# SPECIFIC DESENSITIZATION TO CHEMICALS

## A Pilot Study of 100 Patients

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## ABSTRACT

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Our experience over the past 7 years using a modified Rinkel method of neutralization in the treatment of chemically sensitive individuals is reviewed. We have randomly selected 100 cases from a patient population of nearly 6000. Additional supportive measures in line with accepted guidelines by the AAEM were employed. The specific treatment is carried out by self-administered sublingual neutralizing doses of the offending substances on a t.i.d. basis. The treatment is feasible, safe, effective and practical. Our pilot study shows that recovery is achievable in almost one-fifth of cases, irrespective of age but not sex, and can be maintained for extended periods of time.

**KEY WORDS**

Chemical sensitivity, formaldehyde, hydrocarbons, perfume, electrodermal screening, Rinkel serial dilution titration, sublingual neutralization.

# INTRODUCTION

The presence of natural and synthetic chemicals in the environment and their ill effects are becoming a serious health concern. Although widespread awareness of environmental dangers in the medical community is still lacking, some progress has been made in recent years[1]

Besides gross toxic effects these chemicals can cause a more subtle but no less harmful hypersensitivity syndrome first identified by Randolph[2]. The problem is now recognized with increasing frequency by a small though growing fraction of health professionals as being responsible for a wide range of clinical manifestations seen in general and specialty practice[3].

No epidemiological studies have, to our knowledge, been carried out to define the scope of chemical sensitivity[4]. Although no one is immune to the development of this illness, experience leads us to the conclusion that a much greater incidence occurs among allergic individuals. It is estimated that about 40 million Americans (or one in six) presently suffer from allergic symptoms[5]. From this figure one might extrapolate the potential magnitude of the problem.

One of the major differences between toxicity and chemical sensitivity is that the former often involves one agent whereas the latter has a definite propensity to encompass increasing numbers of substances. Many call the resulting syndrome "multiple chemical sensitivity."[6]

There are numerous possible approaches to the management of chemically sensitive patients. Of these the most important is avoidance of toxic chemicals in the home, at work and during travel. Moving from a contaminated home or work

environment is one solution. Alternatively a clean-up may be possible. Installation of air purification systems may also help. However, these and other methods are, at best, only partial answers.

New approaches to actively reduce chemical sensitivity are clearly needed. We describe the feasibility and effectiveness of one such approach, a method of specific desensitization. In this pilot study it was limited to a few pervasive chemicals. Through chart review we randomly selected 100 patients out of a pool of 5813 so treated. We have not found similar studies in the literature.

## METHODOLOGY

All patients undergo routine history and physical examination. An environmental questionnaire is also used. Medical records and laboratory data from the family practitioner are requested and reviewed. Selected patients are further investigated for specific problems: e.g., endocrine, metabolic, neurological, gastrointestinal and microbiological.

Electrodermal screening utilizing a computerized skin conductance testing instrument (LISTEN SYSTEM)* based upon the principle of Voll[7] is first implemented. The standard chemical panel comprises 120 chemicals of which the most important are formaldehyde, hydrocarbons (ethanol, petroleum, natural gas, auto diesel exhaust, etc.), chlorine, tobacco smoke, perfume, phenol, solvents and pesticides. Patients are also screened for foods, pollen, mold, candida, dust and epidermals. When indicated hormones, neurotransmitters, heavy metals and other substances are tested as well. The system is based upon the Rinkel method using 1:5 serial dilution titration.[8]

Our modification of the Rinkel technique consists of the following. First, we do not use intradermal or sublingual challenges of actual substances as done traditionally by clinical ecologists, Rather, the instrument is a programmed computer system capable of generating an electrical signal of any one of a vast array of stored data which we referred to above. End points are identified by the suppression of electrical skin conductance. Second, the numbering of dilutions in our system is exactly the reverse of what Rinkel employed, e.g. our #1 dilution is obtained by diluting the concentrate 1:5 whereas for Rinkel the #1 represented the most dilute vial.

*LISTEN SYSTEM, Biosource, Inc., Orem, Utah

Our method is virtually non-provocative, non-invasive and relies exclusively on objective electrical conductance measurements.[9]

Epicutaneous testing is used in conjunction with the above for verification only. Antigens are applied cutaneously as concentrates and left in place for 48 hours at which time the reaction is quantified on a one to four scale.[10,11]

Specific desensitization is provided for the most important offending substances. We extrapolate the neutralizing dilution from the end point. This neutralizing dilution is then used for treatment. Based on 10 years of experience with the computerized electrodermal testing instrument we concluded that the neutralizing dilution has a constant fixed relation relative to the end point. The neutralizing dilution for chemicals is always 2 dilutions more concentrated than the end point. Thus with an end point at dilution #6 the neutralizing (treatment) dilution will be at #4. We instruct patients to administer 2 drops of the neutralizing dilution sublingually three times a day, a dosage that we have found safe and effective for the vast majority. Relatively few extremely sensitive individuals may not tolerate this method of administration; they are then advised to place one drop of the treatment solution on the non-hairy surface of the forearm skin once a day and gently rub it in. As tolerance improves sublingual use is generally feasible. Treatment vials are prepared by using 0.4 cc of the neutralizing dilution and adding 9.6 cc nonpreserved sterile water. The shelf life of vials so made is two months without refrigeration. Contamination has not been a problem with proper precautions.

