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FIBROMYALGIA SYNDROME

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Fibromyalgia Syndrome (FMS) is a clinical state of chronic, widespread musculoskeletal pain, stiffness, and fatigue. The term "fibromyalgia" means pain in the fibrous tissues (muscles, ligaments, tendons). It is a technical way of saying, "it hurts all over." FMS used to be called fibrositis, implying inflammation of muscles, but this is not the case. And, it is group of related symptoms and signs, not simply a musculoskeletal disorder.

FMS is common, affecting at least 2 to 5% of the population (some studies find 7 to 10.5%) and is underdiagnosed as a cause of achiness, chronic fatigue, irritability, cognitive dysfunction (thinking or memory impairment), and sleep disorder. Most sufferers ache all over. Their muscles may feel pulled or overworked. Sometimes muscles twitch or burn; other times there is throbbing, shooting and stabbing pain. Frequently the pain and stiffness are worse in the morning, and discomfort may be more intense in muscle groups used repetitively. Some days the pain may be minimal and on others it may be unbearable.

The criteria for diagnosing FMS was established by the American College of Rheumatology in 1990. Chronic and diffuse pain lasting at least three months must occur in a minimum of 11 out of **18** tender or soft tissue trigger point sites. Pain occurs with finger pressure (maximum 4 kg of pressure). Absence of synovitis (inflammation of synovial membrane lining joint capsules), pain in the left side of the body, pain in the right side of the body, pain above the waist, and pain below the waist must all be present. There is axial skeletal pain in the cervical spine or anterior chest or thoracic spine or low back.

The syndrome strikes far more women than men – more than 80% in most reported studies – typically between 30 and 60 years of age, though greater prevalence is sometimes found in women between 60 and 79. In addition to muscular pain, aching and/or stiffness, other common symptoms – "without any definite causal relationship" – include:

- Fatigue, ranging from mild to incapacitating. "Many people have chronic fatigue or chronic pain that can't be explained."
- Disturbed sleep affects nearly 100%. Often there is EEG (recording of electrical activity of brain) evidence of disturbed stage 4 non-rapid eye movement sleep with a burst of alpha activity correlating with symptoms of fatigue and aching. This means FMS patients fall asleep without much trouble, but their deep level sleep is constantly interrupted by bursts of awake-like brain activity. Sleep is not refreshing. Some victims have other sleep disorders such as sleep apnea, sleep myoclonus (nighttime jerking of arms and legs), restless leg syndrome, and bruxism (grinding of teeth).
- Symptoms worsen in cold or humid weather or in drafty environments (almost 100%).
- A history of injury or trauma within the year prior to the start of symptoms (nearly 100%).
- Depression (70 to 100%).
- Irritable bowel syndrome (34 to 73%). Constipation and/or diarrhea, frequent abdominal pain, intestinal "gas," and nausea may be present.
- Chronic headaches, recurrent migraine or non-migraine (tension-type), 25 to 60%.
- Temporomandibular joint dysfunction syndrome (TMJ) in about 25%, though it appears to be related to the muscles and ligaments surrounding the joint rather than the joint itself.
- Raynaud's phenomenon (30 to 50%), with pallor, cyanosis (bluish discoloration), then redness of fingers or toes initiated by exposure to cold or emotional disturbance. Numbness, tingling, and burning may occur.
- Anxiety in about 24%.
- Sicca syndrome (dry eyes and/or mouth), 18%.
- Osteoarthritis 12%, rheumatoid arthritis 7%.

Other ailments may be linked with FMS such as "allergies," chronic rhinitis, hypothyroidism, hair loss, premenstrual syndrome, painful menses, digestive disturbances, easy bruising, cognitive or memory impairment ("brain fog"), dizziness, irritability, mood swings, panic attacks, phobias, numbness and tingling sensations, impaired

coordination, irritable bladder, the feeling of swollen extremities, skin sensitivities.

