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History of chemical sensitivity and diagnosis

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Abstract: Histories of mold, pollen, dust, food, chemicals, and electromagnetic field (EMF) sensitivities are the major categories of triggers for chemical sensitivity. They are tied together by the coherence phenomenon, where each has its own frequencies and identifiable EMF; therefore, they can be correlated. The diagnosis of chemical sensitivity can be done accurately in a less-polluted, controlled environment, as was done in these studies. The principles of diagnosis and treatment depend on total environmental and total body pollutant loads, masking or adaptation, bipolarity of response, and biochemical individuality, among others. These principles make less-polluted, controlled conditions necessary. The clinician has to use less-polluted water and organic food with individual challenges for testing, including dust, mold, pesticide, natural gas, formaldehyde, particulates, and EMF testing, which needs to be performed in less-polluted copper-screened rooms. The challenge tests for proof of chemical sensitivity include inhaled toxics within a clean booth that is chemical- and particulate-free at ambient doses in parts per million (ppm) or parts per billion (ppb). Individual foods, both organic and commercial (that are contaminated with herbicides and pesticides), are used orally. Water testing and intradermal testing are performed in a less-polluted, controlled environment. These include specific dose injections of molds, dust, and pollen that are preservative-free, individual organic foods, and individual chemicals, i.e. methane, ethane, propane, butane, hexane, formaldehyde, ethanol, car exhaust, jet fuel exhaust, and prosthetic implants (metal plates, pacemakers, mesh, etc.). Normal saline is used as a placebo. EMF testing is performed in a copper-screened room using a frequency generator. In our experience, 80% of the EMF-sensitive patients had chemical sensitivity when studied under less-polluted conditions for particulates, controlled natural gas, pesticides, and chemicals like formaldehyde.

Keywords: electromagnetic sensitivity; total environmental and individual pollutant load.

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Introduction

Chemical sensitivity is the adverse reaction to ambient doses [parts per million (ppm) and parts per billion (ppb)] of toxic and non-toxic chemicals contained in air, food, and water. Electromagnetic sensitivity is an adverse reaction to the specific ambient electromagnetic field (EMF) frequencies below the heating level. This quantum field involves fewer particles and has an uncertainty described by the Heisenberg relation.

History of the development of chemical sensitivity

The history of food and chemical sensitivity stretches back over 2000 years to when Hippocrates described people who were made ill by certain food and drink after they fasted or just could not tolerate a food that others could (1).

Hippocrates showed that some people can eat cheese and do well; others, it makes them sick. Also, he showed that if a person fasts for 3 days and takes the wrong food on the 4th or 5th day, he will be sick. Text from Gray's Anatomy showed intricate anatomical parts that got inflamed and made people ill (2). Guyton's Physiology showed multiple principles and physiology and absorption that involved food and chemical changes (3). Heine's book on the ground regulation system laid out the physiology for chemical sensitivity (4).

Altered biochemistry was found in texts on detoxification (5, 6) which showed the basic principles of detoxification and nutrient support of the chemically sensitive.

Selye described the general adaptation syndrome which applied to food and chemical sensitivity (7), while Hare of Australia described the food factor in disease (8).

Rowe also showed the food factor in disease in 1931 (9), while Rinkle described masking in 1936 (10). Hansel [ear, nose, and throat (ENT)] showed there was an optimal dosage concept in 1941 for intradermal treatment (11).

Rinkle described cyclic food allergy and serial dilution (1:5) and titration in 1949 (10). Randolph showed triggering by chemicals and foods and the adaptation syndrome in the specific foods and chemicals in the 1950s (12).

He (in Chicago, IL, USA) wrote Human Ecology and Susceptibility to the Chemical Environment, 1962 (first

printing) (13). This was the first description of chemical sensitivity performed in a controlled environment.

