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WHAT DO WE KNOW ABOUT MULTIPLE CHEMICAL SENSITIVITY?  
AN OVERVIEW OF THE RESEARCH

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## ABSTRACT

Multiple Chemical Sensitivities (MCS) affects between 12.6% and 33% of the population and involves sensitivity to and illness reactions from exposures to chemicals in ambient air. Symptoms can affect any organ system and commonly include headaches, dizziness, fatigue, digestive problems, skin reactions, and many others. The condition is often initiated by one large chemical exposure, a series of low-level exposures, or presence during remodeling (with exposure to fresh paint, carpet, and other chemicals). More women than men may be affected. Life impacts include the loss of work, a decline in finances, difficulty finding safe housing, a lack of medical care, psychological upset, and the need to negotiate disability status. Qualitative researchers have discussed themes of isolation, loss of feelings of productivity, identity changes, and the need to cope with disbelief and delegitimization from others. It is imperative to acquire a greater understanding of this problem in order to both help those who have already sensitized and to prevent greater numbers of persons from becoming affected.

## What Do We Know About Multiple Chemical Sensitivity? An Overview of the Research

### INTRODUCTION

**Description.** Multiple Chemical Sensitivity (MCS) is characterized by intolerance to chemicals in ambient air at levels generally tolerated by the “average person.” Persons first sensitize to chemical exposures and later experience illness reactions to these inciting chemicals. These reactions later spread, first to related, and then to unrelated chemicals (the “spreading phenomenon”) (Ashford & Miller, 1998). Reactions generally involve more than one organ system, e.g., respiratory and digestive, or neurological and respiratory (“Multiple chemical sensitivity,” 1999). MCS can be initiated by one large chemical exposure, a series of low level exposures, or exposure to toxics in the remodeling or renovation of the home or workplace.

**Symptoms.** Symptoms can be related to any bodily system and commonly include headache, muscle or joint pain, nausea, asthma, dizziness, concentration difficulties, fatigue, irritability, and even unconsciousness (Ashford & Miller, 2004; Caress & Steinemann, 2003; Gibson, 2000).

**Incitants.** Chemicals that are commonly problematic include solvents, exhaust, pesticides, perfume, paint, new carpet, cleaning chemicals, tobacco smoke, and others (Caress & Steinemann, 2003). In addition, many reporting MCS also describe problematic reactions to foods, molds, dust, and electromagnetic fields.

### PREVALENCE AND DEMOGRAPHICS

Household population studies have found prevalence rates for MCS that range from 12.6% to 33% of the population (Caress & Steinemann, 2003; Meggs, Dunn, Block, Goodman, & Davidoff, 1996; Neutra, Kreutzer, & Lashuay, 1999; Voorhees, 1999). In the Meggs et al. study, 3.9% of the household sample reported becoming ill every day from reactions to chemicals; this extrapolates to over 10 million persons in the U.S. alone spending every day of their lives sick from chemical exposures. MCS may affect more women than men, but ratios are uncertain due to differences in sampling. Clinical case studies and volunteer samples contain approximately 80% women (Gibson, Cheavens, & Warren, 1996; Lax & Henneberger, 1995). Meggs et al. (1996) found much closer ratios with 39% of women and 24% of men reporting multiple sensitivities to chemicals. However, in Caress and Steinemann’s study, 73% of those reporting sensitivities were women (almost 9% of women and 3.3% of men). Caress and Steinemann reported that 27.5% of those with sensitivities were black and 2.9% were Hispanic.

### CAUSAL HYPOTHESES AND BIOLOGICAL MARKERS

**Biological Markers.** Problematic biological markers found in persons with MCS include abnormal immune parameters (Levin & Byers, 1992), EEG irregularities (Dudley, 1993), immune system changes (Heuser, Vojdani, & Heuser, 1992), abnormal nasal mucosa (Meggs & Cleveland, 1993), detoxification pathway dysfunction (McFadden, 1996; Rogers, 1990), measurable levels of pesticides in the blood (Rea et al., 1992), genetic alterations in genes that control the metabolism of toxic substances (McKeown-Eyssen et al., 2004), and enhanced sensitivity to inhaled capsaicin (Millqvist, Ternesten-Hasséus, Ståhl, & Bende, 2005).

