.uk> telephone: 01604 603247; includes Distant healing. Consider Healing with Seka Nikolic - expensive but effective. Seka is now working from her clinic at 3 Rosemont Road, West Hampstead, London, NW3 6NG TEL: 0207 443 5544. You can also contact her by email: seka@sekanikolic.com
- Geopathic stress is sometimes important
- Guaifenesin – may be worth a try if fibromyalgia is the main problem but I have only seen two patients who have been improved by this.

Everybody gets better from CFS in a different way – almost always a combination of the above. Tackle your illness from every angle you can. Always have a plan. Always keep a light at the end of the tunnel. Keep talking with other sufferers – they will give you ideas and inspiration.

Going on the regime makes you feel worse.

In order of likelihood the symptoms are:

Carbohydrate addiction withdrawal symptoms. – this is the commonest reason for worsening on the Stoneage diet. People who have carbohydrate intolerance can get withdrawal symptoms lasting for several weeks. The dietary regime is a counsel of perfection, go into it gradually and tighten up on it slowly to avoid the worst withdrawal. Be aware that fruit and fruit sugar can make symptoms of hypoglycaemia much worse so do not rely on fruit to keep your blood sugar up – it may do the opposite! See [Hypoglycaemia - the full story](#)

Detoxification reactions – as soon as one takes supplements and eats a Stoneage diet, takes probiotics one will trigger a detox reaction. All these interventions displace toxins from “safe” areas such as fat where the body tucks them out of the way and mobilises them into the blood stream prior to elimination through the liver and kidneys. This causes an acute poisoning effect. Again the advice is to relax the regime and maybe consider other detox regimes which draw toxins out through the skin see [Detoxification](#)

Allergy withdrawal symptoms - it is normal for somebody with allergy symptoms to get withdrawal symptoms when they initially do the diet – the common allergens cause withdrawal for four days, but wheat can cause withdrawal symptoms for up to a month.

Allergy to the supplements. Since starting patients on these regimes, we have had some who are intolerant of D-ribose (because it is derived from corn and there will be small amounts of corn antigen in the sugar), Co-enzyme Q10 (some are soya based, some sunflower oil based so try a different preparation), Acetyl L-carnitine (in which case you have got to eat more meat!) and sometimes NAD (B3). It is common for people not to tolerate my physiological mix of minerals (Mineral Mix). However, whatever the problem, the key is to go back to that regime on which you felt reasonable, then reintroduce things slowly one at a time. Some people do not even tolerate this which makes it most likely that they suffer from multiple allergy, in which case they are going to need desensitisation from one of the doctors listed below. For some reason often people with the worst deficiencies react badly to the very supplements they need. In this case one just has to start with very tiny amounts and build up slowly.

Fermenting gut - people who have a fermenting gut may be made worse by large doses of D-ribose. This is because this 5 carbon sugar could be converted back by the body to a 6 carbon sugar which yeast can ferment. The key here is to reduce the dose and take small amounts regularly through the day so that it is quickly absorbed and does not hang around in the gut to get fermented. See [Fermentation in the gut and CFS](#)

Common Complications

Osteoporosis - all people with CFS are at risk of osteoporosis because they cannot exercise. If you are over 50 with CFS or have had CFS for ten years. Ask for a bone density scan. Osteoporosis is assumed to be a one way process of bone loss – not the case! This can be stopped and reversed with appropriate nutritional supplements! See [Osteoporosis - practical nutritional considerations](#)

Anaesthetics – this is a problem for CFS sufferers with multiple chemical sensitivity - see [CFS and Anaesthetics](#)

Pregnancy – see [CFS and Pregnancy](#)



If your GP will not do the things that are being asked of him/her.

If you need magnesium or B12 by injection, then I am very happy to supply you with whatever is necessary. However, **I have to write to your GP and inform him that I am doing this**, so that if he has any reason to object then he can get in touch with me directly. Should this situation arise, please, **let me have your medical history and/or a completed medical questionnaire** (please request from the office – can be sent to you in the post or by e-mail) and I will write to your GP (and that letter costs £25).

