REPORT OF THE AD HOC COMMITTEE

ON ENVIRONMENTAL HYPERSENSITIVITY DISORDERS

AUGUST, 1985

Ontario

Judge's Chambers
Cabinet du Juge

Provincial Court (Family Division)
Cour provinciale (Division de la famille)

Judicial District of York
District judiciaire de York

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Honourable Murray J. Elston
Minister of Health
10th Floor, Hepburn Block
Toronto, Ontario
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Dear Mr. Minister:

Enclosed with this letter is the report prepared by the Committee on Environmental Hypersensitivity Disorders established by your ministry and on which I sit as chairman.

It is our hope that we have addressed all of the issues that were assigned to us. While the size of the task proved to be much larger than we had anticipated, we have found this a very valuable and challenging experience.

We would appreciate very much having the opportunity to meet with you to discuss our findings and recommendations, once you and other persons within the ministry have had a chance to review the report.

Yours very truly,

Judge George M. Thomson
Chairman

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S. E. Evers, Ph.D.

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Introduction

The Committee on Environmental Hypersensitivities was established in November, 1984 at the request of the then-Minister of Health for the Province of Ontario, Keith Norton. (Letter, Appendix 1.)

The terms of reference set out by the Ministry required the Committee to review current published case studies and visit appropriate treatment centres in order to report on the present level of knowledge about environmental hypersensitivity, paying particular attention to prevalence, to methods of diagnosis and methods of treatment. Further, the Committee was asked to outline possible approaches to investigating, treating or undertaking further research into such disorders.

The report has been designed as follows:

Chapter 1 summarizes the Committee's activities.

Chapter 2 attempts to define the disorder and to summarize theories of causation put forward by those who believe environmental hypersensitivity is an existing and a growing problem. Alternative explanations for the illness are also described;

factors that modify adverse reactions are discussed. In addition, we comment on which theories of causation are worthy of further investigation.

Chapter 3 outlines present fundamental knowledge about the nature of adverse reactions to food, to chemicals and to other environmental agents known to have an adverse effect on human beings. The extent and limitations of our knowledge about selected, wellknown agents are described.

Chapter 4 contains general observations we made after visits to environmental units and to individual clinical ecologists.

Chapter 5 summarizes and comments on the information the Committee received from patients, their families and friends and from the people who deal with patients; this information comes from a number of meetings with individual patients and from many briefs, letters and phone calls received by us over the past six months.

Chapter 6 describes various testing procedures that are used with patients and it summarizes the existing literature on these procedures.

Chapter 7 describes treatment procedures and the literature relating to them.

The first part of Chapter 8 sets out the Committee's findings and the second part its recommendations.

In order to ensure that the report is genuinely useful in any future Ministry initiatives related to environmental hypersensitivity, it is necessary to establish the context in which it was produced and to point out those factors that limited the Committee's operations. Among them:

First, there is a lack of unanimity within the medical community with regard to the matters the Committee was asked to study. For example, we found that even defining the term "environmental hypersensitivity" brought a range of answers, many of them contradictory.

Second, there is a lack of consensus about testing methods used to establish a diagnosis and about patient management once a diagnosis has been made.

Third, there is a broader range of tests and treatments than is generally believed. (A list of some of these tests and treatments, taken from submissions made to us by patients, is included as Appendix 4). Despite the fact that many sufferers said they had been helped by persons in such diverse fields as naturopathy, acupuncture, chiropractic, massage therapy,

kinesiology, irridology and electromagnetic therapy, these approaches could not be analyzed and evaluated by the Committee in the time available to us. Rather, we focussed on a relatively small number of tests and treatments that are used regularly by clinical ecologists in Ontario or that are used elsewhere and likely to be adopted here at some time in the future.

Fourth, it was not possible for the Committee to engage in any independent research on tests and treatments.

Fifth, the area under consideration changes very rapidly -- a fact that became clear in the six months of the Committee's work. It would therefore have been unrealistic for a small, temporarily constituted group to expect to keep current in the field in more than a limited way. Our report, therefore, is based on what we observed at the specific time we observed it and it should be understood in that context.

An increasingly significant issue that became evident as the Committee met and deliberated was that of patient access to non-medical support services. Although the Ministry of Health confirmed that consideration of the problem was not directly within our mandate, it suggested we make recommendations about further study if we felt they were necessary. We were unable to consider the issue in depth, but we did find

that there is a definite need for patient support services for people diagnosed as environmentally hypersensitive and that this need is inextricably linked to the medical response to the illness; as a result, we have decided to offer both our findings and recommendations on this matter.

By the time our deliberations were complete, each of us had an increased sense of urgency about the effect of the environment on human health, though it is not possible to express those concerns except in a general way. Many of the professionals we spoke to and the members of the public who approached us share our sense that there is a link between consideration of environmental hypersensitivity and larger environmental issues.

It is within these limits that the Committee shaped its work and the recommendations that follow. We trust that the Ministry of Health will find that our report sets the stage for further research, that it will be helpful to the Ministry and, therefore, to the people of Ontario.

Chapter One

Activities of the Committee

In order to provide a comprehensive and balanced report on a complex issue, and in spite of the short time alloted for its study, the Committee attempted to hear the views of all interested persons -- patients, their parents and their other relatives, their friends, professionals within the field of environmental medicine and experts working in related fields.

1. Committee Meetings

Members of the Committee spent 13 full days meeting to plan, carry out their work, evaluate the research and the results of their observations and, finally, to discuss their conclusions and recommendations.

2. Advertising

The Committee placed newspaper ads in sixteen newspapers across Ontario, inviting briefs, letters and submissions from any interested parties; the Committee reviewed selections of these, while the Chairman reviewed them all, a total of 1,209. (Appendix 3).

3. Meetings with Groups

In addition, the Committee met with the following groups:

* the Ad Hoc Committee on Environmental Hypersensitivities, December 17, 1984;

* ten representatives of the Canadian Society for Clinical Ecology and Environmental Medicine, under the chairmanship of Dr. John McLennan, February 7, 1985;

* four representatives of the Parents of the Environmentally Sensitive, December 17, 1984. The group, which is headed by Mrs. Margaret Nikiforuk, met with Judge Thomson separately on another occasion;

* Drs. Howard Langer and Norman Epstein, representing the Ontario Allergy Society, April 3, 1985.

4. Meetings with Individuals

The Committee met with the following individuals:

* Dr. Z. Jancelewicz, Chairman of the Allergy Division of the Ontario Medical Association, February 8, 1985;

* Dr. William Chodirker, an allergist at the University Hospital, London, February 8, 1985;

* Dr. Donna E. Stewart, Assistant Professor of Psychiatry, University of Toronto, March 7, 1985;

* Dr. David Roy, Director of the Biomedical Research Institute, Montreal, April 26, 1985;

* Bruce Small, a consultant on environmental issues, December 17, 1984;

* Susan Daglish, executive director of the Allergy Information Association, February 7, 1985;

5. Meetings with Physicians (in Canada)

Committee members also met in Toronto with people in various disciplines related to the topic of study. On March 2, 1985, Judge Thomson, Drs. McCourtie and Woodward met with Dr. Jonathan Brostoff, Professor of Clinical Immunology and Director of a research laboratory of the National Health Service, London, England. Drs. Evers and McCourtie held a meeting on March 26, 1985, with Dr. S. M. Singh, Associate Professor of Genetics at the University of Western Ontario; Dr. Day and Judge Thomson met with Drs. I. Leonard Bernstein and Jordan Fink, respectively the current and past presidents of the American Academy of Allergy and Immunology, on March 30, 1985; Dr. Evers met with Drs. Gordon Nikiforuk and M. Krondl of the Ad

Hoc Committee on Environmental Sensitivities on April 27, 1985.

Drs. McCourtie and Woodward spent February 6, 1985, observing the practice of Dr. J. Krop, a clinical ecologist in Toronto. In Ottawa on March 9, 1985, Dr. Day and Judge Thomson observed Dr. L. Gilka in her practice and talked with several of her patients; on that day, they also met with Dr. J. Molot, with certain of his patients in his office, as well as with Drs. Lynn Marshall and John Coombs. Later, the two Committee members met with several persons who had expressed professional or personal interest in the problems under discussion.

6. Meetings with Physicians (U.S.)

On January 16, 1985, all members of the Committee (excepting Dr. Evers) met with Dr. John Crayton, a Chicago psychiatrist involved in research into environmental hypersensitivity; the following day, they met with Dr. Theron Randolph of Chicago, Illinois at his environmental unit and, on January 18, 1985, spent the day with Dr. William Rea and his staff in Dallas, Texas, discussing their work and research.

On May 2 and 3, 1985, Drs. Day, Evers and Gerrard held meetings in San Francisco with the following

professionals who are involved in research, clinical practice or both: Drs. Donald Jewett, Iris Bell, Alan S. Levin, Phyllis Saifer, Carroll Brodsky, Abbe Terr, Piero Mustacchi and David S. King.

7. Conferences and Meetings

In addition to these discussions, members of the Committee attended conferences and meetings of associations involved in relevant areas of study: on February 25, 1985, Dr. McCourtie went to the National Research Council meeting on Indoor Air Pollution; Drs. Day, Gerrard and McCourtie held discussions with Dr. T. Knicker, professor and head of the Department of Allergy and Immunology, University of Texas, San Antonio, at the meeting of the American Academy of Allergy and Immunology in New York City on March 16, 1985; Dr. McCourtie attended a conference, Man in Health and Disease, sponsored by the Human Ecology Foundation of Canada, presented on April 13, 1985 and Dr. Gerrard attended a meeting on Clinical Ecology sponsored by the California Medical Association on April 30, 1985. Dr. Woodward attended the annual meeting of the Canadian Federation of Biological Societies in June, 1985, to hear talks by Drs. J.F. Soothill and J.W. Crayton.

8. Meetings with Patients

In addition to their discussions as part of their observation of the programs noted above, some members met with patients to discuss the Committee's work. Judge Thomson and Dr. Woodward met with a number of patients in Barrie on February 23, 1985; on March 8, 1985, four Committee members also met with Mr. and Mrs. R. Sommervile and their son, Nathaniel, of North Bay.

9. The Chairman's Meetings with Doctors and Other Groups and Individuals

As the Chairman of the Committee, Judge Thomson discussed the issue of environmental hypersensitivity with the following individuals and groups: R. Halford, associate director of education at the Toronto Board of Education; Dr. Trevor Hancock, associate medical officer of health for the City of Toronto; Dr. Cecil Collins-Williams, former head of the department of allergy at the Hospital for Sick Children; Dr. Rose Sheinin, professor in the Department of Microbiology at the University of Toronto; Dr. Barry Zimmerman, director of the allergy department of the Hospital for Sick Children; Darlene Koski, president of the Human Ecology Foundation of Canada; Dr. Laurel Spielberg, epidemiologist with the public health branch of the Ontario Ministry of Health; Dr. Stephen Spielberg,

associate professor of pediatrics and pharmacogenetics at the Hospital for Sick Children; Dr. William G. Crook of Jackson, Tennessee; Drs. Stanley Baker and Frank Waickman; Julia Grenville; Patricia Orwen; Dr. Richard Ellis; Marie Rounding; Barbara Mowat and Beryl Gasparti; Chris Nikiforuk and Damien Boyd; Gayle Mudry; Maggie Burston; Barbara Ferns; Gloria Lewis; David Baker; Julia Orwen and Michael Goetz; Mr. and Mrs. O. Langmark and their son Christopher; Shirley and David Stronge, parents of patient Sandra Stronge.

The Committee learned a great deal from all those people who, because of their personal or professional concerns, took time out to share their knowledge, ideas and experience with us. We welcome this opportunity to acknowledge their help and to thank them.

Chapter Two

Environmental Hypersensitivity Disorders

This chapter has four objectives:

- to arrive at a working definition of environmental hypersensitivity, based on information given to the Committee;

- to outline the major theories of causation described in the clinical ecology literature;

- to suggest which theories are worthy of further study, based on existing knowledge in this and related fields;

- to note some alternative theories of causation articulated by those who question the existence of the disorder.

A. Environmental Hypersensitivity: Description

Although public concern about the relationship between environmental factors and ill health is greater than ever before, little is known about either the underlying mechanisms or the effects of that relationship. This lack of information severely hampered our efforts to define environmental

hypersensitivity; other factors also prevent the development of a precise definition. They are: inconsistencies in terminology; the diffuse nature of the symptoms and, finally, continuing controversy about some of the procedures used to diagnose the disorder.

1. Terminology

Environmental hypersensitivity has been termed "Twentieth Century Disease", largely by the media. Other terms in common usage include "environmentally induced illness" (American Academy of Environmental Medicine, (AAEM, 1984), "food and chemical sensitivity" (Crook, 1983), "ecologic illness (Bell, 1985) and "chemical hypersensitivity syndrome" (Environmental Health Association, 1985). For purposes of discussion, the use of the term "environmental hypersensitivity" in this report refers to the above conditions.

2. Symptomatology

"Ecologic illness" is defined as "any of a wide variety of chronic syndromes which result from multiple sensitivities to substances from the external environment . . ." (Bell, 1985). Similarly, "chemical hypersensitivity syndrome" is "the complex systemic condition and pathologic states resulting from a single exposure or repeated sensitization to specific

molecules or structurally related chemical compounds" (Environmental Health Association, 1985). These two definitions are used to illustrate the heterogeneous nature of environmental hypersensitivity.

This disorder is characterized by multiple-system involvement resulting in a wide variety of symptoms, of which some are vague and non-specific. Some patients present with only one symptom: for example, headache, abdominal pain, bloating or muscle aches and pains. In general, however, patients report multiple symptoms. The most frequently reported are those affecting the central nervous system -- tension, fatigue, headaches, depression and the inability to concentrate.

An analysis of the main symptoms experienced by patients diagnosed as having environmental hypersensitivity indicates that, in addition to the central nervous system, they involve the following systems:

a) Gastrointestinal: abdominal pain, bloating, heartburn, diarrhea, indigestion, constipation, cramps, nausea, vomiting and anorexia, and food cravings.

b) Respiratory: frequent colds, recurrent bronchitis, congestion and pain in the chest, asthma and unexplained shortness of breath.

c) Musculoskeletal: generalized muscle aches, pains and weaknesses, joint pains, and backaches.

d) Genitourinary: premenstrual headaches and depression, vaginal infections, bladder infections, enuresis, frequency of micturation and painful urination.

e) Eyes, Ear, Nose and Throat: sinus infections, nasal stuffiness, spells of dizziness, earaches, tinnitus, deafness, hoarseness, watering of eyes, and blurring of vision.

f) Skin: eczema, urticaria, dermatitis, hives, widespread flushing and erythema.

g) Cardiovascular: hypertension and cardiac arrhythmias.

It is important to emphasize that the above are the most frequently reported symptoms but do not comprise an all-inclusive list.

3. Diagnostic Methods

A full discussion of the tests and procedures used by clinical ecologists to ascertain the presence of environmental hypersensitivity is found in chapter 6.

4. Working Definition

During the course of our work, we considered at some length the difficulty of accurately describing environmental hypersensitivity and of providing a precise definition, both for reference within the report and for future research. We reviewed the definitions contained in the literature and consulted a number of persons with experience in the area. Although we recognize that the body of knowledge concerning this disorder is rapidly expanding and that subsequent studies may find the following inadequate, we propose it as a working definition of environmental hypersensitivity.

> Environmental hypersensitivity is a chronic (i.e., continuing for more than three months) multisystem disorder, usually involving symptoms of the central nervous system and at least one other system. Affected persons are frequently intolerant to some foods and they react adversely to some chemicals and to environmental agents, singly or in combination, at levels generally tolerated by the majority. Affected persons have varying degrees of

morbidity, from mild discomfort to total disability. Upon physical examination, the patient is normally free from any abnormal objective findings. Although abnormalities of complement and lymphocytes have been recorded, no single laboratory test, including serum IgE, is consistently altered. Improvement is associated with avoidance of suspected agents and symptoms recur with re-exposure.

B. The Environment as a Cause of Environmental Hypersensitivity

It is central to the view of physicians practising clinical ecology or environmental medicine that exposure to "commonly unsuspected or unrecognized" (AAEM, 1985), environmental agents is contributing significantly to ill health. While recognizing the traditional IgE mediated allergic reactions, these practitioners also believe that the pollution of our environment is contributing to the growing number of environmentally sensitive patients. In the opinion of these physicians, "specific offending agents to which individuals of all age groups are becoming increasingly susceptible are found in food, clothing,

drugs, air, water, as well as in the home, work and play environment." (AAEM, 1985).

Substances affecting environmentally sensitive individuals have been categorized as follows (Bell, 1982):

1. Chemical pollutants: natural gas fumes, tobacco smoke, food additives, odors from plastic furnishings, formaldehyde, pesticides (Rea et al., 1984), fungicides, herbicides (AAEM, 1985)

2. Common foods (usually those eaten most frequently and in the largest amounts): milk, wheat, eggs, nuts, corn, chocolate (Egger et al., 1985; Rea et al., 1981; Crook, 1983; Lessof, 1983).

3. Natural inhalants: pollens, dusts, animal danders, moulds.

The above is not a complete list of all substances reported to produce adverse reactions in individuals. It is intended to include only the most common substances cited by patients and by clinical ecologists.

Those practising clinical ecology would agree with the statement of Dr. Ian McTaggart-Cowan (Hall and Chant, 1979) that:

> One of the most daunting environmental problems of our time arises from the flood of man-made chemicals pervading our lives . . . The ingenuity of those who have contrived new chemical compounds and devised ways of inserting them into our economy in useful forms or new processes has had much to do with the improvement of the human state. We have too frequently ignored the other side of the coin. To our distress we have slowly learned that some of these products are damaging to human health . . . It is urgent that Canadians clearly grasp the extent and insidiousness of this threat to the viability of our environment.

C. Theories of Causation

Prior to outlining the theories of causation of environmental hypersensitivity that are espoused by clinical ecologists, certain key concepts, fundamental to understanding the theories, need to be described. Dr. Iris Bell (1982) discusses two of these concepts, "total load" and "adaptation-addiction" in her book, Clinical Ecology.

1. Concepts of Clinical Ecology

a) Total load: This concept is related to the belief that most patients have multiple sensitivities. A low dose of one environmental substance may not have an effect. However, low doses of different environmental substances can have either an additive or a synergistic effect (Bell and King, 1981). Environmental hypersensitivity develops when the patient can no longer handle or tolerate this combined load of physical and psychological stresses. The total load concept has been widely adopted by clinical ecologists.

b) Adaptation-addiction: Randolph (1976) has suggested that patients often crave foods that make them ill -- that is, they become addicted to the substances to which they are sensitive. Many clinical ecologists believe that the greatest response to offending substances occurs with initial exposure (Bell, 1982). With repeated exposures, the body adapts by responding with diminished reactions. This type of adaptation to offending agents is often called "masking". An individual who is chronically exposed to an agent to which he or she is sensitive will develop a degree of adaptation to that agent such that acute symptoms do not arise and sensitivity can be

identified only after a period of withdrawal. The hypothesis of addiction or "bipolarity" is also derived from the idea of adaptation and relates to the "masking" theory: an individual who is chronically exposed to an offending agent adapts to such a degree that near-normal function becomes dependent on the stimulatory effect of that agent. Withdrawal symptoms occur if exposure to the agent is terminated.

2. Major Theories of Causation

Bell (1982) has suggested two classifications of theories for the occurrence of environmental hypersensitivity; each of which may include more that one theory of causation. They are: immune system mechanisms and central nervous system mechanisms. However, in her discussion of them, Bell (1982) states that "various environmental factors can impinge on both of these systems, which may then serve as part of the common pathway through which external stress promotes disease". Thus, adverse ecologic reactions may involve interactions between the two systems. Because of this postulated close linkage between the immune system and the central nervous system, theories of the cause of environmental hypersensitivity are described in terms

of the major environmental factors, rather than by attempting to divide the mechanisms into two distinct groups.

The hypothesis that environmental hypersensitivity is, in fact, environmentally induced is based on a critical presupposition: that either environmental factors are toxic to the host or the host has an altered reaction to environmental factors. Sensitivities to those foods and chemicals found in the everyday environment are thought to be caused by "immune system dysregulation" (AAEM, 1984).

The major triggering factors postulated to cause alterations in immune function or abnormalities in the central nervous system are:

a) viral infections
b) fungal infections
c) emotional stress.

(These trigger factors are outlined later in this chapter in the discussion of the evidence for or against the theories of clinical ecology.)

D. Factors That Modify Adverse Reactions to Environmental Hazards

1. Individual Uniqueness

Clinical ecologists emphasize the uniqueness of the individual and of his or her response to environmental stresses. Iris Bell (1982) said, "The individual's tendency toward specific types of medical and/or psychiatric disorders is likely to be a complex function of age, sex, heredity, biological rhythms and nutritional status." There is a great deal of support for this concept in the scientific literature, and it represents an important area of common ground between clinical ecologists and more traditional medical practitioners.

The level of activity of enzyme systems responsible for metabolizing foreign chemicals ("xenobiotics") is generally low at the fetal stage, rises rapidly after birth and declines slowly in later life (Guengerich, 1984). From conception to puberty, individuals may exhibit particular sensitivity to some environmental agents, showing signs of toxicity that may be unique to this age group. Toxicity may occur at exposure levels to which older individuals exhibit no overt reaction and adverse effects may persist for unusually long periods of time (Spyker, 1975; Fein et al., 1983). Examples of these principles are: the fetal alcohol syndrome (Anon., 1985) and the particular sensitivity

of young infants to nitrite (Cordle and Kolbye, 1982). Similarly, allergic diseases are age-dependent, increasing in incidence until young adulthood, after which they decline (Marsh et al., 1981).

The idea that nutritional status is important in determining the impact of environmental agents on health has been the subject of continuing research for a long time (Calabrese, 1980; Hathcock, 1982; Guengerich, 1984). Too little or too much of a single nutrient, or of protein and energy affects the individual's reaction to foreign chemicals, including drugs; and affects the individual's reaction to such other environmental stresses as radiation, noise and temperature extremes. Each nutrient and energy deficiency or excess can cause either increased or decreased reactivity, depending on the particular response examined.

Immunologically-mediated reactions are also subject to nutritional modulation (Beisel, 1982; Watson and Petro, 1984). The effects on many important immune functions of protein-energy malnutrition (both severe and moderate), over-nutrition and deficiencies or excesses of single nutrients have been studied at an accelerating pace for the past 15 years. The widely accepted idea that nutrition influences immune

functions (that it depresses or enhances them) is currently being analyzed at the cellular and molecular levels.

Sex differences in xenobiotic detoxifying enzyme functions are widely recognized (Guengerich, 1984). Furthermore, a sex difference in immune functions is a well-established phenomenon that is currently the subject of intense research (Grossman, 1984). Drug allergies and food sensitivities occur more frequently among females than among males, as do allergic manifestations of eczema and hives (Eaton 1982; Ericksson et al., 1982). The reverse sexual dimorphism prevails with regard to hay fever and asthma (Eaton, 1982). As a further example, psychologically based food avoidance syndromes (anorexia nervosa, the bulimic syndrome) occur more frequently among women than among men (Lessof et al., 1984).

Biological rhythms, such as the circadian rhythm, can influence reactivity to environmental agents, whether mediated by immunological or by non-immunological mechanisms. This has been shown in, for example, the response of experimental animals to the toxicant potassium cyanide (Bafitis et al., 1978), and is also known in regard to a number of immune functions both in experimental animals and in mice (briefly reviewed

by Shek and Sabiston, 1983).

Genetic make-up represents a determining factor in the sensitivity of individuals to hazardous exposures. According to Kjellman (1982), inheritance is the most important single predisposing factor in the development of type I allergies. Moreover, the clinical expression of allergy, e.g., asthma, hay fever, etc., follows familial tendencies (Gerrard et al., 1976). It is recognized that a large number of genetic conditions will render an affected individual non-immunologically hypersensitive to a drug (Loomis, 1978; Eichelbaum, 1984; Guengerich, 1984; Weinshilboum, 1984); to a chemical in the environment (Loomis, 1978; Carrell and Travis, 1985); or to a food component (Lessof et al., 1984). Many of these conditions are well-defined single gene traits, i.e., inborn errors of metabolism, while others are less well characterized conditions governed by many genes (Loomis, 1978; Eichelbaum, 1984; Lessof et al., 1984). The entire field of pharmacogenetics deals exclusively with the role of inheritance in variations of drug response (Weinshilboum, 1984).

2. Dose

Exposure levels influence both the type and the severity of signs and symptoms of toxicity, as well as

the proportion of individuals who will manifest evidence of adverse reactions (Loomis, 1978; Anderson and Scott, 1981; Fein et al., 1983). At present, the potency of an environmental agent is generally defined in terms of overt, clinically evident manifestations, and the concept of threshold has grown out of this practice. Hall and Chant (1979), said in regard to chemical exposures that:

> The concept of threshold holds that for every toxic chemical there is a level below which there is no apparent effect . . . Put more accurately, this is the level below which toxicological technique detects no effect. Large numbers of scientists and especially bureaucrats disregard this inherent limitation of science, and the concept of a real threshold for every chemical is firmly entrenched. The word threshold, however, is more a bureaucratic than a scientific judgment.

Certainly, there may be no fully "safe" level of exposure with regard to such adverse reactions as mutations and the development of cancers (Murthy, 1983). This view has recently been expressed by

Collishaw et al. (1985) with regard to involuntary exposure to cigarette smoke.

Methylmercury poisoning can be used to illustrate a number of the problems associated with determining a "safe" level of exposure and with identifying typical signs of toxicity for a given level of exposure (Fein et al., 1983). At very high levels of methylmercury, most individuals will exhibit the clinical signs of Minimata disease and many will die from this unusual nervous disorder. Even under those circumstances, however, some persons will be initially asymptomatic but later (perhaps years later) will exhibit Minimata disease and die. By contrast, low-level methylmercury toxicity, when evident, may manifest functionally as tremors, loss of fine muscle coordination, fatigue, apathy, emotional lability, impaired memory and inability to concentrate. Fein et al. (1983), comment that signs and symptoms such as these " . . . are unlikely to be characteristic of a particular compound", but will appear following low-level exposure to a variety of agents.

In light of the observations and findings of this Committee with regard to individuals diagnosed as

suffering from environmental hypersensitivities, the following statement by Fein et al. (1983), is also of interest:

> At two levels of exposure, the effects may be predominantly behavioural and may differ in different individuals. For these reasons, the overt disease model of toxicity is being replaced by a multiple-effects model that includes subtle behavioural alterations and covert physical changes in addition to overt clinical signs.

