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Multiple Chemical Sensitivity (MCS) and Electromagnetic Hypersensitivity (EHS): An Introduction to Environmental Illness

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Abstract

Multiple chemical sensitivity (MCS) and electromagnetic hypersensitivity are disabling conditions hallmarked by adverse reactions to chemicals and electromagnetic frequencies at levels generally considered safe. MCS is underpinned by a vicious cycle of escalating sensitivity initiated by exposure to seven classes of neurotoxicants. Our case study concerns a family sensitized to foods, chemicals and electromagnetic radiation after heavy exposure to phenoxy herbicides and organophosphate pesticides. Also addressed are a number of conditions frequently co-morbid with MCS, which also frequently involve an environmental sensitivity component-which include migraine, rheumatoid arthritis, irritable bowel syndrome, ADHD, hypertension and certain cardiac problems.

Keywords: Multiple chemical sensitivity; Electromagnetic hypersensitivity; Target organ; Neurotoxicants-N-methyl-D-aspartate (NMDA); Nitricoxide

Introduction

Multiple chemical sensitivity (MCS) and electromagnetic hypersensitivity (EHS) are disabling medical conditions with ramifications for not only affected individuals and their families but for wider society as well. Sensitised individuals react adversely to everyday chemicals and/or electromagnetic frequencies at levels customarily considered innocuous; indeed, their reactive threshold may be orders of magnitude below the norm. In one instance the difference in electromagnetic sensitivity was estimated at 10^{10} [3]. This woman also reacted to minute traces of lemon oils picked up by a family member; he had merely been in a room with a bowl of lemons, yet hyperosmia-a hallmark of MCS-allowed her to detect their presence, and hypersensitivity to react to it.

The term MCS encompasses sensitivity to both synthetic petrochemical derivatives and natural chemicals such as food fractions (salicylates, amines etc.), moulds and terpenes [1]. Concomitant EHS may involve hypersensitivity to a diverse range of frequencies [6]. Mobile phones and Wi-Fiare, however, problematic for many. The worst affected MCS and EHS patients may also develop photosensitivity, reacting not dermatological but neurologically with symptoms such as seizures and burning pain so severe that they are forced to live in darkness [11].

Sensitisation is a multi-step process involving an initiating exposure to neurotoxicants with subsequent escalating hypersensitivity to numerous structurally unrelated substances (the spreading phenomenon) [1]. Any system or organ of the body may be the target for a food, chemical, inhalant or EHS reaction. If the respiratory system is involved, reactions may manifest as asthma or bronchitis. If the cardiovascular system is targeted, heart arrhythmias, angina, oedema, hypertension and vacuities may be the outcome. Gastrointestinal involvement will result in vomiting, diarrhoea, bowel spasms or colitis; genitourinary, in cystitis; dermatological, in eczema, urticaria, or dermatitis; ENT, in non-allergenic rhinitis, glue ear, tinnitus, or Menière's disease; ophthalmological, in conjunctivitis, corneal ulcer, nystagmus, blurred vision; and so on. And should the brain be the target organ, then thought processes, mood, cognitive function and behaviour may be disrupted.

To meet the case criteria for a diagnosis of MCS, not only must there be reactivity to multiple chemically unrelated substances but multiple organ involvement as well ("Multiple chemical sensitivity...", 1999). The following case study is typical of those reported the developed world over-typical in the nature of the initiating exposure, the nature of subsequent reactions and triggers, and in the time lag between symptom onset and eventual diagnosis.

The family's health problems began soon after they moved to a rural property. Previously healthy, all members succumbed to numerous, seemingly unrelated conditions. The father, then 31, developed dermatitis, rheumatoid arthritis and asthma. The mother, 26, experienced blinding headaches, depression, fatigue, visual disturbances, tinnitus, recurring cystitis, menstrual

hemorrhaging, seizures, chronic pain, heart arrhythmias and peripheral neuropathy that progressed to paraplegia. Son # 1, 21 months, and Son # 2, 7 months, developed frequent infections, vomiting, and haemorrhagicdiarrhoea. Son # 3, conceived and born on the farm, was ill from birth, plagued by the same constant infections and haemorrhagicdiarrhoea, inability to digest food, growth retardation, and spontaneous bruising and bleeding. Son # 1 went on to develop ADHD, tachycardia and asthma, and Son # 2, chronic fatigue syndrome (CFS), and migraine [11].

Years of hospitalisations, scans, pathology tests and exploratory surgery having produced only negative results, the mother, the worst affected, was eventually labelled psychosomatic. Not for 13 years, until admitted to an ECU-a hospital ward stripped of all potential reactive agents -was her condition correctly diagnosed. Blinded placebo-controlled challenge testing revealed that every symptom so long attributed to stress was in fact a manifestation of environmental sensitivity. Her reactions to perfumes, synthetic fabrics, paints and glues, traffic fumes, natural gas, household cleaners, pesticides, certain foods and electromagnetic frequencies, moulds and terpenes accounted for her litany of health problems. The husband and children proved to be similarly affected. Identification and elimination of reactive incitants won for all a "wellness akin to being reborn." The family's sensitising trigger was traced back to heavy exposure to pesticides, including DDT, 2,4-D, 2,4,5-T, the herbicideacrolein, and Mevinphos, a highly toxic organophosphate.

