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The following talk was presented at the concurrent session of the 1995 conference of the Association on Higher Education and Disability. July 20. **"Multiple Chemical Sensitivities (MCS): What It Is, What It Is Not, And How It Is Manifested – Sheila Bastien, Ph.D."**: Multiple Chemical Sensitivities (MCS): What It Is, What It Is Not, And How It Is Manifested.

I am a neuropsychologist who has served on:

1. **Advisory Panel on Environmental Illness/Multiple Chemical Sensitivity, California Senate Subcommittee/Taskforce on the Rights of the Disabled. Senator Milton Marks. 1993-present.**
2. **On an invited panel of 14 experts for the State of California Department of Public Health and the Agency for Toxic Substances and Disease Registry (ATSDR) to develop a research protocol for evaluating multiple chemical sensitivity (MCS) patients, 1994.**

We have reached the age of modern living through chemistry or , as the TV ads said in the late 1940's and early 1950's (with their lab coats and test tubes), "Better living through Chemistry." What has happened in modern industrial society, however, is the misuse, overuse, and inappropriate disposal of chemicals. We now know that many of these chemicals can be toxic. Some harmful exposures are from ignorance, some from oversight, some from complacency, and some are from criminal negligence. The result on individuals, certain groups, (like the Gulf War veterans), and entire communities is toxic injury. Toxic exposure, whether acute or long-term, creates an overload on the individual which can result in serious health problems, including multiple chemical sensitivity, other illness referable to many organ systems, and in some cases, cancer. Insidious breakdown in resistance mechanisms takes place; individuals are often unaware of their developing sensitivity.

**What is multiple chemical sensitivity (MCS)?**

- Cullin, M.R. ed. (1987) "Workers with multiple chemical sensitivities" **Occupational Medicine; State of the Art Reviews**, defines multiple chemical sensitivity (MCS) as an acquired disorder characterized by recurrent symptoms referable to multiple organ systems, occurring in response to demonstrable exposure to many chemically unrelated compounds at doses far below those established in the general population to cause harmful effects. No single widely accepted test of physiological function can be shown to correlate with these symptoms. [Cullen, M.R. (1987). The Worker with multiple chemical sensitivities: an overview. In Cullen, M.R. (ed). *Occupational Medicine: State of the Art Reviews*. Hanley and Belfus, Philadelphia. 655-662]
- The National Research Council, 1992 workshop on Multiple Chemical Sensitivities (a group working on research protocols for clinical evaluation) reported in *Toxicology and Industrial Health* [Vol. 10 number 4/5 July - October, 1994 Pg. 259

in Claudia Miller's article] the definition of MCS by the National Research Council, 1992:

1. Sensitivity to chemicals. By sensitivity we mean symptoms or signs as related to chemical exposures at levels tolerated by the population at large, that is distinct from such well recognized hypersensitivity phenomenon as IgG-mediated immediate hypersensitivity reactions, contact dermatitis, and hypersensitivity pneumonitis.
  2. Sensitivity may be expressed as symptoms and signs in one or more organ systems.
  3. Symptoms and signs wax and wane with exposure. It is not necessary to identify a chemical exposure associated with the onset of the condition. Preexisting or concurrent conditions, e.g. asthma, arthritis, somatization disorder, or depression, should not exclude patients from consideration.
- Ashford N.A. and Miller, C.S. [1991. Chemical Exposures; Low-Level and High Stakes: (Van Nostrum Reinhold, New York)]. Their definition is: "The patient with multiple chemical sensitivities can be discovered by removal from the suspected offending agent and by rechallenge, after an appropriate interval, under strictly controlled environmental conditions. Causality is inferred by the clearing of symptoms with removal from the offending environment and recurrence of symptoms with specific challenge."

We have come a long way with modern chemistry. Our wood floors are being replaced, most often with carpets; old solid wood furniture is replaced with modern laminates, usually thin wood veneer, laminated over pressed wood. Among other things, this furniture exudes formaldehyde. Plain fir or pine boards for building (sheathing) were replaced with laminated plywood containing, at the very least, high levels of formaldehyde and often toxic wood preservatives. Plaster walls were replaced with drywall, which has its own contaminants -- and as dry wall mud became better, they added more chemicals. Wood shingles were replaced with tar and gravel. Clothing was no longer simply cotton, wool, nylon or rayon, as new chemistry brought forth polyesters, non-wrinkle fabrics; and mattresses and drapes that were treated with fire retardents, introducing even more chemicals. These new fabrics are loaded with chemicals, including formaldehyde. Formaldehyde is a known sensitizer [Carl Zenz, M.D. S.C.D. ed. Developments in Occupational Medicine, (1980), Year Book Medical Publishers, Chicago.], and this adds to the total individual toxic load.