The cause of FMS "remains elusive" and medical classification "lacks both explanatory power and therapeutic implications." Medical research finds no pathophysiology – no disease to explain it -- and no way to cure it. Palliative treatment is the best they can offer. Statements such as "you have to learn to live with it," and "it's all in your head," is the worst they can offer.

Antidepressants, muscle relaxants, analgesics (such as ibuprofen and other non-steroidal anti-inflammatory drugs) are frequently prescribed but offer only temporary masking relief. Injections of lidocaine at tender points numbs pain for a brief time. Drugs that boost serotonin levels (e.g., Elavil, Flexeril, Sinequan, Prozac, Xanax, Klonopin) are common recommendations though they have objectionable side effects and are not a solution. "Most patients, however, will probably need to use other treatment methods as well," such as physical therapy, relaxation techniques, acupunture, acupressure, chiropractic or osteopathic manipulation, a gentle exercise program.

Among theories for the cause is autoimmune dysfunction via an "acute infectious febrile illness which then disturbs the physiologic sleep-regulating mechanism." But there is no concrete evidence for a "virus" or micro-organism etiology. All the patients in one study reported upper respiratory inflammation and associated neurological symptoms (signs of flu) prior to onset of FMS. Yet innumerable people have flu symptoms without developing FMS.

More evidence points to aberrations of the nervous system (both peripheral and central) for the majority of symptoms rather than an intrinsic or structural muscle abnormality. Low muscle oxygenation level, reduction in high-energy phosphate compounds (a muscle power source), increased fluid content, elevated numbers of mast cells, and low exercise capacity of the muscles are "of relevance." Data indicate these alterations in muscles are probably occurring in response to changes in the nervous system. Nerves can tense muscles, create pain, constrict blood vessels (Raynaud's) and intestinal muscles, disturb sleep, and so on.

Substance P, a neurotransmitter (chemical messenger) in pain reaction is markedly elevated in the spinal fluid of FMS patients. Cause or effect? Not yet known. Serotonin (another neurotransmitter) "may have a pivotal role " Serotonin does help modulate sleep, pain, and immune system function, but nothing definite has been elucidated. Neurohormonal dysregulation (involving hormones such as ACTH, GH, vasopressin, oxytocin), metabolic and energetic dysfunction, disorders of REM sleep, and reactive psychopathology have all been suggested.. Another hypothesis is "pain amplification syndrome," exaggerated response to internal and external stimuli. A frequent theme is "dysfunction in neuroimmune hormonal feedback-controlled system" – a combination involving nerve, hormone, and immune systems. Still, no consensus has been reached.

It **IS** known that other diagnoses are very similar or identical to fibromyalgia such as: reflex sympathetic distrophy, polymyalgia, rheumatica, myofascitis, myofascial pain syndrome, and **especially** certain cases of **chronic fatigue syndrome (CFS)** and **multiple chemical sensitivity (MCS)**. There is an "extensive overlap, if not identity" between CFS, MCS, and FMS. All three are chronic, relapsing conditions for which long-lasting response to medical treatment is extremely rare. Researchers admit that "patients with chronic fatigue syndrome commonly satisfy criteria for the diagnosis of fibromyalgia (and visa versa) " [i]

NERVES AND MUSCLES

Normally, the only mechanism by which skeletal muscle is activated involves stimulation of nerve fibers (motor neurons). At the axon terminals (nerve fiber ends) of a motor neuron are vesicles which contain *acetylcholine* (ACh) – the chemical transmitter of nerve impulses. **Calcium** triggers the release of ACh from the vesicles into the cleft separating the nerve end and muscle fiber. The ACh binds to receptor sites and this opens ion channels. More sodium moves in than potassium out, producing local depolarization (neutralization) of the motor endplate. The enzyme *acetylcholinesterase* breaks down ACh, the depolarized endplate returns to its resting potential, and can then respond to a new burst of ACh.

