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ME

MANAGEMENT FILE

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This leaflet is based on an article which first appeared in the ME Association's quarterly *ME Essential* magazine.
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THE ME ASSOCIATION

February 2020

MUSCLE ENERGY

INTRODUCTION

Exercise-induced muscle fatigue is a key symptom of ME/CFS. It is often accompanied by weakness, pain and twitching (fasciculations) in the muscle. So it's not surprising that people believe there is a major problem in the way that their muscles are producing energy during activity.

There is some good scientific evidence to show that in at least some people with ME/CFS there are abnormalities in muscle function that are not just due to deconditioning/inactivity.

But life isn't quite so simple from the scientific point of view because muscle fatigue can also be caused by problems in the brain and nervous system (nerves to the muscles) – as it is in multiple sclerosis.

The view of most doctors is that ME/CFS could involve both brain fatigue as well as muscle fatigue – although current evidence suggests that central/brain factors are more important than peripheral/muscle factors.

WHAT ARE MUSCLE ENERGY SUPPLEMENTS?

These are naturally-occurring substances that assist in the production of energy at a cellular level, especially in muscle. All those being considered here are available as commercial products. They are normally classified as supplements rather than medicines because there is very limited evidence for making medical claims about their effectiveness in ME/CFS.

Most endorsements come in magazine and newspaper articles – not in scientific journals. Consequently, most doctors are sceptical about their value and seldom recommend their use.

Supplements discussed:
Carnitine
Co-enzyme Q10
Creatine
NADH/Enada

HOW DO THEY WORK?

Carnitine is an amino acid (protein-building) derivative that plays an important part in muscle energy production during exercise. It does so by controlling the transportation of what are called long-chain fatty acids into mitochondria – the battery-like components of cells where energy production takes place.

Co-enzyme Q10 – also known as ubidecarenone/ubiquinone – is involved in the transport of sub-atomic particles called electrons into the mitochondria and the release of energy from where it is stored in the form of ATP (adenosine triphosphate). It is also claimed to have antioxidant and cell membrane-stabilising properties.

Creatine may assist muscle function by providing a reserve source of energy in the muscle cells as well as neutralising acids that accumulate during exercise and contribute to fatigue.

NADH/Enada helps to trigger muscle energy production through the generation of ATP. It may also have an effect on the levels of important brain chemical transmitters called serotonin and dopamine – brain chemicals thought to be involved in ME/CFS.

DO THEY HELP IN ME/CFS/

As all four are involved in energy production, the simple answer is that in theory they ought to help weak muscles and exercise-induced fatigue – in many cases the most disabling aspect of ME/CFS. Unfortunately, in practice, the situation is not quite so straightforward.

These are all naturally occurring substances which we either take in through our diet, or the body manufactures internally in the liver.

But taking extra amounts of these different components of muscle energy production does not necessarily mean that muscles will perform more effectively as a result. It's rather like assuming that a malfunctioning car engine will perform more effectively if you just keep adding extra amounts of oil.

WHAT'S THE EVIDENCE THAT THEY WORK IN ME/CFS?

The best way to examine this is to (a) look for actual deficiencies in the individual substances and (b) carry out properly controlled clinical trials involving both the active supplement and a dummy (placebo) pill.

Carnitine: As far as deficiency is concerned, this is the only supplement that has been shown to be low in people with ME/CFS. This work was first carried

out by Prof Peter Behan and colleagues in Glasgow.

They found a significantly reduced concentration of total, free and short-chain carnitine in peripheral blood lymphocytes (white blood cells) in a group of ME/CFS patients when compared to healthy controls.

Behan et al concluded that low cellular concentrations of carnitines may help to explain the immunological abnormalities and impaired energy metabolism in skeletal muscles (reference: *European Journal of Neurology*, 1995, 2, 425 - 428).

Similar findings have been reported from researchers in Japan (reference: Clinical Infectious Diseases, 1994, 18, S62 - S67) and decreased acetylcarnitine up- take in the brain has also been reported from Japan (reference: *Neuroimage*, 2002, 17, 1256 - 1265).