3. Interactions Among Environmental Agents

Additional factors that are widely recognized as important in determining the nature and severity of any individual case of adverse reactivity include additive or multiplicative interactions among agents in combination, whether simultaneously or in sequence. It is recognized that there is additivity between the adverse effects of exposure to cigarette smoke and the effects of coal dust (obstructive airway disease); the effects of cotton dust ("Monday morning fever") involving chest tightness, coughing and shortness of breath); the effects of chlorine (reduced maximal expiratory rate of the lungs); and the skin cancer-

inducing effects of beta-radiation (Surgeon General's report Smoking and Health, 1979).

Similarly, multiplicative interaction (i.e., synergism) is said in the Surgeon General's report to occur in individuals exposed both to cigarette smoke and to asbestos dust (some lung cancers); or to talc, carbon black and solvent fumes in the rubber industry (lung disabilities); to gold mining operations (chronic bronchitis); or to alpha radiation in uranium mines (emphysema, reduced lung function and lung cancer).

Examples of drug and other chemical interactions include the synergistic influence of cocaine on the response to adrenalin; the additive actions common among anaesthetics; the additive enhancement by barbiturates of antihistamine-induced sedation; and numerous additive or synergistic interactions among pesticides (Loomis, 1978). A different type of interaction occurs with ingested morpholine (an industrial, agricultural and medicinal chemical), which enhances the activity of inhaled nitrogen dioxide in producing lung tumours in experimental animals (Witschi and Hakkinen, 1982).

Other, similar, examples of so-called two-stage carcinogenesis are to be found in the promoting action

of agents such as saccharin or butylated hydroxytoluene on cancer induction by chemicals known to be carcinogenic. In such cases, exposure to the promoters and to the actual carcinogens need not be simultaneous (Witschi and Hakkinen, 1982). Finally, interactive effects can differ qualitatively from reactions elicited by separate exposures to the individual agents as shown in the behavioral response of rats given xylene by inhalation and ethyl alcohol by ingestion (Savolainen et al., 1979).

E. Assessing Some Major Theories, Beliefs and Practices in Clinical Ecology

In this section, common tenets and practices, some fundamental to clinical ecology, are considered in relation to supportive experimental evidence of which the Committee is aware.

1. Major Theories Without Significant Experimental Support

a) Total Load, Adaptation, Masking and Bipolarity Theories

The Committee is unaware of experimental support for the total load theory. The study of Savolainen et al. (1979) is frequently cited, but is inadequate for this purpose because each of the two interacting agents

(xylene and ethyl alcohol) was administered at a level sufficient to induce a reaction. This does not constitute evidence for the total load theory as it is described by Bell (1982), i.e., " . . . low doses of substances which singly might be benign may interact '. . . to produce illness." A major problem with the total load hypothesis is that, although it holds the attraction of logic, it may prove experimentally untestable.

With regard to the idea of adaptation, it is well established that the enzyme systems responsible for detoxifying foreign chemicals will increase in activity on exposure to sub-lethal levels of a toxic agent (Guengerich, 1984). At the whole-organism level, this biochemical phenomenon frequently correlates with increased resistance to toxic agents. The corollary hypothesis of "masking", however, is currently without experimental support. This is acknowledged by Bell (1982). A similar problem is found with the "bipolarity" hypothesis. Randolph (1971) and Rea (1982) cite addiction to narcotics, tobacco and alcohol as examples of "bipolarity". Although this hypothesis may have some basis in logic, the Committee is unaware of any experimental evidence that suggests that common foods or environmental chemicals can elicit

an addictive condition.

b) Fungal Infections as a Factor in Environmental Hypersensitivity

Crook (1983) states that chronically ill adult patients who present with multiple system complaints often give a medical history (oral contraceptives, coricosteroid therapy, pregnancy) that suggests Candida albicans may have colonized the intestinal tract. The belief is that Candida, a normal inhabitant of the intestine, particularly of the mouth, and of the vagina, thrives on diets rich in refined carbohydrate. Its growth is held in check by the normal bacterial flora of the gut, and becomes excessive if the bacteria are reduced by repeated courses of antibiotics, and/or if the patient has had courses of steroids, has been on the pill, or has lived on a diet rich in refined carbohydrate and yeast-containing foods. The proliferation of Candida releases toxins that impair immune function. Truss (1980; 1981; 1983) suggested that chronic Candida infection of the vagina and/or gastrointestinal tract could impair the immunologic competence of the host, leading to the development of allergies of the respiratory and genitourinary tracts, of multiple food and chemical intolerances, and of mental changes such as depression, mental confusion, mood swings, and

irritability. The Candida theory is commonly held and elaborately described but, in the opinion of this Committee, it is speculative and devoid of any experimental support.

2. Some Preliminary or Controversial Research Findings Relevant to Theories and Practices of Clinical Ecology

This sub-section looks at particularly interesting experimental work that lends support to some controversial ideas and practices in clinical ecology. The preliminary nature of the cited findings must be emphasized; nevertheless, we acknowledge that new concepts, some perhaps now on the horizon, may be needed to contain our rapidly expanding body of factual information on physiological responses to environmental adversity.

a) Neutralization Treatments

Among the controversial diagnostic and therapeutic procedures in clinical ecology is neutralization, either by sublingual or intradermal administration of an offending agent. In this regard, it is interesting that oral administration of aspirin can elicit desensitization in some, but not all, patients with an idiosyncratic (i.e., non-immunological) reaction to

this drug (Pleskow et al., 1982; Chiu, 1983). The refractory state is initiated within minutes of the desensitizing dose and persists for several days. In addition Kare et al. (1969) demonstrated a little-known diffusional route by which substances such as glucose, salt (sodium chloride) and the insecticide phosphamidon may pass, within less than five minutes, directly from the mouth to the brain. The relationship between this finding and the clinical practice of sublingual neutralization is presently unknown (Bell, 1982); however the absorption of drugs through the oral mucosa is a recognized phenomenon (Gibaldi and Kanig, 1965).

b) Allergic Reactions Fundamental to the Development of Environmental Hypersensitivity

An immunological basis for environmental hypersensitivity is sometimes posited. Intriguing evidence suggests, by association, a role for blood-borne immune complexes in the late-onset symptoms of food allergies (Brostoff et al., 1977; Brostoff et al., 1979; Paganelli et al., 1979; Wraith et al., 1982; Brostoff et al., 1983). The food-elicited immune complexes of allergic subjects appear fundamentally different from those of non-allergic subjects in that they contain IgE (in a mixed complex with IgG) and are

relatively more long-lasting (Brostoff et al., 1983). In addition, oral sodium cromoglycate prevents development of early and late-onset food-related allergic symptoms as well as the appearance of IgE-containing immune complexes in the blood (Brostoff et al., 1977; Brostoff et al., 1979; Paganelli et al., 1979; Wraith et al., 1982; Brostoff et al., 1983).

Sodium cromoglycate is a locally acting, nonabsorbed drug; therefore, a central immunological role of the gastrointestinal tract is proposed for a number of seemingly food-related hypersensitivities. The possibility is that a form of serum sickness (type III hypersensitivity) may be elicited through an intestinal type I reaction to ingested substances. It is hypothesized that the initial type I reaction promotes absorption of immune complexes or of inappropriately large quantities of the ingested allergenic material. Preliminary results consistent with the general hypothesis have occurred in double-blind, placebo-controlled challenge studies using sodium cromoglycate on some patients suffering from conditions not normally considered to result from allergic reactions (e.g., migraine (Monro et al., 1984) and arthralgia (Wraith et al., 1982; Carini et al., 1984) and tartrazine sensitivity (Wraith et al., 1982). In personal communication with the Committee on Environmental

Hypersensitivity Disorders (Toronto, Ontario, Saturday, March 2, 1985), Dr. Jonathan Brostoff suggested that a plethora of adverse reactions could arise, either locally or systemically, from release of inflammatory mediator compounds through binding of IgE-containing immune complexes, within any organ, to cells such as mast cells, basophils, monocytes and platelets. Each of these cell types is known to have specific surface receptors for IgE (Melewicz and Spiegelberg, 1980; Sell, 1980; Hokama and Nakamura, 1982; Joseph et al., 1983; Bowry, 1984).

Other immunological features of patients with environmental illnesses are reviewed by Bell (1982). These include low blood T lymphocytes in the blood, low serum IgA levels and low serum levels of some complement components (cf. also Crayton, 1985 in the latter case). For the most part, these reported effects are slight, found inconsistently and/or of dubious significance with regard to immune function. Moreover it is unclear whether the effects are causative or simply secondary to ecological illnesses. Nevertheless it is clear from the relatively new and rapidly-expanding field of immunotoxicology, that an enormous variety of food components and environmental chemicals can elicit depressive or enhancing influences

on immune functions. These effects may be exerted with considerable specificity. The common food additive carrageenan, for example, may serve as an adjuvant that preferentially induces IgE synthesis (Nicklin and Miller, 1985).

c) Somatopsychic Causation of Behavioural Problems Associated with Environmental Hypersensitivity

As noted earlier in this chapter, emotional stress is frequently mentioned as a trigger factor in the development of environmental hypersensitivity. Patients with environmental hypersensitivity commonly suffer from psychological disturbances and exhibit behavioural problems (Bell, 1982). Both immunological and non-immunological mechanisms might influence brain function as indicated by fragmentary but suggestive support from many published studies. The olfactory system has nervous connections with the limbic system that comprises those parts of the brain with particular regulatory function over behaviour and emotions (Komisaruk and Beyer, 1972; Leonard and Tuite, 1981). Dietary imbalances modulate the levels of some important nerve transmitter compounds in the brains of experimental animals (Anderson and Johnston, 1983). This is the basis, for example, for the controversial

but sometimes efficacious use of oral tryptophan loads in the treatment of depressive disorders (Anderson and Johnston, 1983) e.g., the recent successful double-blind, placebo-controlled study of patients with acute mania or pathological aggression (Young, 1985). Digestion of foods causes release of opiate-like chemicals termed exorphins (Klee et al., 1979), and these substances may subsequently reach the brain (Rapaport et al., 1979).

Finally, much evidence now points to feedback regulation between the immune and central nervous systems by way of both anatomical and biochemical links (Marx, 1985; Tecoma and Huey, 1985). The firing rate of nerve cells in the hypothalamus is increased during immune responses (Marx, 1985) perhaps by way of soluble factors released from activated lymphocytes (Goldstein et al., 1983; Marx, 1985). In addition, human leukocytes may release an opioid activity (Palmblad, 1985). Moreover, thymus hormones may promote stress hormone production from the adrenal cortex by acting through the hypothalamus and pituitary (Goldstein et al., 1983; Marx, 1985). In addition, pathological regulation of brain functions is suggested by the association, in experimental animals, between the development of behavioural anomalies and the deposition at the cerebrospinal fluid/blood barrier of

immune complexes to foods (Hoffman et al., 1978; Harbeck et al., 1979).

A greater variety of observations suggest reciprocating central nervous regulation of the immune system. It is posited that emotional stress can trigger allergic symptoms in sensitive individuals (Furkawa and Roesler, 1980). Psychological stress, e.g., bereavement, seems to depress some immune functions (Marx, 1985; Palmbad, 1985; Tecoma and Huey, 1985). Moreover, lymphocyte-mediated immune responses including type I allergy can be behaviourally controlled in experimental animals, i.e., elicited by a learned stimulus without exposure to allergen in immunologically sensitized animals, or inhibited by a stimulus previously encountered only in combination with a specific chemical immunosuppressant (Marx, 1985; Palmbad, 1985). Central nervous system regulation of immune functions may be mediated by several chemical mediators, including the brain peptides termed enkephalins and endorphins, for which specific surface receptors exist on human lymphocytes (Palmbad, 1985; Tecoma and Huey, 1985; Wybran, 1985). In addition, specific patterns of nerve fibres are now recognized within many organs of the immune system (Marx, 1985). The study of these phenomena comprises a new and rapidly expanding field termed

neuroimmunolodulation. There are now two monographs (Ader, 1981; Guilleman et al., 1985) published on this subject.

d) Viral Infections as a Factor in Environmental Hypersensitivity

Brostoff (1985) has suggested that environmental hypersensitivities may be precipitated by severe viral infections. In this regard, Frick et al., (1979) found that children with a genetic predisposition to allergies often developed those conditions following a virus infection. Moreover, "paralysis" of the immune system by infectious organisms such as the measles virus is a widely recognized, although incompletely understood, phenomenon (Joffe et al., 1983). Several recent reports (Tobi et al., 1982; Hamblin et al., 1983; Jones et al., 1985; Straus et al., 1985) have indicated that the Epstein-Barr virus (EBV), in addition to causing infectious mononucleosis, can initiate a persistent, chronic illness characterized by fever, fatigue, depression, paresthesiae, mental confusion, psychoneuroses, headache, enlargement of liver or spleen, adenopathy, myalgia, arthritis, the development of allergies and abdominal complaints. The evidence of a persisting infection rests on the finding of an elevated titer of IgG antibodies to the viral

capsid antigen (VCA). IgM antibodies to the VCA are found only at the onset of the infection.

Infectious mononucleosis develops when the E-B virus enters the circulation, meets a receptor site on the B cell, then enters the cell and multiplies. Recovery occurs when the host mounts a T cell response (the activated T cells are those characteristically seen in patients with infectious mononucleosis); these destroy and kill many of th E-B virus-containing B cells. The destruction of these cells is, however, not complete. After recovery, the virus may continue to survive in B cells, but its multiplication is thought to be held in check by the host's T cells. The symptoms of patients who cannot completely suppress E-B virus replication and who develop a chronic, polysomatic illness, resemble those reported by patients with environmental hypersensitivity. Many of the patients who wrote to the Committee said that their illnesses started with viral infections, often infectious mononucleosis.

Indirect support for the general idea of a trigger mechanism, whether an infectious episode or not, may derive from present knowledge of factors (Sell, 1980) that can precipitate a seemingly unrelated type III (antireceptor) hypersensitivity.

e) Food Allergy as a Cause for Many Disease Conditions

The clinical ecology literature attributes a wide variety of disease conditions to environmental hypersensitivities. Many of these claims remain unproven, but controversial evidence indicating that migraine headaches and rheumatoid arthritis can originate from food allergies is outlined here.

i) Migraine

Food-related migraine is widely attributed to an idiosyncratic response to tyramine which is found, for example, in cheese, chocolate and red wine (Hanington, 1967; Moffett et al., 1972). As indicated in the brief introduction to the paper of Egger et al. (1983), the enzymatic basis for this claimed idiosyncrasy is not yet established. Some tenuous evidence suggests that migraine can result from allergic rather than idiosyncratic response to foods. Monro et al. (1980), reported that food-specific IgE levels were high in some migraineurs and could even serve a predictive function with regard to migraine-inciting foods in these individuals. Moreover, oral sodium cromoglycate gave partial or complete protection from migraine during single food challenges. Unfortunately the

nature of the challenge procedure is not made clear in this report. Monro et al. (1984), however, reported the efficacy of oral sodium cromoglycate in double-blind trials with this drug in a small sample of migraine patients challenged with known provocants. Moreover, in this study, the appearance of IgE-immune complexes correlated with development of migraine although the specificity of the IgE was not examined. Finally, Egger et al. (1983), implicated a food-allergic mechanism for some migraine sufferers on the basis that a high proportion in a sample containing 40 children with frequent severe migraine responded to a large number of foods (55 in total) in double-blind, placebo-controlled trials. An idiosyncratically based response might not be expected against such a wide variety of seemingly dissimilar foods. Overall, the results of these experimental studies suggest that an intestinal type I allergic reaction to foods might elicit migraine in some patients, and in some cases an initial type I reaction may elicit a delayed response by way of a type III (immune complex) reaction.

ii) Rheumatoid Arthritis

A relationship between diet and the clinical manifestations of rheumatoid arthritis is unproven. Intake of a diet containing a high level of evening

primrose oil (to supply the fatty acid linolenic acid) reduced the severity of experimentally induced arthritis in rats (Kunkel et al., 1981). Similarly, a modest improvement in symptoms was noted in a 12-week double-blind, placebo-controlled study of the influence of the fatty acid eicosapentaenoic acid on rheumatoid arthritis patients (Kremer et al., 1985). The reported effects of manipulating dietary fatty acid content are generally attributed to a pharmacological modification in prostaglandin formation.

A second, and perhaps even more controversial, possibility is that diet and rheumatoid arthritis can be related through an allergic mechanism. The laboratory of R.R.A. Coombs has developed a serum sickness (type III hypersensitivity) model for early rheumatoid-like lesions in rabbits given intravenous injections of bovine serum (Poole et at., 1978). In a presumed extension of this model, Coombs and Oldham (1981) demonstrated development of moderate to severe rheumatoid-like changes in the knee joints of a susceptible breed of rabbits given cow's milk either orally or by intravenous injection. High levels of serum antibodies against cow's milk proteins were found in the challenged rabbits. In an open-challenge case study of a single rheumatoid arthritis patient, Parke and Hughes (1981), demonstrated an association between

development of joint symptoms following milk or cheese consumption and appearance in the serum both of specific IgE antibodies to components of these foods and of modestly increased levels of IgE immune complexes. In other clinical experimentation, Yeatts et al. (1978), reported immune-complex-mediated release of platelet serotonin, an inflammatory mediator, in rheumatoid arthritis patients, and Little et al. (1983), correlated apparent release of serotonin from platelets with the development of joint symptoms in rheumatoid arthritis patients following open challenge with foods known to elicit swelling and pain in the joints of these subjects.

Finally, in this context it may be of some interest that double-blind challenges with suspected foods elicited arthralgia (joint pain) in a small sample of patients (Wraith et al., 1982; Carini et al., 1984). The provocants were previously identified by dietary exclusion and open challenge. In the same studies, double-blind, placebo-controlled oral administration of sodium cromoglycate gave protection against the effects of provocant foods. It must be emphasized, however, that direct evidence is lacking for implicating a food allergy mechanism in the causation of rheumatoid arthritis or related joint complaints.

3. Alternative Explanations for Environmental Hypersensitivity

A number of alternative explanations have been offered for the symptoms demonstrated by patients with environmental hypersensitivity. These are presented for information only and no attempt is made to evaluate the literature in support of each of them:

a) The Premenstrual Syndrome

The somatic complaints of patients with the premenstrual syndrome have many features in common with those reported by patients with environmental hypersensitivity. The premenstrual syndrome is a group of symptoms that recur regularly in the premenstruum (Dalton, 1984). It is a clinical entity not identifiable by laboratory tests. It presents in three forms: in the first and most common, symptoms develop four to five days before menstruation; in the second and next most common, symptoms develop transiently at the time of ovulation and during the week prior to menstruation; in the third and least common but most troublesome, symptoms start at ovulation and progress steadily throughout the premenstrual period, clearing only at menstruation. The symptoms associated with the premenstrual syndrome include such mood changes as

irritability, anxiety, hostility, depression and spells of unaccountable crying. Such somatic complaints as breast tenderness, arthralgias and unexplained fluid retention, as well as bloating, backache, headaches, and food cravings, particularly for coffee, chocolate and candies, also occur.

b) Hyperventilation

Lum (1981; 1982a; 1982b), has reported that hyperventilation can trigger symptoms that resemble closely those manifested by patients with environmental hypersensitivity. These include palpitations; precordial pain; dizziness; paresthesiae, particularly of the hands, feet and face; shortness of breath; dysphagis; heartburn; muscular cramps; and pains; anxiety and even hallucinations.

c) Hypoglycemia

Some patients develop symptoms of anxiety, feelings of prostration, profound exhaustion, and palpitations following meals (Sherwin and Felig, 1981). The effect is more pronounced if the meal is rich in refined sugar and carbohydrate. These patients never develop the syncope or seizures seen in patients with profound hypoglycemia, nor do they become hypoglycemic if fasted. Blood sugar levels taken postprandially may,

but do not often, fall below 50 mg per cent (Anderson and Lev-Ran, 1985). The patient's symptoms are ascribed by some to hypoglycemia.

d) The APICH Syndrome

This explanation is proposed by Saifer (1985), for patients who do not respond to anti-Candida treatment. These patients are classified as having Autoimmunity, Polyendocrinopathy, Immune dysregulation, Candidiasis and Hypersensitivity, the APICH syndrome. The commonest polyendocrine disorder is thyroiditis, followed by oophoritis.

e) Electromagnetism

Smith et al., (1985), have encountered a few patients with environmental hypersensitivity who experience mood changes, which are triggered by very small changes in electromagnetic radiation, by electric outlets in the home, by thunder storms, by fluorescent lighting, and even by passing under or near high-tension cables. These patients often find that their own electromagnetic charges disturb the normal functioning of digital watches, and their own sensitivities to electromagnetic charges in the environment enable them to "witch" successfully for water.

f) Iatrogenic Illness

Opponents of clinical ecology have suggested that environmental hypersensitivity is an iatrogenic illness (Brodsky, 1985; Terr, 1985), that is that the illness is a direct result of diagnostic or therapeutic efforts of a physician. In an analyses of eight environmentally ill patients, Brodsky (1983) concluded that, "These patients search for healers who will provide them with an explanation of their experiences and symptoms that makes sense to them and that fulfills a number of psychological needs."

g) Psychosomatic Illness

Some physicians regards environmental hypersensitivity as a manifestation of a psychiatric disorder. By definition, patients with environmental hypersensitivity have a multiplicity of symptoms, but no laboratory evidence of organic disease. The mental component of their illness suggests to many that the illness is psychosomatic, a disturbed psyche leading to disturbance of the soma (Brodsky, 1983). In a meeting with the Committee on Environmental Hypersensitivity Disorders (Toronto, Ontario, March 8th, 1985), Dr. Donna Stewart discussed this issue. In her opinion, persons suspected of having environmental

hypersensitivity might more appropriately be diagnosed as having somatization disorder (Monson and Smith, 1985; Stewart, 1985).

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Chapter Three

Present Knowledge of Adverse Reaction to Environmental Agents

Introduction

This chapter outlines current information regarding the diversity of adverse reactions that can occur when human beings or animals are exposed to environmental agents. Its second purpose is to demonstrate the limits to our present knowledge about those adverse reactions and about the mechanisms that underly them. It is the Committee's opinion that this information provides an important context within which we place our later consideration of environmental hypersensitivity as a clinical entity.

A. Widely Accepted Disease Reactions

1. Immunologically-Mediated Reactions

In 1906 Von Pirquet coined the term "allergy" to describe a state of "altered reactivity" following exposure to a substance that is nontoxic to most people (Sell, 1980). At present, however, the term is generally applied only to immunologically mediated reactions; according to Sell (1980), "The terms immunity and allergy are now used interchangeably for

manifestations of immune reactions." For the purposes of this report, it is this definition that has been adopted.

Immunopathology is the study of tissue alterations that occur in allergic reactions. Six types of immunopathological processes are recognized; with specific examples, they are as follows (Sell, 1980; Bowry, 1984):

a) Type I Reaction (Immediate Or Anaphylactic)

Clinical manifestations develop within 10 or 15 minutes after exposure to allergen. Most reactions are localized in the skin, gastrointestinal tract or respiratory tract but shock-like systemic reactions also occur. The reaction is antibody-mediated and generally results from the interaction of allergen with IgE-coated mast cells or basophils. It can also result, however, either from a similar interaction with these cells when coated with one IgG subclass (Nava, 1983; Bowry, 1984) or from the activation of complement by IgA or IgM (Hokama and Nakamura, 1982). The inflammatory mediators released by these interactions have been intensively studied in recent years, and their identities and modes of action are becoming reasonably well documented. Examples of substances, some common and some very rare, that can elicit a type

I reaction in human beings and/or experimental animals include the following:

i) "natural" chemicals such as pyrethrum, which is an insecticide constituent, and orris root, used in perfumes, dentifrices and cosmetics (Mathews, 1982),

ii) "synthetic" chemicals, such as toluene diisocyanate used in adhesives and some paints, the epoxy resin activator phthalic anhydride and trimellitic acid, which is an intermediate in the preparation of inks, dyes, platicizers, resins and adhesives ((Pepys, 1982),

iii) drugs, such as penicillin and most other antibiotics, egg-containing vaccines, commercial bovine/porcine insulin preparations, iron dextran and previously-used diagnostic agents including Congo red and sulfobromophthalein sodium (Patterson and Anderson, 1982),

iv) food components, such as B-lactoglobulin, casein, lactalbumin and bovine serum albumin in cow's milk, allergen M protein in codfish white muscle, and the several highly allergenic proteins in egg white and wheat flour (Aas, 1984),

v) food additives, such as vegetable gums (Mathews, 1982), and

vi) other agents, such as mold spores, pollens and house dust components including mites and animal epidermal products (Mathews, 1982), as well as venoms of bees, hornets and wasps (Patterson and Valentine, 1982).

b) Type II Reaction (Cytotoxic)

This reaction is of the "immediate" type similar to type I and is mediated by IgG, IgM or IgA antibodies directed against compounds exposed on cellular or tissue membranes of the human body. Affected cells and tissue membranes are usually disrupted by the action of complement, sometimes in concert with phagocytes. Occasionally a poorly understood blood cell, termed the K cell, may induce similar damage without invoking a complement-dependent mechanism (Hokama and Nakamura, 1982). Examples of this type of reaction directly relevant to the present report include destruction of red blood cells, platelets or neutrophils induced by drugs such as several antibiotics (e.g., penicillin, tetracyclines, cephalosporins, sulfonamides), aspirin, antihistamines, digitoxin, isoniazid, methyldopa, aminopyrine, quinidine, quinine (which is also a food additive), thiouracil, the formerly available sedative

"Sedormid", and numerous other compounds (Roitt, 1977; Hokama and Nakamura, 1982; Patterson and Anderson, 1982; Bowry, 1984).

c) Type III Reaction (Immune Complex-Mediated)

This hypersensitivity is mediated by complexes between soluble compounds and the pre-formed antibodies directed against them. The latter may be of IgG, IgA or IgM type, and the reaction usually develops within a few hours. Resulting complement activation induces inflammatory reactions that may be either localized (e.g., in the kidney, thyroid, joint capsules, lung, intestinal mucosa) or systemic (the shock-like condition termed "serum sickness"). Inflammatory phagocytes and blood clots elicit further tissue injury and death. Examples of disease conditions involving type III reactions are as follows:

i) lung diseases: induced by allergy to organisms including bacteria, fungi and mites, to animal danders (Hokama and Nakamura, 1982) and to synthetic chemicals including diisocyanates and epoxy resins (Nava, 1983);

ii) kidney diseases: induced by reaction to bacteria (streptococci), hepatitis virus B, the malaria organism or the drug penicillamine (Hokama and

Nakamura, 1982; Bowry, 1984);

iii) skin conditions elicited through contact with natural or synthetic chemicals such as salicylates, the dye phenylenediamine and the cathartic henolphthalein (Nava, 1983);

iv) gastrointestinal disturbances: resulting (in pigs and calves) from ingestion of soybean protein (Barratt et al., 1979); and

v) systemic (serum-sickness-like) reactions: to drugs such as penicillin, sulfonamides, piperazine citrate, thiouracil and amino salicyclic acid (Hokama and Nakamura, 1982; Patterson and Anderson, 1982).

d) Type IV Reaction (Delayed Hypersensitivity)

This so-called "cell-mediated reaction" is initiated by specifically sensitized lymphocytes and usually occurs without the involvement of antibodies and complement. The reaction generally requires up to 24 hours to become grossly apparent and 48 to 72 hours to develop maximum intensity. Cellular and tissue injury occur by way of phagocytes attracted to the inflammatory site or by direct action of "killer" lymphocytes or other circulating leukocytes. Examples of type IV immunopathology include the following:

i) dermatitis resulting from contact with diverse natural and synthetic chemicals (Nava, 1983) e.g., botanical agents such as urushiol from the poison ivy plant; components of cosmetics; industrial chemicals; fibres; dyes and finishers used in clothing manufacture; drugs including antihistamines, sulfonamides and penicillin; metals such as nickel; hexachlorphene used in germicidal soaps; chromates used as tanning agents; formaldehyde; and many others (Sherman, 1968; Roitt, 1977); and

ii) lesions associated with allergy to bacteria (e.g., tuberculosis), viruses (e.g., measles, smallpox, herpes simplex), fungi (e.g., Candida) and protozoans (e.g., Leishmania) (Roitt, 1977).

e) Type V Reaction (Antireceptor)

This hypersensitivity is mediated by IgG antibodies and the result is generally an inactivation of biologically active molecules e.g., cell surface receptors for insulin (a form of diabetes mellitus) and neuromuscular junction receptors for acetylcholine (myasthenia gravis). In Graves' disease the thyroid receptors for thyroid-stimulating hormone are blocked by an antibody which, nevertheless, triggers hyperthyroidism. A number of events can trigger type V hypersensitivity.