However, "there are many ways events at the neruomuscular junction can be modified by disease or drugs" – or other poisons or toxic substances or nutritional deficiencies. For example, neuromuscular transmission can be blocked by inhibiting acetylcholinesterase. Some organophosphates – the main ingredients of certain pesticides – inhibit this enzyme. Thus ACh is released normally and binds to receptors, but it is not destroyed and depolarization is maintained. Symptoms can include muscle pain, cramping, muscle

twitching, fatigue, difficulty walking, weakness, difficulty concentrating, and more.

Sustained muscle contraction can occur if a fiber is repeatedly stimulated at a frequency that prevents complete relaxation between stimuli. Such maintained contraction is **tetany**. Deficits of ionizable (free) calcium or nutrients required for calcium utilization (e.g. vitamin D complex, essential fatty acids, magnesium, vitamins A, C, and E complexes), predisposes to tetany.

ATP (adenosine triphosphate) is the biochemical carrier of free **energy**. "In no other cell type does the rate of ATP breakdown increase so much from one moment to the next as in a skeletal-muscle fiber when it goes from rest to a state of contractile activity." There are three ways a muscle fiber can form ATP when contracting:

1. Phosphorylation of ADP (adenosine diphosphate) by **creatine phosphate**. This is a very rapid means of forming ATP at the onset of contractile activity, but the amount of ATP that can be formed is limited by the initial concentration of creatine phosphate.

2. Oxidative phosphorylation of ADP in the mitochondria (organelles that are the source of energy in cells). With moderate exercise or contraction, most ATP is formed by this method. During the first 5 to 10 minutes, the muscle's own store of glycogen (storage form of carbohydrate) is the major fuel consumed. For the next 30 minutes or so, **blood-borne fuels** become dominant – glucose and fatty acids both contributing to the **oxygen** consumption of the muscle. Beyond this period, fatty acids become progressively more important. ATP production may be limited by: a) the **quantity of oxygen** delivered by the blood, b) the quantity of fuel molecules (**nutrients**) delivered by the blood, and c) the rates at which the **enzymes** in the metabolic pathways can process the fuel molecules. This pathway is relatively slow.

3. When the level of exercise (contraction) exceeds about 70% of the maximal rate of ATP breakdown, **glycolysis** begins to contribute an increasingly significant amount of ATP. This glycolytic pathway can produce large quantities of ATP rapidly **when enough enzymes and substrate** (in this case glucose) are available, and can do so in the absence of oxygen. The glucose can be obtained from the blood or the stores of glycogen within the muscle fibers.

At the end of muscle activity, creatine phosphate and glycogen levels in the muscle are decreased and must be replaced. Both processes require **energy**, so the muscle continues to consume increased amounts of **oxygen** for some time after it has ceased to contract. All the above indicate a need for: healthy nerve tissue, good nerve transmission, ionized calcium, acetylcholine (requires choline), functional acetylcholinesterase and other enzymes, adequate supplies of glucose, fatty acids, and other nutrients associated with glucose and fatty acid metabolism, as well as plenty of available oxygen.

GLUCOSE METABOLISM

Carbohydrates in foods – starches in vegetables and grains, sugars in fruits, vegetables, milk, honey, etc. – are dietary sources of glucose. Glycogen is the storage form of glucose in the tissues, including muscle tissues. Stored glycogen is converted to glucose or glucose-6-phosphate by enzymes present within the cells of the tissues. Glucose is the major fuel of the body. It is rich in energy and it can normally be quickly mobilized from glycogen stores when sudden demands for energy are made.

Once glucose is absorbed and in general circulation, the first major tissue to have the opportunity to remove it from portal blood is the **liver**. When blood glucose is too high, the liver removes it from the blood (by glycogenesis and glycolysis). When blood glucose is too low, the liver supplies the blood with glucose (glycogenolysis and glyconeogenesis). The cells of the liver are involved in the greatest number of ways with glucose metabolism. Since glucose is used for glycogen synthesis, glycogen storage is an important feature of the liver. Glucose can be used in the glucoronic acid pathway, important to detoxification of bilirubin, drugs, or any other poison or toxic substance presented into the body. If there is toxic overload or sensitivities develop, the liver's functions can be affected including glucose metabolism.