At the same time, modern buildings were using large expanses of glass and closed air systems. The oil embargo/energy crunch in the 70's brought about more efficiently sealed buildings; windows which would not open or were secured shut. Outside fresh air was cut-off or reduced in the fresh air intakes to save energy; air was recirculated with all its contents and contaminants. The systems would often be shut off at 5:00 and workers remaining in the building would be subjected to inhaling stale air. New carpeting, and laminated furniture was everywhere in these closed environments.

Foods and water contain more chemicals than in the past, including pesticides; multiple toxins are leaching into our water supply. Even products such as toothpaste contain more chemicals each year. Agricultural soils are being depleted of their nutrients and replaced with chemical fertilizers, herbicides and pesticides (nutrient depletion is one of the things that put people at risk for MCS). There are approximately 2,000 new chemicals introduced each year which are unregulated; their long term side effects are unknown. One such chemical brought forth in 1941 has only now, in the 1990's, been given health and safety guidelines. Lag time is enormous.

**In the name of progress we saw the growth of herbicides, pesticides and termiticides. You no longer had to put up with bugs in your yard, spiders in the attic, ants in your pantries or termites and beetles in your house, or even grasshoppers in your crops. Unfortunately, we overdid it. We finally discovered that the organochlorines, such as DDT and Chlordane, were dangerous, cancerous and deadly, so along came the organophosphates. We are now using these products to spray for most anything from fleas to ants to termites. The so-called safe alternative has now been documented to cause a multitude of problems including very serious central nervous system problems. [See Ecobichon, Donald J., and Joy, Robert N. 'Pesticides and Neurological Disease, Second Edition 1994; CRC Press, Boca Raton, FL.]**

**The long-term effects from these organophosphates, in the cognitive realm include impaired vigilance and reduced concentration, reduced information processing, and psychomotor speed, memory deficits, visual memory problems, speech problems, sequencing problems and problem solving difficulties are also seen. Problems with motor steadiness, reaction time and dexterity have also been documented. (Ecobichon, Pg. 227.)**

**After organophosphate exposure, electrocephalograms (EEG) are found to be abnormal and have persisted for one year in studies of primates, (p. 231). Psychological symptoms such as anxiety, psychomotor depression, intellectual impairment, and unusual dreams, were observed in human exposure. The organophosphate class, which is the most commonly used pesticide and termiticide, can induce slow onset (pesticide induced) neuropathies, including Guillian-Barre syndrome, so this is no small matter. A high proportion of these patients exposed to these chemicals develop multiple chemical sensitivity. I have had occasion to evaluate many such patients, including one with pesticide-induced polyneuropathy, and found that those I evaluated had developed multiple chemical sensitivity secondary to exposure. Their EEG's have been abnormal, and when challenged with a substance to which they were particularly sensitive, such as perfume, the EEG became more abnormal (Isaac Silberman, M.D., Neurologist, San Francisco).**

**So what are we talking about? We are talking about the process of environmentally triggered disease. Dr. William Rea, in his first volume on chemical sensitivity [William J. Rea, M.D., Chemical Sensitivities, Vol. I, (1992), CRC Press Inc. 2000 Corporate Blvd., NW., Boca Raton, FL, 33431.], wrote that "rapidly accelerated rate of growth of modern technology has been accompanied by a proliferation of a wide variety of new chemicals... 50% of global pollutants which enter the atmosphere (isolated from natural products or synthesized) are generated by man". He pointed out that in 1987 the American industry poured 22 billion pounds of toxic chemicals into the air, food and water.**