Willoughby in Kansas City, KS, USA, emphasized the intradermal serial dilution and titration of molds in 1963 (14). Binkley described intradermal food neutralization that demonstrated the same for chemicals in 1964 (15). Lee did serial dilution provocation and neutralization tests for the diagnosis of food, pollens, and mold incompatibilities in 1961 (16). Miller confirmed Lee's findings (17).

MacLennan, in Hamilton, Ontario, Canada, in 1974 also played a role in elaborating the intradermal diagnosis and treatment for foods and chemicals (18).

History of the EMF spectrum

For most of history, light was the only known part of the EM spectrum. The ancient Greeks studied light and its properties. It was not until scientific experiments almost 2000 years later discovered new findings about the EMF spectrum (19).

In 1800, Herschel discovered infrared light (20); the next year, Ritter described invisible light rays that induced chemical variations (21). In 1845, Faraday linked EMF to the polarization of light traveling through a transparent material that responded to an EMF (22).

This observation lead to the inference that light itself was an EM wave. This equation predicted an infinite number of frequencies of EM waves all traveling at the speed of light. He also produced and measured the properties of the microwave.

The knowledge of these new types of waves paved the way for the telegraph and the radio. Edison (23) and Telsa (24) each developed certain aspects of electricity making it practical. Many scientists showed problems with wired telephones, and especially with wireless apparatuses, Wi-Fi, smart meters, etc (25, 26).

Roentgen noticed X-rays when experimenting with high voltage radiation in a vacated tube (27). Villard studied the radioactive emission of radiation and identified x and b particles with the power being greater than either (gamma rays) (28). Audrode measured the length of gamma rays and found they were shorter and with higher frequencies than X-rays. Of course, today we have myriads of aberrations and technical changes in this field (29). Schliephake in 1932 showed that radar operators developed microwave illness (30). Johansen is a pioneer in EMF with his mast cell studies in 1980 (31). Rea et al. did a double-blind study on the presence of EMF sensitivity in some people (32). Belpomme in 2015 presented 1500 electromagnetically sensitive patients (33). Carpenter and Sage showed the effects of EMF on health in 2007 and 2012 (34). Hardell showed tissue changes in EMF-sensitive patients (35).

Coherence phenomenon

This was described by Smith and Monro in 1980–1982 (36), derived from Frolich's (37) approach to cellular communication systems, which demonstrated the coherence phenomenon where EMF frequencies were common markers in molds, pollens, foods, and chemicals, as well as the physical and human electromagnetic phenomena. This commonality allowed communication between these entities for diagnosis and treatment. It is one of the most important concepts in the diagnosis and treatment of chemical and electrical sensitivity.

Diagnosis under less polluted, controlled conditions

The first diagnostic tool under controlled conditions was developed by Randolph (38) and Dickey (39), a general surgeon and urologist. Dickey developed the first environmental control unit (ECU, 20%–40% less polluted, and pesticide and natural gas free) with longevity in Fort Collins, CO, USA, and also wrote the first book on Clinical Ecology in 1976. Randolph had developed the first ECU but it was closed before it opened due to hospital politics. Lee introduced intradermal provocative neutralization in 1987 (16). Miller in Mobile, Alabama also emphasized provocation intradermal neutralization (17), confirming Lee's observation. This procedure allowed mold, dust, pollen, food, and chemicals to be provoked and neutralized so the clinician and patient could observe the provocation of symptoms and signs under controlled conditions. The provocation allows reproduction under controlled environmental conditions. The lesser neutralization dose allows for the clearing of symptoms and signs.

Principles used in defining and treating chemical sensitivity were outlined by many physicians and scientists who have studied chemical and EMF sensitivity. These eight principles have evolved

1. Total body pollutant load (sum total of pollutants in the body) (13, 36, 40), where these substances are minimized when the total environmental pollutant

load decreases the total load in the environment – in air, food, and water. However, when the body's pollutant load stays too high, it can trigger or exacerbate chemical sensitivity (41).