Glucose is metabolized (processed) differently in various cells. **Muscle cells** utilize glucose by glycolysis to give pyruvate and lactate. Glycoysis ("sugar dissolution") is the process by which the glucose molecule is enzymatically degraded to yield two molecules of pyruvate During the sequential reactions of glycolysis much of the free energy released from glucose is conserved in the form of ATP. Two important routes are taken by the pyruvate after glycolysis. In **aerobic oxidation**, the pyruvate is oxidized to form the acetyl group of acetyl-coenzyme A (acetyl CoA). Then the acetyl group is oxidized completely to carbon dioxide and water by the

citric acid cycle with the intervention of *oxygen*. In this complicated reaction, at least three enzymes and five coenzyme groups are involved. **Thiamin** (as thiamin pyrophosphate), **riboflavin** (as flavin adenine dinucleotide), **niacinamide** (as nicotinamide adenine dinucleotide), **panto-thenic acid** (as a component of coenzyme A), and **lipoic acid** (a fat-soluble, sulfur-containing substance which "functions in the same manner as many of the B complex vitamins") all play essential roles. Thus, for example, thiamin-deficient individuals are unable to oxidize pyruvate normally. Defective function of the enzyme *pyruvate dehydrogenase* can result in polyneuritis (inflamed nerves) or **generalized malfunction of the motor nervous system**.

The second pathway of pyruvate is its reduction to lactate by **anaerobic glycosis**. With extreme muscular activity – like a 100-yard sprint or sustained contraction – oxygen cannot be carried to the muscles fast enough to oxidize pyruvate any further for generating ATP. Instead, the muscles use their stored glycogen as fuel to generate ATP by anaerobic glycolysis with production of lactate as the end product. ATP levels can usually be maintained for a short period of time, but then decrease. In a sprint, the lactate in the blood builds up to higher concentrations. Slowly it is converted back into glucose by the **liver** during rest and oxygen is consumed at a gradually diminishing rate, repaying the oxygen debt. Anything that interferes with proper circulation can reduce available oxygen.

Much more ATP – much more energy – is produced in the complete oxidation of glucose to carbon dioxide and water than in the conversion of glucose to lactate. The whole process involving oxygen consumption and carbon dioxide formation by cells is **cell respiration**. The fate of pyruvate, then, depends crucially on the **oxidation state** of the cell. Skeletal muscle, which derives most of its energy from **respiration** when at rest, relies heavily on glycolysis during exertion -- or sustained contraction – when glycogen stores are rapidly broken down, or mobilized. Normally, the lactate produced is transported through the bloodstream to highly aerobic tissues such as the heart and the **liver**. However, if lactate is produced in large quantities, it cannot be readily consumed. Then the blood pH falls and oxygen supplies to the tissues need to be increased. [ii]

FMS AND BIOCHEMISTRY

The following findings in fibromyalgia patients are clues involving aspects of the above review:

1. There is **increased** pyruvate and **decreased** lactate production. ATP and muscular isoenzymes *lactic dehydrogenase* (important in catalyzing the oxidation of lactate) are reduced. These findings suggest "biochemical abnormalities" in blood sugar metabolism, particularly glycolysis -- the breakdown of stored sugar to either pyruvate or lactate. 2. Muscle **oxygenation** is abnormal or low, at least in the trigger point areas of the muscles.

Possible implications of these findings include:

- Deficiency of the **vitamin B complex** and its associated nutrients, involving thiamine, riboflavin, niacinamide, pantothenic acid, pyridoxine and other B factors; **chromium** (important to glucose metabolism; a deficit can result in reduced peripheral tissue sensitivity to glucose), **manganese** (the trace mineral activator of B complex, a requirement by the liver for its "finishing touches" on glucose, needed by connective tissue for strength and function), **zinc** (released by the pancreas with insulin, essential to immune system mechanisms), and more.