With magnesium and B12 injections you have two options –

- either you need to find somebody competent, such as a nurse or a private doctor, who will give you these injections;
- or you need to find somebody competent such as a nurse, a diabetic on insulin, or whoever to show you how to self-inject.

If a nurse needs a letter from me confirming that I take clinical responsibility for the treatment, then please ask the office for such a letter. **In any event, I need a letter from you stating that you have such a competent person to assist you with the injections.** I can then send you the magnesium, the B12, the syringes, needles and sharps disposal box to do the necessary.

If your GP is not willing to prescribe thyroid hormones, then I would be able to do so, **ON THE CONDITION THAT** either your GP or a thyroid specialist agree to monitor your thyroid function regularly to check that you remain EUTHYROID; that is to say, you do not have any symptoms of thyrotoxicosis. These symptoms and signs would be: racing pulse, tremor, undue anxiety, undue sweating, irritability, unexplained weight loss, unexplained loss of muscle, unexplained osteoporosis, bulging eyes (exophthalmos) or unexplained goitre.

If you cannot find a doctor who can state that you are euthyroid, then you would need a half hour appointment with me here in Mid Wales to initiate thyroid hormone prescribing, **OR** I would refer you to a local specialist, such as Dr Skinner in Birmingham.



How Long Before You Recover?

Everybody asks me this question! The key point is that CFS is a symptom and once you can identify the underlying causes and correct these and allow time for recovery then you will improve. If you do not then it is back to the drawing board. It also depends how you define recovery. If you mean that you want to get back to how you were before the illness struck, then the answer is probably never. This is because you will simply set up the same conditions which made you ill in the first place.

People who get better from CFS are those who are prepared to make changes. These changes are often painful - changes to diet, personal relations, jobs, attitudes, desires, living environment and so on. If you are not prepared to make changes, recovery is unlikely.

Most CFS sufferers come to me hating themselves. They hate themselves because they can't function as they used to. People have to learn to love themselves as they are, and to be grateful to the illness for allowing them to make changes that make them better people to be with. The people who are best at making such changes get better fastest.

Having said all that, how quickly one gets better depends on what it is that is making you ill. I have some patients who improve simply by taking supplements, or by sleeping better, or by eliminating certain foods from their diet. Increasingly I am finding the detox regimes important -this is a reflection of the increasingly

toxic world in which we live. Usually however it is a combination of these factors. It seems to me that everybody seems to get better in a different way and I am constantly being surprised! This is part of the fascination of treating CFS!

I am painfully aware that having CFS usually prevents one from earning a living. Therefore the treatments I suggest start off with the “cheap and cheerful” and progress onto those which are more expensive or difficult. This is the reason why I put EPD right at the end – because it is time consuming and expensive. However in my NHS practice I used to start on EPD soon because the treatment was free and allergy so often gets in the way of recovery. It is possible for your GP to prescribe EPD. Furthermore increasingly I have patients referred to me by their GP but funded by their Primary Care Trust – ask your GP if he is prepared to make such a recommendation. GPs are the gatekeepers to all benefits within the NHS.

Expense of treatments always must be taken into account when thinking about alternative treatments – I have seen many patients who have spent large amounts of money on illogical treatments.

The pattern of recovery is first to get the regime as tight as possible with respect to pacing, sleep, diet, supplements, hormones, detoxing, hyperventilation, desensitisation and so on. Then I like to see people feeling fine at rest. THEN wait until one feels consistently well at rest, ONLY THEN dare one try a gentle graded activity programme. However if during the course of this symptoms recur, or there is delayed fatigue then one must reduce activity accordingly. Most people come to see me “booming and busting” which is a recipe for disaster.