These include allergic reactions to drugs such as penicillin; chronic infections such as tuberculosis or syphilis; collagen diseases, many of which develop as type III hypersensitivities; pregnancy and some other conditions (Sell, 1980).

f) Type VI Reaction

This is a miscellaneous category characterized by the activation of the complement system of inflammatory mediators by the nonspecific immune (alternative) pathway. An example of this type of condition is gram-negative endotoxic shock induced by cell wall components of some bacteria, including common gastrointestinal organisms (Bowry, 1984).

2) Non-Immunologically Mediated Reactions

a) Reactions To Food Components Including Additives

i) Pharmacological Reactions

Potentially, these reactions can occur in any individual. Active agents include compounds such as caffeine in coffee, tea, and cola drinks, and vasoactive amines e.g., histamine, tryptamine, tryramine, serotonin, octopamine and synephrine found in wine, cheese, yeast extracts, bananas, avocados,

some fish, citrus fruits, etc. (Anderson, 1984; Lessof et al., 1984; Metcalf, 1984). The adverse effects of these compounds are exerted mainly on the gastrointestinal, cardiovascular and central nervous systems (Anderson, 1984). It should be noted that all but a few individuals would have to take abnormal amounts of these compounds to experience these effects. Histamine, for example, is rapidly metabolized by the intestinal mucosa and the liver (Moneret-Vautrin, 1979). On the other hand, such foods as strawberries and crustacea -- as well as ethyl alcohol and the preservative metabisulfite -- will induce histamine release following ingestion (Anderson, 1984).

ii) Toxic And Cancer-Producing Reactions

These reactions can occur in any individual after sufficient exposure. Examples of food toxins include contaminants, additives and natural constituents. Finfish and shellfish accumulate heavy metals such as methylated mercury, while lead is found particularly in fruits and vegetables (Cordle and Kolbye, 1982). (Occupational and general environmental exposures are also a significant cause of heavy metal intoxication.)

Other contaminants include: fungal toxins, such as the liver cancer-producing aflatoxins found mainly on peanuts, corn, and small grains; nitrates from

fertilizers found in domestic water and vegetables; and nitrites included as a preservative and as colour or flavour enhancers in cured meats, some fish and cheese (Cordle and Kolbye, 1982). By its reaction with hemoglobin, nitrite per se, either pre-formed or from nitrate, is toxic primarily to young infants, while both nitrates and nitrites can give rise to nitrosamines, which are recognized carcinogens in animals (Cordle and Kolbye, 1982).

Natural constituents of foods can also exert adverse effects e.g., the effects of oxalates in beets on the central nervous system, gastrointestinal tract and respiratory system (Burton and Hanenson, 1980). Anderson (1984) pointed out that the diverse possible signs and symptoms from food-borne toxins frequently mimic immunologically-based (allergic) reactions.

iii) Idiosyncratic Reactions

These reactions occur only in those individuals with specific susceptibilities resulting from inborn errors of metabolism, disease conditions, drugs or unidentified causes. Primary (genetic) and secondary (disease-related) lactase deficiencies result in gastrointestinal problems after ingestion of only moderate quantities of cow's milk. A congenital

inability to metabolize fructose results in liver disease and failure to thrive in children, and causes food aversions and anomalous behaviour in older subjects. In the severe Mediterranean form of glucose-6-phosphate dehydrogenase deficiency, ingestion of broad beans results in sudden destruction of red blood cells. These and many other adverse reactions due to identified genetic anomalies are reviewed by Lessof et al.(1984), and Anderson (1984).

In addition, a number of food additives can elicit clinical manifestations, particularly in the skin (e.g., hives) and lungs (asthma). Such compounds include the colouring agent tartrazine used in drugs as well as foods and drinks; and such widely used food and beverage preservatives as benzoates, bisulfites, metabisulfites, butylated hydroxyanisole and butylated hydroxytoluene (Anderson, 1984; Lessof et al., 1984). In these cases, idiosyncratic sensitivities are widely believed to occur but etiologic mechanisms remain obscure.

iv) Psychogenic Reactions

These include a number of entities that are poorly understood in terms of etiology, pathogenesis and clinical features. A brief review is presented by Lessof et al. (1984), but other reviews by Metcalfe

(1984) and Anderson (1984), although inclusive of nonimmunologically-mediated food sensitivities, make no mention of psychological disorders. Food avoidance syndromes are most common among women and range from distaste to phobias such as anorexia nervosa and the bulimic syndrome (binge eating of high carbohydrate foods with fatness prevented by purgation, psychogenic vomiting, or periods of starvation).

A second type of psychogenic reaction is psychological food intolerance, which results in physical symptoms when particular foods are knowingly consumed. Finally, in the present context of hypersensitive reactions to foods (or drugs, chemicals, etc.), habitual simulation of ailments that have not occurred is a recognized condition termed Munchausen's syndrome, a variant of which (Munchausen's syndrome by proxy), can be imposed on children by their parents.

b) Reactions To Drugs And Other Chemicals Not Primarily Found In Foods

The classification scheme followed in this sub-section is a modification of that indicated in chapters 7-9 of Loomis (1978).

i) Nonspecific Irritant Actions

These reactions occur mainly on the skin, in the respiratory tract and the eyes, and manifest either as corrosive or blistering actions (Loomis, 1978; Anderson, 1981; Nethercott, 1982). Sulfur dioxide and nitrogen dioxide in smogs resulting from fossil fuel combustion are converted to primary irritants in the presence of water from the air or at mucous membranes. Formaldehyde, ozone and the refrigerant methylbromide are primary irritants, as are numerous organic and inorganic antiseptic and germicidal compounds.

Inhaled irritants, such as air pollutants and strong odours, can trigger symptoms of hay fever in persons with a history of this allergic condition (Mathews, 1982). Moreover, Mathews (1982) stated that "Hyperirritability of the airways to a variety of inhaled pharmacologic agents as well as to nonspecific irritants is common to all asthmatic patients."

In a letter to the Committee, dated May 31, 195, Dr. Leonard Bernstein (University of Cincinnati Medical Center, College of Medicine, Department of Internal Medicine, Division of Immunology, said:

> I think it would be very important to address the question of toxic elements in

> the environment and how such exposures could affect susceptible individuals. There is much available information in the medical literature that ordinary outdoor pollutants such as sulfur dioxide, ozone and oxides of nitrogen can affect patients with pre-existing bronchial hyper-responsiveness . . . . very heavy exposures that one could classify as toxic to such gases as chlorine, very high concentrations of sulfur dioxide and other gases are, in fact, able to induce bronchial hyperactivity . . . the state of bronchial hyperreactivity may persist for years . . . and our group, in fact, has coined a new term for these conditions, "the reactive airways disease syndrome" or "RADS".

ii) Specific Toxicologic And Cancer-Producing Actions

Compounds in this category are toxic primarily on one or two major target organs. They can be specific for a single receptor site e.g., botulinus toxin with regard to its effect on nerve terminals (Loomis, 1978) and the organophosphate insecticides, which interfere with

central and peripheral nerve function by a specific action on the enzyme acetylcholinesterase (Duke and Dumas, 1974).

The halogenated hydrocarbons e.g., carbon tetrachloride and dichloromethane, are common industrial chemicals and are liver and kidney toxins (Anderson and Scott, 1981). The former is widely used as a dry cleaning and industrial solvent, as an extinguisher of fire and as a starting material in industrial organic syntheses, while the latter compound is a cleaning fluid and food processing solvent. Even when ingested in relatively small quantities by primates, methanol ("wood alcohol") causes damage specifically to the retina; it is a common industrial and pharmaceutical solvent also used as an antifreeze component, in gasoline, etc. (Dreisbach, 1980). At very high levels, methanol also damages the liver, kidneys, lungs and brain.

Some agents produce cancers in specific organs, e.g., benzidine used in the manufacture of dyes (liver tumours); thorium dioxide formerly used as a radiopaque medical diagnostic aid (liver tumours) and vinyl chloride monomers used in the plastics industry and as a refrigerant (liver tumours) (Hayes, 1983a).

The importance of minor differences in chemical structure in determining the target organ for

carcinogenesis is illustrated by the nitrosamine group, various members of which affect principally the liver, bladder or brain (Hayes, 1983a). These compounds are found in factory exhausts and cigarette smoke and also derive from nitrite and nitrate food preservatives.

iii) Production Of Pathologic Sequelae

In this type of adverse reaction, malfunctions or tissue malformations develop and remain indefinitely, even after exposure to the responsible agent has been discontinued; this is because the tissue fails to regenerate normal cells (Loomis, 1978). Examples include scar tissue formation in the lung as the result of exposure to such dusts as silica and asbestos (Hayes, 1983b) and cancer of the membranous capsule surrounding the lungs (i.e. the pleura) resulting from asbestos inhalation (Homburger, 1983). Tricresyl phosphate (used,for example, in vinyl plastic manufacture, as a flame retardant, as an hydraulic fluid and in gasoline) damages certain nerve cells with resultant long-lasting muscle paralysis (Loomis, 1978).

Organic mercury, e.g., methyl mercury, results from bacterial conversion of the inorganic mercury, which is widely used in scientific and electronic industries. This form of mercury induces brain damage and

peripheral nerve damage that can be irreversible. It can be internalized by ingestion of foods from treated crops (Cordle and Kolbye, 1982), and is also readily absorbed through the lungs and skin (Hayes, 1983c). Examples of drugs inducing pathologic sequelae include the sedative thalidomide (withdrawn from the market because of malformation induced *in utero*) and triparanol, once used for lowering blood lipid levels but now associated with formation of irreversible cataracts (Loomis, 1978).

c) Ionizing Radiations

Loosely regarded as "radioactivity", ionizing radiations include electromagnetic waves, i.e., x-rays and gamma rays, as well as particulate forms, i.e., alpha and beta particles, neutron, positron, charged and uncharged mesons, accelerator particles and fission fragments (Robertson, 1983). Exposure occurs through natural background radiation (from sources external to and within the planet), medical activities, nuclear weapons testing and nuclear power plants. Rapidly-dividing cell populations exhibit particular sensitivity to high levels of radiation. These populations include bone marrow components responsible for generating blood cells, stem cells for the gastrointestinal epithelium, cells that give rise to

the skin, cells that give rise to sperm, and ova in mature and intermediate follicles. Possible results include hemorrhage, fluid loss, infection or the poorly understood central nervous syndrome, and are acutely lethal. A high incidence of cancers is found among individuals exposed to levels of radiation that are not acutely lethal. A recent epidemiological study (Hickey et al., 1981), however, indicated that background radiation may be, at most, a minor risk factor in the development of a number of cancers and cardiovascular diseases.

B. Widespread, Recognized or Potential Environmental Hazards

1) Cigarette Smoke (a brief summary of findings in the Surgeon General's report, Smoking and Health, 1979)

More than 2000 compounds, including known irritants and carcinogens, are generated by at least seven different chemical processes in a lighted cigarette. Cigarette smoking is an established major risk factor for development of cardiovascular diseases, is causally related to cancers of the lung, larynx, oral cavity and esophagus, and is also associated with cancers of the urinary bladder, kidney (information for males only) and pancreas. The latter three associations indicate

the possibility of as-yet unidentified organ-specific carcinogens in tobacco smoke. Cigarette smoke is further associated with numerous non-cancerous diseases of the respiratory tract and, by unknown mechanisms, with increased risk of morbidity and mortality from peptic ulcers.

The report identified a large number of urgent research needs and made clear our superficial understanding of the pathological conditions associated with cigarette smoking. For example, epidemiological information about cardiovascular diseases is far from satisfactory or complete and knowledge of disease mechanisms is fragmentary and primitive. Six priority research questions were outlined (p. 6-42) concerning the relationship between cigarette smoking and various non-cancerous lung diseases. It was also pointed out (pp. 1-19 to 1-20) that improved information is needed on interactions, whether additive or synergistic, between harmful compounds in cigarette smoke and other hazardous exposures. Finally, tobacco smoke contains numerous compounds that can elicit immune responses and smoking is associated with a variety of immunological anomalies, but the role of allergy in tobacco-related pathology is unknown at present.

An added dimension to the problem of disease associated with cigarettes is the growing awareness of hazards imposed by "second-hand" smoke. The Surgeon General's Report (1979) pointed out that fetal growth rate is retarded by maternal smoking and that the risk of peri-natal mortality is elevated. The Report stated (p. 8-74), "A number of important questions relating to the possible biological effects of tobacco smoke and its constituents on the fetus in utero and the newborn infant remain unanswered . . . " and 88 research questions were subsequently outlined (pp. 8-75 to 8-81). There is also concern about the effects of second-hand cigarette smoke on healthy, non-smoking children, adolescents and adults.

The current controversy is particularly focused on involuntary exposure of healthy adults in the workplace. Collishaw et al. (1985), state that "Existing air quality standards for workplaces do not directly specify an acceptable level for tobacco smoke. The evidence on the composition of tobacco smoke and on the health hazards of involuntary exposure suggests that there may not be a 'safe' level for such exposure."

The acute effects of involuntary exposure on the health of susceptible individuals -- such as those with heart

disease, respiratory ailments and hayfever -- are reasonably well recognized (Collishaw et at., 1985). There is considerable controversy, however, about the possible consequences to the general public of chronic passive smoking. These effects may include impaired lung function and cancers of the respiratory tract (Collishaw et al., 1985) as well as ischemic heart disease (Garland et al., 1985). A recent issue of Consumer Reports concluded that current evidence of long-term risk to the public at large is sparse and conflicting. Data are scarce, even those related to such a simple question as how much tobacco smoke is inhaled by a non-smoker at a given level of exposure.

2) Food Additives

Weiss (1983) stated, "Food additives are probably the most ubiquitous products of modern chemistry." Probably the most thoroughly evaluated food additives are the colouring agents (Borzelleca et al, 1983). Test protocols emphasize pathology, particularly evidence of cancer-causing risk (Khera and Munro, 1979; Weiss, 1983), and also include studies of effects on reproduction and on the fetus (Berdick, 1982). Despite the view espoused by some authors that "The Food, Drug and Cosmetic colours do not pose a threat to human health at levels currently in use or at levels greater

than those currently used", (Borzelleca et al.,1983), Berdick (1982) claimed a paucity of information with regard to trace contaminants, metabolism (an important factor in secondary hazards), and metabolic fates such as tissue accumulation and allergenicity. Moreover, at present behaviour analysis is not routinely conducted in evaluating food additives (Berdick, 1982; Weiss, 1983; Vorhees et al., 1984) or in judging other potentially hazardous agents, although there is accumulating evidence that such methods are sensitive indicators of functional impairment (Weiss, 1983; Vorhees et al., 1984). Weiss (1983) stated that "To set standards requires us to determine exposures producing subtle, not overt, impairment."

A final point was raised by Berdick (1982) and illustrates a further shortcoming of our present knowledge concerning the hazards of food additives: there are about 20 synthetic organic colours (i.e., that are not found in nature) currently being used in foods in the industrialized countries. At the same time, as many as 50 naturally-occurring colours are in use, half of which could be classed as common additives. There is a frequent misconception that synthetic colours are hazardous while natural ones are safe. However, Berdick (1982) points out that " . . . some of the so-called natural colours are complex

chemical mixtures whose composition is incompletely elucidated and whose toxicology is known only to the extent that humans have survived consumption for many years . . . With few exceptions, there is presently much greater assurance of safety of the unnatural colours than of the natural colours . . ."

3) Fluoride

Most current interest in fluoride centres on its efficacy in reducing the incidence of tooth decay, a benefit that has been confirmed by many large-scale controlled studies with children (Anon., 1983). Fluoride serves both to promote formation of hard enamel and to promote repair of weakened enamel. When painted onto the tooth surface, fluoride reduces the numbers of decay-causing bacteria. On a precautionary note, Rose and Marier (1977) reported that exposure to fluorides is increasing in North America because of increased industrial uses of fluoride compounds and because of increased intake through foods and fluoridated water supplies. At present, we have inadequate criteria for assessing "safe levels" of exposure to fluoride, a persistent bioaccumulator, and there is inadequate quantitative information on our total exposure. Occupational fluorosis-related complaints include muscular, skeletal, kidney,

neurological and locomotor ailments, but these are implicated primarily through anecdotal reports. Perhaps of more importance, the adverse effects, if any, of chronic low-dose fluoride exposure remain unknown.

Controversial epidemiological evidence linking chronic fluoride intake and cancer death rate was discussed briefly in the report of Rose and Marier (1977) and elsewhere, e.g., Yiamouyiannis (1977). Fluoride has also been rather vaguely associated with thyroid hypofunction; in a few studies, it has been suggested that fluoride increases the nutritional requirement for magnesium, manganese and vitamin C. Considering the highly controversial nature of the allegations surrounding excessive fluoride exposure (particularly the chronic, low-dose type) and the uncertainties of information about "safe" levels and about actual exposures in human populations, Rose and Marier (1977) listed 19 priority research items related to fluoride toxicology.

4) Formaldehyde and Urea Formaldehyde Foam Insulation (UFFI)

Formaldehyde is off-gassed from a variety of household products, ranging from rugs to particle board. A

number of symptoms have been attributed to formaldehyde and it has been suggested that symptoms caused by the presence of urea formaldehyde foam insulation (UFFI) were produced by the formaldehyde released from the foam. Most responses to the presence of formaldehyde appeared to be in proportion to the concentration of formaldehyde in households.

Therefore, preliminary evaluation of the health effects of UFFI focused on formaldehyde. Among the adverse effects considered were: allergic reactions (Popa et al., 1969; Day et al., 1985); as well as hyper-responsiveness of the upper and lower respiratory tract, including exacerbation of previously existing respiratory problems, such as asthma, bronchitis, emphysema and acute respiratory infections (Porter, 1975; Hendrick and Lane, 1977). In addition, formaldehyde was thought capable of producing sub-clinical lower respiratory tract responses that would increase possible future reactivity to diverse bronchial irritants. It has also bee suggested that substantial air pollutants in urban centres might exacerbate the adverse effects of formaldehyde (LaBelle et al., 1955; Day, 1981).

Day et al., (1982), and Day et al., (1983), undertook a co-ordinated assessment of the potential health effects

of formaldehyde. Persons reporting reactivity to UFFI comprised the study group in each case, and the purpose was to assess the impact of formaldehyde and UFFI off-gas on the upper and lower respiratory tracts and the middle ear. The study of Day et al., (1983), focused specifically on subjects complaining of asthma thought to result from UFFI exposure. UFFI off-gas in a chamber environment increased lower airways reactivity in these subjects. No other indication was obtained to suggest that either formaldehyde or UFFI off-gas function as respiratory irritants or as allergy-inducing compounds. Low levels of formaldehyde, therefore, can act as a respiratory irritant, and levels sometimes observed in UFFI-containing households can elicit an asthmatic response. A reaction to formaldehyde appears likely to be at least partly responsible for the health problems experienced by the small proportion of the population that reacts to the presence of UFFI in its homes.

At present, the long-term effects of formaldehyde on humans are unknown. Current studies involve evaluating the long-term effects of exposure to formaldehyde on undertakers, while future studies should focus, under controlled exposure conditions using specific tests of end organ responses, on the impact of formaldehyde on various tissues over extended periods.

5) Acid Rain

The emissions that produce acid rain derive partly from natural sources, such as decaying organic matter, volcanoes and lightning, but come mainly from the burning of fossil fuels (Garfield, 1985a). This is a global problem because atmospheric acidity is carried into regions thousands of miles from its industrial sources (Garfield, 1985b). A voluminous scientific literature is accumulating on specific effects of acid rain. Most efforts have focused on the impact of environmental acidification on terrestrial and aquatic flora and fauna. While questions of great importance in regard to these matters remain unanswered, there is even greater ignorance about the direct or indirect effects of acid rain on human health (Maugh, 1984; Garfield 1985a).

Acid rain could affect human beings in three ways: first, by deposition on the skin; second, by inhalation and, third, through toxic metals released under acid conditions (Maugh, 1984; Editorial, 1985). No evidence exists of harmful effects from deposition of acid rain on the skin. Sulfur and nitrogen oxides of acidified precipitation are known to cause inhalation-related health problems, but it is impossible, on the basis of present information , to evaluate the nature and extent

of health effects resulting from inhalation of acid pollutants (Maugh, 1984).

The major potential health hazard from acid rain could result from the mobilization of minerals present in rocks and soil. These include: lead, mercury, aluminum, cadmium, manganese, nickel, arsenic and zinc. Present interest centres particularly on lead, mercury and aluminum. No information exists about the amount that environmental acidification contributes to total lead and mercury exposure, but indicative measurements are available in relation to aluminum; furthermore, aluminum accumulates in the central nervous system, is a known neurotoxin and is implicated (by association only) in the development of some brain diseases including Parkinson's disease, amyotrophic lateral sclerosis (Lou Gehrig's disease) and Alzheimer's disease. The latter affects about five per cent of the population aged more than 65 years and is one of the commonest causes of mental deterioration in the elderly. The main conclusion of participants at the recent Conference on Health Effects of Acid Precipitation (National Institute of Environmental Health Sciences, Research Triangle Park, North Carolina, Nov. 14-15, 1984) was that present research efforts have only begun to scratch the surface of this problem (Maugh, 1984).

6) Video Display Terminals (VDTs)

The increased frequency of health complaints related to the use of VDTs, combined with an explosive increase in the number of exposure hours in recent years, has sparked interest in studying health hazards associated with them (Donoghue, 1983; Smith et al., 1983). There is a particularly pressing need for long-term studies on the effects of VDTs on health and on the effectiveness of measures taken to alleviate the associated health problems (Donoghue, 1983).

Stress-related complaints amongst VDT users (e.g., fatigue, nervous disorders, disrupted sleep patterns, etc.) require ergonomic modifications (Donoghue, 1983) and, perhaps, attention to such psycho-social factors as job design (Smith et al., 1983). It is imperative to begin research into designing low-stress workplace environments for VDT users. It is possible that health problems, including fetal harm (which has already been the focus of a great deal of concern), results from the VDT user's reaction to a chronically stressful work situation (Donoghue, 1983; Smith et al., 1983).

The current, cautious position of the Ontario Medical Association Committee on Public Health seems most reasonable; the Committee made the following recommendations during its Toronto meeting of June 6-7, 1983:

> a) That the OMA accept that video display terminals do not emit hazardous microwave, radiofrequency, ultraviolet infrared or x-ray radiations;
>
> b) that there be an expression of reassurance to all concerned that operators of VDTs have no reason to fear radiation health effects from VDTs;
>
> c) that proper ergonomic standards be encouraged in the workplace to maximize VDT operator comfort; and
>
> d) that the OMA continue to monitor and evaluate all scientific developments in this area.

Summary

Most of the reactions described in the first part of this chapter are well recognized and appropriately prevented or treated by physicians practising

conventional medicine. In addition, many workplace hazards mentioned are widely recognized and subject to at least partial control. At the same time, the inadequacy of our information about how humans react to a poor-quality environment dictates caution and even skepticism about our ability to assess the risks to which we are exposed as a result of our simultaneous interactions with diverse agents and complex mixtures. These include: tobacco smoke, natural gas fumes, automobile exhaust, foods and food additives, micro-organisms, agricultural sprays, fluorescent lighting, heavy metals, asbestos, noise and electromagnetic waves. The complexity of the problem, the urgency with which it must be addressed, is evident in this excerpt that was written just in regard to commercially produced chemicals (Somers, 1982):

> The scope and nature of the chemical world created by our rapidly developing technological society over the past 30 years have had a dramatic impact on human health and the environment. The inventory of existing chemical substances in commerce numbers about 70 000 and the estimate of new chemicals entering the market each year in quantities greater than one tonne range from 200-1 000. The

> hazards of these chemicals range from the acute to the long-term: not only the highly publicized concerns with industrial accidents, home insulation, transport of dangerous chemicals, damage to wildlife, possible carcinogenic or mutagenic effects, and toxic waste disposal, but also the hazards of chronic neurotoxic or behavioural changes, or of subtle environmental damage.

The quotation makes no direct reference to the additional complexity that perhaps arises from alterations to chemicals as a result of such processes as metabolism and combustion.

We must develop the knowledge to understand and predict the impact of our civilization on our environment and, ultimately, on our own health. Growing awareness of this need is evident in the existence of the Pollution and Education Review Group, which was established by the Board of Education of the City of Toronto in September, 1984. It is also exemplified (on a larger scale) by the vigorous efforts of academics and industrialists to renew interest by the federal and Ontario governments in establishing high-quality centres related to environmental medicine, like the

Canadian Centre for Toxicology at Guelph and Toronto.