2. According to Selye's, Randolph's, and our observations, adaptation or masking occurs when the individual rapidly gets used to an incitant and does not perceive the entry or reaction as causing and aggravating chemical sensitivity (42). The patient has to decrease the total body pollutant load with the removal of all possible incitants so triggering agents can be found (43) with challenge at the ambient doses in ppm or ppb. The idea of doing studies in less-polluted environments has been observed to allow the patient to depurate the toxics, which allows the adaptation or masking to be eliminated. This procedure allows cause and effect to be proven with individual ambient dose challenge in ppm or ppb. Each chemical has its own detoxification pathway; therefore, some are easy to detoxify while others are difficult – causing or exacerbating chemical sensitivity.
3. Biochemical individuality occurs where each individual has his own specific individual reaction and threshold for triggering chemical sensitivity (42, 44), some of which can be fended off while others cause chemical sensitivity.
4. The switch phenomenon is where the individual can change the reaction individually, i.e. stimulatory to depressed phase; or the ENT reaction is overtaken by asthma or arrhythmias (45).
5. Bipolarity of the response, where there is a stimulating phase and a depressive phase from the same exposure, which often can confuse the clinician as to the cause of the original disease (13). Often, the clinician misinterprets this problem to be a psychosomatic disease without any proof. They use failure to trigger under uncontrolled conditions, therefore, calling something psychosomatic without proof.
6. Spreading phase, where the reaction spreads to different organs, which often involves numerous specialists who have different interpretations as to the rightful cause of the disease and often suggest that the cause is unknown (46). In fact, if studied under controlled, less-polluted conditions, individual causes can be found, i.e. pulmonary dysfunction, fibromyalgia, arthritis, and arrhythmia (40, 47–50). Also, the spreading of incitants can be large with many molds, foods, and chemicals as triggers, until the individual has no safe food.
7. The law of nerve injury: when the injury heals, it results in hypersensitivity to subsequent incitants, i.e. scar sensitivities. The clinician often is confused about the origin of the problem. Diseases like polio or other bacteriological or virus problems can predispose to chemical sensitivity with a subsequent lighter exposure of the chemicals or mycotoxins years later (51).
8. Subtle or large head injury results in memory loss; usually, short-term memory loss or episodes of confusion and imbalance may occur (52). Like the bacterial or viral disease, these injuries can predispose a subject to chemical sensitivity when another exposure occurs later in life.

Technology

Technology was developed not only at the Environmental Health Center – Dallas (EHC-D) but also by members of the American Academy of Environmental Medicine (AAEM) to verify and quantify chemical and electrical sensitivity in a less-polluted environment.

Materials for cleanliness (less-polluted environment for decreased air pollution, pesticides, specific herbicides and formaldehyde reduction), tissue oxygenation, nutrition, and less-polluted food and water were emphasized from our background in cardiovascular surgery at the University of Texas SW Medical School, Parkland Trauma Hospital, and at the Veterans' Hospital. Randolph's principle of low to no outgassing of construction materials in the rooms were followed and improved by particulate counts, gas chromatography, and mass spectrometry. These materials had no formaldehyde, phenol, pesticide, natural gas, or other chemicals and the construction principles outlined were followed (53). High-efficiency filters of non-toxic metal, ceramic, and charcoal for gases and particulates were used. However, low outgassing is paramount in constructing less-polluted rooms (54) made of stone, ceramic, hardwood, porcelain, glass, etc. This technology is the principle for accurate diagnosis and treatment. Clean living accounts for 60%–75% of the treatment (55). Less-polluted rooms for better diagnosis and treatment were constructed (53, 56–58).

Fenyves and Edgar did quantitative air analysis studies of indoor and outdoor air. Their Department of Physics, University of Texas at Dallas did building analyses and inspections. Evaluations were eventually performed in 500 buildings (57). However, they helped develop less-polluted areas and buildings consisting of 5× less particle counts which were also analyzed by gas chromatography and mass spectrometry for lower gaseous pollutants.