**In 1988 Dr. Rea was named the first professional Chairman of Environmental Medicine at the Robens Institute of Industrial Environmental Health and Safety at the University of Surrey in Guilford, England. In the introduction to his first volume on chemical sensitivity, he wrote "modern technology has given many conveniences and ability to explore the outer limits of knowledge...allowed us to travel to the moon,... this technology has led us to uncover secrets of the Universe and has brought into focus the severity of environmental pollution on earth; the Apollo astronauts emphasized the extent of this pollution when viewing the earth from space, although they initially called it the "blue planet", these astronauts saw at closer range pollution on all areas of the earth, which led them to state that "man has fouled his nest and this must be corrected."**

**The point, according to Dr. Rea, is that man's well-being is a function of his environment; living in polluted surroundings adversely affects health. He also pointed out that as the number of dangerous environmental pollutants continues to multiply so do reports of numbers of people sensitive to these contaminants.**

Cindy Duehring [in Environmental Access Research Network in an article called "Screening for Nervous System Damage From Chemical Exposure"] wrote that it was a most dangerous illusion that our society has brought forth, in the false belief, that the chemical ingredients in our everyday home and office consumer products, from cosmetics and perfumes to cleaners and carpets, have been tested for health effects to protect the public. Most of the chemicals have never tested and are not under any regulation. There are three new chemical compounds introduced in the United States every day. Pre-marketing testing of compounds as potential neurotoxicants have serious deficiencies. Many of these neurotoxic compounds came into use before the passage of the Toxic Substance Control Act in 1976 and remain untested and are still not required to be tested (Duehring). The problem is compounded by disposal of chemicals. Everyday, several millions of gallons of chemicals are introduced into Lake Erie which is the source of drinking and bathing water for most cities from Cleveland, Ohio to Buffalo, NY (Rea). Our own San Francisco bay is polluted. Two towns near the Carquinez bridge just 20 minutes from where I live, have been gassed.

Both organic and inorganic pollutants are a problem. Dr. Rea adds that "inorganic pollutants include ozone, carbon monoxide, nitrous oxide, sulfur dioxides, heavy metals and other metals. Organic pollutants include pesticides, formaldehydes, solvents such as toluene and xylene, drugs, terpenes, cleaning chemicals, cigarette smoke, combustible products, consumer products (e.g. clothing, building materials, hygiene products, etcetera) and biological compounds (mold toxins). The most toxic organic pollutants are those classified as halogenated aromatic and aliphatic hydrocarbons". He also adds that according to the EPA more than 4 million chemical compounds are currently recognized. So what causes chemical sensitivity? According to Dr. William Rea, it can arise in several ways. Individuals who survive exposures may have lowered resistance to disease as a result of the condition of their nutrient pool brought on by exposure, and this can develop into symptoms of ill health. Upon later exposure, they may experience enhanced symptoms. Spreading can occur, which means that they either react to more chemicals or more organ systems are involved.

He discusses three major instances that have occurred in the 20<sup>th</sup> century, that have graphically illustrated that chemical sensitivity may be caused by a significant, acute exposure to toxic substances: in World War I when the troops were exposed to Mustard Gas with an aftermath and development of chemical sensitivity; Agent Orange syndrome where veterans had problems which persisted for years after their initial contact; and the incident of cyanate in Bhopal, India, which left an estimated 86,000 people injured, and "Several months later, many remained afflicted with recurrent symptoms that are today believed to be manifestations of chemical sensitivity." He also added that chemical sensitivity can occur subsequent to bacterial, viral or parasitic infection; however, he said that only 1% of his Dallas patient population have traced the origin of their illnesses to such an event. He has evaluated 20,000 people through the Environment Health Center in Dallas which he founded.

The manifestations of chemical sensitivity are multiple in nature. They can effect many organ systems, and which systems are affected most may well depend on the biological weakness of a particular system, or previous trauma. Enzyme pathways are affected. Liver detoxification pathways become overloaded. Mucosa of the body change. Blood brain barriers are affected (Rea)

Dr. Rea wrote that "at their onset, symptoms of chemical sensitivity are almost always reversible." This is a very positive statement; however, he added that when organ

involvement increases, responses are more difficult to decipher and reverse. He adds that although these various illnesses involve multiple systems and organs, only one end-organ may ultimately be damaged as a result of repeated insults, and this can result in end-organ failure and extreme fixed named illnesses. He cites the example of a mechanic constantly exposed to car exhaust who could develop general symptoms such as aches and pains, malaise, headaches and fatigue. These symptoms might then continue for several months until finally renal failure or some other specific end-organ disease develops. He wrote that the factors that are influencing the onset of chemical sensitivity are total body load, the nutritional state, and bioaccumulation of toxic substances, as well as other factors.