It is that kind of growing environmental concern that was the impetus behind an afternoon session of the BIO EXPO'85 conference at the Bayside Exposition Center in Boston (May 14-15, 1985). It was focused on the development of microbial pesticides because " . . . chemical pesticides are implicated as carcinogens and environmental pollutants" (MacFarlane, 1985).

In the context of this chapter, a long-term, wholehearted commitment to research and development that is devoted to improving environmental quality is an imperative for socially responsible government, at all levels.

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Chapter Four

Clinical Ecology - Programs Visited

As explained in the first chapter of this report, the Committee had substantial contacts with people involved in all aspects of environmental hypersensitivity. These included visits to clinical ecologists and to other physicians and to wellknown environmental units in the United States. In Toronto, Judge Thomson met with Dr. William Crook, Dr. Stanley Baker and Dr. Frank Waickman. We also spent a very helpful and informative day and-à-half with Dr. Jonathan Brostoff, an immunologist from England, who is active in both research and clinical practice with patients diagnosed as sensitive to food or chemicals.

Committee members also met with most of the clinical ecologists now practising in Ontario. A discussion between our members and several members of the Canadian Society for Clinical Ecology and Environmental Medicine was led by Dr. John Maclennan, a widely recognized pioneer in the field of clinical ecology in this province. A questionnaire seeking information about the tests and treatments currently in use in Ontario was circulated to all of the clinical ecologists who

attended.

Two members of the Committee observed a day of clinical practice in the office of a Toronto physician and two others met with patients and practitioners and observed some testing procedures during a full day of meetings in Ottawa. In addition, one Committee member attended a meeting on clinical ecology, sponsored by the Human Ecology Foundation, held in Toronto on April 13, 1985.

Rather than describing each of these trips and meetings in detail, we wish to make a number of general statements about the practice of clinical ecology as it was observed by us. We stress that these are made solely as a result of the visits and discussions outlined above and they should not be given a greater weight than such limited experience would justify:

1. We wish first to acknowledge the openness and eagerness with which the clinical ecologists and other professionals received us. Everyone we met was extremely cooperative and hospitable. Even more important, they were willing to discuss and demonstrate their work and to explain the approaches they have adopted in their practices. We were given free access to patients in both inpatient and outpatient programs; at no time did we have to be concerned that information was being withheld. In fact, most of the

doctors we met were quite open -- not only about the cases and approaches they felt had produced successful results -- but also about the limits of their knowledge and the areas of uncertainty, even concern, that exist within the field as a whole. For example, most of the clinical ecologists accept that there is a need for additional research to establish, in scientific terms, the efficacy of many of the tests and treatments now being employed.

2. The doctors we met demonstrated varying levels of awareness of the importance of nutritional counselling when the suggested treatment involved alterations to a patient's diet. Some were very skilled in that area or had well-trained people available; we noted that, when the nutritional adequacy of one particular diet for an Ontario child was questioned by the child's school, the clinical ecologist involved in the case sent the diet to two experts for analysis and that they assessed it as nutritionally adequate. Others did not seem to place a high priority on the nutritional effect of prescribed diets.

3. As a group, the doctors we met showed a high level of awareness and concern about the environment and about the effect it may be having on us. As individuals, clinical ecologists are increasingly

uneasy about the possible effects of an ever-more polluted environment.

4. Some of the clinical ecologists we met appeared to accept uncritically the thesis that environmental factors are the cause of symptoms presented to them by their patients. In some cases this seemed to amount to a predisposition in favour of environmental hypersensitivity.

In our opinion, this could not be justified simply on the basis of how patients had come to the attention of clinical ecologists. Those referred to inpatient environmental units were generally patients for whom the diagnosis of environmental hypersensitivity had already been made by clinical ecologists in the patients' home communities. The pre-selection process is much less clear and uniform for those who sought help on an outpatient basis. We were concerned when we were told that nearly 100 per cent of one practitioner's patients had symptoms attributable to environmental hypersensitivity.

In making that observation, we should add two other points: first, it must be acknowledged that this predisposition toward a particular diagnosis is probably not unique to this specialized area of medicine. Furthermore, our experiences varied: in

Ontario, for example, we encountered a number of practitioners who were quite careful in their approach, who did not leap to environmental explanations and who took a conservative, gradual approach in searching for possible food and chemical sensitivities.

5. We were impressed by the calibre of medicine practised by some of the doctors we met, quite apart from their work as clinical ecologists. Examples of this were readily apparent in the case work described to us by some Ontario practitioners and in our observations of the Dallas program.

6. Given the great emphasis placed on sublingual and intradermal end-point titration testing as a diagnostic tool -- either alone or as a means of verifying histories taken from patients -- we were surprised to note that tests were often carried out in a much less controlled fashion than we had anticipated. We observed no double blind testing and no use of placebos. In both the United States and in Ontario, we observed testing that was carried out in a single blind manner; we also observed testing in both places that could only be described as open. This was of particular concern to us, given the subjectivity of the measurements that are used to determine patients' reactions to the testing and given further the major

decisions that a patient may be asked to make on the basis of those results. Our concern carried over to the area of treatment by neutralization where, once again, we found that the process was often quite open and subjective.

In some cases, patients, particularly those in environmental units, also undertook food and chemical challenges. We were told about, but did not observe, double blind chemical testing performed in Dr. Rea's unit in Dallas and Dr. Brostoff described a double blind food challenge that he uses in his practice. We accept the statement of some practitioners that limits on the type of testing that can be carried out are sometimes dictated by a given patient's ability to bear the costs of such investigations. Moreover, the work done prior to referral to the clinical ecologist may suggest that subsequent testing need not be as precise as might otherwise be required. However, these factors do not eliminate the concerns we have as a result of our direct observations of the testing procedures.

7. Our observations also raised a number of questions about the extracts used, both for testing and treatment purposes. Understandably, those extracts are free of preservatives. However, in talking to physicians who

use such extracts, we found little awareness of the possibility that an absence of preservatives may cause problems with regard to stability, sterility and reliability.

For instance, there seemed to be little hard information about the stability of the extracts over time. Moreover, we wonder how sterile they were, with no anti-bacterial additives, after extensive use. In addition, the relatively crude method of preparation of some of the extracts (e.g., diesel fuel extract that is prepared in Texas) raises questions about the reliability of the resulting product.

8. From our observations and the reports of many patients, it appeared that doctors practising clinical ecology are warm and sympathetic and that their attitude has a very positive effect on the patients. Patients confirm that they are listened to attentively. Doctors seem to make a substantial effort to treat each patient as a partner during both diagnosis and treatment. From our observations, longer appointments seemed to be the norm, with heavy emphasis on the histories presented by the patients.

9. Throughout the field, there seemed to be great acceptance of what might be called "fringe" or

scientifically unverified testing and treatment methods as long as patients reported they were satisfied. One example of such a treatment is the broad use of intravenous injections of high dosages of vitamin C to deal with acute reactions to foods or chemicals. As noted earlier is this report, many patients have sought help through a very broad range of therapies and treatments beyond those offered by clinical ecologists. Some of the clinical ecologists we met were very supportive of such practices despite the absence of good data that would demonstrate their efficacy. In addition, there seemed to be a willingness on the part of some practitioners to accept new techniques or technologies (e.g., the Vegatest machines), though there is no clear theoretical explanation for the results said to be achieved through their use.

10. Based on our observations, we believe that patients with a considerable variety of problems present themselves to clinical ecologists for treatment, particularly on an outpatient basis. Not only is the range of symptoms wide (see chapter 2), but the severity of illness ranges from the very slight to the very serious.

While a number of patients had been pre-selected by

other clinicians as possibly environmentally hypersensitive, it is also true that a number had not been to many (if any) doctors before consulting a clinical ecologist. As explained in chapter 5, this is understandable, given the diverse ways patients hear about and seek help from clinical ecologists.

These general observations, based on our contact with practicing clinical ecologists in the limited time available for such visits, are all that are possible under the circumstances and it must be recognized that each one is not necessarily applicable to any individual practitioner. Nonetheless, the Committee found this aspect of its work helpful in the process of formulating its findings and recommendations.

Chapter Five

Patient Submissions

The Committee heard from many patients and those close to patients, sometimes as a result of personal contact. However, the bulk of the information came from letters and briefs written to us. We were surprised at the number of patients (607) who wrote, often sending lengthy and detailed descriptions of their medical histories and of the various treatments and interventions they had found successful or unsuccessful; we heard as well from parents, spouses, relatives or friends of patients.

This chapter is a summary of the information we received from patients and other concerned persons. Appended to the report is a summary of submissions (Appendix 3), as well as a brief analysis of 147 of the patients' letters. (Appendix 4)

We have drawn a number of general conclusions from our review of the briefs and from the meetings we had with individual patients and with such advocacy groups as the Parents of the Environmentally Sensitive.

Before setting them out in more detail, the Committee wishes to acknowledge two limitations to the information we received. The first and most obvious is the fact that it is entirely anecdotal; we did not attempt to verify it independently. However, that does not render it unimportant nor did it lessen the impact on us of the often unhappy, sometimes tragic, stories we were told. As will be seen, certain of our recommendations are supported by reference to this important patient information.

Nonetheless, we do recognize that what follows is limited and we do not want any assumption made that these patient histories, in themselves, are proof of the existence of the specific disorder or illness we have been asked to examine.

Second, it should be noted that we heard disproportionately from those patients who have found or who are finding success with the approaches and treatments prescribed by doctors practising clinical ecology. This was probably inevitable, given that the major focus of our inquiry was seen as directed at the tests and treatments used by clinical ecologists and that patients were encouraged by clinical ecologists and others to write to the Committee. It is therefore impossible to know how a randomly chosen

group of patients with similar symptoms would have responded.

A further preliminary point should be made: because of our acute sense of the enormous suffering and personal distress that many patients have endured, with the authors' permission, we have appended to this report, as Appendix 5, three letters that are examples of the kinds of stories we were told by the more severely ill patients. They spoke of increasingly severe symptomatology, accompanied or followed by lengthy and costly treatment, often involving major environmental or social change. Some have not had any amelioration of their condition, even after several years of illness and after exposure to a bewildering number of treatments and interventions. These personal histories played a major role in convincing the Committee that there are a number of very sick people in Ontario for whom various kinds of support should be available -- notwithstanding any ongoing debate about the cause of their condition.

The following is a review of information given to us by patients and others.

1. As a group, patients presented an impressive number and range of symptoms said to be the result of

exposure to foods or chemicals. A list of them is included in Appendix 4 to this report; they show that all the systems of the body are involved and physical, mental and emotional complaints are evident. Consistent with the literature, the most commonly described symptoms included: "brain fag" or spells of mental confusion, gastrointestinal tract difficulties; eye, ear, nose and throat problems; respiratory problems; cardiovascular irregularities; skin disorders; genitourinary problems as well as muscle, joint and bone pain.

A list of offending foods and chemicals is equally impressive and is also included in Appendix 4. The most common foods included: milk, eggs, beef, pork, corn, salt and chocolate. The most common chemicals included: diesel fuel, phenols, food preservatives, perfumes, household cleaners, and synthetic fibres. In some cases, one environmental agent was identified as the primary or only causal factor; more often, though, patients named quite long lists of substances said to be contributing to their illness. A growing number of persons believe that fungal infections, particularly Candida, are responsible for their increased sensitivity to environmental agents.

Not only was there enormous variation in the symptoms reported, but the severity of patients' illnesses also

varied. While some presented as very seriously ill, many had symptoms that were much less severe. A very great range was evident in just those patients we met personally or whom we observed at the offices of individual clinical ecologists. Much of this chapter comprises an outline of common features the patients described to us, but it should not obscure the fact that, from our observations, this is not a homogeneous population. Media presentation of individual cases perhaps distorts the overall picture.

2. As a group, those patients we met in physicians' offices or in environmental units and those who wrote to us impressed us as articulate, well educated and well read on environmental issues generally and on environmental hypersensitivity in particular. Many more women than men were represented and the overall socio-economic level of patients seemed higher than that of the general population.

Some of those demographic impressions can be explained by other factors: we heard primarily from those who are receiving treatments not covered by the Ontario Health Insurance Plan; this alone probably skews the socio-economic picture of the patient population. Furthermore, we sought input in a way that biases the response in favour of those most apt to know of our

existence and most able to develop briefs and submissions for the Committee.

Now, more than ever before, articles and stories about environmental concerns, about the plight of individual patients and about the work of clinical ecologists and others appear in the popular press. This has produced a patient population that feels more knowledgeable about such issues than it would if the disorder was of a kind discussed only in medical texts and learned journals. It is difficult, of course, to say how much the features of our patient sample can be ascribed to these factors rather than to some unique characteristic of people who suffer from environmental hypersensitivity. The only feature of the patient population that has been noted elsewhere and that does not appear attributable to any of the above factors is the presence of many more women than men.

3. Notwithstanding the above, we were struck by the almost accidental way many of these patients first began to see their problem as possibly being environmental hypersensitivity. They told of having met someone who had heard of the work of clinical ecologists or who had been a patient. They happened to have a family practitioner who was aware of the diagnosis and who knew of a clinical ecologist to whom

one could make referrals. They watched a television programme that dealt with the problem or read a newspaper article about an individual patient. They lived in one of the Ontario communities where a clinical ecologist practises or where there is an established local association, such as a Human Ecology Foundation. (It appears that there are parts of the province in which there is above-average interest in the topic, as well as substantial publicity about the issue and a concentration of patients, e.g., Toronto, Ottawa-Carleton, Kitchener, Niagara Falls). Many patients were unhappy at the haphazard way they had obtained information they subsequently found to be extremely valuable.

Beyond this, they were concerned about the enormous difficulty they experienced in securing balanced information on the subject of environmental hypersensitivity. It seemed to many people that they had been caught in the midst of a growing debate between different parts of the medical profession. The literature and public discussion the debate engenders is enormously confusing to them and seemed to range from total endorsement of environmental hypersensitivity to absolute rejection, with few examples of objective analysis in between.

Patient confusion was perhaps best exemplified by the different perceptions they had of research in the field. Almost everyone seemed to have heard of or to have read stories about research that demonstrated the truth of the positions held by them or by the persons treating them. The few who had heard of research that reached the opposite conclusion had been told that the methodologies used in such research had been criticized in other studies.

Understandably, there was a tendency to embrace texts and articles that used easily grasped language in discussing the illness and one or more of the theories of causation. A recurring complaint was that the controversy within the medical profession was readily apparent, that it appeared to affect seriously the ability of patients to obtain financial assistance or other supports -- and yet patients were virtually unable to obtain objective analyses of the issues.

4. Given the variety of symptoms reported to us and the wide differences in the severity of the illness, it is not surprising that it is difficult to describe the stages of a "typical" case as reported to us. For some, symptoms seemed to develop in a slow and gradual manner, a process that is consistent with the view that the illness is caused by chronic, multiple, low-dose

exposure. In others, a major precipitating event could be easily identified -- perhaps a large amount of pesticide sprayed in the work or school environment or perhaps a move to a larger, industrial, urban area or perhaps the introduction of a drug or other chemical ingested as part of a medical investigation or treatment of another illness. We noted that many connected the onset of serious difficulties with a recent viral illness of some sort.

5. The patient histories we reviewed highlight the increasing degree of medical specialization as our understanding of illness and its treatment becomes more and more complex. Many of those who wrote to us had lengthy medical histories and had seen a number of specialists in their search for a firm diagnosis. The patients in our analysis had, on average, consulted six medical practitioners each.

We note that patients we met at the offices of clinical ecologists had less lengthy histories of prior consultation with large numbers of doctors.

6. In general, the patients we heard from were quite critical of those doctors who practise so-called "traditional" medicine. Some of their feelings were the result of frustration at dealing with specialists

who had been unable to diagnose the cause of their illness, often after extensive testing. Their unhappiness was often compounded by resentment at the suggestion that a psychiatrist should be consulted because the illness appeared to be psychiatric in origin. The major complaint of others was that the doctors they had seen were unaware of environmental hypersensitivity or were openly critical of doctors practising in the field of clinical ecology.

For some patients, the larger issue was this: "traditional" practitioners are perceived as over-reliant on drug therapies and unwilling to be open to a more holistic treatment approach and to so-called "alternative" therapies that patients were finding helpful.

At the same time, we wish to stress that a number of patients greatly appreciated the efforts made by their family practitioners and by the specialists to whom they were referred, in an attempt to find the cause of their presenting symptoms.

7. As shown in the sample letters appended to this report as Appendix 6, many submissions dealt with the costs associated with both diagnosis and treatment. Some of those who contacted the Committee attempted to compare the estimated costs of diagnosis and treatment

of those interventions covered by the Ontario Health Insurance Plan and of those therapies not covered by OHIP but ultimately found helpful by the patient. For the more severely ill patients who had been hospitalized and treated by many specialists, the comparisons were quite impressive.

Patients were not alone in making these comparisons. Many of the clinical ecologists with whom we met or who wrote to us said that they find the treatments they now employ less expensive than those they previously prescribed. Attached to this report as Appendix 2 is a letter from a British physician who strongly makes this point. (See also Krop, J. "Future Prospect of Preventative Medicine Cost Effectiveness" In press, July, 1985.)

As might be expected, there was general dissatisfaction with the fact that, in a province where medical care is perceived to be a universally insured service, certain physician-prescribed treatments are not freely available. Fuelling this sense of unhappiness was the realization that many very expensive, fully insured interventions had been tried and found not to be helpful.

For most patients, the major expense was the amount they were incurring for tests and treatments. The costs of individual testing procedures and of extracts used in neutralization therapy seemed to vary considerably. In addition, there was often the expense of regular appointments at which their neutralization levels were checked.

The expenses incurred by patients often go further: the use of organic foods is normally part of any diet manipulation and such foods are often costly and difficult to obtain. Substantial expense may be undertaken in order to obtain water that is considered drinkable. The recommended course of action for a number of people involves minor environmental changes: home oil heating units are replaced with electrical heating. Rugs and other items made of synthetic fibres may have to be removed from the home. The ventilation system may need alteration. Or the treatment recommended for some patients may involve major adjustments in their work and home environments: an employee terminates his employment or a student leaves school and a new home is found as far as possible from the offending elements in the environment.

Many patients who wrote to us described the struggle to meet expenses associated with what was often a long and

arduous treatment process. In the cases we analyzed in detail, patients bore an average annual cost of $4,463.00 for the types of procedures described above; the minimum reported cost was $400.00 and the maximum was $12,378.00.

Patients confirmed that OHIP does not cover the major tests and treatments performed by clinical ecologists. However, information about access to treatment by others was much less clear.

A small number of persons had become inpatients at environmental units in the United States. We estimate that 20 to 30 patients have been referred to these programs and have made the trip, generally to the units in Chicago and Dallas.

OHIP covered the costs of transportation if an air ambulance was necessary; in addition, the full OHIP standard ward charge was paid. The physicians treating the patient are paid as a physician in Ontario would be, according to the Schedule of Fees. Investigations that are listed in the Schedule and are carried out are also paid for at the same rate. The amount paid may be considerably less than that charged to the patient, particularly at a time when the disparity between

Canadian and American currency rates is so great. Moreover, tests not covered in Ontario are not covered by OHIP when performed in the units themselves.

Although these restrictions on payments are part of stated policy, we were advised of cases in which the patient's full costs were paid. We were unable to determine whether this was through inadvertence or because an agreement to pay was negotiated in advance.

A number of patients had access to private insurance plans that cover medical expenses and drug costs not paid by OHIP. From the histories presented to us, it would appear that the items covered by such plans vary widely. Some include the costs of tests and treatments prescribed by clinical ecologists. Many do not. Some appear to place limits on the amount or the length of coverage. We encountered a small number of cases in which the costs associated with special, prescribed diets were allowed. In general, it seems that the position of private insurers has become more restrictive in recent years as the number of claims has grown and the controversy over clinical ecology has become more public. This is parallel to similar developments in the United States.

8. The information we received regarding the patients' access to social assistance programs was even more varied and confusing. Some persons had been able to secure assistance under the Family Benefits Act on the grounds that they were disabled or permanently unemployable. They were few in number and, generally, they had been accepted only after a protracted and frustrating claims process, which often included appealing to the patient's local provincial member for assistance. Some of the most seriously ill persons we encountered had not been recognized as disabled. It appeared that an individual patient's success often depended on the response of the doctor who functioned as a regional member of the Community and Social Services Medical Advisory Board and, even more, on the attitude of the doctor to whom the patient was referred for a second medical opinion.

There were similarly mixed results when claims for Workers' Compensation were made by those who alleged they were unable to work as a result of reactions to substances encountered in the workplace. Some received coverage, most did not. Here, of course, the patient had the added task of demonstrating that his or her disability was work related. Once again, the attitude of the individual doctor to whom the patient was referred for an independent medical opinion seemed to

have a major impact on the result.

Interestingly, many patients and patient advocates were aware of which specialists were sympathetic and which were perceived as strongly antagonistic to the claims of clinical ecology. In some cases, an application for financial assistance had become stalled in acrimonious debate about which "independent" doctor was acceptable to the patient and to those reviewing the claim. As an illustration of the fluidity of developments in this field, it is worth noting that during the short term of this Committee's work, some doctors were perceived as moving from being opposed to being supportive.

A number of patients were receiving general welfare assistance, although we heard stories of strong resistance from individual local welfare administrators. Some patients sought funds for food supplements in order to ameliorate the cost of prescribed rotation diets. At this point, we know of no successful applications for such funds. We were advised of one patient who has been awarded a disability pension under the Canada Pension Plan.

It was clear to us that, particularly for the financially weakest patients, the pathway to financial assistance is complex and is successfully traversed in

only a small percentage of cases. The cases that troubled us most were those of persons living socially isolated lives; with almost no financial resources; who are unable even to choose doctors they think can help them and who are constantly denied access to basic social assistance programs on the grounds that a disability that seems distressingly real to them simply does not exist.

9. Patients and those close to patients spoke of problems that extended beyond those listed above. Included among them is the extensive time and energy that has to be devoted to simple management of one's life following a diagnosis of environmental hypersensitivity. It ranges from the inconvenience of looking for and buying organic foods to the extensive efforts made by parents to educate others about the needs of their children, to the kind of massive reorganization of one's life that can be required in order to avoid exposure to the offending substances. The social isolation and the loneliness that results from avoidance approaches was described movingly in some submissions. Several persons we spoke to had not left their homes or had not been to a restaurant or a movie or a social gathering in several months, sometimes even longer. Some patients are so restricted they are not able to have physical contact with their

own family members.

Several letters, especially those written by close family members, spoke poignantly of what happens to the family as a whole when one member is seriously ill and unable to be part of normal family activities. The absence of support groups or access to persons with similar difficulties was often mentioned as a factor in isolating patients and their families.

There are a growing number of branches of the Human Ecology Foundation of Canada in Ontario; the Allergy Information Association has been in existence for 20 years. Recently, advocacy groups such as the Parents of the Environmentally Sensitive have been formed and are actively lobbying for greater assistance for these patients. Certain individuals have been particularly active in providing assistance, information and emotional support to patients. We are especially aware of the efforts of the Nikiforuk family, including Christian Nikiforuk (despite an ongoing and serious illness), of Darlene Koski, Barbara Mowat and Bruce Small -- among a long list of others.

9. Many patients said that the most important event in their illness was the point at which it was identified, either by themselves or by a doctor, as

environmentally induced. Many stress the enormous relief and satisfaction they experienced from receiving what seemed to be a firm diagnosis; that feeling was enhanced if the diagnosis repudiated psychiatric or psychological explanations for the patient's symptoms. It is difficult to overstate the importance patients attached to this event. It did not seem to diminish appreciably even in those cases where the treatments they then received did not produce sudden or extensive relief.

10. As has already been noted elsewhere in this report, the range of therapies patients found helpful exceeded all our expectations and extended well beyond the specific treatments undertaken by clinical ecologists. While many patients discontinued their search after finding those treatments helpful, others sought further alternative help at the same time that they were undertaking the treatments prescribed by clinical ecologists or after they had completed a course of treatment under a clinical ecologist. Apparently, a number of patients sought these therapies by themselves while others were referred by the doctors treating them. For some, the search through the so-called "fringe" areas of medicine seemed as lengthy and as frustrating as the earlier search through a wide range of medical specialties. A list of the therapies

mentioned to us is appended to this report.

11. Almost all of the those who were being treated by clinical ecologists and who wrote to us spoke favourably of their doctors and of the treatments. A few were less enthusiastic and were somewhat suspect of the field as a whole; however, we heard from very few patients who were strongly critical of the work of the clinical ecologists they had consulted. We do not know the extent to which that was because of the unique characteristics of the patient sample who contacted us. (Some individual patients did tell us that they knew of cases in which the work of the clinical ecologist was perceived as costly and not helpful.)

Some patients simply avoided one or more of the offending substances and said that recovery was immediate. At the other extreme, there were many patients for whom recovery was described as gradual and lengthy, often interspersed with numerous setbacks. Many letters and submissions described how patients accepted "a lifelong problem" that could recur in a more severe form at any time.

We were somewhat surprised at how easily and willingly some patients accepted costly and extremely inconvenient changes that had been prescribed for their

lives, even when the initial results were not as impressive as they had anticipated. Two factors seemed to contribute to this continuing sense of satisfaction: the fact that the cause of the illness had apparently been identified and the belief that the symptoms would have been much worse without the prescribed treatment.

12. Our patient sample included a number of children. Appended to this report, as Appendix 7, is a letter from a mother and father describing their children's illnesses and the efforts made to deal with them. It was our impression that the above-noted controversy and confusion in this field was particularly troubling for parents, who, understandably, are often desperate to find relief for their child's symptoms. It is easy to understand that many, although not all, of the parents we heard from seemed to be uncritically accepting of diagnoses and treatments. We also noted that parents whose children had been diagnosed as environmentally sensitive spent a considerable amount of time describing to others the child's illness and the measures they wished taken in looking after the child. Some parents were faced with the difficult task of administering intradermal treatments; others spoke of the problems involved in keeping a child on a special diet. This was not only difficult but a number of parents had a continuing concern about the nutritional

adequacy of a restrictive diet during an important developmental stage of a child's life.

13. We received a number of submissions that complained of problems associated with exposure to cigarette smoke. Several dealt with what was perceived as a broader problem of indoor air quality. A host of other environmental issues were raised in the submissions we received, including concerns about the effects of pesticide spraying, PCB's and other toxic elements in our drinking water, about fluorescent lighting, urea formaldehyde insulation and junk foods.