Matrix Laboratories (Gary Cude) now performs air analysis by commercial means and have performed 500–1000 air analyses in buildings. Also, Matrix Laboratories does portable air analysis that can be shipped from remote areas (59, 60). Formaldehyde, benzene, methane, ethane, propane, butane, toluene, and xylene, as well as pesticides and many other chemicals are found. A typical air analysis is shown in Table 1A and 1B. This analysis can be done for hundreds of chemicals.

Table 1: Typical air analysis of a home.

A. Analysis – Pesticides
Reference method: Collection of PUF sorbent GC/MS

Analyte	**4555-1 Bedroom**		**4555-2 Kitchen**		**4555-3 Living room**	
Above ppb	**µg/m³**	**ppbv**	**µg/m³**	**ppbv**	**µg/m³**	**ppbv**
Aldrin	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
a-BHC	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
b-BHC	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
d-BHC	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
G-BHC (Lindane)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chlordane	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
4,4′-DDD	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
4,4′-DDE	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
4,4′-DDT	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Dieldrin	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
a-Endosulfan	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
b-Endosulfan	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan sulfate	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin aldehyde	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor expoxide	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Methoxychlor	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Toxaphene	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Pyrethrum	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorpyrifos (Dursban)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Diazinon, Malathion, Parathion	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Glyphosate	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Estraziwe	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Herbicides	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1

B. Microscopic examination of particulates on Air-O-Cell Filters of a home:
sample volume: 0/2 m³
Method: transmitted and polarized light microscopy, 100–1000×

Particulates>1 µ dia.	**4555-1 Bedroom µg/m³**	**4555-2 Kitchen µg/m³**	**4555-3 Living Room µg/m³**
Mold spores	320	210	280
Pollen	460	380	410
Natural fibers (cellulose)	600	250	540
Synthetic fibers	20	23	28
Glass fibers	60	40	80
Inorganic particles:			
Quartz	>10,000	>10,000	>10,000
Clay	500	200	400

Laboratory tests and their results: blood, urine, inhaled, total body

1. Rea presented papers on environmentally triggered cardiovascular disease, vasculitis, phlebitis, including biopsies, incitant tests and immune parameters, and implants, showing toxic substances could cause internal problems like gastrointestinal (GI) and genitourinary (GU) malfunction, kidney disease, and cardiovascular and brain dysfunction, in addition to fatigue, fibromyalgia, and ENT disease (60–62).
2. Wing, an Australian ENT surgeon, researched 100 nasal biopsies in the 1990s for molds and foods which triggered chemical sensitivity (63), showing the ground regulation system of the connective tissue matrix being congealed and destroyed.

Blood and urine analysis

3. Laseter quantitatively analyzed blood, air, and chemicals before and after chemically sensitive patients were placed in the controlled environment (64).

   He also analyzed blood in 13,000 patients. Urine was measured in 5000 patients; solvents in 3000 patients; toxics, i.e. formaldehyde, phenol, petrochemicals, etc. and organophosphates and chlorinated pesticides were measured in 5000 patients (64).

Psychological scan

4. Butler and Didriksen at the University of North Texas developed psychological profiles objectively showing brain injury, not psychological conditions. Over the years, approximately 2000–3000 profiles were done; approximately 2000 showed brain injury, not psychological conditions. Other abnormal laboratory analyses were found in the chemically sensitive (65, 66).

Brain SPECT scan

5. Simon and Hickey developed a triple-camera SPECT brain analysis technique for diagnosing brain toxicity patterns at Dallas Radiological Associates. Six hundred and eighty-two SPECT brain scans were taken between 2000 and 2015 (67) (Figure 1).
6. Autonomic nervous system disturbance in chemical sensitivity has been demonstrated objectively by two types of technologies:

   Heart Rate Variability (68) – 1500 cases have been performed at the Environmental Health Center-Dallas. Pupillography for measuring the chemically sensitive were found by Ishikawa, S. and Miyata, M., Kitasato University Medical School, Kitasato, Japan.