It is interesting to note that carnitine deficiency has been reported in AIDS, hepatitis C and coeliac disease – all of which have symptoms in common with ME/CFS.

However, a more recent study funded by The MEA that examined free, total and esterified (acyl) carnitines in urine and blood plasma in more detail found no significant differences between ME/CFS patients and controls (reference: *Clinical Chimica Acta*, 2005, 361, 150 - 158)

In treatment trials, L-carnitine supplementation (at a dose of 1gm three times a day) produced statistically significant clinical improvement in 12 of the 18 studied parameters after eight weeks treatment in a small group of ME/CFS patients (reference: *Neuropsychobiology*, 1997, 35, 16 - 23).

In a more recent trial, acetylcarnitine produced a beneficial effect on mental fatigue whereas propionylcarnitine acted on general fatigue (reference: *Psychosomatic Medicine*, 2004, 66, 276 - 282)

Co-enzyme Q10: There are no published treatment trials involving the use of Co-enzyme Q10 in ME/CFS. But it has, been reported to be of benefit when used to treat a small number of specific mitochondrial muscle disorders (reference: *Neurology*, 1992, 42, 1203 - 1208). Co-enzyme Q10 seems to be much more popular in America than it is here in the UK.

Creatine: No clinical trials have been carried out involving ME/CFS.

NADH/Enada: An American trial into the use of NADH reported that eight out of 26 (31%) of ME/CFS patients responded favourably to 10mg of the supplement per day in contrast to only two out of 26 (8%) to a placebo (reference: *Annals of Allergy, Asthma and Immunology*, 1999, 82. 185 - 191).

The trial, although published in a reputable medical journal, was rightly criticised for using only a very small number of patients, a very short follow up period, and a surprisingly low response to the placebo.

In a more recent randomised trial patients were followed up for two years. Twelve who received NADH had a dramatic and statistically significant reduction in symptom scores during the first trimester. However, symptom scores in the following trimesters were similar in both active treatment and placebo groups (reference: P*R Health Science Journal*, 2004, 23, 89 - 93).

2010 MEA MANAGEMENT SURVEY RESULTS

■ Carnitine (318 reports): 2.8% greatly improved; 28% improved; 62.9% no change; 3.8% slightly worse and 2.5% much worse.

■ NADH (358 reports): 3.3% greatly improved; 16.5% improved; 63.4% no change; 12.3% slightly worse and 4.5% much worse.

■ There was no feedback on Co-enzyme Q10 or creatine.

ARE THERE ANY SIDE–EFFECTS?

■ Carnitine is generally well tolerated but can occasionally cause nausea, vomiting, stomach pains, diarrhoea and sleepiness. Body odour is also sometimes reported.

■ Co-enzyme Q10 appears to be free from serious adverse effects. It should not be taken during pregnancy or breast feeding.

■ Creatine needs to be used with caution. It can cause kidney damage if taken in high doses.

■ NADH/Enada was reported to be free from side-effects in the first American trial. However, feedback to the MEA is that over a third of users experience minor side-effects, including nausea, loss of appetite, stomach upsets and insomnia. A smaller number have reported more severe adverse effects including de-personalisation, agitation, or a major relapse in symptoms.

WHERE CAN THESE SUPPLEMENTS BE OBTAINED?

Health food stores and pharmacies stock a wide range of supplements. If not, they will usually be able to order them. They can be quite expensive and it's worth comparing prices.

If you have access to a computer, many companies sell them on-line, including well-known High Street health stores and pharmacies. But it is unlikely that a doctor would be willing to prescribe any on the NHS.

OVERALL VERDICT

Although there are some theoretical reasons why these supplements might help to boost energy production in ME/CFS, the only one to show some any promise is carnitine.

Tere isn't much evidence from clinical trials to recommend these products. However, if you want to try one, and carnitine seems the most promising, and you can afford the cost, then it may be worth doing so for a month or two to see if it makes any difference.