Scientific research has unearthed a number of physiological and biochemical abnormalities found in individuals with Chronic Fatigue Syndrome/Myalgic Encephalomyelitis.

Many of these factors such as micro-nutrient deficiencies (Co-Enzyme Q10, Functional Vitamin B12 Deficiency, Zinc etc) have been proven to correlate to the symptoms such as chronic fatigue, autonomic dysfunction, inflammation, immune system dysfunction, oxidative stress and neurocognitive symptoms typically seen in individuals with chronic fatigue syndrome.

Some of the other factors which may contribute to the pathogenesis of CFS/ME include hypothalamic-pituitary-adrenal axis dysregulation, hypocortisolism, micro-nutrient deficiencies, inflammatory/oxidative stress and nitrosative disorders, mitochondrial dysfunction, viral infections, heavy metal toxicity such as mercury and much more.

I have created this resource with a collection of some of my favorite studies and scientific research on the possible pathogenesis of CFS/ME, which may hopefully be of help to other individuals suffering from this debilitating condition.

I will continue to keep this resource updated with current studies and research as applicable. If anyone has any good research papers on CFS/ME, please share them via the comment section below and we will add them to the list.

**Mitochondrial Dysfunction & Energy Metabolism**
1. Coenzyme Q10 deficiency in myalgic encephalomyelitis/chronic fatigue syndrome (ME/CFS) is related to fatigue, autonomic and neurocognitive symptoms and is another risk factor explaining the early mortality in ME/CFS due to cardiovascular disorder.


2. Does Oral Coenzyme Q_{10} Plus NADH Supplementation Improve Fatigue and Biochemical Parameters in Chronic Fatigue Syndrome?

http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4346380/

3. Chronic fatigue syndrome and mitochondrial dysfunction

http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2680051/

4. Mitochondrial dysfunction and the pathophysiology of Myalgic Encephalomyelitis/Chronic Fatigue Syndrome (ME/CFS).


5. Targeting mitochondrial dysfunction in the treatment of Myalgic Encephalomyelitis/Chronic Fatigue Syndrome (ME/CFS) – a clinical audit.


**Hypothalamic-Pituitary-Adrenal-Axis Dysregulation, Hypo-Cortisolism & Neuro-Endocrinology**

1. The role of hypocortisolism in chronic fatigue syndrome.

2. Hypocortisolism: An Evidence-based Review

http://www.mmimedicine.com/assets/pdf/IntResources1IMCJ_10_4_p26-33_Hypocortisolism_3.pdf

3. A Review of Hypothalamic-Pituitary-Adrenal Axis Function in Chronic Fatigue Syndrome

http://www.hindawi.com/journals/isrn/2013/784520/


5. Evidence for and pathophysiologic implications of hypothalamic-pituitary-adrenal axis dysregulation in fibromyalgia and chronic fatigue syndrome.


6. The HPA axis and the genesis of chronic fatigue syndrome.


7. The neuroendocrinology of chronic fatigue syndrome and fibromyalgia.


**Nutrient Deficiencies**

1. Increased concentrations of homocysteine in the cerebrospinal fluid in patients with fibromyalgia and chronic fatigue syndrome. (Vitamin B12 Deficiency)


2. Lower serum zinc in Chronic Fatigue Syndrome (CFS): relationships to immune dysfunctions and relevance for the oxidative stress status in CFS.


3. Vitamin B status in patients with chronic fatigue syndrome.
4. Multivitamin mineral supplementation in patients with chronic fatigue syndrome
http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3907507/

5. Association between vitamin D status and markers of vascular health in patients with chronic fatigue syndrome/myalgic encephalomyelitis (CFS/ME)

6. In chronic fatigue syndrome, the decreased levels of omega-3 poly-unsaturated fatty acids are related to lowered serum zinc and defects in T cell activation.

**Oxidative Stress, Anti-oxidants & Glutathione**

1. Increased ventricular lactate in chronic fatigue syndrome. III. Relationships to cortical glutathione and clinical symptoms implicate oxidative stress in disorder pathophysiology.

2. Oxidative stress levels are raised in chronic fatigue syndrome and are associated with clinical symptoms.

3. Chronic fatigue syndrome: oxidative stress and dietary modifications.
Inflammation

1. Neuroinflammation in Patients with Chronic Fatigue Syndrome/Myalgic Encephalomyelitis: An \(^{11}\text{C}-\text{(R)}\)-PK11195 PET Study.


2. Gut inflammation in chronic fatigue syndrome.


3. Normalization of leaky gut in chronic fatigue syndrome (CFS) is accompanied by a clinical improvement: effects of age, duration of illness and the translocation of LPS from gram-negative bacteria.


Alternative Therapy & Potential Treatments

1. Possible use of repeated cold stress for reducing fatigue in chronic fatigue syndrome: a hypothesis

http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2164952/


3. Therapeutic effects of oral NADH on the symptoms of patients with chronic fatigue syndrome.
4. A randomized, double-blind, placebo-controlled pilot study of a probiotic in emotional symptoms of chronic fatigue syndrome

http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2664325/

5. Green tea extract and catechin ameliorate chronic fatigue-induced oxidative stress in mice.


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