The average patient receives four vials to be used sequentially for neutralization of individual or groups of related items. Highly sensitive individuals should initiate desensitization with one item only. Patients are also instructed to separate the use of sublingual drops by half an hour from food, drink, supplements or drugs irrespective of

mode of administration. They are also to carry out all other necessary measures (avoidance, individualized diet, supplementation and non-specific alternative means) to reduce total environmental load. Appropriate drugs such as hormones, antifungals may also be prescribed.

Each patient's chart was reviewed and an attempt was made to reasonably establish a causal link between a single chemical and the individual's primary symptomatology. Three groups were thus established: Formaldehyde, Hydrocarbon and Perfume (Table I). Patients were further categorized by their primary system involvement into central nervous, respiratory, mucocutaneous, musculoskeletal and gastrointestinal subgroups (Table II). We want to re-emphasize that the study patients also received neutralization to additional, non-chemical, allergens and various desirable therapeutic interventions. Table III indicates distribution by age and sex. The largest number of patients were in their fifth and sixth decades. The average age was 42. Because of too small numbers we felt it best to lump two decades together. Thus we arrived at four age groups representing youth, young adults, middle age and seniors. There were 26 men and 74 women. One should note a significant gender difference between the youth group and other age groups. In the youth group there is a 3.6:1 ratio in favor of males. A female preponderance of 4.7:1 exists in all others combined. Whether young males are indeed more prone to chemical sensitivity will become clearer with future additional large scale studies.

# RESULTS

The survey reflects the findings in somewhat less than 2% of cases in an office practice accumulated over the past seven years.

To evaluate the results three criteria were used. First, objective electrodermal measurements; second, subjective reports of the patient; and third, necessity for ongoing desensitization. These criteria enabled us to unequivocally place patients in the following categories: recovery; improvement; no improvement. No patient deteriorated.

In view of the retrospective nature of the study a more precise, quantitative, grading of the subjective clinical response was deemed unreliable and therefore undesirable.

We define recovery as a) a state in which electrodermal abnormality is no longer demonstrable to the specific chemical agent in question; b) the patient is asymptomatic under conditions that exist in the home, work place and during travel; and c) specific desensitization to the previously offending chemical is no longer required. Such recovery will, of course, remain relative and can be disrupted by excessive environmental exposure to the specific substance or by nonspecific incitants.

Improvement is defined as a) continuing reactivity to the specific substance to which the patient is being desensitized both by clinical and electrodermal assessment; b) the test reactivity, i.e. the end point, is stable over an extended period of time; and c) clinical symptomatology is intermittent and mild; however, continued specific desensitization is necessary.

Prior to this type of therapy many patients were disabled and virtually carried on a "glass bubble" existence.

Table IVa shows that 18% of patients recovered and 10% showed no improvement. A satisfactory outcome was therefore seen in 90% of our material.

Table IVb and V show responsiveness to treatment by age and chemical grouping. Due to small numbers meaningful comparisons are limited. Group III does not lend itself to analysis. By and large there is no striking difference among the age categories for the other groups with regard to recovery and remission. Those past 60 years of age, however, seem to have more difficulty recovering from hydrocarbon than formaldehyde sensitivity. Recovery was zero for hydrocarbon but 17% for formaldehyde sensitivity.

A comparison of the youth category with the averages of the combined other age categories hints at a possible difference in the number of nonresponders: i.e. 21.4% vs. 8.4%.

Table VI indicates the length of time required for a response to occur. The time to recovery was between one and two years for 15 patients. One patient took 5 years to recovery while another did so after only six months of treatment. The maximum length of time to no improvement was seven years while the median was five to five and one half years. Seven of the ten patients showed no change after four years.

Table VII shows response by sex. Recovery is achieved by 42.3% of men and 12% of women. Further analysis is not feasible because of the small numbers in the various subgroups.

Table VIII illustrates response by the primary target system. Central nervous system symptomatology predicts the worst prognosis for recovery (11%). The greatest recovery is in the mucocutaneous category (nearly 28%). Recovery is about 25% with respiratory and musculoskeletal symptoms.

