

# REFERENCE DATA SHEET FOR MULTIPLE CHEMICAL SENSITIVITY

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## POTENTIAL PROBLEM AREAS

- Workplace engineering
- Evaluation and diagnostic testing
- Treatment and therapy
- Psychosocial implications
- Clinical and epidemiological research
- Environmental and occupational exposure compliance
- Indoor air quality
- Worker's compensation
- Product liability and warnings

## INTRODUCTION

In the 1950's, Dr. Theron Randolph first observed in a patient an effect he termed a "chemical susceptibility problem." Dr. Randolph then proposed the theory of extremely low-level chemical exposures adversely affecting an individual. A wide range of symptoms were attributed to the condition, and various therapeutic approaches were proposed.<sup>1,2</sup> This observation has also been termed "environmental illness," "20th Century disease," "immune system dysregulation," "total allergy syndrome," "chemically acquired immunodeficiency syndrome," "cerebral allergy," "environmental maladaptation syndrome," "food chemical sensitivity," and "multiple chemical sensitivity (MCS)."<sup>3,4,5</sup> In addition, MCS has symptomatology similar to that reported in "sick building syndrome."<sup>6</sup>

MCS is often considered enigmatic, partially because of lack of clear definition of the disease.<sup>7</sup> A common basis of most definitions is that of a multi-symptomatic, multi-organ syndrome elicited in response to levels of chemicals, common foods, and/or drugs not eliciting such an effect in most people.<sup>8</sup> Generally, duration and level of exposure are not consistent with the known toxicological properties of the chemical(s) involved in the exposure.<sup>9</sup> In addition, there are no published, validated population estimates of the prevalence of MCS.<sup>10</sup>

The lack of clarity in definition of MCS has resulted in a division of opinion within the medical community.<sup>11</sup> The American College of Physicians published an extensive report on MCS and the related practice of clinical ecology in 1989. The College concluded that existing literature offered "inadequate support for the beliefs and practices of clinical ecology" and that diagnoses and treatments for MCS were ineffective. The American College of Occupational and Environmental Medicine endorsed this report. Position papers of the American Academy of

Allergy and Immunology state there are no immunologic data to support the beliefs of the clinical ecologists. The American Medical Association (AMA) in 1991 concluded MCS should not be considered a recognized clinical syndrome. The AMA stated MCS proponents should prove any new tests in appropriately controlled, peer-reviewed clinical trials rather than shifting the burden to MCS critics to demonstrate effective therapies.<sup>12</sup> These views contrast those of the clinical ecologists and other physicians represented by the American Academy of Environmental Medicine.<sup>13</sup>

## **IMPLICATIONS**

*Difficulties are associated with MCS as a scientifically diagnosable disease. MCS requires definition as a disease and such definition requires consensus in the medical community. Epidemiological studies need to be well-constructed to assess the causal inference between exposure and disease. Clinical tests require control and should be based on sound scientific design to remove bias. Confounding issues, such as idiosyncratic response, dietary status, concurrent use of medications, and underlying disease need to be carefully assessed. The physiological mechanism for MCS, if one exists, must eventually be understood and confirmed by recognized scientific and medical studies published in peer-reviewed journals.<sup>14</sup> Unfounded worker's compensation claims and toxic tort actions may have resulted from the conflicting ideas and incomplete information regarding MCS.<sup>15</sup> Legislators and regulators may not be basing decisions regarding MCS on scientifically supported claims.<sup>16</sup> Courts have held widely differing views in allowing traditional scientific evidence and expert testimony in MCS cases.<sup>17</sup>*

## **PROPOSED DEFINITION**

Dr. Mark R. Cullen, a professor of medicine and epidemiology, has attempted to define MCS, primarily for research purposes, and his is the most widely used clinical definition. Cullen's definition consists of points including:

- MCS is acquired in relation to documented environmental exposure(s), insult(s), or illness(es);
- Symptoms involve more than one organ system;
- Symptoms recur and abate in response to predictable stimuli;
- Symptoms are elicited by exposure to chemicals or diverse structural classes and differing toxicological modes of action;
- Symptoms are elicited by exposures that are demonstrable (albeit low levels);
- Exposures that elicit symptoms must be very low (several standard deviations below levels known to cause adverse human responses); and,
- No single widely available test of organ system function can explain symptoms.

