A review of the Multiple Chemical Sensitivity (MCS) Guidelines for South Australian Hospitals 2010

Includes

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Executive summary

Idiopathic environmental intolerance (IEI), formerly known as multiple chemical sensitivity (MCS) (further referred to as 'MCS/IEI'), is the term used to describe a condition involving a broad array of recurrent nonspecific physical and psychological symptoms attributed to exposure to low levels of a wide spectrum of chemical, biological or physical agents common in the everyday environment.

There are no universally accepted clinical case definition (diagnostic) criteria for MCS/IEI. Despite extensive research over the past 50 years, there is little understanding of the causes and pathophysiological mechanisms of this condition. There are no diagnostic laboratory or clinical tests. The condition is not included in the current version of the International Classification of Diseases (ICD-10). It is, therefore, difficult to ascertain how common MCS/IEI is in the general population. South Australian estimates report about 1% prevalence of self-reported MCS.

While there is no clinical definition and medical explanation for the symptoms reported by MCS/IEI patients, the symptoms are nevertheless real to the person who reports them. Some of the reported symptoms may take a significant toll on many aspects of a person's everyday life, including relationships, lifestyle, and work.

A wide range of chemical, biological and physical factors can be encountered in a healthcare facility. Some of those may be perceived as potential symptom triggers by individuals who identify themselves as having MCS/IEI. Attending a healthcare setting may cause considerable concern and sometimes distress for this group of individuals.

It is important that the healthcare service providers are aware of the MCS/IEI and are advised on how to ensure a patient reporting MCS/IEI has this condition taken into account while attending to their presenting health needs.

SA Health issued a guidance document, *Multiple Chemical Sensitivity (MCS) Guidelines for South Australian Hospitals* in 2010 which is now due for review and update. To undertake this review, SA Health established a panel of clinical, scientific and regulatory experts representing the SA Health Local Health Networks. The scope of the review and update process included:

> conducting a brief review of scientific literature,
> conducting an evaluation of the utility and performance of the 2010 guideline (a questionnaire for healthcare sites),
> conducting a search of the hospital safety and incidents database, Safety and Learning System (SLS),
> reviewing guideline documents issued by other jurisdictions,
> drafting an updated guideline document based on the outcomes of the review.

The membership of the MCS Hospital Guidelines Review Panel included:

> A/Prof Nicola Spurrier, Public Health Physician, Department for Health and Ageing (DHA) - Chair
> Dr Kateryna Babina, Senior Scientific Officer, Public Health Toxicology, DHA
> Ms Bronwyn Cadd, SA Ambulance Service, Extended Care Paramedic
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> Ms Louise Kay, A/Nurse, Management Facilitator, S&QR, Paediatric Medicine, WCHN
> Ms Sue Lyons, Chief Project Officer, Disability SA, Department for Communities and Social Inclusion
The Review Panel identified several shortcomings in the 2010 guideline document, including:

- The length of the document, limiting its utility for busy health care sites.
- The document is too prescriptive and fails to recognise the individual and disparate nature of the concerns of individuals identifying as having MCS/IEI.
- The document fails to recognise the limitations inherent in the operational reality of most healthcare sites.
- The actions/measures prescribed by the document have a very little scientific basis from the standpoint of benefits to the clinical outcomes for the patients reporting MCS/IEI.

The Review Panel recommended that the Multiple Chemical Sensitivity (MCS) Guidelines for South Australian Hospitals 2010 be rescinded and replaced with the new document: Management of Patients Reporting Idiopathic Environmental Intolerance/ Multiple Chemical Sensitivity: Guidelines for South Australian Hospitals and Healthcare Sites.

The new guideline document includes recommendations from SA hospital and other healthcare sites staff, as well as opinions of the MCS Hospital Guidelines Review Panel. The document emphasises that SA Health staff have an obligation to interact with all patients/carers in a respectful and non-judgemental manner. While it may not be possible or practical to alter many aspects of the clinical environment, SA Health staff should endeavour to reduce the individual’s exposure to potential triggers. However, this must not compromise clinical safety. Clinical safety refers to that of the individual and that of other patients.
Introduction

Definitions and terminology

Idiopathic environmental intolerance (IEI), formerly known as multiple chemical sensitivity (MCS), is the term used to describe a condition involving a broad array of recurrent nonspecific physical and psychological symptoms attributed to exposure to low levels of a wide spectrum of chemical, biological or physical agents in the everyday environment. This document will use the term ‘MCS/IEI’ to acknowledge both definitions of the same condition.