14. Patients and others made many recommendations dealing with an impressive range of issues. We have reviewed all of these and some are endorsed by us in the chapter (number eight) that sets out our recommendations. Rather than summarizing the suggestions or listing only those the Committee adopted, we have decided to append to this report as Appendix 8 a list of all of the recommendations we received. We feel this is important information the Ministry of Health should have as it determines how to proceed.

Chapter Six

Diagnostic Methods

A. Observations From Site Visits

Five Committee members visited both the out-patient and hospital facilities in two environmental control units in the United States. Two members visited a clinical ecologist in Toronto, while two others observed testing techniques employed in an Ottawa-area physician's office.

The testing procedures observed in each practice included intradermal and sublingual end-point titration with neutralization; while there was some variation in technique, the methods employed were, in general, very similar to those described in various publications. In addition, intranasal challenges were conducted during the Toronto visit.

The Committee discussed testing procedures at length at its February meeting with clinical ecologists. A questionnaire was distributed to them; a summary of responses was given to us by the Secretary for the Canadian Society for Clinical Ecology and Environmental Medicine and, in addition, two physicians responded individually. The responses indicate that the testing

methods being used by the physicians attending the meeting included sublingual and intradermal end-point titration procedures; and nasal, oral and inhalation challenges. Single-blind tests using placebos were employed by several physicians, although we did not observe the use of placebos in our Ontario visits. At least one person is using cytotoxic food testing, although the Canadian Society for Clinical Ecology and Environmental Medicine does not endorse that particular test. Apparently, hair analysis is rarely used.

Use of Vega II type machines in Ontario was described to the Committee; it would seem that several variations of this machine are available. However, attempts to observe it in actual use were not successful.

B. Summary of Literature Reviewed

Within the allotted time, the Committee attempted to obtain as much information as possible about diagnostic testing methods; this chapter is based on the information contained in eleven books, 48 published articles, six abstracts and in several personal communications reviewed and discussed by Committee members.

C. Diagnostic Methods That Were Considered

The methods used to diagnose environmental hypersensitivity varied somewhat amongst different practitioners. Accepted methods are described here first and are followed by a description and discussion of more controversial tests used by clinical ecologists.

1. History-taking

All the physicians we interviewed assured the Committee that a patient's history is a very important tool in reaching a diagnosis of environmental hypersensitivity. Most use a questionnaire that includes many questions about exposure to the environment, and about the patient's dietary habits. This is supplemented by the physician's review and by careful documentation of that history.

No universal method of history-taking exists and each physician uses whichever technique seems most suitable to him or her. However, we are under the impression that, in eliciting information from patients, clinical ecologists place significant emphasis on exposure to those elements, like paint fumes or chemicals, that could be considered harmful. Committee members discussed whether, in view of this emphasis, doctors

give sufficient attention to other relevant historical facts that might explain the patient's illness. The question is impossible to answer with finality but, in any event, we did not discover any evidence to suggest that this is a problem in regard to Ontario practitioners; it appears that information was gathered carefully by the doctors we interviewed and that they believed they were obtaining all relevant facts.

2. Physical Examinations

The physical examination is usually a routine part of the investigation; most doctors told us that they found, on examination, that those with environmental illness were within normal limits; the physical, therefore, was used most frequently to rule out other organic illness.

3. Routine Laboratory Tests

Routine laboratory tests -- for example, hemoglobin, white blood cell count, blood sugars, liver function tests and x-rays -- were often used in investigating patients. It was our impression that a large number of tests were ordered, mainly to rule out other illnesses rather than to make a specific diagnosis of environmental hypersensitivity. The physicians in Dr. Rea's organization, for example, said they ordered

perhaps 200 tests on each individual and that the results of the majority were within normal limits. There was no indication to us that any specific routine lab tests indicated the presence of environmental hypersensitivity.

4. Blood Tests for Normal or Abnormal Aspects of Immune System Function

All such tests are insured by OHIP, except the RAST test. Total serum IgE, T & B cell studies, as well as measurement of serum immune complexes, are used by some physicians and are considered valid in testing for several medical conditions.

a) Serum IgE: The immunoglobulin classified as IgE (epsilon) has been documented to mediate immediate (allergic) hypersensitivity reactions. (Ishizaka, 1967). The measurement techniques currently in use are accepted as valid and reliable. The total serum IgE tends to be raised in patients with eczema hayfever or asthma. (Middleton et al., 1983).

IgE levels are either normal or low in patients with environmental hypersensitivity. As discussed in chapter 2, a number of clinical ecologists who feel that many food and chemical sensitivities are not IgE mediated (Bell, 1982), believe that this low level is

consistent with environmental hypersensitivity.

The test, therefore, is thought to be useful in different ways, tending to show elevated levels in IgE mediated illnesses and normal or low levels in environmental hypersensitivity. The Committee was unable to find scientifically acceptable studies to verify the thesis that lows levels can be seen as predictive of environmental hypersensitivity.

b) RAST: The radioallergosorbent test (RAST) is used to give a quantitative estimate of Ige antibodies directed against a defined allergen. It gives information similar to that obtained from the standard allergy skin test.

The RAST test has a number of advantages: lack of patient risk; objectivity; qualitative results. Furthermore, results are not affected by simultaneous use of drugs, such as antihistamines. It can be used on persons with diffuse dermatitis or dermatographism, for whom skin tests are not helpful.

Disadvantages of the test: it is less sensitive than the skin test for some allergens and it is much more expensive. (Middleton, et al, 1983).

The RAST test is sometimes used by clinical ecologists to rule out Ige mediated illnesses; it is usually

negative in patients diagnosed as environmentally hypersensitive -- a further suggestion that the mechanism is not related to the Ige system. (Bell, 1982).

c) T & B lymphocytes, numbers, subsets, functions: Methods of measuring numbers and functions of the the T & B cell systems have become available in the past several years. The T-cells are involved in delayed hypersensitivity responses and, in addition, have a regulatory role in antibody production. The system is quite complex and assays are difficult. T-cell types include helpers, suppressors, null cells and killer cells. The B-cell system is involved in the production of various types of antibodies, with specific T-cell helper and suppressor clones for each antibody. The system is in dynamic equilibrium, with many modulating influences, including genetic and environmental factors.

According to one theory (discussed in chapter 2), abnormalities of the T-cell system of regulation, with decreased suppressor T-cell function, lead to abnormal B-cell activity and subsequent overproduction of antibodies. (Rea, 1978). Therefore clinical ecologists are interested in T-cell and B-cell functions as a possible explanation of some symptoms in patients.

Measurement techniques include blastogenesis (induction of cell division) using substances such as lectins or antigens. Cells are stimulated to subdivide; DNA is usually measured as an indicator of active division. It has been shown that antigen reactive T-cells can function in the absence of proliferation and that absence of cell division may not correlate with absence of function (Middleton et al., 1983). The products of the stimulated T-cells (such as lymphokines) can also be measured, and this test does correlate well with delayed hypersensitivity activity. The regulating function can be measured by in-vitro functional assays, usually involving the mixture of T & B cells and determining a marker such as antibody production. As well, each type of cell can be quantified by using monoclonal antibodies directed against certain cell membrane determinants in each population of cell.

We have not been able to find any studies that demonstrate that abnormalities in the T & B cell system are predictive of environmental hypersensitivity.

d) Immune Complexes and Complement: The concept that circulating immune complexes, (antigen-antibody) can be pathologic was first suggested by Von Pirquet and Schick in 1905. Circulating immune complexes (CIC), have been studied extensively and there are now at

least forty assays that have been used for detection of complexes of various types in, perhaps, a hundred diseases (Middleton et al., 1983). Each assay is limited, in that certain types of complexes will be measured and others will be detected. The variables include the nature of the antigen and the type of antibody involved in the complex. Complexes vary significantly in size and size plays a role in the activity of the CIC. A further factor is the site of activity of the CIC: for example, it may activate the complement system in the blood or may be active on a certain tissue receptor.

Perhaps the most important question is whether the presence of the complex is the cause or a consequence of disease; for example, complexes have been demonstrated after the ingestion of milk with no evidence of pathology and no symptoms in persons with IgA deficiency. (Middleton et al., 1983).

While it has been suggested that immune complexes are associated with environmental hypersensitivity, the mechanism has not yet been defined; some possibilities are discussed in chapter 2. McGovern (1980) has reported that, compared to normals, immune complexes are elevated in patients with food and chemical sensitivities. Brostoff (1979) has presented evidence

of the presence of IgE complexes induced by allergen challenges. These results are preliminary and, at present, do not provide a satisfactory explanation for environmental hypersensitivity.

The complement system may be activated by some complexes and it has been suggested as one mechanism for environmental hypersensitivity. Trevino (1981) reported that the C3 and C4 components of complement decreased in patients who were challenged with foods. The foods were selected by the leukocyte cytotoxic test; no statistical analyses of the evidence were presented in the article. Rea (1978) has also suggested abnormal activation of the complement system in some of his studies.

Martin et al., (1984) studied complement levels in a double-blind food challenge study of 23 children suspected of having reagin mediated positive food sensitivities. He found an increase in certain complement levels in some of the positive food challenges and decreases in several negative challenges. He concluded that, at present, serum complement measurement was not a useful test for suspected food sensitivity.

As noted in chapter 2, the literature is still very inconclusive on the importance of circulating immune complexes and the role of the complement system in the explanation of environmental hypersensitivity. This in turn raises questions about the present value of testing in this area.

5. Blood Tests For Trace Substances And Nutrients

Biochemical techniques have now been developed to measure some substances in human tissues in quantities as small as parts per billion. These techniques can be used for both normal nutrients, such as vitamins, as well as for potentially toxic substances, such as pesticides. There are a number of possible sources of error in the determinations, including contamination of the sample during collection, during storage and, particularly, during the preparation for measurement. When done properly, biochemical techniques are generally accepted as being accurate, reproducible and reliable. The illnesses caused by a high-dose, toxic exposure to some of the pesticides are well recognized and are accepted by virtually all medical practitioners. A number of clinical ecologists feel that low-dose exposure may have adverse effects contributing to environmental hypersensitivity disorders. They advocate screening patients' sera for

many chemicals, including chlorinated hydrocarbons. As noted in chapter 2, we still have a great deal to learn about the possibly adverse effects of low-dose exposure or of the presence of very low concentrations of these substances in humans.

There is only limited evidence to support the thesis that there are adverse effects from very low-level exposure. Rea (1984) and his associates feel that even levels in the range of 0.05 parts per billion, (PPB) may be harmful. They reported a correlation between improvement in brain function and decreasing levels of some pesticides during treatment in an environmental control unit. The accuracy of the results is difficult to assess because there was no control group and because statistically significant changes occured in relation to only four of the fifteen pesticide residues measured. Laseter (1983) reported the presence of pesticide residues in the sera of 99 per cent of 200 randomly selected environmentally sensitive patients; the levels were at or above the 0.05 PPB level. No control group was included in this study and Rea notes that comparisons are difficult because of differences in methodology. He does comment that the findings are "similar to those reported for the frequency of chlorinated hydrocarbon pesticides in body fat of the United States population".

As illustrative of how little we know in this area, it should be noted that both Barnes (1975) and Hindmarsh (1983) state that certain trace substances are essential for optimal health; some substances, such as selenium, may be beneficial in low doses and toxic at higher levels. Hayes (1975) discussed at some length the evidence that small doses of many compounds are beneficial even though larger doses of the same compounds may be injurious. Most of this evidence is from plant and animal studies and he comments on the difficulties of designing human studies.

The availability of sensitive biochemical techniques means that further studies of either the beneficial or toxic effects of various doses of these elements are now possible. At present, the diagnosis of human illness related to either toxic or decreased levels of factors such as pesticides, or nutrients rests with careful analysis of the patient's history including pertinent exposure, plus the physical examination.

6. Challenges

a) Oral Challenges: Despite problems in administration and interpretation, oral food challenges are generally accepted as useful diagnostic tests. The problems include: the amount of food given; the

method of administration; adequate blinding of the patient and the observer; the choice of placebo and, finally, measurement or assessment of the response. There is also some debate about timing of the reaction and how long one must wait before deciding that the test is negative. Some practitioners feel that food may cause an adverse reaction up to two days after the challenge.

The double-blind technique, using a challenge that approximates an ordinary meal combined with a previously proven true placebo, has many advantages but is technically very difficult. A number of researchers have used the technique or have used smaller quantities of food or placebos in opaque capsules. This provides adequate blinding for both the patient and the observer and eliminates the problem of recognition by taste. There is, however, a limit on the amount of food the patient can take in capsule form.

In standard clinical practice, an open challenge is often quite adequate, particularly if an objective change such as urticaria (hives) or asthma is caused by the food. Prior to the challenge, clinical ecologists often prescribe an interval of several days of avoidance of the suspected food. Various forms of oral food challenge are used by many practitioners and

provide useful information for diagnosis.

b) Nasal Inhalation Challenges: The technique used for nasal inhalation challenges, as described to the Committee and as observed in the Toronto office of a clinical ecologist, consisted of having the patient inhale through one nostril a small quantity of powder or particulate matter; the amount of powder on the flat end of a toothpick was used. Substances tested included pollens, molds, household insect extracts and others. Following baseline observations, the patient inhaled the powder and was then monitored for both local and generalized effects. The development of symptoms or signs distant from the nasal mucosa might be considered a positive result. The Committee was not told of any neutralizing procedure associated with this test.

This type of challenge or modification of intranasal challenge has been used by investigators in the past and may show local positive reactions. It is certainly recognized as a method for testing IgE mediated sensitivity. If it is done carefully, this technique is valid. Local reactions involving the nasal mucosa or the respiratory tract are self-explanatory. More distant reactions -- if accompanied by objective signs, e.g., urticaria, or subjective symptoms, e.g.,

headaches -- might need repeated confirmation.

7. Indoor Air Quality Measurements There is abundant evidence that indoor air quality, either in the home or in the workplace, is an important determinant of human comfort. Indoor air quality has been studied extensively and there is a large body of information available on some of the factors involved. These include: humidity, temperature, light and ventilation. Excess humidity can lead to mold overgrowth in a building and can subsequently cause reactions that are often allergic in nature, including bronchial asthma in susceptible individuals. Low humidity may contribute to dryness of the mucous membranes of the nose or throat and perhaps lead to increased susceptibility to infections in the throat.

A comfortable temperature range and adequate, but not excessive, lighting are particularly important in order to maintain productive activity in the workplace. Abnormal levels of temperature or of lighting can contribute to absenteeism.

Ventilation is perhaps the most important human comfort factor in any building; people have been reported to feel quite uncomfortable, even if the air is clean, if there is inadequate air movement. The ventilation system is also vital in removing other potentially

harmful substances -- such as tobacco smoke or carbon dioxide -- from the area. A ventilation system must be designed to fit the use made of the building; for example, one engineering standard requires an air change of 5 cubic feet per minute per person in a nonsmoking environment, but this is raised to 20 to 25 cubic feet per person if smokers will be using the room.

Many of these factors and other components of indoor air can be measured using existing techniques. The engineering principles and technology are available at present and, in many cases, they are very precise. Examples of other measurable substances are: formaldehyde, carbon monoxide, volatile organic gases, particulate matter such as asbestos and radioactive materials like radon.

The Committee feels that such measurements can be made accurately of the home or the workplace of an individual thought to be having adverse reactions. When medically indicated, these measurements should be considered as legitimate diagnostic testing methods.

8. Controversial Tests Used By Clinical Ecologists

The Rinkel method, serial intradermal provocative testing and sublingual provocative testing have a number of factors in common. The tests are described in the following section; the Committee was told that variations on these procedures are used by different practitioners.

a) Rinkel Method (End-Point Titration): This is used for determining sensitivity to a substance and also to establish a subsequent therapeutic dose. The tests start with weak, non-reacting dilutions and progress at about ten-minute intervals to stronger reacting dilutions (Willoughby, 1974; Miller, 1977). The substances are injected intradermally and the wheal is measured ten minutes later. A number of complicated skin test patterns of reaction are described by Willoughby; they include: normal response, flash response, linear erythema response, hour-glass reaction with a clear central zone, and responses with short or long plateaus. Each of these responses is used as an indication of a certain pattern of sensitivity.

The accuracy of the method in determining sensitivity to a substance, particularly to an inhalant allergen

such as ragweed, is non-controversial. The technique, when used in this way, is similar to other systems of skin test end-point titration. This testing in now included as an insured service by OHIP up to a maximum of 50 tests per patient per year.

The controversial aspect of the technique is its use in therapy, i.e., in determining a starting dose and subsequently, a final therapeutic dose. This matter is reviewed in chapter 7.

b) Serial Intradermal Provocative Testing: This technique has been used for both diagnosis and for treatment of hypersensitivity disorders. A subcutaneous injection of the suspected substance is given and the patient is observed over an interval for symptomatic change. The patient may also keep a diary of responses based on observations of change in pulse rate or the development of any adverse symptoms. The wheal size is measured carefully and an increase in the wheal is an indication of a positive test. Different concentrations of the material are given to terminate any symptoms, i.e., to neutralize the reaction. An altered reaction is considered positive. A number of articles and texts describe the procedure in detail (Rinkel, 1963). The articles indicate that the end-point concentration can be used for therapy to either

desensitize the patient or to prevent reactions.

Assessment of the literature regarding this type of test is somewhat difficult in that both the diagnostic and therapeutic aspects of the test are included in a number of reports. The following is a review of some of the available studies, with comments on their limitations.

Two of the studies with negative findings were never published as full articles. A study by Bronsky et al. (1971), of use of the technique on children with asthma due to food allergy was published as an abstract only. Crawford and colleagues (1976) judged that the subcutaneous provocative food test was invalid and unreliable. This study was published in abstract form. It is not possible to comment on the quality of this research without reviewing the full reports. Draper (1972) observed a high false positive rate associated with the intradermal provocative test for diagnosis of food allergy. His study involved a large number of subjects but it was not double-blind and controls were not used. The American College of Allergists (Caplin, 1973) evaluated the subcutaneous provocative food tests and found them unreliable. However, the statistical analysis was not appropriate and does not include all the subjects in the study.

One other study has been completed since 1983: Jewett and Greenberg conducted a double-blind experiment of intradermal provocative testing that was reported to the Society for Clinical Ecology in October, 1983 and as an abstract in 1985 to the American Academy of Allergy and Immunology. Committee members met with the principal investigator to discuss this protocol and the findings. It is important to note that both advocates and critics of intradermal provocative testing approved the research protocol and the study was conducted in the offices of clinical ecologists. According to Jewett, "the 'best' subject had T=0.12 overall, the results approximate a normal distribution centred on p=0.5, (pure chance)." There was no difference in the symptom provocation rate between placebo and experimental injections. Jewett contends that the placebo response is dominant and that the method cannot detect environmental hypersensitivities. The questionable validity of the methods used in this study has been noted by others as well (Williams, 1985). These are, however, the methods used by clinical ecologists. Jewett does not question the existence of environmental hypersensitivity; instead, the results of his study suggest flaws in the testing method.

A proponent of the technique, Willoughby, advocated

intracutaneous provocative food testing in an anecdotal report published in 1965. Miller (1977) reported that food extract injection therapy resulted in an improvement of symptoms in patients with food sensitivities. This was a preliminary study only, involving just eight patients and a final report has not yet appeared. The outcome measure, based on scoring of symptom improvement, was highly subjective and, therefore, of questionable validity.

Rapp (1979) successfully used intracutaneous neutralization testing and sublingual therapy for hyperactivity related to food allergies. However, because of the small number of subjects involved in the study, it must be regarded as a case report. In an investigation of children with hyperkinetic syndrome, O'Shea and Porter (1981) found that intradermal testing for sensitivities, followed by sublingual treatment, was effective. Once again, the sample size was so small (15 subjects) that it must be viewed as inconclusive.

The Committee is of the opinion that these procedures are unproven at present and that further research is required to establish their accuracy.

c) Sublingual Provocative Testing: This technique

is used, both for sensitivity and for deciding on the treatment dose of sublingual drops. A number of different methods are used, the most common of which consists of placing three drops of a selected dilution under the patient's tongue and then observing the development of symptoms for ten minutes; pulse rate can also be monitored during that time. A neutralizing dose to abolish symptoms is then calculated, using a more dilute material.

A number of problems are associated with the methodology used in this technique: some clinical ecologists believe that food sensitivity can change over time and that the patient must be sensitive at the time the technique is used. Another problem, this one related to the placebo, is the possibility that a patient may be able to identify the test substance by taste and the observer must measure the appropriate parameter in this regard. That is particularly important in dealing with children whose psychologic changes can affect the end point. In addition, there is the concept of masked sensitivity, suggested by Randolph (1978), who posited that symptoms related to frequently eaten foods might be masked. Therefore, perhaps five days should elapse between the last time the food is eaten and the time the test is given.
As already discussed in relation to intradermal

provocative testing, an assessment of the literature is difficult because the results in many studies include both testing and therapy.

In 1973, the American College of Allergists reported that the sublingual method of provocative testing for food allergy was unreliable and insensitive. (Breneman et al., 1973). However, the protocol used for the study has several flaws: criteria for the selection of subjects were not described; the testing procedure was not randomized; data on several subjects were missing and many of the data relating to the rest were rejected prior to analysis. A subsequent report included data from the 1973 study, as well as information about additional subjects (Breneman et al, 1974). The authors concluded that sublingual testing did not discriminate between placebo and food extracts, but the same limitations of the study still apply.

Hosen (1976) compared two methods of diagnosing food allergy and found that therapeutic fasting followed by challenge feeding was better than sublingual provocative testing. The major flaw of this study was that it was non-blinded. Lehman (1982), conducted a double-blind study of sublingual provocative food testing that did not discriminate between placebo and food drops. The use of changes in nasal mucosa as the

outcome measure is highly questionable and the sample size was small.

One of the more widely quoted negative reports was published as a letter to the editor (Kailin and Collier, 1971), thus precluding a critical evaluation of the research design and interpretation of the results.

Green (1974), suggests that sublingual provocative testing is useful for foods and FD&C dyes. He conducted 8,348 sublingual provocative tests on 506 patients, using the single-blind method. He found 368, or 4.4 per cent, positive reactions. These were confirmed, when possible, by history and by withdrawal and subsequent reintroduction of the substance. He concluded that further investigation to improve the technique and the allergens for testing is merited.

Three other studies support the sublingual method. All are seriously flawed. Green (1974) tested dyes and foods on a large number of patients but did not include a description of the subjects. King (1981) tested the hypothesis that greater psychological effects would occur on allergen than on placebo trials in patients with food allergies. One-third of the subjects were dropped from the study and were not accounted for in

the analysis. Moreover, the double-blind conditions are suspect. King concludes that sublingual provocation induces psychological symptoms more frequently than placebo, but, in view of the two flaws mentioned, his conclusions may not be valid. More recently, Mandell (Mandell and Conte, 1982) tested the sublingual provocation method on patients with arthritic pain and he reported positive effects. He said that the testing procedure was double blind, but did not describe the method. Furthermore, the criteria used in selecting subjects were not stated.

The Committee received one further study on the sublingual method, by King et al (1985). It has not yet been published but has been reviewed in its final form; in addition, representatives of the Committee met with the principal investigator and discussed the findings. The investigators completed a double-blind experiment on the usefulness of the sublingual method as a test for foods that cause behaviour responses in children. Findings suggest that sublingual food challenges can produce both behavioural and cardiac effects in children with suspected food sensitivities.

The investigators acknowledge that the effects are minimal and subtle; for example, they report that the cardiac effect is a statistically significant mean

difference of only 1.6 beats per minute between one of their food and placebo challenges, (X=84.6, SD=11.9 for food, X=83.0 plus or minus 12 for placebo.) This difference was limited to the two-minute reading and occurred only after the second of three challenge procedures. The authors do not advocate widespread use of this sublingual method of testing until their results are confirmed.

The Committee is of the opinion that these testing methods are unproven at present and that they require further research.

General Comments

The three techniques: the Rinkel method, when used to establish a therapeutic dose, serial intradermal and sublingual provocation testing, have been studied and reviewed by a number of authors who reached disparate conclusions. (Grieco, 1982; Podell, 1983). The evidence in support of the procedure relies heavily on clinical observations (Hiatt, 1975). Advocates acknowledge that the effectiveness of the procedures has not been proven by properly controlled research studies. (May, 1984; Bell and King, 1981; King, 1985).

All three procedures share certain problems:

(i) A lack of consensus about several aspects of these tests. Various methods are utilized by different practitioners; there is considerable variation in the degree to which physicians rely on these tests for diagnostic purposes and there is lack of agreement on which tests give accurate results for various substances. (Golbert, 1975).

(ii) A lack of consistency in identifying which indicators found in a patient's history, on physical examination and as the result of laboratory work, should result in testing.

(iii) A lack of consistency in the source of substances used in testing and in quality control of such substances, combined with a lack of information on the biologic activities present in those substances -- a matter of particular importance in regard to very dilute concentrations.

(iv) Symptoms, as reported by patients, that are used to define a positive test response are generally subjective and are not verifiable according to objective measurement.

(v) The use by physicians and technicians of a wide variety of observations to define positive test

responses. A number of authors question the validity of changes in pulse rate (Bronsky, 1971a) and respiration rate; moreover, other positives are based on undefined observations, e.g., panic-type attacks, confusion, changes to handwriting.

(vi) The limited used of subsequent withdrawal, followed by controlled challenges to confirm test results. The results reported in Draper's study (1972) would suggest that this is necessary.

d) Cytotoxic Food Tests: The Committee was told that at least one practitioner in Ontario uses this test for diagnosis of environmental or food sensitivities despite the position paper of the Canadian Society for Clinical Ecology and Environmental Medicine that does not recommend this test.

The test consists of adding a substance, often a food, to the patient's blood cells and then observing changes in the cell structure. It was first described by Black (1956) and has been modified since; it has been the subject of many reports since its introduction and remains a controversial procedure for several reasons: interpretation is subjective; the test is time consuming; results in repetitive runs show a variation in results (Lehman, 1980b). There are problems of

interpretation of cell changes and a lack of a concordance between two examiners, as reported by Lieberman (1975). The Committee agrees that this test is unproven at present.

e) Hair Analysis: The Committee was told that, in Ontario, analysis of hair for multiple elements is rarely used in the diagnosis of environmental hypersensitivity. There are laboratories where many elements in the hair can be analyzed and from which physicians receive computerized printouts describing which trace elements have been found.

Hair analysis is a standard diagnostic tests for arsenic poisoning; in his review, Hindmarsh (1983) cautions that arsenic binds avidly to the hair's outer surface and that, therefore, external contamination must be eliminated before this analysis can be used as an indicator of toxicity. Many other observations have been made regarding the presence in the hair of zinc, magnesium, copper, manganese, etc. No clear pattern has emerged and Hindmarsh states that "a practical use for hair trace element analysis in the diagnosis and management of diseases and nutritional disorders has yet to be proven." (Exceptions to this are chronic arsenic or uranium exposure).