As a neuropsychologist, I have tested over 1,000 patients who have been exposed to a variety of toxins including solvents, formaldehyde, organophosphates, etcetera; many of these patients have MCS. I began testing these patients in 1980. Since then, there has been a lot of interest in Multiple Chemical Sensitivity, especially in the last few years. A recent conference in April 1994 in Baltimore Maryland was sponsored by the U.S. Department of Health and Human Services, Agency for Toxic Substance and Disease Registry. The proceedings have been published in Volume 10, #4-5, July-October 1994. The Agency for Toxic Substance and Diseases Registry has provided support for two major national conferences on the subject of MCS. The first was held at the National Academy of Science Meeting in 1991. The second was sponsored by the Association of Occupational and Environmental Clinics in September of 1991. In the fiscal year 1993, this agency received a Congressional mandate which provided funding for chemical sensitivity/low-level chemical and environmental exposure workshops. To address the mandate, a panel of experts was convened. They explored the issues related to the neurobiological effects of chemical exposure and particularly the role of the nervous system in MCS. Claudia Miller, M.D., University of Texas Health Science Center, discusses the historical overview. It has also been discussed in Multiple Chemical Sensitivities At Work, a training manual for working people produced by the Labor Institute in New York City. (This history is taken from both of these references.) Theron Randolph, M.D., who practiced in Chicago, noted the chemical susceptibility problem in 1951. In 1975 the environmental control units were operated by Randolph and W. J. Rea, a member of the Science Advisory Board at the Environmental Protection Agency, at that time, to help identify chemicals and foods that provoke symptoms in MCS patients. In 1979 a U.S. District Court in Hawaii ruled MCS disabling, and ordered the Department of Health, Education, and Welfare Division to provide Social Security benefits to an MCS patient. In 1984 a California bill to require research on MCS was passed in both houses of state legislature, but is opposed by the California Medical Association. In 1986 the Oregon Court of Appeals ordered Worker's Compensation Benefits for a furniture store worker on the basis of MCS.

The California Medical Association 1986, the American College of Physicians 1989 and the American Academy of Allergy and Immunology in 1986 criticized the clinical ecologists who were identifying and treating MCS as "lacking critical thinking and the use of proven techniques." An acrimonious debate ensued.

In 1987 the National Academy of Sciences workshop was held. In 1987 "Workers With Chemical Sensitivities" in Occupational Medicine: State of the Art Review, was published. Mark Cullen, editor, was professor of medicine and epidemiology at Yale University. It was the first comprehensive collection of articles on MCS. In 1987 the California Court awarded Worker's Compensation Benefits to an employee who was found to have developed MCS from long-term exposure to polychlorinated biphenyls. In 1988 workers of the EPA headquarters became ill when new carpets were installed and other remodeling took place. Some of the employees developed MCS. Some of these employees are still

working at home, and many of them still have MCS or continuing illness. Some have not been able to go back to work. In 1988 the Social Security Administration adds a section on MCS to the agency's program operations manual for disability determinations. In 1989 the Indoor Air Quality Act was amended to address MCS following the National Center for Environmental Health Strategies testimony before a Senate subcommittee. In 1989 Doctors Nicholas Ashford and Claudia Miller prepare a report on MCS entitled "Chemical Sensitivity," for the New Jersey State Department of Health. In 1989 the Ohio Court of Appeals reinstates an order of the Ohio Civil rights Commission finding unlawful employment discrimination for dismissal of a worker with MCS. In 1990 a task force of the American Public Health Association states that the government agencies should provide funding for MCS research and that MCS should not be labeled psychogenic unless environmental causes have been ruled out. In 1990 the Indoor Air Quality Bill is passed by the US Senate, but the house bill never reaches the floor for a vote. In 1990 the Department of Housing and Development (HUD) recognizes MCS as a disability requiring reasonable accommodations under the fair housing and rehabilitation act of 1973. The policy was followed by a legal opinion issued by HUD in April 1992, recognizing MCS as a physical disability. MCS patients disrupt the San Francisco meeting of the American College of Allergy and Immunology, where MCS patients are characterized as mentally ill. In 1990 the Americans with Disabilities Act of 1990 recognized individuals with MCS as disabled. In 1991, at the request of the EPA Division of Indoor Air, the National Academy of Sciences organizes a workshop on MCS. They agree on outlines for research protocol. In 1991 a comprehensive review of MCS literature entitled Chemical Exposures; Low level and High Stakes, by N. Ashford and C. Miller is published. In 1991 environmental health activists picket the New York city meeting of American College of Allergy and Immunology. In 1992, US Congress appropriates \$250,000 for MCS research to be coordinated with the National Center for Environmental Health Strategies. In 1993 Mt. Sinai Occupational Health Clinic was awarded \$100,000 to conduct an MCS study. And the seminal meeting (sponsored by the U.S. Department of Health and Human Services, Agency for Toxic Substance and Disease Registry) held in April 1994, proceedings which are published in Toxicology and Industrial Health, Vol. 10.