The MCS/IEI is defined by the following three criteria: (1) an acquired disorder with multiple recurrent symptoms; (2) reported as associated with diverse environmental factors tolerated by the majority of people; and (3) not explained by any known medical or psychiatric disorder.¹

Other terms for MCS/IEI include:

> 20th Century Disease
> Acquired Intolerance to Solvents
> Allergy Toxemia
> Cerebral allergy
> Chemical Acquired Immune Deficiency Syndrome (Chemical AIDS)
> Chemical Sensitivity or Intolerance
> Clinical Ecology Syndrome
> Eco-syndrome
> Environmental Hypersensitivity
> Environmental Illness
> Environmental Somatization Syndrome
> Environmental Stress Syndrome
> Immune Dysfunction Syndrome
> Total Allergy Syndrome
> Toxic Encephalopathy
> Toxicant-Induced Loss of Tolerance (TILT)

MCS/IEI History

The concept of ‘environmental hypersensitivities’ distinct from allergies and food intolerances, was developed in the 1950s by T. Randolf, the founder of ‘clinical ecology’, a field of medical practice which was never recognised as a medical speciality. Clinical ecology has evolved into what is now known as environmental medicine.¹

The term “Multiple Chemical Sensitivities” was introduced in 1987 by M. Cullen who described MCS as follows: “An acquired disorder characterised by recurrent symptoms referable to multiple organ system, 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 available test of organ system function can explain the symptom.”²

MCS has been the subject of many symposia, roundtables, workshops, and reviews. The seminal workshop conducted by the International Programme on Chemical Safety (IPCS) took place in Berlin in 1996. The IPCS Workshop recommended moving away from using the term “multiple chemical sensitivity” as it was considered that the term made assumptions on the causality of the disorder, which were not supported by the scientific evidence. The IPCS workshop proposed a new term, Idiopathic Environmental Intolerance (IEI).¹ In Australia, an authoritative review of scientific evidence behind MCS has been conducted by the National Industrial Chemicals Notification and Assessment Scheme (NICNAS) in collaboration with the Office of Chemical Safety and Environmental Health (OCSEH). This review identified knowledge gaps and needs for further research and was published in 2010.³
Clinical aspects

Commonly reported symptoms and triggers

The clinical picture of MCS/IEI is characterised by the broad range of non-specific symptoms involving multiple organs and systems. There is no consistent characteristic symptom pattern. Symptoms most commonly cited in the literature include:

- Headache
- Fatigue
- Confusion
- Depression
- Shortness of breath
- Arthralgia
- Myalgia
- Nausea
- Dizziness
- Memory problems
- Gastrointestinal symptoms
- Respiratory symptoms

Triggers

MCS/IEI sufferers identify a remarkably wide and diverse range of chemical, biological and physical factors as symptom triggers. Most commonly, the literature mentions the following as potential triggers of MCS/IEI symptoms:

- Carpeting, printing ink, soft plastics, synthetic fabrics
- Chlorinated and fluoridated water
- Cigarette smoke
- Cleaning products
- Electromagnetic field
- Fragranced products such as perfumes, aftershave, and deodorants
- Pesticides
- Pharmaceutical drugs and anaesthetics
- Volatile organic compounds, including paint and solvents

The critical factor is that the symptoms of MCS/IEI are reported to be triggered by exposure to very low levels of the perceived triggers, i.e. background levels of exposure, which do not cause concern for the vast majority of the population.

Diagnosis

There are no universally accepted clinical case definition (diagnostic) criteria for MCS/IEI. Despite extensive research over the past 50 years, there is little understanding of the causes and pathophysiological mechanisms of this condition. There are no laboratory tests and no clinical guideline documents.

Disease classification

WHO issues the International Classification of Disease (ICD), a reference tool for clinical, health management and epidemiological purposes. It allows for the monitoring of the state of health and disease prevalence, incidence and distribution in a standardised manner. Different countries and jurisdictions introduce local modifications to the WHO version of ICD to accommodate local conditions and views of healthcare professionals. In Australia, ICD reviews and updates are conducted by the Australian Consortium for Classification Development (ACCD) (https://www.accd.net.au/).