**Causal hypotheses.** The limbic kindling hypothesis postulates that the oversensitization of neurological tissue in limbic pathways results from repeated low level stimulation by chemical incitants (Bell, 1994; Bell, Miller, & Schwartz, 1992; Rossi, 1996). A number of animal studies support kindling in general, and Rogers, Miller, and Bunegin (1999) showed that mice pre-exposed to toluene showed both impaired learning and more illness upon subsequent toluene exposure. Meggs (1995a, 1995b) has proposed that airway inflammation and neurogenic switching may account for the illness reactions seen in MCS, much like the mechanisms seen in Reactive Airway Disease Syndrome (RADS) or Reactive Upper Airway Disease Syndrome (RUDS). Congruent with both of these theories is Pall's (2003) extension of the neural sensitization theory to include elevated peroxynitrite/nitric acid, which initiates a feedback loop resulting in a more permeable blood brain barrier and neurogenic inflammation. Other theories have implicated psychological mechanisms, but studies have failed to identify psychological markers of MCS (Østerberg, Karlson, & Ørbaek, 2002). A Japanese study has shown that persons with MCS are symptomatic only when provoked with chemicals and are free of both somatic and psychological symptoms when in chemical-free conditions (Saito et al., 2005).

## LIFE IMPACTS

**Work and Finances.** People with MCS report major difficulties with work and finances. In Gibson et al.'s (1996) initial life impact study of 305 persons (80% of whom were women), over two thirds of participants had lost or been forced to quit their jobs due to their inability to tolerate chemicals encountered in the workplace. Only 7% of the sample was currently working in a setting that the participant considered "safe." Caress and Steinemann (2003) and Voorhees (1999) found respectively that 1.8% and 2% of household population samples had lost jobs because of chemical hypersensitivity. Employed persons with MCS generally report difficulties acquiring accommodations, declining health due to ongoing exposures, and harassment from co-workers (Gibson, 2003). Many report being forced out of the workplace due to lack of work accommodations. Income losses may be severe; Gibson et al. (1996) found mean personal income for 305 persons with MCS was just above poverty level and had declined over \$17,700 since the onset of MCS. In a follow-up study, 151 of 268 persons indicated that they had sought disability compensation. Over half were successful, but the award was low (mean = \$12,000) and the process was lengthy (mean = 2 years). Many had to accept psychiatric diagnoses in order to gain compensation because of the lack of acceptance of MCS as a viable physiological problem.

**Medical Care.** Medical care for persons with MCS is often inaccessible, expensive, and ineffective. Participants in our life impact research saw a large number of medical practitioners (mean of 8.6 each), but said that only a quarter of them were helpful (Gibson et al., 1996). Financial resources are strained through large medical expenditures. Gibson et al. (1996) found that participants spent a mean of \$5,000 on medical care in one year, and \$34,000 over the course of their illness. Gibson, Elms, and Ruding's (2003) respondents spent \$7,000 in one year and \$51,000 in total. In spite of the large expenditures and repeated efforts to acquire help, participants have reported that physicians do not take them seriously, are uneducated regarding the effects of toxics, and even encourage them to expose themselves to the incitants that make them ill. Iatrogenic harm seems common as participants have reported suffering delays in diagnosis, drug side effects, treatment for the wrong condition, invasive testing, and even unnecessary surgeries (Engel, Gibson, Adler, & Rice, 1996). Respondents fared no better with mental health providers where their MCS symptoms were ignored, they received labels of mental illness, and they faced being drugged or hospitalized (Gibson et al., 1996). As a result, persons with MCS tend to experiment with a large number of unproven treatments, both conventional and alternative. In spite of the large number of interventions purported to help MCS,

only chemical avoidance and making a safe living space have been reported to help over 95% of persons (Gibson et al., 2003). A number of treatments have consistently been reported to do more harm than good (e.g., drugs such as anti-depressants) (Gibson et al., 2003; Johnson, 1996-1998; Leroy, Davis, & Jason, 1996).

**Housing.** For two reasons, housing is one of the most challenging obstacles for people with MCS. First, finances are strained to the point where often only low income housing is an option. This housing is rarely chemical-free. Second, the spreading phenomenon often dictates that persons may no longer be symptom-free in their previously tolerated housing. Gibson et al. (1996) found that 305 participants with self-reported MCS had spent a mean of \$27,816 in attempt to make their homes safe. Relocations are common, but often fail, and some people are not able to find traditional safe housing at all. Of these respondents, 66% reported having lived in unusual circumstances such as tents or RVs at some point during their illness.