   These were found to be abnormal in the chemically sensitive with the following results: sympathetic increase alone, sympathetic increase and parasympathetic decrease, and parasympathetic decrease alone.
7. Thermography has been performed on 3000 chemically sensitive patients showing aberrations at the EHC-D (69).

Nutrition mechanisms

Pangborn, Bland, and Pall first developed ways to define nutrient mechanisms for detoxification which have been used at the EHC-D in 10,000 patients (70–72). Many parameters were abnormal, including the detoxification mechanisms of methylation, sulfonation, gluconization, peptides, glutathione conjugation, and abnormal levels of peptides, individual vitamins, amino acids, carbohydrates, lipids, and minerals.

Nutrition has been measured subsequently and practically by Overberg for oral nutrition in 2000 patients (73) at the EHC-D.

Rea et al. has measured nutrient levels in 5000 patients treated them with intravenous nutrition (74) at the EHC-D.

Immune modulation is now measured objectively for chemical sensitivity by:

- IgG subsets: IgG subsets in 200 patients (75) started at the EHC-D for immune evaluation were found to be abnormal.
- T-cell deficiency or malfunction: T-cell deficiency or malfunction was analyzed in 5000 patients (76) finding 90% to be abnormal.
- Body fluid analysis: Griffiths analyzed body fluids for the presence of molds and mycotoxins at EHC-D (77) in 500 patients and found 90% to be abnormal.
- Urine mycotoxin analysis: Hooper analyzed urine mycotoxins which were first developed at the EHC-D for 200 patients (78). Now, he has measured several thousands in his facility, Real Time Laboratories (78), with 87% cases being found to be abnormal.