Rosalind Gibson, PhD (1985) of the University of Guelph provided the Committee with a review of the subject. She concludes that:

> . . . normal levels of trace elements in the hair are still poorly defined and standard values by age, sex, geographic location are not yet available. Hence the use of hair trace element levels as a screening procedure to assess trace element status of individuals has limited use at the present time. Nevertheless hair analysis is useful for comparison of certain trace element levels of different populations, especially for the detection of environmental exposure to heavy metals.

The use of this type of testing should be reserved for highly selected cases in which a specific element is suspected after history-taking and physical examination. At the present time, hair analysis does not seem to be a reasonable test for any possible deficiency or toxicity.

f) Therapeutic Trials For Candida Albicans: As discussed in chapter 2, it has been suggested that

Candida albicans is a cause of many symptoms experienced by patients diagnosed as environmentally sensitive.

The diagnosis of Candida seems to rest mainly on the history plus a positive response to a therapeutic trial (Zwerlinger et al., 1984), rather than on specific diagnostic tests. A positive history is suggested if the patient has taken courses of antibiotics, birth control pills, coricosteroids or has been pregnant. Further support is given to the diagnosis if the symptoms are aggravated by tobacco smoke, perfumes, diesel fumes or chemical odors. Crook (1983) states that cultures for Candida are not indicated and of very little help. This is because most individuals have Candida in their skin or in their digestive tracts.

Other tests include sublingual or intradermal provocation-neutralization, or variations on these techniques. Blood tests for immune responses to Candida are available in a limited number of laboratories. These include measuring circulating Candida antigen or levels of anti-Candida antibodies. These tests are difficult to interpret because it is a ubiquitous fungus to which virtually everyone is exposed at some time. The laboratory changes, therefore, may simply reflect this exposure and not be

an indication of disease.

Some of these tests are useful (Gentry et al, 1983) in persons with active infections causing obvious pathology, such as chronic mucocutaneous candidiasis or disseminated infection with an active focus and septicemia.

The Committee was unable to find any scientifically acceptable study, such as a double-blind trial, to support the validity of the above testing methods. We have already described problems with provocation-neutralization tests; the only available information about circulating Candida antigens and immunoglobulin levels related to "Candida Overload" comes from laboratories where tests are done. The Committee was unable to find any independent assessments of these procedures.

g) Vega II-Type Machines: The Committee was told by a clinical ecologist about the use of an electronic machine (Vega II) for diagnosing hypersensitivity disorders. To date, a limited amount of information has been found about such machines; they are apparently being used both for diagnosis and for determination of neutralizing doses of test substances.

Literature from Europe (Schimmel, 1984), states that the machine has been used for diagnosis of "disturbance fields," in the dental and maxillary regions where disturbance fields indicate subchronic inflammation, with or without local symptoms. Changes in the current may indicate problems with the teeth or indicate distant diseases such as eczema, migraine or nephropathies.

One report, (Krop et al., 1985) provides some information on the use of this machine for testing in hypersensitivity disorders. The patient is connected to the machine by two electrodes placed on chosen acupuncture points; one possible point is the medial side of the third toe. After standardization of the meter, the test substance is inserted into a well in the machine and a change in the galvanometer response is used to indicate possible sensitivity. A number of filters, such as cadmium or ferum metalicum or manganum, may be used for various purposes. Claimed advantages are efficiency (testing of 30 antigens in one and one-quarter hours), ability to test very sensitive or uncooperative patients, and objectivity of the response. One disadvantage relates to the acupuncture point, which may be affected, either by local pathologic changes or because it is exhausted. Patients may not be convinced of their sensitivity and

thus will not follow the ecologic advice subsequent to the test. There may be an interfering effect from electro-magnetic fields in the area.

There is no apparent explanation for such changes in electrical fields in environmentally sensitive patients, particularly when they are not exposed directly to the possible offending substance. The absence of scientific studies demonstrating the effectiveness of this testing technique means that it is, at present, an unproven procedure.

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Chapter Seven

Treatment Methods

The purpose of this chapter is to describe the primary treatment methods used in the care of environmentally hypersensitive patients by clinical ecologists in Ontario and to review the existing literature relating to those treatments. Rarely used treatments are discussed briefly.

General Patient Care

The extent to which clinical ecologists prescribe various treatment measures for environmentally hypersensitive patients depends on the degree of sensitivity, the range of environmental agents found to produce symptoms and the presence or absence of a diagnosis of Candida albicans. The primary treatment methods include:

1. Environmental change: this ranges from avoidance of suspected agents and minor lifestyle changes to the prescription of substantial environmental change in the home and/or work environment and lifestyle.

2. Dietary change: this may involve simple elimination of foods; rotary diversified diets; the use of vitamin and mineral supplements; the use of pure water and pure (organically grown) foods.

3. Therapeutic extracts: neutralizing extracts (containing dilute solutions of the offending environmental agents) are given by intradermal injection by the physician, are self-administered, or are taken in the form of sublingual drops.

4. Treatments for Candida: anti-fungal agents and low carbohydrate yeast-free diets, etc.

Whenever possible, clinical ecologists avoid the use of conventional drug medications (American Academy of Environmental Medicine, 1984-85; personal communication, patients and clinical ecologists, 1985).

A. Chronic Patient Care

1. Environmental change: Environmental change is a major treatment approach and often the first measure prescribed for environmentally hypersensitive patients. Essentially, this means avoidance of chemicals and other substances to which the patient has been found to be sensitive. For many patients, the prescribed environmental change may involve the simple avoidance

of one or two offending substances and minor lifestyle changes. However, those who are diagnosed as sensitive to a wide range of environmental agents may need to make changes that are much more dramatic.

In general, environmentally ill patients are instructed to avoid such commonly encountered items as scented shampoos, aftershave, deodorants, cigarette smoke, auto fumes, carpets, etc. (Bell, 1982; Levin and Zellerbach, 1983; ECU, 1984). The prescribed environmental changes may affect established family practices, either minimally or significantly. These may range from eliminating items that are perfumed, replacing household cleaning agents with natural products and avoiding certain social activities, through extensive alterations to the home (i.e., replacing gas heating and cooking appliances with those that use electricity; removing carpets and all plastic and synthetic materials; installing air and/or water filtering systems), to moving to a new location, changing jobs, and eliminating virtually all social activities.

Rea (1982) suggests that a person with chemical sensitivities has a crucial need for environmentally safe home conditions. Patients are sometimes advised to maintain one environmentally safe room in their home

when they cannot afford to make extensive housing renovations.

It is clear that avoidance as a treatment technique can be effective. The Committee's only concern in this regard is that major, prescribed lifestyle changes may have a considerable social, financial, and emotional impact on the patient and his or her family; therefore, every effort must be made to avoid making these changes unless they are absolutely necessary.

2. Dietary Manipulation

a) Elimination Diets

Prescribed changes in diet form the basic treatment for patients diagnosed as having food sensitivities. If only a small number of foods are implicated, elimination of them is prescribed (Goldstein and Heiner, 1970; Randolph, 1974; Crook, 1983a). The Committee considers elimination diets an effective treatment technique.

b) Rotary Diversified Diet

If multiple foods are found to cause adverse reactions, a rotary diversified diet is often prescribed (Lee, 1969a; Bell, 1982; Rea, 1982; Crook, 1983a). In a rotation diet tolerated foods are eaten at regularly spaced intervals of four to seven days (Bell, 1982),

with only a single food eaten at each meal. After three to six months on this regimen, the patient may be given a diet consisting of several foods; however, each individual food continues to be rotated. A given food is eaten no more than once every four to seven days and no two foods to which the patient has shown sensitivity are eaten on the same day (Bell, 1982; Borgati, 1985). The principle underlying the use of rotary diets is that, if tolerated foods are eaten in rotation, new sensitivities are less likely to occur. When tolerance develops to avoided foods, these may be worked back into the diet on the same rotational basis without producing adverse reactions (Rinkel, 1948; Bell, 1982).

The Committee is concerned about the nutritional dangers, the complexity and the difficulty of following strict rotation diets. Their potential nutritional inadequacy is demonstrated by the sample diet described by Bell (1982; Appendix 9), in which only four foods, one at each meal, are eaten per day. Because of the hazards of severe dietary restrictions and because of the importance of vitamin and mineral supplements, the role of the dietician is crucial in planning an individually tailored, nutritionally sound and easy-to-follow rotation diet (Todd, 1978; American Academy of Environmental Medicine, 1984-85; Joint Report, 1984).

The rotation diet may be effective for those who are sensitive to many foods. There is substantial literature describing rotation diets and reporting on their successful use with individual patients. However, we were unable to find any formal evaluation of the diet and so it remains unproven.

c) Vitamin and Mineral Supplements

In order to maintain adequate nutrition in patients on restricted diets, vitamin and mineral supplements are often prescribed (personal communication from clinical ecologists and patients, 1985). The American Academy of Environmental Medicine (1984-85) also supports the use of vitamin and mineral replacement therapy. In the opinion of the Committee, it is an appropriate treatment approach when prescribed for this purpose. Our concerns about the prescription of high levels of supplementation are discussed later in this chapter.

d) Pure Foods and Water

Identifying substances in water and food that may be causing adverse reactions is of particular concern to clinical ecologists; therefore, many patients are encouraged to purchase pure water and to eat organically grown foods. It may be difficult to ensure that such foods, in fact, are free of chemical

contaminants. Adherence to an organic diet may lead to considerable expense and inconvenience.

3. Therapeutic Extracts: Some form of allergy extract therapy is often advocated as a treatment for the environmentally hypersensitive, for the control of chemical, food and inhalant-type sensitivities (Morris, 1969; Lee, 1969a; Lee, 1969b; Miller, 1972; Dickey, 1976; Miller, 1976; Miller 1977; Miller, 1981; Bell, 1982; Crook, 1983a). There are two basic methods of determining the extract dose level for environmentally sensitive patients.

a) The Rinkel Method

The first intradermal method was described by Rinkel (1963) and has since been modified by his students (Williams, 1971; Willoughby, 1974). A safe titration with which to begin treatment is determined by observing the whealing response induced with graded intradermal administrations of the allergen. Bell (1982) and Miller (1972) have described in detail the techniques used for the Rinkel method:

> The method uses simultaneous intradermal application of a set of progressively stronger 1:5 dilutions of the test material concentrate, usually in doses of

0.01 cc. Test doses initially form a 4 mm wheal. In a patient sensitive to the test allergen, the wheal will grow over a ten minute period. The dilution that first induces a wheal growth of over 2 mm is called the end point. Treatment will begin with some volume of this dilution. In serial dilution titration the skin whealing response alone -- not a change in symptoms -- is the criterion for selection of the appropriate treatment dilution (Bell, 1982).

b) The Provocation-Neutralization Method

The second method, provocative-neutralization, also involves intradermal injection of dilute allergen and has been described by Lee (1969a) and in greater detail by Miller (1972). Allergen extract is administered and, once the symptoms have been provoked, a weaker or stronger dilution is administered in an attempt to relieve them. The dilution that does so is termed the neutralizing dilution. This dose level is given at regular intervals with adjustment as required. Treatment involves long-term administration of the neutralizing dilution in a prophylactic manner prior to meals; the frequency is determined by individual

patient variation.

There are three main differences between the Rinkel method and the provocative-neutralization method. First, larger volumes of allergen are injected: 0.05 cc. in the latter vs. 0.01 cc. in the former method. Second, in the provocation-neutralization method, the systemic symptoms that are provoked by the injection are monitored, in addition to the whealing response. Third, the provocation-neutralization treatment can be performed with intradermal or sublingual administration of allergen extract (Dickey, 1976; Levin and Zellerbach, 1983).

During the testing, the examiner must evaluate objective clinical signs, including subtle changes in attitude, behaviour and voice tone. In addition, such physical signs as urticaria and upper and lower respiratory distress, i.e., sneezing, nasal stuffiness and wheezing, must be evaluated.

The whealing response is considered superior by some because the neutralizing dose can be determined with higher efficiency and because, in asymptomatic patients, the whealing patterns can be used as a guide to finding the neutralizing dose (Miller, 1972). Guidelines for determining the neutralizing dose by

symptom patterns were developed by Lee ("Lee's Axioms") and are explained well by Miller (1972). An increase or decrease in a patient's symptoms will guide the investigator in deciding which dilution of allergen to test for on subsequent trials.

A rotary diet, in conjunction with food neutralization therapy, is said to be beneficial in dealing with food sensitivities (Bell, 1982; Rea, 1982). Rea also states that neutralization therapy is a stopgap measure in treating chemical sensitivities and that avoidance is clearly the treatment of choice.

c) Assessment of Allergy Extract Therapy

Considerable controversy surrounds the use of both the Rinkel method and the provocation-neutralization method. There are few double-blind studies that deal with these methods; much of the published work in this area, both positive and negative, is in the form of abstracts (Bronsky et al., 1971; Crawford et al., 1976; Miller, 1976; Miller, 1981); case reports (Rapp, 1978; 1979); and letters to the editor (Kailin and Collier, 1971). In the absence of the full reports, it was not possible for the Committee to evaluate the above research.

There is a report attesting to the efficacy of extract therapy in the treatment of hyperkinesis in children (O'Shea and Porter, 1981). Although this study is double-blind, it relies on subjective assessment of the child's behaviour as an index of extract or placebo efficacy.

Intradermal and sublingual extracts may also be used as a treatment for acute adverse reactions (Bell, 1982; Levin and Zellerbach, 1983; Rea et al., 1984). Two double-blind evaluations of food extract injection therapy support this method of treatment (Rea et al., 1984; Miller, 1977). Rea et al. (1984) indicated that injection therapy eliminated acute reactions in sensitive individuals following oral food challenges. The authors noted that the neutralizing dose eliminated reactions in 60 per cent of the patients, while placebo reduced such reactions in only 15 per cent. It is worth noting that the authors included anaphylactic reactions to food but did not characterize and differentiate responses to these, as opposed to others where there was no reagenic response. There are several flaws in the study: the statistical analysis is inappropriate; controls were not used; the participation rate was only 38 per cent; and there is no discussion of the refusals.

Miller (1977) also reported a significantly better response to extract therapy than to placebo in eliminating acute symptoms due to food sensitivities. However, on a four point scale, the mean difference between extract and placebo was only 1.33. The patients were required to follow a strict diet and to self-administer the extract or placebo at home. In addition, the study relied heavily on patient evaluation of symptomatology and it offers little objective assessment. This was a preliminary study with only eight patients; the final report has not yet appeared.

Boris et al. (1985) recently described a double-blind study of neutralization therapy for animal antigen-induced asthma. Subjects who received the neutralization doses of antigen were protected against a subsequent bronchoprovocative challenge.

There is a controlled, multicentre, double-blind evaluation reported by Hirsch et al. (1981) refuting the efficacy of the provocation-neutralization method of treatment. In this study, the Rinkel injection method is evaluated as a treatment for atopic rhinitis. The authors concluded that the Rinkel method was no

more effective than a histamine placebo in influencing the weekly mean symptoms, medication and physical exam scores or IgE antibody levels. The evaluation of the results was based mainly on objective, not subjective, parameters.

The Committee is aware of only one study that directly compares the effectiveness of the Rinkel method to the current standard method of immunotherapy. In their controlled double-blind study, Van Metre et al. (1979) evaluate the two techniques for efficacy in the treatment of ragweed pollen hayfever. In highly sensitive patients, the "optimal dose" determined by skin-test titration (Rinkel method) is, on the average, 10,000 times lower than the maximum dose used in the current standard immunotherapy method. The results of this study, involving 43 patients, indicated that, compared with the effects of either the Rinkel method or a placebo, the standard method of immunotherapy produced a significant decrease in ragweed hayfever symptom/medication scores, an increase in antiragweed IgG levels, and a decrease in seasonal rise in antiragweed IgE levels. Using these parameters, the effect of the Rinkel method was not significantly different from the effect of the placebo.

The Committee has concluded that there is, as yet, inadequate objective evidence demonstrating the effectiveness of either the Rinkel or the provocation-neutralization methods.

4. Treatments for Candida

The unproven causal relationship between Candida albicans and environmental hypersensitivity is discussed in chapter 2. The Committee was advised that most clinical ecologists in Ontario believe that Candida is a cause of many of the symptoms of environmental hypersensitivity and that they treat many of their patients for this problem.

The most commonly prescribed treatments include: eliminating such possibly aggravating drugs as antibiotics; using such oral anti-yeast drugs as nystatin and ketoconazole; and a low carbohydrate, yeast-free diet. Further measures recommended by Crook, 1983b, are avoidance of chemical pollutants and the use of antioxidants and therapeutic extracts.

Members of the Committee were puzzled by the oral use of nystatin in some circumstances, because the drug is not absorbed from the gastrointestinal tract and, nonetheless, is prescribed for Candida overgrowth in other parts of the body.

Levin and Zellerbach (1983) state that treatment with nystatin is to be considered safe but still experimental and that it should not be considered a panacea for all food and chemical sensitivities.

Some patients with Candida are treated with ketoconazole, a drug reported to cause side effects varying from mild (headache, dizziness, nausea, pruritis) to serious (hepatic necrosis) (AMA, 1983).

In addition, the Committee is aware of one Ontario doctor who occasionally uses Candidal injection therapy (Gilka, 1985).

The Committee was unable to find any studies demonstrating the effectiveness of any of the above-mentioned therapies (except the use of nystatin and ketoconazole); existing reports are primarily anecdotal in nature.

The Committee considers that nystatin and ketoxonazole are effective in the treatment of Candida; the difficulty lies with the unproven theory of causation and with the possibly serious side effects resulting from the use of ketoxonazole. In addition, although nystatin is a relatively inexpensive therapy that, under appropriate circumstances, is very safe, there is no clear evidence yet that it can be used safely over

very long periods. "It may be poorly absorbed but over a sufficient length of time, low-level absorption might create adverse effects in a proportion of the treated population." (Zimmerman, 1985). It would appear that sound studies could be done quite easily to determine whether long-term use of nystatin is both effective and safe.

B. Acute Patient Care

1. Treatments for Acute Reactions

a) Vitamin C Injections

In treating anaphylactic-like shock symptoms, intravenous injections of vitamin C are given over a period of 20 to 30 minutes.

There is a body of experimental evidence to suggest that high doses of vitamin C may attenuate smooth muscle contractions and hence may be effective against anaphylactoid reactions. This literature extends over at least the last twenty years and was summarized recently by Schachter and Schlesinger (1982). In experimental animals, large doses of vitamin C may prevent anaphylaxis and other allergic reactions and may reduce airway obstruction caused by 5-hydroxytryptamine, bradykinin and histamine. With

human subjects, conflicting results are reported, but megadoses of vitamin C may inhibit bronchospasms induced in asthmatics by histamine, exercise and exposure to particulates. Four mechanisms for these controversial results currently possess some experimental support. These include a direct effect of vitamin C on smooth muscle as well as indirect effects mediated through the influence of vitamin C on histamine break-down, cyclic AMP metabolism and prostaglandin production.

Two concerns about this treatment appear to have received little attention. First is the possible impact of massive vitamin C injections on acid-base balance, and second is the danger of generating the hydroxyl redical, a particularly reactive and dangerous molecule, through the interaction of ascorbic acid with oxygenated hemoglobin and other blood components (Benatti et al., 1983; Winterbourne, 1981). The pro-oxidant (i.e., free redical-producing) nature of injected vitamin C has been demonstrated in rats receiving dose levels comparable to those reported to the Committee as clinically effective (Dillard, 1982).

It has been suggested that enzymes and buffering systems are hindered in the allergic reaction (Randolph, 1974). The bicarbonate buffer is said to be

one of the first impaired (Randolph, 1974), and alkali salts are given in order to restore acid-base balance (Clark and Randolph, 1950; Randolph and Clark, 1954; Randolph, 1962; Randolph, 1974; Bell, 1982; Hathaway and Warner, 1983; Levin and Zellerbach, 1983); they are also recommended (sodium and potassium bicarbonate in a ratio of 2:1) for the attenuation of adverse reactions (Dickey, 1976; Bell, 1982; Levin and Zellerbach, 1983). These are given by mouth or intravenously.

b) Naloxone

The Committee was also advised that some clinical ecologists treat acute reactions with naloxone. Naloxone has been reported to have a positive effect in the treatment of anaphylactic shock (Gullo, 1983), pruritis (Bernstein and Swift, 1979; Summerfield, 1980; Smitz and Legros, 1982), asthma and angiodema (Vilter, 1980).

c) Extract Therapy

The use of intradermal and sublingual extracts as a treatment for acute adverse reactions has already been discussed in this chapter.

d) Miscellaneous Treatments

It is suggested that induction of vomiting within the

first hour after ingestion of a non-tolerated food is useful in minimizing reactivity in patients who experience an acute clinical reaction following exposure to an offending substance. After one hour, a laxative is usually given (Bell, 1982). Finally, having a patient breathe 100 per cent oxygen by mask for several minutes following an adverse reaction assists in the elimination of symptoms (Bell, 1982).

At this time, the procedures used for the treatment of acute reactions must be classified as scientifically unproven.

2. Environmental Control Units

Patients from Ontario who are severly sensitive to multiple environmental agents and whose health has deteriorated to the point where they are unable to be treated in a doctor's office (Crook, 1983a; Levin and Zellerbach, 1983) or at home, may be referred by clinical ecologists to environmental control units in the United States. These units are designed to provide an environment where the patient, removed from exposure to the airborne and contact substances that cause adverse reactions, is able to undergo testing and treatment (Dickey, 1976; Levin and Zellerbach, 1983). A high degree of commitment to the program is required (Appendix 10). It is estimated that approximately one

per cent of environmentally hypersensitive patients will require the treatment program provided in these units (Levin and Zellerbach, 1983).

The environmental unit is often a floor of a hospital on which construction and design utilize natural products and furniture made from them (Dickey, 1976; Rea, 1982; Crook, 1983a; Levin and Zellerbach, 1983). Stainless steel, ceramics and unscented cleaning products are used. Both staff and patients are instructed to avoid cosmetics and to use unscented shampoo and deodorant.

On admission to an environmental unit, a patient is usually fasted on pure spring water for approximately five days. Organic, unseasoned foods are then introduced, one at a time (Dickey 1976; Crook, 1983a; Levin and Zellerbach, 1983). This method is also used for chemicals. Clinical reactions are recorded and lists are made of individual sensitivities. Randolph (1962) states that this is the most accurate method of discovering which environmental agents are causing illness. Therapeutic extracts are prepared for the patient at the neutralizing level determined during the testing process. The patient is taught how to manage his or her diet and is given suggestions on wearing apparel and on making environmental changes that will

assist in coping with particular sensitivities (Levin and Zellerbach 1983).

While formal evaluation of environmental control units is not available, the Committee is of the opinion that such units appear to be helpful in providing both a temporary, safe environment for acutely ill patients and a good setting for testing and research purposes.

Members of the Committee visited the environmental control unit supervised by Dr. T. Randolph in an older building located in downtown Chicago and the unit supervised by Dr. W. Rea, located in a modern facility in a suburb of Dallas, Texas. There was no monitoring of air quality in either unit by any state or federal agency; however, the Dallas facility appeared to be superior in terms of measures taken to ensure a clean environment.

C. Rarely Used Treatment Methods

The Committee was advised by patients and physicians of a number of other treatments used for the environmentally hypersensitive. A given treatment may be preferred by one or two clinical ecologists and not be used by others. Only those currently in use in Ontario or those that might be used here in the near

future are considered in this section.

1. Transfer Factor

Transfer factor is an active principle in viable leukocytes, leukocyte extracts and leukocyte dialysates obtained from immune human donors, and has the capacity to transfer cutaneous delayed-type hypersensitivity in vivo to non-immune recipients. Transfer factor has been used to treat a wide range of disorders: immunodeficiency diseases, neoplasms, chronic fungal, viral and bacterial infections (Levin et al., 1973; Massicot, 1982). Chronic mucocutaneous Candidiasis has been treated with transfer factor alone (Kirkpatrick, 1971; Truss, 1981) or in combination with anti-fungal agents such as amphotericin B (Buckley et al., 1968; Marmor and Barnett, 1968; Rocklin et al., 1970). Results from these studies are mixed in regard to the efficacy of transfer factor. Overall, the use of transfer factor appears to be safe, with few reported side effects.

Levin (1985), reports:

> We now have evidence that the symptoms of acquired food and petrochemical allergies are mediated by immune complexes. Immune complex formation and regulation are

> controlled by suppressor cells. Transfer factor enhances suppressor cells which in turn reduce the formation of antigen antibody complexes. Such complexes cause the symptomatic food and chemical reaction.

At this time, however, Levin does not provide supporting data.

There are no adequately controlled studies that demonstrate the effectiveness of transfer factor. The reports noted above are either anecdotal or inconclusive or both.

2. Tissue Extracts

Tissue extracts are administered by at least one clinical ecologist is Ontario, either alone or in combination with vitamin C (Gilka, 1985). Tissue tablets prescribed include drenatrophin (beef adrenal), thymatrophin (beef thymus) and revitolose-C-1000 (fresh extract of adrenal cortex, testicle and brain substance in glycerine solution). An enzyme mixture, viokase (amylase, lipase, protease), is used by at least one clinical ecologist in Ontario (Maclennan, 1985), as a treatment option.

No controlled studies on the use of tissue extracts as

an effective treatment for environmental hypersensitivity could be found in the literature.

3. Vitamin and Mineral Therapy - Megadoses

The Committee was made aware that vitamin and mineral supplements may be given in large doses for therapeutic purposes. Unfortunately, there is evidence that some patients will disregard a physician's advice and will self-prescribe increasing quantities of vitamin/mineral preparations -- to the point of overdosing (Schaumburg et al., 1983; Berger and Schaumburg, 1984; Issenman et al., 1985). One of the possible dangers of vitamin/mineral overdose is sensory neuropathy, which can occur from even relatively modest excesses of vitamin B6 (Schaumberg et al., 1983, Berger and Schaumberg, 1984). Intake of megadoses of vitamin C can impair the function of some liver enzyme systems responsible for detoxifying drugs and other xenobiotics (Basu, 1983), and may predispose patients with cystinuria to kidney disease (Spielberg, 1985). A third example of potential danger concerns the trace element zinc: excessive doses of this nutrient can elicit a number of adverse effects including gastric irritation, anemia (through secondary copper deficiency) and, possibly, can depress some immune functions as well as cause predisposition to

cardiovascular disease (Filteau and Woodward, 1984; Anon., 1985).