Without these nutritional factors, pyruvate cannot be properly oxidized, can accumulate on and irritate nerve endings. Muscle soreness is a common result. Fatigue, exhaustion, weakness, sleep disturbances, depression, anxiety, irritable bowels, digestive disturbances, headaches, numbness, tingling, lightheadedness and dizziness, are among the symptoms of a vitamin B complex deficiency syndrome. Increased homocysteine levels have been associated with the degree of fatigability in FMS patients. Deficits of folic acid, vitamin B12, pyridoxine, and other B complex components are associated with elevated homocysteine.

- Deficits of calcium, magnesium, potassium, choline, inositol, essential fatty acids, fat-soluble vitamin complexes (A, D, E, and K), and other nutritients needed can impair neuromuscular function.

The irritability of the neuromuscular system largely depends upon a balance and adequate supply of calcium, magnesium, potassium, and sodium. Calcium and magnesium are directly involved in striated and smooth muscle contraction. A lack of adequate **calcium** can result in twitchings and tetany of skeletal muscles. Passage of nerve impulses across the

myoneural junctions depends upon calcium. Neurotransmitters affected by calcium include serotonin, acetylcholine, and norepinephrine. Calcium activates the enzyme which triggers the breakdown of glycogen for energy production. In the presence of calcium, *adenosine triphosphatase* is activated to hydrolyze ATP for muscle contraction. **Magnesium** is a cofactor in decarboxylation of pyruvate and is required for oxidative phosphorylation in the production of ATP. Magnesium functions in muscle relaxation and neuromuscular transmission and activity. Inadequate supplies may result in tetany similar to that of calcium deficiency. One study found 12 out of 13 FMS patients had low red blood cell magnesium levels. **Potassium** is important in muscle contraction and nerve transmission. Glycogen formation and glucose catabolism, protein and carbohydrate metabolism are all potassium dependent.

Choline and **inositol** not only play vital roles in liver function, but also in transmission of nerve impulses. **Vitamin A complex** is necessary for development of skeletal and soft tissues (such as muscle), in inflammation and repair processes, and other immune system mechanisms. **Vitamin C complex** is supportive to inflammation, repair and – due to its function of maintaining collagen – is essential for connective tissue formation and integrity. It protects the brain and spinal cord and is needed for adrenal gland function. **Vitamin D** aids absorption of calcium, the breakdown and assimilation of phosphorus, and is valuable in maintaining a stable nervous system. **Vitamin E** protects vitamin B and C complexes, and essential fatty acids from oxidation. It plays an important role in cellular respiration of all muscles, especially cardiac and skeletal, making it possible for muscles and their nerves to function with less oxygen, thereby increasing endurance and stamina. Vitamin E prevents adrenal and pituitary hormones from oxidation and promotes proper functioning of linoleic acid. It may be involved in calcium metabolism. **Vitamin K** is involved in phosphorylation in which phosphate, when combined with glucose, is passed through the cell membranes and converted into glycogen. It is also vital for normal liver function. A deficiency depresses calcium transport.

- **Liver stress,** often from toxic accumulations, can affect glucose metabolism, the conversion of fats and fat-soluble vitamins, conjugation of hormones (including adrenal, thyroid, ovarian, testicular), energy levels, and much more. A deficit of the "Wulzen" or "antistiffness" factor (as found in raw milk, whole sugar cane) can result in a decrease of anaerobic glycolysis by the liver and a decrease in the respiratory rate of muscle tissue.

- Interference with **oxygen availability** for utilization by muscle tissues. Biochemical and medical studies find there is inadequate oxygen in the blood -- so inadequate supplies for muscles -- in persons with FMS. This could suggest some poison or toxic buildup and interference. Also, many nutrients can play roles.

The vitamin B, E, and complexes; a number of minerals including potassium, magnesium, selenium, calcium, organic copper, and others; all amino acids in a biologically active form; coenzyme Q (1-10), cytochromes (pigments important to cellular respiration); phosphorylative enzymes and myoglobin (proteins); unimpaired fatty acid metabolism – all are required along with oxygen, hydrogen, adequate glycolysis, and unimpaired citric acid cycling for the provision of energy for muscle work, muscle repair, and muscle tone.