[Chances of recovery](#)



Dealing with doctors

There are very few doctors who recognise that CFS exists, of those only a minority actually understand the devastating nature of the illness and a very few of those have any idea how to treat it. Unfortunately the view of the psychiatric field headed by Simon Wessely (who has achieved this by endlessly quoting his own studies and ignoring those which do not accord with his thinking) prevails, which is that all you need to do is give a few antidepressants, cognitive behaviour therapy, graded exercise and bingo – a cure is round the corner. The psychiatric key to getting these results is make the patients exercise at the expense of all other activity, then don't follow them up long enough to see the relapse. Indeed this is the view supported by Government, Insurance and Pension schemes who would find it impossible to properly fund the correct treatment of CFS and compensate those individuals poisoned by their occupations. The irony is that some short term investment in the correct early recognition and treatment of would result in huge long term savings!

So do not expect any miracles from your GP. The problem is that the GP is the gatekeeper to all NHS services, benefits, social support etc, so you need him on your side. With a fully co-operative GP and this book, you can do almost everything which I can offer. A list of practitioners available from www.ecomed.org.uk

Most doctors do not distinguish, indeed do not want to distinguish, between fatigue and frustration vs sadness and depression. If you burst into tears with frustration at the total lack of understanding that merely reinforces the universal diagnosis of depression. Nearly all CFS patients react adversely to “normal” doses of antidepressants and so they stop them. This is then used as evidence of lack of co-operation in a difficult patient. Indeed, it is this “battle of belief” which has to be waged at every doctor-patient meeting which is so exhausting for CFS sufferers.

Because doctors do not diagnose any more, i.e. they do not look for causes of ill health, they will be unsympathetic to possible toxic causes of CFS. They receive virtually no training in nutrition at medical school so expect no help here. Most of them do not accept that food allergy exists, which makes desensitisation seem daft to them. Most have no idea of the many functions of magnesium but on the basis of complete ignorance will tell you that magnesium injections are dangerous. Because they only use B12 for

preventing pernicious anaemia, you will be told that 2mgs a week is an overdose. They do not realise the huge potential of B12 as an instant antioxidant. Because they are used to diagnosing hypothyroidism on a TSH they will refuse to do a T4. If your GP tells you that he wants to consult with colleagues before sanctioning a treatment, then the battle is already lost.

They will ask for evidence of success for these treatments. However the best results come from a package of treatment which includes all the above factors. Such a package is not amenable to the traditional method of assessing treatments, namely the placebo controlled double blind trial (perfectly suited of course to testing drugs and considered the only truly “scientific” method). However one doctor, Dr Teitelbaum has researched this package of treatment. Although he and I have never met or corresponded (except indirectly) the package of treatment he offers his patients is remarkably similar to mine – namely diet, nutritional supplements, pacing, attention to sleep, correction of hormone levels, probiotics etc. By following up a group of patients with this active treatment comparing them to a placebo group (counselling only) he has clearly shown substantial improvements due to these physical interventions.

To my mind the only trial which is relevant is patient response. My patients get better and this is why I currently have a six month waiting list for new patients.

Doctors argue endlessly about what we should call CFS. There are lots of other names: myalgic encephalitis, fibromyalgia, post viral syndrome, neurasthenia. These are not really diagnoses, simply descriptions of clinical patterns. Whilst the experts argue about names I am only interested in getting sufferers better. CFS is not a diagnosis but a symptom which may have many causes. The name of the game is to work out the underlying cause. The problem with Western Medicine is that doctors do not diagnose any more. They treat symptoms with symptom suppressing drugs instead of getting to the root cause of disease. This arises as a result of original thinking in medicine being driven by the pharmaceutical companies. The best policy for drug company profits is to have a population of sick people requiring medication for life – so never diagnose and cure – that’s bad for business. The multinational pharmaceuticals dictate to the doctors, medical journals and government and treatment guidelines are set up accordingly.