The breakdown of results into the chemical groups I and II (group III has insufficient numbers) by target symptomatology is shown in Table IX. The potential for recovery has the lowest probability for symptoms related to the central nervous system in both groups. There is a trend for more frequent recovery from formaldehyde than hydrocarbon in the two most involved systems (CNS and respiratory) while the reverse is suggested for the mucocutaneous system. There is no significant difference between the groups and target symptom categories for improvement. Central nervous system symptoms decreased as well as those of other target categories.

## DISCUSSION

The growing impact of chemical sensitivity on society necessitates the development of new methods of specific treatment which can be integrated into the existing repertoire. In the first 25 odd years since this syndrome was described virtually nothing, but restrictive methods: i.e. elimination, rotation, and avoidance were recommended.[12] Many who suffered this illness were forced into the seclusion and safety of their own little "sterilized" environment as it were. Time was considered the best healer.

During the last 25 years a more profound understanding of nutritional biochemistry expanded therapeutic options. Evidence suggesting a relationship between micronutrient deficiencies and specific illnesses began to emerge.[13] The ability of chemically sensitive patients to detoxify xenobiotics was found to be impaired.[14] The idea that improved biochemical balance might result in reduction of chemical sensitivity soon led to the widespread inclusion of nutritional approaches in the overall protocol. During the past decade numerous other methods have also been suggested to this end: e.g. ion and magnetotherapy, macrobiotic diet, sauna, homeopathy, and herbal medicine. Anecdotal reports indicate that some of these may provide some benefit.

Specific desensitization to chemicals has been practiced by clinical ecologists for some time. However, immunotherapy akin to inhalant and food desensitization by subcutaneous injections or sublingually has, in our experience as well as in others,[15] been rather disappointing. No formal reports of such immunotherapy are known to us.[16] Similarly we are unaware of any publication dealing with a systematic investigation into specific treatment via desensitization for chemical sensitivity.[17,18,19] It is our belief that the

pilot study here reported is a contribution to the alternatives now in use documenting as it does the feasibility and long term maintenance of chemical desensitization despite its inherent limitations.

The mechanism of action of the method we employed remains unknown. We are inclined to the view that the subcutaneous or sublingual immunotherapy used by clinical ecologists exerts its benefit in an entirely different manner than the desensitization method herein described.

Perhaps the most positive practical aspect of this study is the fact that 90% of patients responded favorably to the neutralization method employed. We are impressed with the findings that 18% could regain tolerance and that over 80% achieved it within two years.

The question arises as to the reasonable length of time one should persist with desensitization. Our experience suggests that 70% of patients will respond within four years yet the data also indicate that some might begin to benefit as long as five and a half years after initiation. Persistence may thus be rewarded for a few patients.

Contrary to common beliefs and our own expectations, youth does not guarantee success. Although recovery is seen slightly more often, the number of those not improved may be considerably higher.

Desensitization to formaldehyde seems to be easier than to hydrocarbons judging by the number of non-responders (less than 3% vs. 13% respectively). The difficulty of achieving good tolerance to hydrocarbons is particularly evident for those past 60 years of age. Further analysis of data (not tabulated) reveals a gender difference as regards

recovery. For all chemical groups 30.8% of men recovered as compared with 12% of women. For the hydrocarbon group alone the numbers were 29% vs. 16%. One should note, however, the far fewer numbers of men than women in the survey.

As expected neurologic manifestations are the most resistant to treatment. Eleven percent recovered; 13% did not improve at all. This compares unfavorably with other systems.

In conclusion, we have documented a method for successful specific treatment of the chemically sensitive patient. It is virtually non-provocative, non-invasive, safe, applicable to all age groups, and provides easily reproducible end-point determinations over extended periods of time.

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# Table I

*Chemical Groups by Sex*

| | Group I Formaldehyde | Group II Hydrocarbon | Group III Perfume |
|---|---|---|---|
| ♂ | 9 | 17 | 0 |
| ♀ | 26 | 45 | 3 |
| Total | 35 | 62 | 3 |
| TOTAL | | 100 | |

# Table II

## *Target System Categories by Group and Sex*

| System | Total | ♂ Group I | ♂ Group II | ♂ Group III | ♀ Group I | ♀ Group II | ♀ Group III |
|---|---|---|---|---|---|---|---|
| Central Nervous (CNS) | 45 | 5 | 9 | 0 | 8 | 21 | 2 |
| Respiratory | 23 | 0 | 5 | 0 | 6 | 11 | 1 |
| Mucocutaneous | 18 | 3 | 2 | 0 | 6 | 7 | 0 |
| Musculoskeletal | 8 | 1 | 0 | 0 | 4 | 3 | 0 |
| Gastrointestinal | 6 | 0 | 1 | 0 | 2 | 3 | 0 |
| TOTAL | 100 | | | | | | |