One example: Cellular assimilation of oxygen is only possible by reason of the presence of unsaturated fatty acids. A major reason for oxygen starvation at the cellular level is rancid or altered fats and oils ingested. These destroy the body's stores of vitamin E so the cellular demand for oxygen can rise 250%! Fresh, natural, unaltered, essential fatty acids (EFAs) from foods are like oxygen "magnets" that pull oxygen into the body, make oxygen available to the tissues by activating or opening oxygen molecules via processes regulated by sulfur-containing proteins. *Trans*-fatty acids -- produced by high temperatures and hydrogenation (frying, pasteurization, refined oils, margarine, shortening, partially hydrogenated oils, etc.) – interfere with the production and function of prostaglandins that regulate muscle tone, inflammation response, and immune system competence. Processed, altered, rancid, fried, hydrogenated, and fats and oils interfere with natural cell functions, inhibit cell oxidation (respiration) and energy levels, may injure cell membranes and tissues, require a lot of energy to process and use up energies in immune defense reactions.

EFAs and sulfur-rich proteins work together to help fatigued muscle recover rapidly from exertion, to restart oxidation when it is low. Natural fats regulate oxidation rate, metabolic rate, and energy production in all cells. Omega-3 fatty acids, often deficient, are needed to

increase stamina, aid recovery from fatigue after muscle use, help healing of muscle and blood vessel and nerve tissues.

Dr. Johanna Budwig claims that fat droplets found in muscle cells are the only microscopic feature that distinguishes rheumatic cells from normal cells. According to her, these fats distort cells, irritating nerve endings and causing pain. The fat droplets, she says, contain saturated or altered "unreactive" fats that are unable to take part in cells' metabolic activity. Unnatural, altered fats in the diet cannot be properly used by the body, so Dr. Budwig feels that they are "dumped" somewhere. In rheumatic-type illnesses (pain, soreness, stiffness, inflammation of muscles), that place is the muscles. Altered fats, along with nutrient deficiencies and the presence of other toxic molecules, can worsen reactions to chemical poisons and even certain foods.

- Interference with, alteration of, or disruption of proper **enzyme** function. Many poisons and toxic substances have this capacity including fluoride, aluminum, mercury, lead, cadmium, organochlorine pesticides, and more.

"Many different toxic chemicals, additives, preservatives, pesticides, and chlorinated hydrocarbons may cause vitamin, amino acid, lipid [fats], enzyme, and mineral depletion that results in a selectively nutritionally depleted individual." Biochemical individuality determines an individual's unique response to pollutant exposure, depending on nutritional status, detoxification parameters, inherited tendencies, amount and type of pollutant insults, etc., that the person is equipped to handle. Not only the individual's ability to process noxious substances (including accumulation over the years) but the intensity of reaction to toxic exposures and susceptibility to chemicals is specific. Thus, while a group of people may be exposed to the same pollutant, one person may develop sinusitis, one asthma, one cystitis, one arthritis, one FMS, and one may appear to be unaffected.

- **Stress** is apparently a significant player in FMS. Individuals will differ in response to amounts and types of stress whether physical, chemical, nutritional, thermal, emotional, mental. The adrenal or "stress" glands are often the first glands to be overwhelmed, so adrenal fatigue may be common. The thyroid gland is particularly sensitive to many toxic insults, so imbalances there may be noted.

- Taking **isolated, fractionated, or synthetic vitamins, single minerals or amino acids** – especially in large amounts – can create biochemical imbalances which are worse than deficiencies. Such a pharmacological approach may contribute to the problem.