Many more things have taken place since then, one of which locally is that many public meetings are no longer allowing people wearing perfumes to attend. The Oakland City Council and the Bay Area Rapid Transit (BART) administration both have recently made this mandate as a condition to meeting attendance. Magazines with perfume inserts can be fined up to \$100 if they do not remove them before mailing to California, and so forth. There are so many things happening that it is difficult to keep up to date with the current advances. A 1993 Senate committee task force has been formed in San Francisco and still is working on access for the rights of the disabled in terms of MCS. MCS patients are becoming more organized, more vocal, and increasingly validated by recent conferences. Claudia Miller points out that many of the patients often attribute the onset of their illness to specific exposures (Vol. 10) such as repeated exposures to solvents, chemical, pesticides in sick buildings, or combustion products. Patients report more problems and greater difficulties indoors where air fresheners, perfumes, and cleaners are used and where there are such things as particle board and carpets which outgas. The outgassing releases VOC compounds (Toxicology and Industrial Health, page 257). These patients are often funneled off to psychiatrists and psychologists by physicians who are not familiar with MCS. "From the patient's perspective, they have lost their health, their livelihood, their friends and sometimes even family. Individuals with professional careers are likely to view their cognitive difficulties as most disabling," Dr. Miller added. They are often mislabeled as malingerers or given a psychiatric diagnosis.

Dr. Miller notes that chemical sensitivity has been reported among distinct demographic groups (page 261): industrial workers, sick building occupants, contaminated communities and individuals. A fifth group, Persian Gulf War veterans, is also mentioned. She says. "It is especially easy to overlook environmental causes if complaints are subjective and nonspecific, such as headache, fatigue, depression or difficulty concentrating. But the temporal cohesiveness occurring in a group of individuals sharing a recognizable exposure, for example several family members, co-workers, community members or Gulf War veterans, help physicians recognize the possibility of environmentally caused illness. The outbreak of MCS among the technical staff of the EPA headquarters is an example." Recently, I have been working as part of a team of experts evaluating patients injured from a refinery release in the town of Crockett (investigating the results of the Catacarb spill of August-September 1994) adjacent to the Carquinez Bridge in northern California. UNOCAL had a leak in their tank which grew and released Catacarb and other toxic pollutants which drifted onto two entire towns. Over 700 patients have come into the Good Neighbor Clinic in Crockett (paid for but not run by UNOCAL) because of symptoms; more are on the waiting list. Patients in general have eye-damage; breathing problems; immune abnormalities; rashes; increased mole size; skin tags; possible neuroendocrine disorders (abnormal menstrual periods); neurological abnormalities that include memory, concentration, decreases verbal fluency, and motor problems; and one has a serious movement disorder. Many, but not all, have developed MCS.

About 25 of these patients have been evaluated by me at this time. Neuropsychological testing shows problems in cognitive flexibility; calculation; visual-motor ability; verbal fluency; memory; attention and concentration; and often lateralized motor and tactual sensory abnormalities. These motor abnormalities could not be accounted for by anxiety or depression alone. Many of these patients have a post-traumatic stress disorder. Children are having problems in school; their grades are dropping, and they have abnormalities on neurocognitive tests. Many of the patients would meet the criteria for dementia, secondary to a medical condition; probably toxic encephalopathy. Many people are moving out of town. Real estate values have plummeted.