THE KEY FACTOR IS TO REMEMBER THAT CFS IS A SYMPTOM, NOT A DIAGNOSIS AND A GOOD HISTORY COMBINED WITH THE TESTS AVAILABLE CAN TELL US WHERE THE BIOCHEMICAL PROBLEMS LIE.

However, if you do have a doctor who is willing to learn, then the scientific background to this work can be found in:

- Environmental Medicine in Clinical Practice, price £43
- Effective Allergy Practice cost £5
- Effective Nutritional Medicine cost £5
- Multiple Chemical Sensitivity cost £10

The above are available from the British Society for Ecological Medicine (BSEM), Administrator, BSEM, c/o New Medicine Group, 144 Harley St, London W1G 7LE; email: thebsem@gmail.com
website: <http://www.ecomed.org.uk>

- The Journal of Environmental and Nutritional Medicine
- Clinical Pearls – this monthly paper goes through the world literature pertaining to nutrition – makes for excellent reading.

If a medical practitioner wishes to join the BSEM, which gives easy and cheap access to these publications, please share these contact details with them. The website also has a list of doctors who practise Ecological Medicine.

CFS Ability Scale

The fatigue in CFS is both mental and physical. For some sufferers, the physical is the greatest burden and for others, the mental fatigue is most troublesome.

100: No symptoms with exercise. Normal overall activity. Able to work or do house/home work full time with no difficulty.

90: No symptoms at rest. Mild symptoms with physical activity. Normal overall activity level. Able to work full time without difficulty.

80: Mild symptoms at rest. Symptoms worsened by exertion. Minimal activity restriction needed for activities requiring exertion only. Able to work full time with difficulty in jobs requiring exertion.

70: Mild symptoms at rest. Some daily activity limitation clearly noted. Overall functioning close to 90% of expected except for activities requiring exertion. Able to work/do housework full time with difficulty. Needs to rest in day.

60: Mild to moderate symptoms at rest. Daily activity limitation clearly noted. Overall functioning 70% to 90%. Unable to work full time in jobs requiring physical labour (including just standing), but able to work full time in light activity (sitting) if hours flexible.

50: Moderate symptoms at rest. Moderate to severe symptoms with exercise or activity; overall activity level reduced to 70% of expected. Unable to perform strenuous duties, but able to perform light duty or desk work 4-5 hours a day, but requires rest periods. Has to rest/sleep 1-2 hours daily.

40: Moderate symptoms at rest. Moderate to severe symptoms with exercise or activity. Overall activity level reduced to 50-70% of expected. Able to go out once or twice a week. Unable to perform strenuous duties. Able to work sitting down at home 3-4 hours a day, but requires rest periods.

30: Moderate to severe symptoms at rest. Severe symptoms with any exercise. Overall activity level reduced to 50% of expected. Usually confined to house. Unable to perform any strenuous tasks. Able to perform desk work 2-3 hours a day, but requires rest periods.

20: Moderate to severe symptoms at rest. Unable to perform strenuous activity. Overall activity 30-50% of expected. Unable to leave house except rarely. Confined to bed most of day. Unable to concentrate for more than 1 hour a day.

10: Severe symptoms at rest. Bed ridden the majority of the time. No travel outside of the house. Marked cognitive symptoms preventing concentration.

0: Severe symptoms on a continuous basis. Bed ridden constantly, unable to care for self.

This is the scale I use in conjunction with the mitochondrial function scores to help assess the levels of disability in CFS.