# Table III

## *Age Distribution by Sex*

| Age | Total | ♂ | ♀ |
|---|---|---|---|
| 0-19 | 14 | 11 | 3 |
| 20-39 | 23 | 4 | 19 |
| 40-59 | 51 | 7 | 44 |
| 60-79 | 12 | 4 | 8 |
| TOTAL | 100 | 26 | 74 |

# Table IVa

## *Overall Response to Treatment*

| Quality | # | % |
|---|---|---|
| Recovery | 18 | 18 |
| Remission | 72 | 72 |
| No Response | 10 | 10 |
| TOTAL | 100 | 100 |

# Table IVb

## *Desensitization Results by Age and Chemical Groups*

| Age | Total # | Formadehyde (I) | | | Hydrocarbon (II) | | | Perfume (III) | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | TR | R | NR | TR | R | NR | TR | R | NR |
| 0-19 | 14 | 1 | 3 | 0 | 2 | 5 | 3 | 0 | 0 | 0 |
| 20-39 | 23 | 2 | 6 | 0 | 2 | 10 | 2 | 0 | 1 | 0 |
| 40-59 | 51 | 2 | 15 | 0 | 7 | 21 | 4 | 2 | 0 | 0 |
| 60-79 | 12 | 2 | 3 | 1 | 0 | 6 | 0 | 0 | 0 | 0 |
| TOTAL | 100 | 7 | 27 | 1 | 11 | 42 | 9 | 2 | 1 | 0 |

TR: Recovery
R: Remission
NR: No Response

# Table V

## *Response to Treatment by Age Groups*

| Age | Total | TR # | TR % | R # | R % | NR # | NR % |
|---|---|---|---|---|---|---|---|
| 0-19 | 14 | 3 | 21 | 8 | 57 | 3 | 21 |
| 20-39 | 23 | 4 | 17 | 17 | 74 | 2 | 9 |
| 40-59 | 51 | 10 | 20 | 38 | 75 | 4 | 8 |
| 60-79 | 12 | 2 | 17 | 8 | 67 | 1 | 8 |
| TOTAL | 100 | 18 | 18 | 72 | 72 | 10 | 10 |

TR: Recovery
R: Remission
NR: No Response

# Table VI

## *Length of Time Needed for Response to Treatment*

| | >1 Year | 1 Year | 2 Years | 3 Years | 4 Years | 5½ Years | 7 Years |
|---|---|---|---|---|---|---|---|
| Recovery | 1 | 6 | 8 | 1 | 1 | 1 | 0 |
| No Improvement | 0 | 1 | 0 | 2 | 1 | 5 | 1 |

# Table VII

## *Treatment Response by Sex*

| Age Group | Total | ♂ TR | ♂ R | ♂ NR | ♀ TR | ♀ R | ♀ NR |
|---|---|---|---|---|---|---|---|
| 0-19 | 14 | 3 | 6 | 2 | 0 | 2 | 1 |
| 20-39 | 23 | 2 | 1 | 1 | 3 | 15 | 1 |
| 40-59 | 51 | 2 | 4 | 1 | 5 | 37 | 2 |
| 60-79 | 12 | 1 | 3 | 1 | 0 | 6 | 1 |
| TOTAL | 100 | 8 | 14 | 5 | 8 | 60 | 5 |

TR: Recovery
R: Remission
NR: No Response

# Table VIII

## *Response by Target System*

| System | Total | TR | R | NR |
|---|---|---|---|---|
| CNS | 45 | 5 | 33 | 7 |
| Respiratory | 23 | 6 | 16 | 1 |
| Mucocutaneous | 18 | 5 | 11 | 1 |
| Musculoskeletal | 8 | 2 | 5 | 1 |
| Gastrointestinal | 6 | 1 | 5 | 0 |

TR: Recovery
R: Remission
NR: No Response

# Table IX

*Treatment Results, Group I and II, According to Target System*

| System | Total # | Group I | | | Group II | | |
|---|---|---|---|---|---|---|---|
| | | TR | R | NR | TR | R | NR |
| CNS | 43 | 2 | 11 | 0 | 3 | 21 | 6 |
| Respiratory | 22 | 2 | 4 | 0 | 3 | 12 | 1 |
| Mucocutaneous | 18 | 2 | 6 | 1 | 3 | 6 | 0 |
| Musculoskeletal | 8 | 1 | 4 | 0 | 1 | 1 | 1 |
| Gastrointestinal | 6 | 0 | 2 | 0 | 1 | 3 | 0 |
| TOTAL | 97 | 7 | 27 | 1 | 11 | 43 | 8 |

TR: Recovery
R: Remission
NR: No Response