MCS was considered for the inclusion in the Australian version of ICD (ICD-10-AM [Australian Modification]) in 2003. The public submissions were reviewed by the National Centre for Classification in Health (NCCH) and its expert advisory groups. The proposal to include in ICD10-AM was rejected by NCCH in 2003 on the grounds of (1) lack of clinical or laboratory evidence of pathological process;
(2) difficulties in differential diagnosis; (3) lack of internationally recognised diagnostic criteria; (4) lack of validated diagnostic.\(^3\)

MCS/IEI is included in German and Austrian versions of ICD.\(^3\) Since 2012, MCS has been included in the Danish version of ICD, with the diagnostic code label “symptoms related to chemicals and scents” in a subcategory of “medically unexplained symptoms.”\(^7\)

**Epidemiology**

The reports of the MCS/IEI prevalence and age/gender distribution are inconsistent throughout the current scientific literature. The lack of diagnostic criteria and the absence of the disease classification code for MCS/IEI preclude the collection of consistent epidemiological data. The current knowledge of MCS/IEI incidence is largely based on self-reporting of a self-diagnosed condition. There are a number of questionnaire instruments, which are useful for academic and clinical research.\(^8\)–\(^10\) The diversity of the instruments used for case definition by various researchers makes the comparison and systematic review of various study results difficult.

While some studies report the individuals with MCS as mostly female, between the ages of 30-50 years and with above average socio-economic status (SES), other studies report the age band of <20 to 35 years of age, across all income and education levels and yet others reported predominant age group of 45-65 years of age in low SES stratum.\(^3\)

The prevalence of self-reported MCS among the South Australian population has been reported at about 1% in 2008.\(^11\) This may represent an overestimate because the data were based on telephone interviews of a random sample of approximately 2000 and the questions used in the study were not specific to MCS. The study also reported higher prevalence of MCS in the age group 45 to 74 years old and women and people of relative socioeconomic disadvantage reporting hypersensitivity more often.\(^11\)

**Impacts on quality of life**

Importantly, the symptoms of MCS/IEI are real to the person who reports them, despite the lack of toxicological explanation.\(^12\)

Some of the symptoms experienced by the MCS/IEI individuals may be debilitating and may take a significant toll on many aspects of everyday life, including relationships, lifestyle, and work.\(^13\),\(^14\) To a large extent, the individual’s coping strategies determine the severity of limitations to the quality of life.

**Disability**

MCS/IEI is not considered a disability and does not meet eligibility criteria for specialist disability services provided or funded by the South Australian Government as described in the Department for Communities and Social Inclusion (DCSI) *Eligibility for Disability Services and Programs Sector-Wide Policy* developed in 2014.\(^15\) Nor is MCS/IEI recognised as a disability under the *National Disability Insurance Scheme Act 2013* as outlined in the *Operational Guideline – Access – Disability Requirements*.\(^16\)

The South Australian Government is committed to providing individualised person-centred care and support that is respectful of, and responsive to, the preferences, needs, and values of patients and clients, including people experiencing the symptoms of MCS/IEI.
Treatment interventions

Individuals with MCS/IEI symptoms who seek help from their GPs are frequently referred to allergy specialists. Often, these patients also report strong odour intolerance. If following clinical investigations there is still no explanation for the symptoms, these patients are usually provided with explanation, reassurance, and guidance on avoidance measures.

In 2005 the South Australian Parliamentary Inquiry (Social Development Committee, 2005) identified that the patients with MCS considered education, support and acknowledgement of their suffering as the most beneficial interventions. Other effective treatments reported in the literature include psychotherapy and cognitive behavioural therapy.

Some groups promote a range of interventions, ranging from intravenous injections of vitamins and nutritional supplements to ‘detoxification therapies’ such as sauna, colonic irrigation and others. The efficacy of these interventions in the treatment of MCS/IEI has not been tested systematically and they are not supported by mainstream health practitioners.

In the absence of clear evidence-based treatment options, individualised care plans and a person-centred care model based on a multidisciplinary treatment approach are likely to facilitate improvement in the quality of life in individuals reporting MCS/IEI.