Iris Bell has discussed MCS in her article ["Neuropsychiatric Aspects of Sensitivity To Low-Level Chemicals: A Neural Sensitization Model," prepared for the conference on Low-Level Chemical Exposure and Neurobiologic Sensitivity; sponsored by the Agency for Toxic Substances And Disease Registry in Baltimore Maryland, April 6&7, 1994.] She has reviewed the literature on MCS as a psychiatric disorder and found serious flaws with the sample size and methodology in these studies. She has also completed six surveys of over 2,000 individuals (in a population of half young adults and half active retired older adults in southern Arizona) who report at least one chemical odor that makes them ill. Roughly 15 percent have identified at least three out of five chemicals (pesticide, perfume, car exhaust, paint and carpet) causing frequent illnesses. In addition 30 percent of the samples endorsed as true a single question "Do you consider yourself to be especially sensitive to certain chemicals?" Therefore, there is a significant proportion of the normal population that is sensitive to chemicals, or considers themselves sensitive to chemicals. In discussing the classic psychiatric disorders, Dr. Bell reported that MCS patients state that they become irritable, depressed or confused for a few minutes or hours only during days involving chemical exposures. They usually return to normal cognition thereafter. They express interest in their usual activities, except when reacting to chemicals. This is different from depressed patients who report depressed moods most of the days and nearly everyday report a generalized loss of interest. MCS patients have poor balance and/or clumsiness, a rare presenting complaint of depression. She states that all of the studies of MCS patients

point to the central nervous system as a major site of involvement. She also cites neuroimaging studies, single photon emission photography, and brain (SPECT) scan studies of MCS patients [Heuser et al. 1993; Simon et al. 1992;]. Dr. Bell reported that they found diffuse cortical deficits, especially in frontal, temporal and parietal regions. The abnormalities appear bilaterally but more in the right hemisphere. Heuser concluded that the pattern resembled vasculitis. Simon noted (Dr. Bell) it looked like abuses of stimulants and solvents with possible small infarctions (This study has now been published by Heuser and Mena and differs for age groups.).

What have I found? I have found that patients, for the most part, are not malingerers (over 1000 patients). I have had one or two patients who have exaggerated their symptoms, and one that may have been a malingerer. However, in general these are patients who suffer from a variety of problems that include concentration and memory problems, irritability, anxiety and depression, spatial confusion, insomnia, headaches, nausea, palpitations, chest pain, muscle spasms and aches, joint aches, difficulty calculating, fatigue, and confusion. Many have breathing problems, asthma, and carry inhalers or oxygen. These Patients often have either had a previous history or concurrent history of hypothyroidism or thyroiditis, in my clinical observation. In my population and in the research literature, there is a spreading phenomena. They seem to get worse later on; the sensitivity generates from things that can vary from an original acute/chronic agent(s) to low-level/multiple-chemically unrelated substances, (Bell, Rea) such as perfume, car exhaust, carpets, newsprint, tobacco and car exhaust. Patients report new sensitivities to perfumes, everyday cleaning products, alcohol, foods and medications. There is a cross-sensitization. Once initiated, heightened susceptibility to chemicals and foods, which are mixtures of inorganic chemicals, persist indefinitely (Bell). Problems spread to more organ systems. Gradual symptomatic improvement follows long-term avoidance of triggering of substances. Dr. Bell notes that resumption of frequent intermittent exposures can reactivate symptoms at any time as in kindling and sensitization. This is fairly complex; kindling has to do with the stimulation of the limbic system, which creates an electrical response, which increases cortical irritation over time, and can lead to seizure. Some of the patients do have seizures, especially on exposure. In fact I have seen several in my office. What have we found on formal neurocognitive testing? We often find concentration problems, with Digit Span being lower on the Wechsler Adult Intelligence Scale-Revised. Typically Arithmetic is one of the lower scores, with evidence of dyscalculia. It often depends on the kind of chemical exposure as to whether abstract reasoning is impaired; it is more likely to be non-verbal abstract reasoning that is impaired.

Visual discrimination (Picture Completion) often shows scatter, indicating higher premorbid function, and is one of the lower scores. Perceptual tasks are often impacted such as Block Design, as is eye – hand coordination and visual motor speed (Digit Symbol). On the Halstead-Reitan Neuropsychological Battery, the impairment index is often in the mild or borderline range of impairment. These patients often have trouble shifting sets (Trailsmaking and the Category Test). Visual scanning is often impaired. The most curious finding is on the Tactual Performance Test (a test of sensory-tactual abilities) where the left, nondominant hand (99 percent of my patients are right-handed) is usually impaired or more impaired; this is consistent with the more right parietal hemisphere findings in toxic injury that have been reported in the literature.