We were unable to obtain studies demonstrating the effectiveness of this approach.

4. Thyroid Therapy

Thyroiditis has also been proposed as a cause of environmental hypersensitivity (Saifer, 1985). The Committee is aware of only two physicians in the United States, Dr. Eduardo Gaitan of Birmingham, Alabama and Dr. Phyllis Saifer of San Francisco, California, who use thyroid therapy as an approach to the treatment of this disorder. Patients present with memory loss, morning fatigue, gastrointestinal and muscular symptoms. Evidence of thyroid antibody is considered to be evidence of autoimmune thyroiditis, in spite of normal thyroid function. Treatment consists of administration of either synthetic T4 or natural dessicated thyroid extract. Patients who do not respond after six months of thyroid treatment may undergo a thyroidectomy, in order to remove the deleterious tissue effects of abnormal thyroxine (Saifer, 1985). There are no controlled research studies available to verify this approach.

5. Kelly Method

This form of therapy was brought to the attention of the Committee by a patient in another province (James, 1985). The Kelly method includes the use of organic foods, vitamins, minerals, enzymes and protomorphogens (e.g., raw adrenal tissue or raw liver tissue in tablet form) and of a dental splint. The combined method is not used in Ontario (Maclennan, 1985); however, some components are used in the treatment of environmental hypersensitivity, as discussed earlier in this chapter. This procedure, as well, remains scientifically unproven.

6. Mercury Amalgam Fillings

Another factor alleged by some to contribute to the total load of those with environmental hypersensitivity is the mercury in the amalgam used in the treatment of dental caries. Symptoms are said to include irritability, depression, anxiety, stomatitis, spells of abdominal pain, diarrhea, cardiac irregularities, tinnitus, tremor, emphysema, asthma, rhinitis, weakness, fluid retention and anorexia (Ziff, 1984). Absorption from fillings is not expected, therefore it is difficult to explain a relationship of fillings to this multiplicity of symptoms, even if one does exist. Cronin (1980), states that amalgam fillings, once

inserted, do not cause reactivity but that contamination of the facial skin and buccal mucosa during filling of the teeth can accuse eczema of the face and neck which may become widespread (Frykholm, 1957; Vickers, 1967). However, patch tests applied to the buccal mucosa are usually reported negative (Cronin, 1980).

It has been reported that systemic absorption of mercury from amalgam can be a rare cause of dermatitis in sensitized patients. In a case study, Sidi and Casalis (1951) report on a woman who had been sensitized as a child by topically applied mercury. She had chronic eczema of the head, neck and forearms, but no stomatitis. Patch testing with mercury was positive. Her amalgam fillings were removed, and the eczema subsequently healed.

Patients told the Committee that some physicians advocate the removal of dental fillings for the control of the symptoms of environmental hypersensitivity. This intervention, however, is used only when other treatment methods have failed (Maclennan, 1985). At the present time, it is a treatment method that remains unproven.

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Chapter Eight

A - CONCLUSIONS

We come now to the purpose for which this Committee was formed: to set out our conclusions and to formulate recommendations that may be useful to the Ministry of Health in deciding on future initiatives related to environmental hypersensitivity.

Certain of our conclusions are little more than restatements of issues covered earlier in this report; on other matters, this is the first opportunity the Committee has had to express its position.

I - Prevention and the Environment

We wish to begin by stating that our study of one disorder, environmental hypersensitivity, raised our collective concern about the role of environmental factors as a cause of human illness. We believe that chapter 3 illustrates the basis for that concern. It seems clear that we are inexorably increasing the toxicity of our environment. Some of those chemicals may not be hazardous. However, it is clear that some are and that, for many, we have no way as yet of knowing whether they are or are not harmful; nor do we

have adequate information on the effects of low-dose exposure over long periods or the possible synergistic effects of long-term exposure to many chemicals. These concerns were expressed repeatedly by people we met with or who wrote to the Committee.

In the course of this Committee's work, we were impressed by the strong commitment to a clean environment demonstrated by many of those we met or heard from; we were asked repeatedly to examine the issue of environmental hypersensitivity in a broader environmental context and many of the recommendations we received reflected this approach. A number of individuals expressed the opinion that the seriousness of such issues is not adequately appreciated by government. If that view is accurate, we would join them in their concern.

We were impressed with the efforts many people are making to minimize environmental risk. For example, we learned that many school boards have begun to identify agents within the school environment that could be affecting student performance and behaviour. A number of quite sensible and practical measures are being taken to minimize the likelihood of such effects, including: postponing painting and spraying activities until school vacations; establishing a special

committee to identify potentially hazardous building products in order to gradually eliminate them from existing buildings and prevent their use in future structures; developing experimental "low-pollution" classrooms in one or two schools to find out whether they help individual students who seem to have special environmental needs. While such experimental classrooms are of value, we believe that, in the long run, the answer is to ensure that the school environment as a whole is appropriate so that some students are not isolated from the rest of the student body.

We think that it is important that any attack on the problem be a balanced one; we were given a "clinical ecology handout" prepared by consultants for use by one school board -- and being made available to other boards across the province -- which seemed to us to lack that kind of approach. On the whole however, we were impressed with these examples of concern about environmental factors that might hamper the abilities and wellbeing of individual students.

II - Existence and Prevalence of Environmental Hypersensitivity

Clearly, it was a central task of the Committee to report on whether, in its opinion, what is known as

environmental hypersensitivity exists. In formulating a position, we acknowledge first the problems we faced in defining the term. Throughout the period of the Committee's existence, it was easier to say what environmental hypersensitivity is **not** rather than to say, with certainty, what it is. Generally, the people we are dealing with do **not** manifest symptoms that are immunologically measurable at present. We have not included those who have been exposed to unacceptable levels of known toxic elements in the environment. Furthermore, the enormous range of symptoms ascribed to environmental hypersensitivity, combined with the absence of agreed-on, scientifically established methods of verifying its existence, make it difficult and even controversial to describe the environmentally hypersensitive patient.

Even after considering the issue at length, reviewing definitions contained in the literature, and consulting a number of persons knowledgeable in the field, we found no unanimously endorsed definition; we are of the opinion that a great deal of work remains to be done before one that is precise and acceptable emerges. Nonetheless, we have arrived at a definition for the purposes of this report. As set out in chapter 2, it is:

> Environmental hypersensitivity is a chronic (i.e., continuing for more than three months) multisystem disorder, usually involving symptoms of the central nervous system and at least one other system. Affected persons are frequently intolerant to some foods and they react adversely to some chemicals and to environmental agents, singly or in combination, at levels generally tolerated by the majority. Affected persons have varying degrees of morbidity, from mild discomfort to total disability. Upon physical examination, the patient is normally free from any abnormal, objective findings. Although abnormalities of complement and lymphocytes have been recorded, no single laboratory test, including serum IgE, is consistently altered. Improvement is associated with avoidance of suspected agents and symptoms recur with re-exposure.

In chapter 3, we set out examples of environmentally induced adverse reactions. We also confirmed that there are many environmental hypersensitivities already

well established in the scientific literature. The best known is probably the effect of cigarette smoke on some people; another example is the evidence that certain foods produce conditions such as non-allergic urticaria (hives) in susceptible individuals.

In our opinion, there is good reason to believe that environmental hypersensitivity goes beyond what has already been verified, and to suggest that there are a number of persons who <u>are</u> being adversely affected in various ways by exposure to one or more agents in our environment. We relied on the following factors in coming to this decision.

a) The presence, already mentioned, of many new chemicals being added to our environment with relatively little understanding of their potential effects, coupled with the knowledge that certain sensitivities have been verified, logically suggests that the problem may be even greater than is now understood. If, as has been noted, "scientific knowledge never will be complete . . . (and) our theories or models do not exhaust reality" (Jackson, 1985); if we also accept that the practise of medicine is still an art as much as a science; and if we acknowledge that, as we make progress, "the complexity of the human system, and the scale of our remaining

ignorance, becomes more apparent"(Jackson, 1985), then it is reasonable to accept the view that environmental hypersensitivity is a growing phenomenon.

b) There is the striking amount of anecdotal material, already referred to, that we were given; even if one acknowledges the limits of that type of data, the sheer volume and the consistency of the histories described were impressive. In the words of Dr. David Roy, a bioethicist who met with the Committee, after reviewing a number of letters:

> In my opinion it would be intellectually unjustified to ignore these reports. It would seem to me that these reports constitute their own initial raw data to support the existence of some kind of complex syndrome that you can call environmental hypersensitivity or ecological illness or whatever other descriptive term we need.

c) As noted in chapter 2, some <u>theories</u> of causation, though not yet scientifically verified, merit further study. They include the following:

i) the well-recognized fact that sensitivity to external stimuli is individual and variable; following

from that is the developing perception that some persons are genetically predisposed to greater sensitivity to environmental substances. Acceptance of this supports the proposition that threshold levels may vary from person to person and, within any individual, from one time to another;

ii) the view that the immune system can become compromised after a viral infection;

iii) the theory that immune complexes involving different immunoglobulin classes cause pathology;

iv) the suggested feedback loop between the central nervous system, particularly the brain, and the immune system.

As noted in chapter 2, these theories are not yet verified as explanations of environmental hypersensitivity. However, there are findings in various fields of research that suggest that these theories are worthy of further study. To this extent, they support the argument that the diagnosis of environmental hypersensitivity may be a valid one.

d) The appeal of the approach taken by <u>some</u> of the persons working and studying in this field lies in the fact that they reflect an approach to the practice of

medicine that is "marked by acceptance of complexity, by attempts to study and relate multiple variables and by striving for theories straddling interdisciplinary boundaries." (Lipowski, 1977) Nutritional, social and environmental factors are seen as relevant to an understanding of the illness; there is some recognition that the meaning of the illness is important to the patient. There is also evidence of an holistic attitude in the approach to therapy, "working person to person in such a way that the client is an active agent and learner." (Jackson, 1985)

It would be incorrect to characterize all those working in the field as operating in this way; we encountered people who were rigidly locked into one or more of the as-yet-unproven causation theories. We also found people who focused solely on their own clinical experience and who saw little need for research to establish the efficacy of what they do. However, while recognizing that the approach taken does not, in itself, validate the diagnosis, the Committee acknowledges the extent to which work in this field supports a multi-disciplinary perspective and recognizes the doctrine of multi-causality of physical illness.

While we believe that there is evidence to support the view that a significant number of persons show symptoms of environmental hypersensitivity (as defined above), we are unable to make any definitive statement about the prevalence of the disorder. In our view, there are a number of reasons for questioning estimates that the affected population is a large one and that it is growing rapidly. These are as follows:

1. Much of the identification of the disorder is based on diagnostic tests of unproven reliability; that fact alone makes it impossible for us to make definitive statements about the prevalence of the condition. As we have already noted, many patients have undergone large numbers of conventional medical tests, all with negative results; at the environmental unit in Dallas, for example, patients are subjected to a wide range of tests designed to identify or eliminate other possible explanations for their presenting symptoms.

2. As set out in chapter 2, a number of other explanations for the symptoms have been put forward. They include:

i. The Premenstrual Syndrome

ii. Hyperventilation

iii. Hypoglycemia

iv. The Autoimmunity, Polyendocrinopathy, Immune dysregulation, Candidiasis and Hypersensitivity Syndrome (the APICH Syndrome)

v. Electromagnetism

vi. Iatrogenic Illness

vii. Psychosomatic Illness

Reference to the enormous range of symptoms accepted as consistent with a diagnosis of environmental hypersensitivity and the great variability of the patients themselves helped persuade the Committee that these alternative explanations are relevant to some of the patient sample under review. The more difficult -- and, at this point, unanswerable -- question, is the extent to which this patient population would be reduced by subtracting those whose illnesses are other than environmental hypersensitivity.

It was frequently suggested to us that these people, in fact, suffer from psychiatric disorders -- the two most often named are somatization disorder and clinical depression. Clearly, this is an area of controversy; we have already discussed the strongly negative reaction of patients to what they see as an attempt by physicians to seek refuge in a psychiatric label whenever it is impossible to identify a biological cause for their illness.

Somatization disorder is defined as occurring when a patient has "a history of physical symptoms of several years' duration beginning before the age of 30 . . . complaints of at least 14 symptoms for women and 12 for men from the 37 symptoms listed in the manual; to count as a symptom (it must be reported by the individual as having) caused him or her to take medicine other than aspirin, alter his or her life pattern or to see a physician. The symptoms are not adequately explained by physical disorder or physical injury and are not side effects of medication, drugs or alcohol. The clinician need not be convinced that the symptom was actually present but the report of the symptom by the individual is sufficient." (DSM III - Diagnostic Criteria)

Understandably, the patient may feel that the continuing failure of traditional medicine to identify the cause of illness is, of itself, no justification for a decision that he or she is psychiatrically ill -- that the doctors' inability to recognize the real cause of the illness has been taken as proof of mental disturbance.

We are convinced that emotional and psychological factors do play a role in some patients; many of them do not deny emotional disturbance. However, they argue

that such disturbance is the inevitable byproduct of a lengthy attempt to seek treatment, characterized by inaccurate diagnoses, possibly by several unsuccessful or even harmful attempts at treatment, by increasing disability and by social isolation. In such cases, the key question is whether the "real" cause is to be found in the psyche, or in the environment.

Those who see the illness as simply a psychological manifestation can be said to be as inflexible as those who see it as strictly a biological disorder. One author notes that:

> . . . the concept of psychogenesis of organic disease is as reductionist as the germ theory of it, against which pioneers in psychosomatic medicine inveighed. . . To distinguish a class of diseases as "psychosomatic disorders" and to propound generalizations about "psychosomatic patients" is misleading and redundant. Concepts of single causes and of unilinear causal sequences -- for example, from psyche to soma and vice versa -- are simplistic and obsolete. (Lipowski, 1977)

3. The diagnostic difficulties for both doctor and patient may be exacerbated by the widespread perception

that medical science is better able to explain the physiological processes of the body and to identify the causes of disease than, in fact, is the case. When the cause of a patient's illness is not known, this, ideally, should be recognized by both the physician and the patient. The physician should not feel that it is necessary to ascribe a cause to the illness rather that admitting that the cause is not known. Such a confession of ignorance is not always accepted by a public that has been encouraged to believe that all illnesses have a known cause. There is still perhaps a general unwillingness to appreciate, as all conscientious medical practitioners do, that medicine is both a science **and** an art.

4. As noted earlier, some patients have been subjected to a very large number of conventional medical tests and procedures with negative results. The existence of a number of ill persons desperately in search of the cause for their illness, coupled with what may be a predisposition on the part of some to diagnose environmental hypersensitivity, increases concern about the possible iatrogenic nature of the disease.

5. We remain sharply aware of the anecdotal or clinical nature of much of the evidence presented to us and, as we noted earlier, the literature is filled with

causation theories that are both varying and controversial. Moreover, while we have already acknowledged that some are worthy of further study, it is also true that they are essentially unproven.

Furthermore, the history of medicine abounds with examples of innovations that achieved prominence and acceptance on the basis of anecdotal and clinical evidence alone, only to be discarded when sound, scientific research demonstrated that they were ineffective. A number of individuals who wrote to or met with the Committee expressed concern that we might make the same mistake. In their view, judgment should be withheld until research provides reliable answers.

Consideration of all these factors tempered but did not alter the Committee's opinion that the diagnosis of environmental hypersensitivity has validity. However, we are convinced that it is impossible to estimate, with any degree of precision, the total number of persons in Ontario who have such sensitivities.

III - Medical Approaches to Environmental Hypersensitivity

We acknowledge that, throughout the medical field, there is growing awareness of the importance of environmental factors in understanding disease; the

development of the specialties of industrial medicine and toxicology are obvious illustrations that this is so. When taking medical histories, many family practitioners, allergists and others now routinely ask questions designed to identify possible problems in the patient's immediate environment, i.e., at home, in the workplace, as the result of dietary habits.

Concern for the social and environmental context of disease is part of any comprehensive analysis of a patient's condition. It has been said that "when medicine is practiced . . . with . . . basic nutritional and ecological concepts incorporated into clear medical theory, many conditions which we have viewed as specific diseases of unknown etiology can be more effectively prevented and managed." (Beasley, 1981).

There is evidence at the same time that a number of family practitioners and medical specialists do not sufficiently recognize that these external factors can play a role in causing illness. Members of the Committee and some of the experts we met make this point. In addition, as we have already mentioned, a number of patients complained that their doctors were unwilling to accept even the <u>possibility</u> that foods or chemicals might be implicated in their symptoms.

Several of the experts we consulted feel that one reason for this is that little time is devoted in medical training to environmental issues.

There is a growing understanding of the importance of the nutritional aspects of illness in clinical care; we were pleased to learn that "some medical schools have moved to incorporate nutrition education into the curriculum and to enhance nutritional care through cross appointments with the clinical departments of hospitals." (Draper, 1985). Nonetheless, we remain concerned that knowledge about nutrition continues to be less than it should be amongst members of the medical profession as a whole.

We found that there has been increased interest in recent years in the quality of indoor air, focused especially on urea formaldehyde foam insulation and the "sick building syndrome". Rooms with poor ventilation hold the potential for problems because they can enclose elements such as cigarette smoke, carbon dioxide, carbon monoxide, formaldehyde, radon and moulds; however, it is often possible to measure indoor air quality, to identify existing problems, and to work out methods of dealing with them. While a few doctors apparently seek such an analysis, we sense that most do not consider it a possible or warranted test.

In chapter 4, we described the practice of clinical ecology as we observed it and we wish here only to set out some of our findings on the subject.

a) Committee members are of the opinion that the approach of clinical ecologists to their patients appears to have a positive impact quite independent of the medicine they practise. The doctor's attitude to the patient, combined with a firm diagnosis and recommended course of action, presented as likely to produce full recovery, has a positive effect on the healing process. That effect is probably heightened even further if, prior to the diagnosis of environmental hypersensitivity, a psychiatrist has characterized the illness as a psychiatric disorder. The reasons were well stated in one letter received by the Committee:

> Some illnesses respond well to biological treatment; pneumonia caused by the pneumococcus responds to penicillin, even if psychological and social factors are involved in determining that this particular individual has come down with the disease. Other illnesses, such as in the area of chronic pain, have no simple biological explanation. They are

symbolic illnesses -- illnesses in which the meaning to the individual of being ill is a paramount factor.

The treatments for symbolic illnesses are often considered mere placebos by biological medicine. Placebos are interventions that cannot be demonstrated experimentally to have a better effect than "no" treatment at all on a group of individuals with a disease. The specific placebo as an intervention on the symbolic level directed at the meaning of an illness for a specific individual, however, often is an extremely effective intervention. Placebos can be used with biological interventions, but the placebo itself releases some natural power of the body to heal itself.

Traditional allergists and clinical ecologists do not see illness the same way. The allergist explains illnesses solely by biological models. The clinical ecologist does not always fully distinguish between the biological

> mechanisms and the meaning of an illness. Some illnesses such as rheumatoid arthritis are explained in immunological concepts as an autoimmune disease -- the body develops antibodies against itself. Treatment requires medical intervention with drugs. Clinical ecology sees most immune reactions as caused by environmental agents outside of the self. The individual can act to control this exposure. These two explanations of allergy have very different symbolic meanings. (Gibson, 1985)

In the Committee's view, the contrast between the approaches taken by the two specialties is overstated, but the writer does show the importance of treatment that recognizes the symbolic meaning of illness. The importance of this may be greater if, as we were advised, the success rate of psychiatry with those diagnosed as suffering from somatization disorder is not high. In an analysis of the illness and of various treatment methodologies, one writer has noted:

> Few patients are more dissatisfied with their medical care than persistent somatizers, and very few are less welcome

> in the offices of most doctors. They consume an inordinate amount of their doctors' time, energy and patience and a disproportionate slice of medical insurance plan disbursements. Nonetheless, they often do not receive adequate treatment, their physicians rarely enjoy the satisfaction of a clinical job well done, and the patients are frequently labelled "crocks" (Lowy, 1975).

In viewing this as relevant to the work of clinical ecologists, we are not suggesting that all positive results of their work are due only to placebo effects; in the same way, the fact that earlier investigations of a patient did not result in a diagnosis the patient was willing to accept in no way means that the diagnosis made was inaccurate nor does it necessarily reflect on the quality of medicine practised by the physicians involved.

We reiterate our concern that <u>some</u> of the persons practising in this field seem predisposed toward a finding of environmental hypersensitivity and toward the use of certain treatments. At the same time, we wish to emphasize that this did not appear to be true

of all of the doctors we observed, nor do we believe that this is a problem unique to this field of medicine. (For example, we heard from many people concerned about what they described as an over-reliance on drug therapies in other fields of medicine.)

However, with a patient population that presents such a range of symptoms, and with the uncertain state of the art with respect both to theories of causation and to the most often-used tests and treatments, it is particularly problematic when such a predisposition exists.

For example, we were struck by how readily the presence of excess Candida in the body is said to cause extremely diverse symptoms. Our intention here is not to reject this theory of causation, but only to note that it is often accepted more readily in individual cases than might be expected on the basis of current research.

In chapters 6 and 7, we described the tests and treatments most frequently employed by clinical ecologists. Here, we wish to record our concern about risks associated with certain of the approaches taken, either as observed by members of the Committee or as reported to us. They are:

1. The use of megavitamins (e.g., B-6, C) to deal with specific patient reactions.

2. The prescription of long-term diets without adequate consideration of possible nutritional risks, especially of dietary regimens prescribed for children at a period when they are developmentally labile.

3. The use of certain drugs with substantial risk associated with long-term use in the absence of adequate monitoring: e.g., ketoconazole for the treatment of Candida albicans.

4. Recommending major life changes too quickly, possibly causing major financial problems, upsetting the patient's emotions or sense of wellbeing and harming family relationships.

None of our concerns about particular approaches found in the practise of clinical ecology should be interpreted as meaning that all who work in the field employ such techniques. Clearly, that is not so.

IV - The Tests Used by Clinical Ecologists

The Committee's analysis of the testing procedures is contained in chapter 6.

There is very little controversy about the diagnostic aspects of the history, physical examination and

routine laboratory tests. When used on the basis of reasonable medical indications, the tests for immune system function, measurement of trace elements or nutrients and the various challenge tests give useful information to aid diagnosis. This is also true of the Rinkel technique of serial titration when used for diagnostic purposes. The use and results of these tests have to be viewed in conjunction with the history and physical examination. Indoor air quality measurements are available and greater use of the technology, perhaps with government support, may also help in diagnosis in selected situations.

Other tests are considered more controversial. The first three, (Rinkel, when used to establish a starting neutralization dose; intradermal provocative and sublingual provocative) are used commonly by clinical ecologists in Ontario, as well as by ecologists and other practitioners in the United States, who feel they are useful and accurate. The Committee's conclusion is that these tests are scientifically unproven at present.

Other tests (cyto-toxic blood tests, hair analysis, therapeutic trials for Candida infections and Vega II-type machines) are highly controversial at the present time. The Committee was unable to find satisfactory

published evidence that these tests or procedures are effective for the diagnosis of conditions such as environmentally hypersensitivity.

V - The Treatments Used by Clinical Ecologists

An analysis of treatment procedures is contained in chapter 7.

With respect to the treatment of chronic adverse reactions, the Committee is of the view that there is evidence to support the use of avoidance procedures, particularly those that involve less extensive environmental changes. The elimination diet, as one form of avoidance, is demonstrably effective, as is the use of vitamin and mineral supplements to maintain adequate nutrition. The rotation diet, used when many foods are suspected of causing environmental hypersensitivity, may be effective as an avoidance procedure, although there is not adequate scientific proof that such a demanding and restrictive approach is necessary. The use of extract therapy (the Rinkel method or the provocative-neutralization method), and the use of organically pure food and water have not, as yet, been scientifically demonstrated to be valid.

In the treatment of Candida albicans, nystatin is

considered to be effective and has minimal side effects, although the effects, if any, of long-term use or even use for several months, are not yet known. Ketoconazole, while considered effective, presents the risk of serious side effects if used for long periods of time. The difficulty with these treatments rests with the unproven thesis that excess Candida can produce environmental hypersensitivity.

A number of treatments for acute adverse reactions to environmental agents are considered. The use of megadoses of vitamin C, nalaxone treatment and the administration of intradermal or sublingual extracts for this purpose have not, in the Committee's opinion, been proven scientifically to be effective.

Although we were unable to find methodologically sound studies demonstrating their effectiveness, environmental control units seem helpful as a means of providing relief for acutely ill patients and for the purpose of providing an ideal environment within which testing procedures can be undertaken with these patients.

Other treatments (not in common use) -- transfer factor, tissue extract, large doses of vitamins and minerals, thyroid therapy, and the removal of mercury fillings -- have not, as yet, been proven to be

effective.

VI - The Patients

In chapter 5, we summarized the information provided to the Committee by patients said to be suffering from environmental hypersensitivity. We have reached a number of conclusions that form the basis for several later recommendations.

1. The patients we heard from are not homogeneous in their symptoms or the seriousness of their illness, and they range from the mildly ill to the seriously disabled. In the search for an explanation of their illness, many have been seen by several specialists. While a great number report satisfaction with the treatment and the procedures used by clinical ecologists, many continue the search for a total answer to their problems. In Appendix 11, we have included a list of the many "alternative" therapies reported to the Committee by patients.

2. We found that patients tend to be overwhelmed by confusing and conflicting information about the possible causes of their illness. Media reports often focus on the strong views held by those who represent the extreme ends of what is, after all, a continuum of views; decisions on where to seek relief from symptoms

seem to depend on which of the many sources of information reaches an individual patient. Not only does the oversupply of opinions and data create confusion, it also encourages patients to move from doctor to doctor, from one therapy to another, in an effort to fully understand all possible causes of one's continuing health problems. In this, their behaviour seems consistent with reported findings on why people seek treatment by alternative medicine. (Moore, et al., 1985)

3. The information patients do obtain fills a vacuum caused by the absence of identifiable sources from which they can get accurate information about the state of knowledge in this field. It is worth pointing out that news of the existence of the Committee itself brought a steady flow of requests for members' advice on where individuals could obtain a balanced opinion about problems related to environmental hypersensitivity.

4. We found that the response to patients by the Ontario Health Insurance Plan (OHIP) is clear in some respects and not in others: the plan does not now cover the cost of provocative testing or of neutralization treatments, though the Ontario Medical Association Tariff Committee did include provocative

testing in the fee schedule (1971 to 1979), but that was qualified to include bronchial challenge testing only (Moss, 1985).