The clinical management principles agreed by Australian clinicians have been outlined in the NICNAS/OCSEH *Multiple Chemical Sensitivity: identifying key research needs* report as follows:

- Accept that the person with MCS feels ill and is affected by the illness;
- Provide an empathetic relationship to offer understanding and support;
- Encourage self-management rather than offering or seeking a cure;
- Recognise and explain that no specific therapy has yet been proven to be of benefit;
- Maintain a long-term positive approach.

Patient management in the hospital environment

A wide range of chemical, biological and physical factors can be encountered in a healthcare facility. Some of those may be perceived as potential symptom triggers by individuals who identify themselves as having MCS/IEI. Attending a healthcare setting may, therefore, cause considerable concern for this group of individuals whether that is as patient, carer or visitor.

Some MCS/IEI patients may express very specific requests as to the conditions of their stay in a healthcare facility. These are often based on trigger avoidance approach. There is no conclusive evidence that trigger avoidance interventions while attending a healthcare facility are effective in improving the overall clinical outcomes for the patients. However, attention to these patients’ concerns may improve their general wellbeing by improving the quality of their experience in a healthcare setting.

Current (2010) SA Guideline document

The 2010 SA guideline document, *Multiple Chemical Sensitivity (MCS) Guidelines for South Australian Hospitals* was approved and published in 2010. The Review Panel understand that the frontline healthcare professionals were not extensively consulted during the development of the 2010 Guidelines.

The 2010 Guidelines were largely based on the then current, but now rescinded (July 2011) guideline document developed by Queensland Health (Royal Brisbane and Women’s Hospital, Metro North Health Service District).
Since the publication of the SA Guidelines, NICNAS, and OCSEH published a joint report ‘A Scientific Review of Multiple Chemical Sensitivity: Identifying Key Research Needs’. This report, along with the relevant peer-reviewed literature, was consulted extensively in the process of this review of the 2010 SA Hospital guideline document.

The Multiple Chemical Sensitivity (MCS) Guidelines for South Australian Hospitals 2010 was due to be reviewed and updated in 2015.

Guidelines issued by other Australian jurisdictions

Other Australian jurisdictions have issued guides and guidelines for the management of MCS/IEI patients in the hospital environment.

Queensland

Queensland Health issued two documents titled Position Statement on Multiple Chemical Sensitivity and Process for the Management of Patients who identify themselves as suffering from Multiple Chemical Sensitivity in July 2011. These documents replaced the former Queensland hospital guideline document (issued by Royal Brisbane and Women’s Hospital, Metro North Health Service District) upon which the 2010 SA hospital guideline document was largely modelled.

Victoria and Western Australia

Victoria Health published Multiple Chemical Sensitivity: A Guide for Victorian hospitals in 2011. In Western Australia, WA Country Health Service issued Multiple Chemical Sensitivity/Chemical hypersensitivity guideline in 2010. These documents were modelled on the 2010 SA guideline and the now rescinded Queensland guideline document.

New South Wales

NSW Health issued a factsheet ‘Multiple Chemical Sensitivity Disorder’, (last updated September 2015), which mentions that ‘Reasonable accommodation should be made to support people who identify as having MCS and who have a treatment plan by a registered medical practitioner when they attend NSW Health facilities.'

Australian Capital Territory

Canberra Hospital and Health issued Standard Operating Procedure for Multiple Chemical Sensitivities (MCS) - Care of Patients in 2012. The document is a detailed prescriptive set of instructions. This document is currently due for review.

Current (2010) SA guideline evaluation

The Review Panel conducted an evaluation of the utility of the 2010 guideline document and the incidence of patients with MCS reporting dissatisfaction with the hospital staff’s approach to their condition.

Hospital staff questionnaire

The Review Panel undertook a survey aimed to measure healthcare professionals’ experiences with patients reporting MCS/IEI symptoms as well as to evaluate their familiarity and satisfaction with the guideline document under review. The Review Panel designed a questionnaire, which was distributed among hospitals and other healthcare sites through Local Health Networks.

The questionnaire included the following items:
1. Are you aware of the SA Health Multiple Chemical Sensitivity guidelines?
2. Is there a specific local protocol for managing individuals with Multiple Chemical Sensitivity in your health setting?
3. Have you ever provided care for a patient who reports having Multiple Chemical Sensitivity?
4. Are you aware of any complaints by patients regarding their health care because of Multiple Chemical Sensitivity in your health setting?
5. Are you aware if there is a dedicated space for the care of patients with Multiple Chemical Sensitivity in your health setting?
6. Do you believe the 2010 Guidelines are a useful document? An electronic link to the document was provided with this question.
7. Are you aware of any concerns staff have had about these Guidelines?
8. Do you have any suggestions how these Guidelines can be improved?