Helpful organizations – support for patients and doctors

Getting Benefits

Recovering from CFS is expensive! Apply for benefits if you qualify – this provides essential funds to spend on your recovery programme. The benefits worth looking at are:

- Incapacity benefit – for patients unable to work
- Disability Living Allowance – for extra money to help with disabilities which prevent patients caring for themselves – this is made up of a care and a mobility component. There is huge variability from region to region as to who gets and who does not. If you are unreasonably turned down, ask for the reasons why including a copy of the examining doctors report. Ask for help from Citizens Advice Bureau, or a solicitor. I can help with supporting letters, but there is a charge for reports. Please phone the office and ask for Caroline (one of my secretaries). The mitochondrial function test is very useful because this gives an objective measure of fatigue which cannot be argued with – the scientific paper to support this has just been published (Jan 2009) in the International Journal of Clinical and Experimental Medicine – see <http://www.ijcem.com/files/IJCEM812001.pdf>

Further information and support for patients

Go to **One Click** run by Jane Bryant <http://www.theoneclickgroup.co.uk> who have an excellent and informative email newsletter to keep you abreast of the latest ideas in helping CFS sufferers.

Organophosphate Users Support Group OPUS

This is the charity I have helped to set up to support people with OP poisoning on the Welsh Borders. Membership is free. Write to The Rev Nick Reid, The Vicarage, Lydbury North, Shropshire, SY7 8AU for an information pack.

www.rs-opus.co.uk

Aerotoxic Pilots – see www.aerotoxic.org

The Samaritans a nationwide charity providing confidential emotional support to anyone in a crisis. Tel: 08457 90 90 90 – 24 hours a day, 7 days a week. E-mail: jo@samaritans.org website: www.samaritans.org They also have over 200 Branches across the UK and Ireland, ask the Operator for local Branch numbers or look in the phone book.

Suicide is a real risk for severely afflicted CFSs, especially when their illness is trivialised and dismissed by ignorant doctors.

Further information and support for doctors

British Society for Environmental Medicine (BSEM) - contact Administrator, c/o New Medicine Group, 144 Harley Street, London W1G 7LE; email: thebsem@gmail.com
Website: www.ecomed.org.uk

Practical considerations

I would like to make clear my potential role in your process of recovery if you decide to follow my advice. I appreciate that it can be a daunting task to make a start and this is why I have made my advice as structured and clear as I can. This means that you start with the *MITOCHONDRIAL FUNCTION PROFILE* test to confirm your diagnosis and identify physical problems with your energy production. The letter of interpretation contains full details of the diet and other necessary lifestyle interventions based on your questionnaire.

To order any test

To order any test mentioned in the book, please send a completed medical history (MEDICAL QUESTIONNAIRE available from the website or by contacting the office) together with your payment. For example, for the *Mitochondrial function profile* send a cheque for £310, i.e. £230 for the tests and £80 for my letter to your GP, made payable to Sarah Myhill Limited) to my office at Upper Weston, Llangunllo, Knighton, Powys LD7 1SL and a test kit will be sent out to you. We now have a credit/debit card facility in the office so you can phone up, order the test and pay for it at the same time if you prefer. The price for my letter reflects the fact that in that 15 – 17 page letter I interpret 7 separate tests as well as giving advice about all the various health problems reported in your questionnaire.

What I can and cannot supply you with

My philosophy is to try to supply all my patients with as much information (free on my website) as is necessary to get them well, together with the best possible value supplements. As a doctor, I am allowed to supply patients with supplements in a way that cuts out a lot of the red tape and bureaucracy and therefore makes them very cheap. Once you have sent me a history, questionnaire, done tests and your GP has received a letter then **effectively you become my patient for the purpose of prescribing only**, which allows me to supply you with the necessary in order to get well – the only downside is that I have to keep your GP informed and there is a cost for such letters.

The major logistical problem I am running in to at the moment is a simple numbers game. I have so much happy feedback from people doing these regimes and taking the tests that I am currently being overwhelmed with requests for tests. This means that I cannot provide the full back up service to everybody that I would most like to provide. If you find that even with all the advice contained in this book you are not making enough progress, please, choose from one of the following doctors or practitioners listed at [Practitioners of Ecological Medicine](#) and/or [Practitioners trained to treat CFS](#)



NEVER, EVER GIVE UP!