MCS and EHS are not allergies. The underlying mechanism is not immunological but neurological. Seven (7) classes of chemicals, including solvents and organophosphate, organochlorine and synthetic pyrethroid pesticides, have the capacity to induce the vicious cycle now known to underlie MCS [8]. The initiating chemical exposure creates hypersensitivity in neurons in the brain, which then produces endogenous chemicals that create further hypersensitivity. Central to this process are NMDA (N-methyl-D-aspartate, a receptor for the neurotransmitter glutamate), nitric oxide (a signalling molecule that is necessary for normal neural function but detrimental if produced in excess), and peroxynitrite (a tissue-damaging free radical).

The process is initiated by the influx of calcium ions into the cell; this results in the production of nitric oxide via stimulation of calcium-dependant nitric oxide synthases. Nitric oxide then stimulates the release of glutamate, which stimulates NMDA receptors, thereby further elevating nitric oxide levels Pall [7]. The allied chronic fatigue and fibromyalgia syndromes share the same pathology Pall [8]. EHS would appear to be underpinned by the same vicious cycle, as electromagnetic radiation (EMR) also induces intracellular calcium release [9].

The formation and retention of long-term memories is also governed by intracellular calcium and NMDA stimulation. Indeed, long-term potentiation (LTP)-described as the cellular basis of the neuronal implementation of learning and memory-is in essence a form of neural sensitisation involving persistent enhancement of synaptic response and a reduction in the threshold at which neurons in the hippocampus fire after repetitive stimulation. Repetitive stimulation of a neuron by its neighbour actually results in a physical change: the membrane changes, forming an additional contact point with its neighbouring cell, thereby doubling the bond between the neurons and thus also amplifying signal strength while lowering the threshold at which neurons fire.

Based on a model of pain sensitisation in rodents, my own 2002 hypothesis presented MCS/EHS as both a pathologisation of the long-term memory encoding process and a connectopathy: hyperconnectivity and excessive plasticity could conceivably allow the brain to be sentient of and the body to react to environmental stimuli below the normal sensory threshold. Under this model, multiple chemical sensitivity could be termed "hyper-memory" [5,11]. This connectopathy model complements the nitric oxide model, as intracellular calcium release and stimulation of NMDA receptors effects both the propagation of neuronal connections and elevated nitric oxide levels.

MCS has long been suspected to involve a genetic predisposition, given that the majority of people exposed to these chemicals do not develop the syndrome. Wenow know that polymorphisms of certain genes increase the risk of an individual developing MCS after chemical exposure. Identified to date are CYP2D6, NAT1 and NAT2, genes that encode for enzymes that metabolise certain chemicals and drugs; PON1 and PON2, which encode for enzymes that biodegrade organophosphate pesticides and nerve gases; MTHFR, which is implicated in the metabolism of some B vitamins [10] and CCK-B, which acts indirectly to produce higher NMDA activity [8].

Frequently co-morbid with MCS, the following conditions have also been frequently demonstrated to be manifestations of food and chemical, sensitivity: migraine [4], asthma [1], irritable bowel syndrome [1,11] at least some cases of autism [15]; ditto for systemic lupus erthematosis (SLE) [16]; Crohn's disease and ulcerative colitis [14]; chronic cystitis [16], and rheumatoid arthritis and related disorders including Reiter's syndrome, ankylosing spondylitis, polymyalgiarheumatica and Still's disease [20]. As in our case study, the improvement effected by the identification and removal of reactive incitants can be dramatic: autistic children speaking and interacting socially for the first time; migraine sufferers becoming headache-free, while also clearing depression, epilepsy, chronic fatigue and gastric problems [19]; significant improvement in 100% of rheumatoid arthritis patients undergoing a water fast in an ECU: i.e. while withdrawn from potential food and chemical incitants [18,21,24]; and 92% of hypertensive patients medication-free on discharge from an ECU [26].

Certain illnesses generally labelled "mental" have also been shown to frequently involve a sensitivity component, the brain being here the target organ for a reaction. Depression, ADHD, and schizophrenia are perhaps the most widely quoted. Once again, identification and elimination of reactive triggers can be

life-changing-schizophrenics, for instance, de-institutionalised to resume a normal life [2,14] 65-80% of ADHD children off Ritalin, their behaviour considered normal, with dietary controls alone [22,25] juvenile delinquents with multiple convictions for arson, car theft, burglary, criminal damage and assault transformed into productive members of society upon implementation of the same regimen [12, 27]; a child's IQ originally assessed at 80 re-tested at 140 after food, chemical and inhalant triggers for his cerebral reactions were identified and banished [26]. It all sounds almost too good to be true. Yet it is a truth to which doctors specialising in environmental illness and their patients the world over-including the author of this article-can attest.

Conclusion

Ecological assessment of 400 patients with a variety of chronic conditions presenting at two University of Texas clinics revealed that 20.3%were chemically sensitive. The study authors noted that such patients would improve with avoidance of provoking foods, chemicals and medications [13]. Add to such statistics EHS, with prevalence studies ranging from 2.7% of the population in Switzerland to 8.0% in Germany, and the ramifications for the wider community are indeed profound. The stumbling block to greater awareness of MCS and EHS and application of the tenets of ecologically oriented doctors is no longer technical. With mainstream medical journals mostly reluctant to accept non-paradigmatic research, the problem now is how to convince physicians and other health care professionals of their validity and multifarious applications.

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