The Review Panel received 65 responses from senior clinicians, registrars, medical scientists, pharmacists, nursing and midwifery staff, allied health professionals and SA Ambulance officers. Respondents came from a wide range of health sites, including country hospitals. The majority of respondents reported over ten years of experience working in a health setting.

Overall, the responses showed:

> low awareness of the existence of the 2010 Guideline document or relevant local protocols;

> the majority of respondents had never encountered a patient reporting MCS/IEI in their practice and never heard of complaints by patients reporting MCS/IEI regarding their care;

> most respondents were not aware if a dedicated space existed in their health setting for the care of patients reporting MCS/IEI;

> upon reading the document (using the link provided in the questionnaire), about half of the respondents said the 2010 guideline appeared a useful document while the other half either found the document ‘useless,’ ‘too long,’ ‘unhelpful in the long run’ or did not answer the question;

Following were the most common recommendations for the improvement of the document:

> Include input from healthcare professionals.

> Shorter document with easy to follow guide.

> Greater dissemination of the new document.

> Considerations to be given to providing the current scientific knowledge regarding MCS/IEI.

Incident monitoring database search

The Review Panel conducted a search of the SA Health Safety Learning System (SLS) database entries from 2010 to 2015 using the search terms ‘chemical sensitivity’, ‘chemical allergy’, ‘MCS’, ‘idiopathic environmental intolerance’, ‘multiple chemical’, and ‘chemical’. The relevant incidents were reviewed and contributed to the development of the new guideline.

Conclusions

The Review Panel identified several limitations in the Multiple Chemical Sensitivity (MCS) Guidelines for South Australian Hospitals 2010. The main limitations included:

> The length of the document, limiting its utility for busy health care sites.

> The document fails to recognise the individual nature of the concerns of individuals identifying as having MCS/IEI.
The document does not acknowledge the limitations inherent in the operational reality of most healthcare sites and the need to prioritise patient safety.

The actions/measures prescribed by the document lack scientific basis from the standpoint of benefits to the clinical outcomes for the patients reporting MCS/IEI.

**Recommendations**

The Review Panel recommended that the *Multiple Chemical Sensitivity (MCS) Guidelines for South Australian Hospitals 2010* be rescinded and replaced with the new document: *Management of Patients Reporting Idiopathic Environmental Intolerance/Multiple Chemical Sensitivity: Guidelines for South Australian Hospitals and Healthcare Sites 2016.*
Appendix 1


These Guidelines are to be used when a patient/carer reports to SA Health staff that they have Multiple Chemical Sensitivity (or Idiopathic Environmental Intolerance).

These Guidelines are consistent with the following SA Health documents.
- SA Health Consumer Fact Sheet entitled ‘Consumer information on respecting your privacy and dignity with patient centred care principles’ (2014)