There are often lateralized and localized motor abnormalities. There are memory impairments both verbal and visual. There is often serious visual memory impairment. Knox Cubes, a test of visual sequencing and memory, is almost always impaired in this

population. And finally the MMPI-2 usually shows significant elevation on several of the clinical scales. This has been reported in the research by Rosemarie Bowler, Ph.D., on toxic injury patient profile and separately by David King, M.D., on the MCS profile on the MMPI.

The MMPI-2 is consistent with a large subgroup of CFIDS patients. The MMPI-2 cannot be interpreted in a normal way with sick patients. See research from John Hopkins Commonly, investigators of psychiatric traits or psychiatric disorders in medical illness use a flawed strategy... That is, psychological tests are administered or psychiatric interviews are conducted and the resulting profiles are interpreted solely in terms of psychopathology. In some cases, those medical symptoms that are most central to the condition are subtracted from the analysis. However, the non-specific medical symptoms associated with a chronic illness or its treatment and the psychosocial consequences of chronic illness are often not acknowledged or taken into consideration. Although patients with medical illnesses of known pathophysiology are sometimes spared the psychogenic explanation for their condition, they are often burdened with secondary psychiatric diagnoses. Moreover, such constructs as "cancer personality," although out of favor at present, suggest that patients with medical illnesses are sometimes stigmatized with psychogenic explanations and burdened with responsibility for their illness...

In our judgement, the mental health of chronically sick people should not be judged by the same norms that are used to evaluate the mental health of healthy people (21-22). ("Inferences From Psychometric Data About Psychiatric Traits and Psychogenic Origins in Conditions of Unknown Etiology, Focusing on Multiple Chemical Sensitivities Syndrome," Ann L. Davidoff, Ph.D., Linda Fogarty, MA, Division of Occupational Health, Department of Environmental Health Sciences, School of Hygiene and Public Health, 1995).

**So what is multiple chemical sensitivity?** It is a multi-system disorder usually brought on by toxic exposures which are acute, or low-level long-term exposure such as in sick building, which increases a person's total toxic load, depletes nutrient stores, and causes problems in many systems and organs in the body. Upon re-exposure, the individual becomes increasingly sensitized, and often there is a spreading effect where they are bothered by many more chemicals (It often spread to food, medications, and molds), and many more systems in the body are involved. It almost always seems to affect the central nervous system, and the results that I am primarily interested in are the effects that it has on memory, concentration and learning. These are all dramatically impaired when a person is exposed. This is very important in terms of accommodation in a classroom or work situation. If exposed, a person may not be able to process what is said, or store the information processed in a lecture, for example. A child may not be able to learn. It may be possible for them to sit in the corner of a classroom, wearing a charcoal filter mask, near an open door. It may be useful to have whole room filters. It may be possible to move the class. Certain classes are very difficult, such as chemistry classes, because a charcoal filter cannot get rid of all the chemicals. These persons/patients seem to take more time to do things than other people do; and giving them more time on examinations would be one kind of accommodation. Letting them sit as far away from other people as possible, near open windows, is also helpful. Videotaping a class may be an option.

Two young men (twins), now residing in Arizona, were having problems in high school, were very chemically sensitive, and were having trouble in their high school classes and could not pass. They were allowed to take the GED examination outdoors and were in the 99<sup>th</sup> percentile when tested in a clean environment.

We have done testing in our office, which is a relatively clean environment, and then allowed the patient to expose themselves to perfume or other irritants, and we have watched the differences. We have also done this blind on occasion and found dramatic differences. As a follow-up, we have sent these patients to Dr. Isaac Silberman, a neurologist in San Francisco, who has done baseline EEGs, which are usually abnormal on baseline. However on challenge, with the same substance that we have used, the EEGs become more abnormal. So that is what MCS is. What it is not, is a psychiatric disorder, although a chronic illness of any kind causes anxiety and depression. Its manifestations are complex and multiple. We are really talking about toxic injury; MCS is just the tip of the iceberg.

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