Diagnosis and clinical management should include a detailed history and comprehensive medical and psychosocial evaluation of the patient. Of critical importance is to rule out the presence of a physical disease caused by defined occupational or environmental factors (e.g., asthma, lead poisoning, allergic alveolitis, etc.).<sup>18,19</sup>

## **CAUSAL INFERENCE**

Causal relationships cannot be determined on the basis of anecdotal reports alone due to difficulties in determining if a reaction is truly associated with a described exposure. Some reactions may be caused by any number of chemical exposures, such as foods consumed/dietary habits, genetics/idiosyncratic factors, concurrent use of medication, or by underlying disease. Confounding and bias may occur, and it is necessary to use the scientific method rigorously in assessing a disease such as MCS.<sup>20</sup>

The following aspects of association have been used in the scientific community to distinguish causal from noncausal associations (although general consensus exists that, other than temporality, there is no singly reliable criterion for determining whether an association is a causal association; all aspects of the association should be

considered before deciding the most likely interpretation of the association is causation):

- Strength (statistical power from epidemiological studies);
- Consistency (repeated observation of an association);
- Specificity (cause leads to a single effect; however, causes of a given effect cannot be expected to be without other effects);
- Temporality (cause precedes effect);
- Biological gradient (presence of a dose response curve);
- Plausibility (biological plausibility of the causal hypothesis);
- Coherence (a cause and effect interpretation does not conflict with what is known of the disease);
- Experimental evidence (e.g., animal studies, institution of preventive action affecting disease outcome, etc.); and,
- Analogy (chemical similarity may result in similar effects).<sup>21</sup>

## **IMPLICATIONS**

*As previously mentioned, there are no published, well-conducted epidemiological studies to provide statistical association between chemical exposure and MCS. The lack of clear definition of the disease itself has precluded collection of this data. Cullen's definition of MCS, if followed, could help to provide a more manageable definition to conduct such studies.*

*Recommendations in the scientific community have stated that when temporality is indicated, the dose response characteristics must be carefully evaluated. People should be made aware that odor detection does not ordain toxicity. The mere fact that the subject may have smelled the vapors does not establish toxic assault. In a situation in which a pre-existing condition (asthma) is similar to the claimed injury, establishment of causation from a subsequent chemical exposure may be virtually precluded. Alternative explanations for the possibility of cause for the alleged injury should be assessed.*<sup>22</sup>

*There is no established and widely available test to diagnose MCS. Appropriate organ function tests, biological monitoring to specific chemical substances, controlled challenge testing with suspected causative agents (using placebos and double blinds), quantitative encephalography, immunologic testing, and neuropsychological testing have been recommended to rule out other illnesses in a differential diagnosis, but are subject to interpretation.*<sup>23,24,25</sup> *Medications have been noted to include a wide spectrum of effects and may affect biological monitoring of industrial chemicals.*<sup>26</sup>

## **ROLE OF INDUSTRIAL HYGIENE**

Industrial hygienists seek to prevent occupational disease and injury through the anticipation, recognition, evaluation and control of environmental hazards found in the work environment. Industrial hygienists have been incorporated into occupational health settings as clinical consultants. This role includes:

- Expanding analysis from single index case to an industry (an "index case" may suggest hazards in an industry);
- Evaluating workplace exposures of individual patients (e.g., measuring or estimating exposures);
- Obtaining a complete occupational history;
- Consulting regarding the potential and nature of the exposure;
- Interpreting environmental data;
- Inspecting worksites to evaluate control mechanisms;
- Modifying environmental controls;
- Educating patients;
- Work simulation;
- Implementing programs; and,
- Advising physicians and nurses.<sup>27</sup>

## IMPLICATIONS

Increasing interaction between occupational health professionals may provide a general methodology for objectively conveying scientific information in matters concerning MCS. In any case study, a review of medical records, in conjunction with an industrial hygiene inspection, exposure estimation, and literature review may offer a more likely causal factor for explaining the subject's symptoms. Although some criteria for causal inference is subjective, dose response information, limited statistical data, temporality, and the weight of experimental evidence may indicate a more likely cause for the symptoms.

Industrial hygienists may aid in such investigations by performing a review of records (such as OSHA records, monitoring records, material safety data sheets, safety inspection reports, and medical records) or a facility inspection. The facility inspection may include interviews with the facility management and other employees, a tour of the facility, an assessment of the facility's ventilation systems, and assessment of operational parameters of the facility (e.g., the number of employees, the production levels, observation of work practices, etc.). Such reviews and inspections may reveal more detailed information regarding the nature of the chemical exposure(s) involved in assessing MCS.

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