<table>
<thead>
<tr>
<th>A. Developing respectful partnerships with individual patients/carers</th>
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<tbody>
<tr>
<td>SA Health staff have an obligation to interact with all patients/carers in a respectful and non-judgemental manner.</td>
</tr>
<tr>
<td>SA Health staff should acknowledge that for individual patients/carers with this condition, exposure to certain chemicals or physical agents may result in considerable distress.</td>
</tr>
<tr>
<td>Whilst the nature and aetiology of Multiple Chemical Sensitivity does not have current scientific consensus, it is inappropriate for staff to question the validity of the disorder with the individual concerned.</td>
</tr>
<tr>
<td>SA Health staff are required to communicate to the patient that their individual concerns will be taken seriously and that modifications to the health care environment will be considered (see below).</td>
</tr>
<tr>
<td>Because individuals will come into contact with a number of clinical and ancillary staff in health care settings, senior member/s of the health care team (medical and nursing) need to be made aware of individual patient circumstances and potential triggers as soon as practicable.</td>
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<tr>
<td>If difficulties arise in the relationship between individuals and SA Health staff, this must be communicated promptly to the most senior member of the clinical team and appropriate mediation undertaken.</td>
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<tr>
<th>B. Identifying triggers and communicating this information to other staff</th>
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<tbody>
<tr>
<td>Once SA Health staff are informed by an individual of their MCS/IEI status, staff will need to document the particular triggers of concern to the individual.</td>
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<tr>
<td>The potential triggers must be recorded in the ‘Patient Alert’ or equivalent section of the medical records.</td>
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<tr>
<td>To ensure optimal communication of these potential triggers to other staff (clinical and non-clinical) additional methods of communication should be considered depending on the situation: for example,</td>
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<td>&gt; signage on door or end of bed</td>
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<tr>
<td>C. Modifying the environment</td>
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<td>-------------------------------</td>
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<tr>
<td>Whilst it is not possible or practical to alter the clinical environment, SA Health staff should endeavour to reduce the individual’s exposure to potential triggers. However, this must not compromise clinical safety. Clinical safety refers to that of the individual and that of other patients.</td>
</tr>
<tr>
<td>SA Health staff should discuss ways of modifying the environment with the individual, whilst explaining that clinical safety is unable to be compromised.</td>
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<tr>
<td>Potential modification of the environment will depend on individual circumstances (including severity and acuteness of the clinical scenario) and availability but may include:</td>
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<tr>
<td>&gt; providing the individual with a separate room and separate bathroom</td>
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<tr>
<td>&gt; locating individual away from high traffic areas and away from freshly renovated and/or repainted areas</td>
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<tr>
<td>&gt; minimising use of scented personal products</td>
</tr>
<tr>
<td>&gt; allow individual to supply their own linen</td>
</tr>
<tr>
<td>Cleaning products may be of concern to some individuals. Cleaning with appropriate disinfectant/antimicrobial compounds in health care settings is mandatory to minimise cross-contamination of infectious agents. A senior member of the clinical team or the SA Ambulance state duty manager may need to discuss this issue with an infectious disease expert and senior cleaning staff. There may be alternative cleaning products available which are more acceptable to certain individuals with MCS/IEI (i.e., unscented).</td>
</tr>
<tr>
<td>D. Responding to concerns throughout the health service visit/admission/transport occasion</td>
</tr>
<tr>
<td>Individuals with MCS may experience difficulties with additional triggers throughout their health service visit. Staff must respond to these additional concerns using the approaches described above.</td>
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Appendix 2

Proposed Mechanisms of MCS/IEI Causation – Overview of Current Scientific Literature

Proposed toxicological mechanisms of IEI

Immunological dysregulation

Theories of chemically induced immunological deficits or dysregulation have been studied extensively. The studies measured a broad variety of immunological parameters. Several studies reported changes in some immunological parameters while other studies reported contrary results. The proposed theories behind the idea of immunological dysregulation as a mechanism of MCS/IEI, do not explain the variety of symptomatology and the broad range of toxicologically and physically diverse triggers. The studies to date provide inconsistent results and fail to support the theory of immunological dysregulation in individuals with MCS/IE unequivocally.

Respiratory hypersensitivity/neurogenic inflammation

The neurogenic inflammation theory was first hypothesised in the 1990s. The proponents theorise that the non-specific immune responses to low-level irritants may be initiated by the interaction of chemicals with the C-fibres of sensory nerves in the respiratory mucosa. It is proposed that the distant multi-organ involvement may then occur via neurogenic inflammatory switching mechanism whereby local sensory activation in respiratory tissue may lead to the release of inflammatory modulators in distant tissues.

While several studies investigated a putative role for neurogenic inflammation effects in MCS/IEI subjects, they found inconsistent and contradictory results and failed to explain the multitude of triggers and the variety of non-specific symptoms reported in MCS/IEI.

Time-dependent sensitisation / Limbic kindling / Neural sensitisation

The neural sensitisation theory suggests that the symptoms of MCS/IEI may be the effect of the acquired hyper-sensitiveness that manifests itself in several body systems. It proposes that in the initial stages, the exposure may cause persistent changes in the function of the nervous system, which may later spread through ‘cross-sensitisation’ mechanisms to involve the whole nervous system as well as other systems, as a response to even very low exposures.

The limbic kindling theory of MCS/IEI suggests that increased limbic system excitability may be augmenting the individual’s with MCS/IEI pre-disposition to react to low-level exposures.

The animal models, however, demonstrate that the limbic kindling mechanisms require exposure to pharmacologically effective levels of triggers, rather than low levels of exposure as alleged in MCS/IEI.