**Personal Distress and Identity Changes.** Personal distress is a common response to the severe limitations, forced life changes, and losses associated with MCS. Loss of work, lack of medical care, scant opportunities for housing and public access combined with the general disbelief in and lack of attention to the condition from professionals and laypersons engender isolation and trauma. Gibson et al. (1996) found that one fifth of 305 people with MCS had seriously considered suicide, while 3.3% had made suicide attempts. Identity changes are common sequelae of role loss, inability to work, and relationship strains. People with MCS have reported experiencing unwelcome personality changes as a result of chemical exposure and isolation, as well as a loss of self-positioning in society, extrusion from family roles, and having to completely re-plan and re-design their lives and futures (Gibson, Placek, Lane, Brohimer, & Lovelace, 2005).

**Relationships and Social Support.** Gibson, Cheavens, and Warren (1998) found fairly low levels of perceived social support in a sample of persons who had experienced MCS for a mean of 15 years. Families were often unwilling and/or unable to understand and accommodate the respondents. Some marriages and partnerships ended, and friendships were reportedly strained. When partnerships did end, respondents often said that MCS was to blame.

## BIOGRAPHICAL/AUTOBIOGRAPHICAL WRITINGS

McCormick (2001), Johnson (2000), and Zwillinger (1997) have all gathered first person accounts of living with MCS from women, men, and children that detail the disintegration of their ability to live in an industrialized world because of chemical poisoning. Zwillinger's respondents are close to homeless and her pictorial essay probably comes the closest to encapsulating the impact of severe MCS in a small number of pages. These collections include the voices of physicians, poets, psychologists, students, chemists, teachers, and others now disabled from chemical exposures and living in tents, cars, RVs, and specially retrofitted trailers. Other personal accounts exist in the research literature of published conference proceedings that have dedicated a portion of their time to listening to the experiences of those with MCS. For example, Helen Keplinger (1994), an attorney with the U.S. Environmental Protection Agency, details the process of becoming ill from renovations in the EPA's Waterside Mall building. And Cynthia Wilson (1994) describes the loss of her business and health and the life that is now a "waking nightmare."

## DISCUSSION

Multiple chemical sensitivity is an "emerging" condition that overlaps with chronic fatigue syndrome in symptoms, but has the unique indicator of intolerance for chemicals present in ambient air. Despite

its wide prevalence and some initial quality research into the problem, the lack of adequate study, treatment, and accommodations for MCS causes those who experience it to endure severe life impacts. The lack of acceptance and integration of the problem into our medical institutions leaves health care largely inaccessible for this population. Extrusion from the work force is common and engenders financial depletion and isolation. Housing needs are salient due to the need for a chemical-free living space. Relationships suffer due to the lack of understanding of the condition. Personal distress is common and may include suicidal impulses and identity changes. In spite of these extreme difficulties, the condition remains poorly understood and people are not generally accommodated in public resources that others take for granted. There is a dire need for education, research, legislation, accommodation protocols, housing, and medical care for persons who experience environmental sensitivities. In addition, the presence of MCS makes a statement about the need for greater awareness and action regarding the everyday exposures to chemicals that are taken for granted in industrial culture. MCS cannot be understood outside of the context of industrial capitalism (Lax, 1998).

## REFERENCES

- Bell, I.R. (1994). White paper: Neuropsychiatric aspects of sensitivity to low-level chemicals: A neural sensitization model. [Special Issue]. *Toxicology and Industrial Health*, 10, 277-312. Proceedings of the Conference on Low-Level Exposure to Chemicals and Neurobiologic Sensitivity.
- Bell, I.R., Miller, C.S., & Schwartz, G.E. (1992). An olfactory-limbic model of multiple chemical sensitivity syndrome: Possible relationship to kindling and affective spectrum disorders. *Biological Psychiatry*, 32, 218-242.
- Caress, S., & Steinemann, A. (2003). A review of a two-phase population study of multiple chemical sensitivities. *Environmental Health Perspectives*, 111, 1490-1497.
- Engel, L.R., Gibson, P.R., Adler, M.E., & Rice, V.M. (1996, March). Unmet medical needs in persons with self-reported multiple chemical sensitivity. Poster delivered at the Annual Meeting of the Southeastern Psychological Association, Norfolk, Virginia, March 20-23.
- Gibson, P. R. (2006). *Multiple chemical sensitivity: A survival guide*, Second Edition. Churchville, VA: Earthrive Books.
- Gibson, P. R. (2003). Work experience and accommodation for persons with multiple chemical sensitivity. Invited presentation delivered at the Chemical Injury Information Network Chemical Injury Conference October 3-5, Fairfax, VA.
- Gibson, P. R., Cheavens, J., & Warren, M. L. (1996). Multiple chemical sensitivity/environmental illness and life disruption. *Women & Therapy*, 19, 63-79.
- Gibson, P. R., Cheavens, J., & Warren, M. L. (1998). Social support in persons with self-reported sensitivity to chemicals. *Research in Nursing & Health*, 21(2), 103-115.
- Gibson, P. R., Elms, A. N. M., & Ruding, L. A. (2003). Perceived treatment efficacy for conventional and alternative therapies reported by persons with multiple chemical sensitivity. *Environmental Health Perspectives*, 111, 1498-1504.
- Johnson, A. (1996-1998). MCS Information Exchange Newsletter. Brunswick, ME: MCS Information Exchange.
- Johnson, A. (2000). Casualties of progress. Brunswick, ME: MCS Information Exchange.
- Keplinger, H. (1994). Patient Statement: Chemically sensitive. [Special Issue]. *Toxicology & Industrial Health* 10(4/5), 313-317. Proceedings of the Conference on Low-Level Exposure to Chemicals and Neurobiologic Sensitivity.
- Lax, M. B. (1998). Multiple chemical sensitivities: The social construction of an illness. *International Journal of Health Services*, 28, 725-745.