For example, there is such a close inter-relationship among B vitamins that deficiencies of a single part of the complex are rare (and usually exogenously induced). Large doses of one member of the B complex can create imbalance and precipitate deficiency of (increase requirements for) other members of the complex. The entire, intact food complex is required for biochemical balance and is crucial to function. The natural coenzymatic B_1 is thiamine pyrophosphate. Most B vitamin supplements contain synthetic forms of thiamin, produced from petrochemicals or other non-food elements. Synthetic forms of thiamin cannot be properly processed or used, cannot be converted into the bioactive coenzyme form which is essential to the preparation of pyruvate for entering the citric acid cycle.. The natural coenzyme form – always found with the rest of the components of the complex – is the **only** kind the body can use in biochemical reactions. The same holds true of any other nutrient. [iii]

TOXIC INSULTS

A study focusing on "immunoreactant exposure" (poisons, toxic substances, individual sensitivities) that would disrupt the "neuroimmune hormonal feedback-controlled system" (nervous/immune/endocrine gland systems) found FMS patients had many reactions to environmental agents, food additives, other chemicals, and some foods.

For example, 42.5% of the participants reacted to monsodium glutamate (MSG), 37% to food colorings, 37% to cola beverages, 22.5% to sulfite/metabisulfite, 20% to aspartame, 20% to BHA (a chemical preservative), 20% to cadmium, 20% to lead, 20% to Tylenol, etc. Many of the foods that caused reactions either contained refined sugars (e.g., chocolate, cocoa, cola), are altered from their natural state (e.g., pasteurized milk), or commonly contain pesticide or other chemical residues.

To single out an example, the FDA has received more than 10,000 consumer complaints regarding the artificial sweetener, **aspartame** (NutraSweet, Equal, Crystal Light). Among the common complaints are "fibromyalgia-type symptoms," muscle spasms, headaches, depression, loss of memory, irritability, anxiety,

chronic fatigue, insomnia, loss of equlibrium, tinnitis, and much more. One physician reported two cases of back or side pains from ingestion of aspartame. When aspartame was avoided, the pain disappeared. When aspartame was reintroduced, the pain returned.

Aspartame is one of many chemical compounds that can disturb serotonin levels in the brain. Decreased levels can result in depression, headaches, sleep disturbances, increased sensitivity to pain, and other symptoms. It is thus noteworthy that use of 5-hydroxyl-L-tryophan (5-HTP) **pharmacologically** in doses of 100 milligrams three times a day has been used to treat FMS. 5-HTP stimulates the elevation of serotonin levels (a drug effect). Significant improvements have been reported in the number of tender points, pain intensity, quality of sleep, anxiety, and fatigue. Almost 50% of patients experience "good" or "fair" response. About 30% report side effects. A nutritional approach with food complex supplements and dietary improvements may bring even better results without side effects.

"Environmental influences on disease states of the musculoskeletal system are beginning to be recognized by most physicians. For example, environmental causes of fibromyalgia from solvent exposure or silicon implants have been described." Chemical poisons frequently emerge as contributors to FMS. Approximately 40% of the body is skeletal muscle. So pollutant injury to this system can have serious consequences, especially for people who are chemically sensitive. "Involvement may include chronic fatigue, fibromyalgia, arthralgia [joint pain], or simple, fleeting aches and pains." A wide range of "pollutant-influenced" effects can occur in the musculoskeletal system.

William J. Rea, M.D., Environmental Health Center in Dallas, states: "We have seen many chemically sensitive patients with myalgia [muscle pain] and fatigue that resulted from pollutant exposure. They frequently complain of a flu-like syndrome with muscle aches and pains. The muscles are extremely tender to palpation." Invariably, multiple triggers (toxins, chemicals, inhalants, etc.) are identified. "In addition, nutritional deficiencies are frequently discovered" which may be clinical in degree and nature. Subclinical deficiencies no doubt exist in all sufferers. These deficits can preclude and intensify multiple chemical sensitivity. Pollutant exposure can deplete nutrient supplies.

Although the cause of primary fibromyalgia "is not known," evidence is accumulating for "environmental triggers." Chemicals such as organochlorine and organophosphate pesticides as well as foods (which may contain pesticide residues) have been linked with FMS in several studies. Stiffness and pain has rapidly cleared in patients once the triggering agents are identified and eliminated – and return with re-exposure. "These patients do extremely well over long-term follow up of 5 years, remaining free of their symptoms without medications as long as they avoid their triggering agents." Supportive nutritional assistance – including detoxification and a diet of whole, natural, organically-produced foods as well as quality food supplements – may reduce some or most sensitivities to some level of tolerance for the chemical triggers.