The studies of neural sensitisation/limbic kindling theory provided inconsistent results. The human studies did not use MCS/IEI subjects specifically, while the animal studies used exposure models at levels that were significantly overtly neurotoxic.
NMDA receptor activation/ increased levels of nitric oxide

Another theory suggests that the hypersensitivity may be explained by increases in N-methyl-D-aspartate (NMDA) receptor activity accompanied by a stress-induced increase in the tissue levels of nitric oxide (NO) and peroxynitrite. This theory implicates seven chemicals/classes: organophosphorus/carbamate, organochloride and pyrethroids, organic solvents, carbon monoxide, hydrogen sulphide and mercury compounds.38,39

There is a lack of evidence that NMDA receptor activity can be demonstrated in patients with MCS/IEI.3,5,38,39

Toxicant-induced loss of tolerance (TILT)

The toxicant-induced loss of tolerance (TILT) theory suggests that acute or chronic chemical exposure may cause susceptible persons to lose their tolerance to previously tolerated exposures. It is suggested that TILT may be a two-step process: (1) initiation from a single high dose or repeat low dose exposures and (2) triggering from common everyday exposures.40,41

The TILT theory does not propose any detail on the pathophysiological mechanisms that could trigger the loss of tolerance. No studies testing this theory have been reported. To date, TILT theory is an observational hypothesis, which does not explain what toxicological receptor-based mechanisms could result in the broad range of chemicals implicated in triggering MCS/IEI symptoms.3,5,40,41

Genetic vulnerability – altered xenobiotic metabolism

It has been proposed that MCS/IEI individuals may be particularly susceptible to environmental exposures due to the genetic predisposition underpinned by the alterations in xenobiotic metabolising enzymes. Some studies examined various enzyme systems, including various cytochromes CYP450, paraoxonase/arylesterase (PON1), glucuronosyltransferases (UGT), N-acetyltransferase (NAT) as well as genetically based determinants of xenobiotic-metabolising capability.42,43 Studies in Gulf War veterans found a significant association with PON1 R genotype and symptoms similar to MCS/IEI.44,45 The reported studies in MCS/IEI subjects are difficult to compare due to the variations in study design and case definitions.46

A genetic rat model, Flinders Sensitive Line (FSL), is a rat model of inherent cholinergic hypersensitivity, exhibits some symptoms similar to MCS/IEI. The cholinergic system is pervasive and involved in many physiological and behavioural functions. FSL rats exhibit symptoms like depression, fatigue, reduced appetite (but not cognitive dysfunction) without precipitating chemical exposures.47

Across available literature, current genetic profiling does not provide a clear genotypes characterisation of individuals reporting MCS/IEI. A significant confounding factor in implicating genetic susceptibility is that many xenobiotic-metabolising enzymes also play important roles in normal physiological function and in the metabolism of endogenous products.3–5,42–47

Psychiatric and psychological co-morbidity

Some studies refer to MCS/IEI as a somatoform reaction, a depressive disorder, post-traumatic stress disorder or a panic disorder. The prevalence of psychiatric disorders in patients reporting MCS/IEI has been reported in the range between 42% and 100% in some studies. MCS/IEI subjects score significantly higher than healthy controls on measures of somatic symptoms and psychological predictors for somatisation. It is believed that trait anxiety and symptom interpretation, perception and attribution may contribute to the persistence of somatoform symptoms in MCS.48

Simple exposure to odours under distressing circumstances may interact with individual’s beliefs, reinforced by popular media messages, which may lead the individual to interpret their somatic
symptoms as linked to the exposure to odours. Thus, the perception of having MCS/IEI may be stemming from a combination of certain personality traits, attitudes, cultural beliefs and social conditioning as well as pathological changes. 49

A number of controlled clinical trials using challenge testing have been conducted with individuals reporting MCS/IEI. A systematic review of thirty-seven studies concluded that, while there is a great variation in study designs and blinding approaches, the reactions to chemical triggers occurred in MCS/IEI individuals in cases when exposure was clearly discernible. In other words, when the patients know that they are exposed to a real and not an imitation substance, they report clinical symptoms. 50

MCS/IEI has been recommended to be considered as and treated as a somatoform disorder with an emphasis on addressing ‘threat’ beliefs rather than then approaching it from the toxicological or immunological perspective and attempting to find and manage physiological causes only. 12
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