- LeRoy, J., Davis, T. H. & Jason, L. A. (1996, Winter). Treatment efficacy: A survey of 305 MCS patients. *The CFIDS Chronicle*, pp. 52-53.
- McCormick, G. 2000. Living with Multiple Chemical Sensitivities: Narratives of Coping. MacFarland.
- McKeown-Eyssen, B., Baines, C., Cole, C.E.C., Riley, N., Tyndale, R.F., Marshal, L., & Jazmaji, V. (2004). Case-control study of genotypes in multiple chemical sensitivity: CYP2D6, NAT1, NAT2, PON1, PON2, and MTHFR. *International Journal of Epidemiology*, 33(5), 1-8.
- Multiple chemical sensitivity: A 1999 consensus. (1999). *Archives of Environmental Health*, 54(3), 147-149.
- Meggs, W. J. (1995a). Multiple chemical sensitivities: Chemical sensitivity as a symptom of airway inflammation. *Clinical Toxicology*, 33(2), 107-110.
- Meggs, W. J. 1995b. Neurogenic switching: A hypothesis for a mechanism for shifting the site of inflammation in allergy and chemical sensitivity. *Environmental Health Perspectives*, 103(1), 2-4.
- Meggs, W. J., Dunn, K. A., Bloch, R. M., Goodman, P. E., & Davidoff, A. L. (1996). Prevalence and nature of allergy and chemical sensitivity in a general population. *Archives of Environmental Health*, 51(4), 275-282.
- Millqvist, E., Ternesten-Hasséus, E., Ståhl, A., & Bende, M. (2005). Changes in levels of nerve growth factor in nasal secretions after capsaicin inhalation in patients with airway symptoms from scents and chemicals. *Environmental Health Perspectives*, 113(7), 849-857.
- Østerberg, K., Karlson, B., & Ørbæk, P. (2002). Personality, mental distress, and risk perception in subjects with multiple chemical sensitivity and toxic encephalopathy. *Scandinavian Journal of Psychology*, 43, 169-175.
- Rogers, W.R., Miller, C.S., & Bunegin, L. (1999). A rat model of neurobehavioral sensitization to toluene. *Toxicology and Industrial Health*, 15, 356-369.
- Rossi, J (1996). Sensitization induced by kindling and kindling-related phenomena as a model for multiple chemical sensitivity. *Toxicology*, 111, 87-100.
- Saito, M., Kumano, H., Yoshiuchi, K., Kokubo, N., Ohashi, Yamamoto, Y., Shinohara, N., Yanagisawa, Y., Sakabe, K., Miyata, M., Ishikawa, S., & Kuboki, T. (2005). Symptom profile of multiple chemical sensitivity in actual life. *Psychosomatic Medicine*, 67, 318-325.
- Voorhees, R. (1999, Feb. 8). *Results of analysis of multiple chemical sensitivities questions, 1997*. Behavioral Risk Factor Surveillance System, New Mexico Department of Health.
- Wilson, C. (1994). Patient statement; Chemical sensitivity – one victim’s perspective. [Special Issue]. *Toxicology & Industrial Health* 10(4/5), 319-321. Proceedings of the Conference on Low-Level Exposure to Chemicals and Neurobiologic Sensitivity.
- Zwillinger, R. (1997). *The Dispossessed: Living With Multiple Chemical Sensitivities*. Paulden, AZ: The Dispossessed Project.