Extreme inactivity increases glycogen and possibly its accumulation in the liver or muscles, particularly if glycolysis is already impaired. Exercise decreases glycogen reserves. No wonder exercise (particularly aerobic) is one of the most effective treatments for FMS! Active individuals lower their disability and improve the speed of their recovery.

Pollutant injury increases the demand for glucose at least 2 to 3 times. This increased demand over a long term strains liver metabolism and can create food cravings as well as sudden episodes of weakness in a chemically sensitive person.

Other biochemical disruptions can occur from pollutant injury such as: Disturbances of nucleic acids may occur, which can affect ATP production. Pyruvate is a precursor for structures which, with other compounds, form a "metabolic pool" fed by small molecular breakdown products to supply "building stones" common to carbohydrates, proteins, and fats. Pollutant injury to these links can cause subtle disturbances in metabolism that result in both over- and underactivity. "Often food intolerance occurs in the chemically sensitive individual due to this malfunctioning metabolism."

During the body's efforts (especially by the liver) for detoxification, many pollutants can infringe upon, or travel through the citric acid cycle, the main pathway by which proteins, carbohydrates, and fats are utilized. Overload of these pathways can cause various reactions and even food intolerance. The citric acid cycle cannot function as efficiently as it should. "Since pollutants can damage the availability of vitamins, minerals, and amino acids in many ways, this whole cycle is vulnerable to pollutant overload."

One study explored similarities and differences among patients diagnosed with chronic fatigue syndrome (CFS), fibromyalgia (FM), and multiple chemical sensitivity (MCS). Patients with either CFS or FM "frequently" reported symptoms consistent with MCS. Poisoning of one sort or another is apparently a cause and component in the FMS puzzle. [iv]

CONCLUSION

Although the exact causes of FMS have not been completely or specifically identified, a basic equation is becoming clear: Chronic malnutrition + foul-nutrition + chronic poisoning = FMS. This general equation is implicated in many modern-day maladies. The specific components involved and biochemical individuality (susceptibility) usually determine the type of illness manifested.

For FMS, nutritional considerations may include support to detoxification, adequate vitamin B complex, other vitamin complexes including A, C, and E; minerals (calcium, magnesium, zinc, potassium, chromium, selenium, manganese, and others), essential fatty acids, chlorophyll, total protein. Adrenal support for some and thyroid support for others may be helpful.

Foul nutrition can include refined sugars, artificial sweeteners, refined flours and any other refined or processed "non-foods." Rancid and otherwise altered fats, artificial fats such as Olestra, also fit the definition. Most such items – beyond being toxic due to denaturation, alteration, and nutrient-stripping – also contain chemical additives as preservatives, artificial colors and flavors, MSG, etc. They may be "enriched" or "fortified" with synthetic or isolated nonfood "vitamins" and minerals which cannot be used nutritionally but can disrupt.

Pesticide residues occur in most commercially raised and produced foods. Animal products contain higher amounts of pesticide residues (particularly in the fats) as well as drug and hormone residues. Irradiation produces toxic by-products in foods. Aluminum, fluoride, chlorine, pesticides, and other chemical poisons appear in water used for drinking and cooking. Environmental pollutants are common in homes and places of business.

If possible, chemical sensitivities should be identified. The diet should be cleaned up and only natural, whole, and – whenever possible – organically raised foods should be eaten. Water should be free of contaminants. Synthetic vitamins and other non-food, fractionated "nutriceuticals" should be avoided. Food complex supplements along with a wholesome diet will aid in reestablishing physiological and biochemical equilibrium. Regular, moderate exercise and reduction of stress are positive adjuncts along with chiropractic treatment, massage therapy, or acupuncture. FMS may **not** be a diagnosis which condemns an individual to a life of discomfort, fatigue, and woe. There is much that can be done towards recuperation and recovery!

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