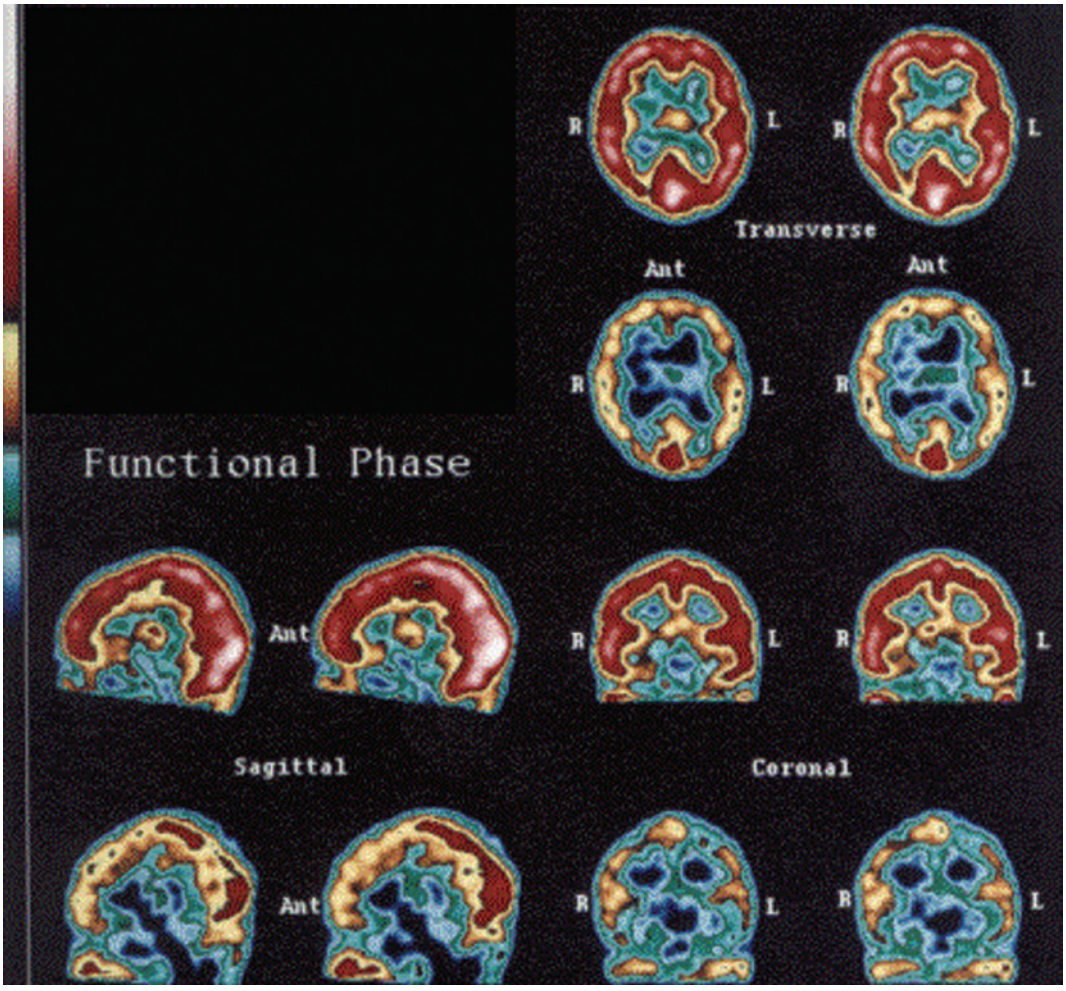

Figure 1: Normal SPECT brain scan – smooth, uniform, distinct outlines, no rough edges or holes in cerebral hemispheres or abnormal temporal lobes. Abnormal SPECT brain scan – rough edges, holes in cerebrum, temporal lobes obliterated or poorly outlined.

– Serum complement: serum complement was found to be abnormal in 95% of the chemically sensitive patients.

Challenge tests are a way to quantify and verify chemical and electrical sensitivity

Challenge tests can involve oral (79), inhaled (80), and intradermal (81) tests; both oral and inhaled challenges with organic and commercial food can be used. Intradermal challenge, shown in a less-polluted room with preservative-free antigens, can be performed to confirm the diagnosis. Intradermal challenge was done with antigens for molds, pollens, foods, chemicals, and implant materials. These have been performed on 20,000 patients. Inhaled chemicals in the ECU room inside a less-polluted booth can be done and have been done in 1000 patients.

Provocation EMF challenge is done in a copper and porcelain steel room with various frequencies from a frequency generator.

EMF modulation was performed by:
– Grounding – leather shoes
– Shielding – copper, aluminum, silver – total body
– Gowns – copper, silver, cotton
– Metallic and magnetic impregnated blankets – vests, pads, energy balancing

Breath analysis

1,3-Butadiene was the most commonly found chemical. This can be produced by natural isoprene in the body. It can also be a byproduct of the production of synthetic rubber found in automobile tires, nylon, styrene, or

Examples of sources:	
Butane (2-methyl propane) – Natural gas, refining petroleum, oil	Cyclopropane, ethylidene – Anesthetic, pyrethrum pesticides, chrysanthemums

acrylonitrile, which is used in the production of rubber tires. Factories that produce butadiene are involved in the industrial production of 4-vinylcyclohexene.

Exposure symptoms include blurred vision, vertigo, fatigue, low and high blood pressure, headaches, nausea, fainting, and decreased pulse for up to 2 years of exposure. Using breath analysis can broaden the clinician's outlook on what toxics are present in patients and where they might be found in their environment so that avoidance can take place.

Discussion

These different tests can be performed under less-polluted, environmentally controlled conditions to diagnose chemical and electrical sensitivity precisely. They take the guess work out of the diagnosis as they have now been performed in 30,000 patients seen at the EHC-D in the last 35 years. They should be spread out universally to aid in diagnosis. The pitfalls of ignoring the principles and facts developed, as well as the less-polluted controlled environment, over the last 30 years are obvious, and if not followed, can lead to errors in diagnosis and treatment.

Summary

Diagnostic tools are now available in the practicing physician's office when construction and maintenance is performed on a routine basis, with attention to using less-polluted materials. The history and techniques have evolved over the last 30 years, taking the guess work out of chemically and electrically sensitive patient diagnosis and using the term psychological in the solid diagnosis of chemical and electrical sensitivity.

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