At the same time, OHIP has authorized the treatment of individual patients in environmental units in the United States. In some cases, the costs of transportation to the unit have been covered as well. The costs of provocative testing and neutralization treatments are not covered by OHIP when they are carried out within these units, although this does not seem to have been true in every case. We have not been able to determine how and when patients are authorized for treatment within one of these units; the primary determinant appears to be whether the referral is judged appropriate by the patient's doctor and whether the patient can pay the costs not covered by OHIP.

5. There is, of course, the obvious problem of how patients meet expenses not covered by OHIP. The response of private health care insurers varies and, when expenses are paid, coverage is accompanied by ongoing skepticism and regular review. The cost to patients varies and can be significant if uninsured test and treatments as well as major environmental changes are recommended. Clearly, those patients

without resources risk being denied the choice of even such less expensive measures prescribed by their doctors as modest environmental alterations and dietary change.

6. We are of the opinion that serious difficulties can arise when patients seek access to financial and other kinds of support services. We view this as partially a medical issue because the decision made is often tied to the opinion of the individual doctor to whom the applicant for assistance is referred. However, we believe the problem is a broader one and relates to the failure to recognize that the person is disabled or unable to carry on a normal life, regardless of the reasons for the disability. Perhaps the best example of this is the case of the young woman who has twice been a patient in a U.S. environmental unit at substantial expense to OHIP and others, and who has otherwise been confined to her home for most of the past two or three years; nonetheless, she has twice been denied disability benefits under The Family Benefits Act.

Under section 1(3) (b) of that Act, a "disabled person" is defined as one "who has a major physical or mental impairment that is likely to continue for a long period of time and who, as a result thereof, is severely

limited in activities pertaining to normal living, as verified by objective medical findings accepted by the Medical Advisory Board."

The then-Minister of Community and Social Services acknowledged the difficulty of evaluating "such a specific medical/health related issue within a social services ministry", (Drea, 1984) particularly when the issue is as controversial as environmental hypersensitivity. However, we are concerned that individual applicants for assistance are being denied medical benefits because there is a failure to see beyond the controversy to the applicant; furthermore, there seems to be a preference for the "objective" opinion of a physician practising conventional medicine that the patient is mentally disabled rather than for the "objective" opinion of a clinical ecologist that the cause is environmental. Much seems to depend on the viewpoint of the local member of the medical advisory board who makes a recommendation to the director in each individual case.

There is evidence that there are similar problems when an applicant seeks to be classified as permanently unemployable under the Family Benefits Act, applies for a Canada Disability Pension, asks for supplementary

funding to cover the cost of special foods on a prescribed diet or even seeks general welfare assistance. Those who apply for Worker's Compensation benefits face the added difficulty of having to demonstrate that the illness is employment based. Our experience suggests that, as individual doctors broaden their definition of workplace elements that can affect individual capabilities, the number of successful applications increases.

Committee members believe that it is important to recognize that ongoing debate about the etiology of the disorder has obscured the fact that there are a number of persons who are ill, whose condition has not been recognized and who are being poorly served, particularly in their need for support services, because of the existing controversy about the validity of environmental hypersensitivity as a diagnosis. Some patients seem to serve as classic examples of how people can "fall between two stools" when professionals disagree about the nature of their problem.

The labels placed on patients can be extremely important, lending symbolic meaning to them and sometimes playing an important role in determining how effective the treatment is. In our recommendations, we place a high priority on research designed to

establish appropriate diagnoses. In the interim, however, people who are sick -- especially those who are severely ill -- need help, compassion and support as they struggle with their disabling conditions.

VII - General Information

At present, at least eleven doctors in Ontario are known to practise clinical ecology. The Canadian Society for Clinical Ecology and Environmental Medicine was recently founded and is headed by Dr. John Maclennan; another group, the Canadian Human Ecology Foundation, is located in Dundas, Ontario and has branches in Hamilton, Kitchener, Ottawa, and Toronto.

Parents for the Environmentally Sensitive, headed by Mrs. M. Nikiforuk, actively seeks support for patients. In addition, an ad hoc committee, established in Toronto under the chairmanship of Dr. G. Nikiforuk, includes members with a wide range of expertise and background. It is now engaged in the development of research proposals in the field of environmental hypersensitivity.

Although we were unable to gather definitive information on the practise of clinical ecology in other provinces, we are aware of at least three clinical ecologists in British Columbia; the B.C.

Plainair Environmental Allergy Society informed us that they have 200 members and are an active advocacy group in that province. Tests and treatments are not covered by the B.C. health insurance program; we were not told that any persons had gone to environmental units in the United States or that costs had been covered by the insurance plan.

There are also doctors practising clinical ecology in Alberta where, we were informed, the government health plan does not cover the cost of tests and treatments; nor are trips to the United States and treatment there paid by the health plan. The same is true in Saskatchewan, although the full costs for patients recommended for treatment in environmental units in the United States by Dr. John Gerrard (a member of this Committee) have been covered by the government. (These patients had been seen previously by the appropriate specialists -- allergists, neurologists, psychiatrists -- and had not been helped.)

We were unable to identify any Manitoba doctors practising clinical ecology but were informed that the health insurance plan in that province does not include payments for tests and treatments or for referrals to out-of-province clinics. Information from the provinces east of Ontario was scanty: there do not

appear to be any clinical ecologists in the Maritime provinces and no examples of a provincial health insurance plan that covers tests, treatments or referrals to environmental units were cited to us. In Nova Scotia, the Allergic and Environmentally Sensitive Society has been formed and is seeking financial support from the government for referrals to out-of-province specialists and to units in the United States.

In the United States, there are more than 1,000 physicians practising environmental medicine. Dr. James O'Shea, past president of the American Academy of Environmental Medicine advised (1985) that there are 350 clinical ecologists who are members of this society. He also reported that there were more than 1,000 members of either the American Academy of Otolaryngologists or the Pan American Allergy Society who are using the testing procedures commonly employed by clinical ecologists. Our information is that there are at least five environmental units in existence (Dallas, Chicago, Denver, Watertown, N.Y., and Chadburn, N.C.).

The major tests and treatments used by clinical ecologists are no longer covered by Medicare and a number of major private insurers now similarly refuse to cover such procedures.

In the United States, there is considerable controversy within the medical profession about clinical ecology, most evident in the dispute between the American Academy of Environmental Medicine and the American Academy of Allergy and Immunology; in 1981, the latter released a position statement criticizing many of the techniques used by clinical ecologists. It has also just released two papers on "unproven procedures for diagnosis and treatment of allergic and immunologic diseases" and the "Candidiasis hypersensitivity syndrome".

There is much activity in the courts and this is reported in the Ecological Illness Law Report; there is extensive political pressure in some states for legislation or for legislative committees to review the issue. One member of this Committee, Dr. Gerrard, attended a hearing on clinical ecology held last April 30 by the California Medical Association.

There are a number of doctors in England engaged in practise and research in this field, particularly in relation to food intolerance. There are two "environmental units", one at a private hospital in London directed by Dr. Jean Monro, the other a recently opened private centre in Yorkshire, directed by Dr. Jonathan Maberly. In general, the National Health

Service does not cover the cost of tests and treatments carried out, either on an in-patient or out-patient basis. We were advised, however, that patients referred to Dr. Monro by consultants, after being fully investigated without success in a National Health hospital, had their full expenses covered by the National Health Service.

An environmental unit, directed by Dr. Colin Little, is located in a state-supported hospital in Melbourne, Australia, where patients' stays are financed privately.

VIII - The Positions Taken by Relevant Associations

The Committee heard from a number of professional associations, societies, committees, etc., interested in the field of environmental hypersensitivity. In some cases we received briefs specifically addressed to us; in others, we obtained papers released recently by organizations. Where possible, we have appended copies of the findings or recommendations they contain to this report.

We met with members of the Canadian Society for Clinical Ecology and Environmental Medicine and also received written proposals and recommendations from them. They recommended that the major tests and

treatments used by clinical ecologists be covered by OHIP. They accept the Committee's statement that existing research into the efficacy of these tests and treatments is insufficient and they strongly support further work in this area. They indicated their eagerness to be part of the development of a research design and their willingness to accept the results of good research designed on this basis.

We did not receive a formal brief from the Ontario Medical Association but understand that their present view is that the tests and treatments used in this field remain unproven and ought not to be financially supported until their validity has been scientifically demonstrated. As we have already noted, sublingual and intradermal provocative testing were once part of the fee schedule but have since been removed. The Association denied the request made to them recently to establish a specific subsection on clinical ecology within their organization. The OMA has recently established an "adverse reaction reporting program", a pilot project that asks physicians to provide information about food sensitivities reported to them by their patients. The committee managing this program is chaired by Dr. Michael van Veldhoven and reports to the Public Health Committee of the Ontario Medical

Association.

The Committee met with the chairman and one other member of the Allergy and Clinical Immunology subsection of the Ontario Medical Association; its position is that the theories of those practising clinical ecology and the tests and treatments they use are unproven and should not be supported unless and until they are shown to be effective.

As noted previously, the American Academy of Allergy and Immunology has issued position statements that set out their view that the theories and procedures adopted in the field of clinical ecology are unproven. These position statements are included as Appendix 12.

The Committee met with representatives from the Ontario Allergy Society and received its position paper; their primary proposal reads as follows:

> A committee of investigative scientists be appointed that must be acceptable to the allergists and the ecologists of Ontario. This committee must evaluate testing and treatment procedures in a scientific fashion regarding patients undergoing ecologic investigation The decision of the committee must be

binding and acceptable by both the allergists and the ecologists.

The members of the Ontario Allergy Society will be happy to accept the findings of this select investigation group. Should the testing and treatment procedures be shown to have merit we would be happy to accept them, otherwise a premature acceptance of the ecologists unproven techniques would undoubtedly introduce many other unproven treatments seeking early credibility.

The American Society of Environmental Medicine has published a position paper dated 1984-1985, a copy of which is included as Appendix 12. The Society endorses a number of tests and treatments, under circumstances that are set out in the report. These include the following:

1. Serial end point titration.

2. Intradermal and sublingual provocative testing.

3. The Prist test.

4. The RAST test.

5. Inhalation challenge test.

6. Elimination and rotary diversified diets.

7. Avoidance.

8. Extract immunotherapy.

9. Sublingual and subcutaneous neutralization therapy.

10. Comprehensive environmental controlled hospital care.

11. Vitamin, mineral, lipid and amino acid replacement therapy.

12. Symptomatic drug treatment (only when the above measures are ineffective).

Susan Daglish, executive director of the Ontario Allergy Information Association provided us with an informal statement on environmental hypersensitivity. In summary, it states that:

a. Some individuals may react physically, and behaviourally to foods and environmental substances.

b. Traditional allergy treatment is meeting the criteria of science but failing to meet the needs of a growing number of patients.

c. Clinical ecology often meets the perceived needs of the patient but has not yet met the accepted

standards of scientific validity.

d. It is recommended that clinical ecology be subjected to careful and objective study.

The Committee obtained the Report on Food Intolerance and Food Aversion prepared by a joint committee of the Royal College of Physicians and the British Nutrition Foundation in England, 1984; their conclusions and recommendations are included in this report as Appendix 13.

We appreciate the information and reviews of the literature and research in the field, given us by those professional organizations, some of long standing, and are pleased to append them to our report.

Many other briefs and reports were received from persons and organizations interested in the issues involved in environmental hypersensitivity. For example, a number of patient organizations based in Ontario and elsewhere submitted briefs and made recommendations to us. In addition, a number of individual doctors, some of whom are practising clinical ecology and some of whom are not, wrote to us. A summary of all of the recommendations received by the Committee are included as Appendix 8.

IX - The Professional Debate

As a Committee, we have become increasingly dismayed at the polarized and adversarial positions being taken in the United States on the issue of environmental hypersensitivity. Our unease has been increased by the realization that there is evidence, although fortunately not yet extensive, that the same hardening of attitudes is taking place in Ontario, often fueled by media reports that highlight the extreme positions referred to elsewhere in this chapter. The toll, emotional and financial, on those involved in disputes in the United States was apparent to us; increasingly, the conflict seems to be moving into the courtroom.

We believe that confidence in the health care system is eroded when productive dialogue between different medical specialties disappears or is replaced by acrimonious debate before a confused public. Protagonists take up positions that are clearly untenable: e.g., "all medical treatments are based upon sound scientific research"; "the environment plays little role in the generation of disease"; "all the identified patients are emotionally ill". Research that is clearly unsound methodologically is given greater weight than it deserves. There is a tendency to assert the validity of one's position on the basis

of the quantity, not the quality, of the clinical trials that have been undertaken. Success is measured in the name of the latest clinician or researcher to cross from one "side" to the other.

This Committee feels strongly that taking an absolute stance in this field is not only risky scientifically, given that there is a great deal we do not know about our environment and its effects on us, but it is also unproductive and divisive, antithetical to the task of promoting collaborative efforts that will help in understanding and treating the problems of a growing number of patients.

We emphasize again the need to develop approaches that bring together all practitioners, however their perspectives differ, and to do so before the gulf between them becomes as great as it now appears to be in the United States. We quote the position taken by a doctor and researcher in California who, at various times, has been seen as both a proponent and opponent of clinical ecology. We do not fully agree with all his observations, but repeat them here because they show a person willing to accept uncertainty in a field where answers are far from obvious:

Efforts to condemn the practice of Clinical Ecology (or Environmental Medicine, or its next name) will only reinforce the isolation of patients who have sought their help, and continue the paranoia upon which some of these physicians thrive. It also makes these physicians and their patients the "underdogs", which improves their ability to attract media attention. This in turn puts the issues in the political arena, where an impartial evaluation is unlikely.

Those techniques, like chiropractic, homeopathy, naturopathy, etc. exist because of the vacuum that exists in the allopathic medical care system with regard to mild, multi-organ symptoms. Most specialties "diagnose" these ailments as "mental", and half-heartedly recommend psychiatric consultation. Yet, psychiatrists are no better at treating the "somatizing patient" than are other specialties. This should give us pause -- is the "diagnosis" correct? And what

should we expect patients to do under such circumstances but to search for someone who will take their symptoms seriously?

These patients deserve a careful workup with consideration of a number of differential diagnoses for multi-organ symptomatology (Jewett, 1985).

B - RECOMMENDATIONS

I - Prevention

In our conclusions, we acknowledged our concern, as a Committee, about the impact of a growing number of possibly toxic agents in our environment. That concern extended well beyond the relatively narrow range of issues assigned to us. In light of this, we wish to begin this section of the report by recognizing that the prevention of sickness is as vital in this area as it is in any other area of health care. Measures that increase the number of healthy, disease-resistant persons and minimize exposure to factors that are known to produce illness, are important goals in any health care system.

While it was not possible for the Committee to address the issue fully, we have included as Appendix 14 the final chapter of a report prepared for the federal government that describes an ideal prevention framework. (Jackson, 1985) In addition, we believe that the following are examples of the kind of preventive action indicated in this area:

> **Recommendation 1:** Because many people suffer from exposure to respirable suspended particulates (RSPs) or secondhand cigarette smoke, we strongly support measures to minimize exposure to it. These include: enacting by-laws, such as those now in effect in a number of Ontario municipalities, that control smoking in most public places. We believe that it is appropriate to consider further restrictions to include such locations as waiting areas for public transportation. It seems to us appropriate that smoking be controlled in all public forms of transportation, including buses, trains and airplanes.

If it is necessary to prohibit smoking in these areas, in order to achieve adequate control of the problem, we would support such action.

Laws that regulate smoking in all workplaces, appear necessary, given the major difficulties involved in producing ventilation systems that would eliminate the problem. Measures that discourage smoking in schools and that prohibit the presence of secondhand smoke in areas where there are pre-school child-care programs would be clearly beneficial to children, particularly those with such respiratory diseases as asthma or recurrent episodes of bronchitis.

Existing technology to measure levels of RSPs in the air that may not be discerned easily but are possibly harmful, should be more fully utilized than it now is.

Finally, we believe that efforts now being made to inform the public of the possible difficulties associated with secondhand smoke should continue -- for

example, the booklet prepared by the Ottawa-Carleton Regional Health Unit advising parents of the benefits to children of smoke-free air in the home.

> **Recommendation 2:** We recommend action to ensure that patients and others have accurate information about food content, chemicals and other products in everyday use, information to which those concerned about environmental issues are entitled.

Dr. J. C. Alexander (1985) of the Department of Nutrition at the University of Guelph and others advised us that the labelling requirements for chemicals, drugs (particularly excipients in drugs) and household articles are much less extensive here than in the United States. Moreover, information about contents is not available in an easily understandable form.

While labelling requirements are more stringent in regard to foods, there are still problem areas, i, e., information on the use of hormones or antibiotics in meat production and on the plant source of vegetable oils. We support the recommendation made in the Report on Food Intolerance and Food Aversion, that consideration be given to "the feasibility of setting up a central data bank where food product composition (should) be examined. Products that are free of

ingredients known to be responsible for intolerance should be registered in the data bank, and doctors and dieticians should have access to it." Such possibly dangerous substances as sulphides should be identified and physicians should be educated about their possible effects. A more extensive statement of that committee's proposal is included as Appendix 15a; a labelling proposal that was presented to us in Ottawa is also included as Appendix 15b.

In general, we support reasonable measures designed to provide consumers with information that they consider essential if they hope to prevent symptoms by avoiding certain foods, chemicals and other substances.

We believe that modest, commonsense approaches to avoidance of suspected substances -- approaches that can be implemented without major cost -- should not have to wait on verification of all alleged sensitivities. Some of the measures being adopted by specific school boards have been cited as examples. Those who understand the apprehension of patients and seek to provide them with reasonable support and assistance are to be commended. We recommend that school personnel in particular be encouraged to help parents in their search for ways to reduce their children's susceptibility to illness.

As noted previously, many people emphasized the need to halt the proliferation of toxic elements in our environment. They expressed particular concern about acid rain and about the number and level of pesticides in general use. While these are issues beyond our mandate and expertise, we have no hesitation in supporting these objectives as highly relevant to general health promotion.

II - Research

> **Recommendation 3** We recommend that research be undertaken to establish the prevalence of environmental hypersensitivity and to determine which of the current tests and treatments being used by clinical ecologists are demonstrably useful.

We have noted the serious definitional and theoretical difficulties that make estimates of the prevalence of environment hypersensitivity impossible. Further, the tests and treatments most commonly used by clinical ecologists have not been scientifically demonstrated to be effective. While we would not presume to set research priorities in the health field, and, while not everyone would agree with us -- including some of the

people with whom we met -- we are satisfied that research in these areas should hold a high priority.

To use Braunwald's description in relation to a different field, "this rapidly growing enterprise is developing a momentum and constituency of its own, and as time passes, it will be progressively more difficult and costly to curtail its materially if the results of carefully designed studies prove this step to be necessary." (Braunwald, 1977).

The timing is particularly appropriate, since both those in Ontario who support the practice of clinical ecology and those who question it have expressed their willingness to accept the results of well-designed research studies.

Practical and political realities are such that reliable information is needed quickly. Furthermore, it is important that patients receive clearcut answers to their questions about the validity of procedures used to diagnose and treat their illnesses. As well, it is crucial that this research be methodologically sound, in order to avoid any attempts to discredit research findings that challenge the position of either of the opposing sides of this controversial issue.

If such research is undertaken, reliable information about effective diagnosis and treatment may be available sooner than is now the case with many other unevaluated procedures that are currently part of standard medical practice. (McKinlay, 1981)

> **Recommendation 4:** To provide an estimate of the prevalence of environmental hypersensitivity and in the absence of clear diagnostic criteria, we recommend a cross-sectional survey be undertaken using the definition set out in chapter two. Because subsequent investigation may prove our definition inadequate, it should be used to identify persons with environmental hypersensitivity for the purposes of this study only. Such a survey would require the cooperation of those Ontario physicians who are members of the Society for Clinical Ecology and Environmental Medicine.

With each patient's consent, the medical records of those thought to have an environmental sensitivity disorder would be made available by the practitioner to an independent review panel consisting of at least two physicians with an appropriate breadth of perspective.

(It might be necessary to establish more than one review panel.) The panel would decide whether or not each patient identified by the clinical ecologist met the diagnostic criteria; after collecting information, estimates of the proportion of the population currently affected and the age and sex distribution of those with the condition should be possible. Furthermore, findings might suggest whether there were some common factors amongst those so identified.

> **Recommendation 5:** Research into diagnostic testing procedures should comprise random, controlled clinical trials conducted on the major tests currently used by clinical ecologists in Ontario, i.e., provocative testing, Rinkel technique. In addition, those treatment methods currently used by clinical ecologists should be rigorously tested for efficacy. Treatments to be considered for evaluation include intradermal and sublingual neutralization, the rotary diversified diet and the long-term use of nystatin.

Recommendation 6: The Committee recommends that the research be carried out in a multi-disciplinary investigative and therapeutic environmental unit, established for a defined period of time, for the assessment of environmental hypersensitivity disorders.

We recommend that funding for three years be provided, because this is sufficient for completion of the initial investigations; after three years, it might be reasonable to expect that such an environmental unit would sustain itself through other funding sources, e.g., grants obtained in open competition.

Such a unit is necessary in order to reach a research design agreed on by all of those involved in its development; it should be established at a university-based hospital following advertised requests for proposals. Perhaps it should be established as part of a larger setting that deals generally with environmental illness. Both in-patient and out-patient services should be available.

It is essential that the successful research proposal be designed and managed on an inter-disciplinary model, including both clinical ecologists and those who bring expertise from other fields, e.g., allergy, immunology, toxicology, environmental illness, nutrition and psychiatry.

We have considered which other areas of research might be addressed by the unit and have decided that expectations in this regard should not be rigidly fixed before funding proposals are received. Appendix 16 sets out research recommendations received from researchers in the field. Appendix 8 lists research recommendations received from patients and other interested persons.

III -The Funding of Tests and Treatments

1. Testing procedures

In chapter 6, we reviewed the existing literature on the efficacy of a range of testing procedures, used by those practising clinical ecology. This leads us to the following recommendations:

> **Recommendation 7:** We recommend the following procedures as being of demonstrable validity and worthy of initial or continued financial support:

1) patient histories;

2) routine lab tests

3) nasal inhalation challenges

4) double blind food challenges

5) indoor air quality testing

6) the Rinkel technique (when used for diagnostic purposes)

We have noted the heavy emphasis placed on taking patient histories and feel this is extremely important when dealing with patients whose symptoms are not easily diagnosed and are possibly related to their exposure to the environment. Moreover, we believe that ongoing counselling and monitoring patients' progress are important in implementing measures such as avoidance and dietary change.

> **Recommendation 8:** We recommend that the fee schedule permit an enlargement of the fee to be charged if added time is required to obtain good histories, to counsel a patient on avoidance procedures and to monitor the patient's performance.

Second, we view routine laboratory tests as an appropriate part of the investigation, in order to eliminate other diagnoses.

Third, we find that nasal inhalation challenges are supportable providing that they are done with appropriate care and if they are evaluated in reference to local reactions involving the nasal mucosa or the respiratory tract using equipment that reliably detects nasal responsiveness.

> **Recommendation 9:** We recommend that consideration be given to expanding the nasal inhalation challenges covered in the fee schedule to include a wider variety of compounds and antigens, i.e., formaldehyde, phenols, etc. Consideration should be given to the kind of training physicians should have before undertaking such challenges.

Fourth, while double blind food challenges are difficult and subject to problems of administration and interpretation, in our view they are an appropriate investigative technique following an elimination diet and they should be supported. In clinical practice, an open challenge is adequate if it is measured by objectively determined changes in the patient.

Fifth, as previously stated, we are of the opinion that the measurement of indoor air quality is appropriate and possibly helpful when indicated by the patient's history.

Finally, the Rinkel technique, used as a diagnostic tool, is, in our view, an appropriate procedure.

We find that the following procedures have not been scientifically demonstrated to be effective:

a. The Rinkel Method (end-point titration), when used as a means of establishing a starting dose for neutralization purposes.

b. Serial intradermal provocative testing.

c. Sublingual provocative testing.

The composition of the Committee itself and its role as an ad hoc scientific/technical advisory body might suggest that the recommendation here is an easy one; governments should support through public funding only those medical services or technologies, the effectiveness of which has been demonstrated through the use of optimal methodology. If public financial support is to be limited to procedures of properly demonstrated efficacy, the above tests do not qualify.

J. McKinlay (1981) has said that "once the state acts to support an innovation and social policy is implemented, the career of an innovation can be viewed as having passed the point of no return". We agree that, once supported, a procedure takes on a certain momentum and can be difficult to halt, even when it proves less than promising; a considerable degree of caution in funding would seem to be appropriate.

It is easier to deny support for a procedure that has not yet been formally evaluated when that denial is accompanied by the recommendation that research into the procedure's effectiveness be given high priority; moreover, it is necessary to ask why it is unethical to withhold funding for as-yet unevaluated innovations on certain patients in order to ascertain their effectiveness or potential for harm and yet quite ethical to subject patients to an innovation, despite the absence of reliable evidence concerning its effectiveness or its potential for harm. (McKinlay, 1981) We are not persuaded that an innovation should be endorsed simply because the established practise of medicine has within it a number of standard procedures and recent innovations that fall short of demonstrated effectiveness.

However, we also recognize that, in many cases in the past, the decision to support a medical procedure was made in the absence of demonstrated effectiveness. Moreover, we are certain that similar decisions will be made in the future. To some degree, this is simply a way of accepting the truth that practical, political and ethical factors play a role in this type of decision making.

It also recognizes that there are often difficulties in designing, funding and completing good research and that these can be compounded by the fact that certain theories may not apparently lend themselves to accurate evaluation. In addition, there is the inconsistency of adhering staunchly to strict criteria when considering new tests or treatments when, in the past, these have not been applied to treatments that have long obtained financial support. The problem is even further compounded by the fact that the Committee is dealing with investigations and therapies used by qualified doctors; the medical profession has, for a long time, strongly -- and properly -- defended its right to seek and apply new clinical approaches.

We recognize that the proposed research will take some time to complete and that there are many people who argue that support should be given to these procedures

until the results of that research are known. The most persuasive reason in favour of that argument is the plight of those seriously ill patients who find these tests, and the treatments that flow from them, helpful.

The Committee has attempted to identify factors that may be relevant to determining whether to support a test or treatment that has not been validated scientifically. We have been greatly aided in this effort by Dr. David Roy, a bioethicist who is the Director of the Biomedical Research Institute in Montreal.

While we recognize that the following is an incomplete list, we believe that these are relevant factors.

Factors that support public funding:

a) The intervention is relatively inexpensive or is the least costly of the tests or therapies said to deal with the problem.

b) There is a substantial amount of first evidence of relief or success with the use of the therapy.

c) Use of the intervention is growing.

d) The therapy is said to produce a detectable difference within a fairly short time.

e) The therapy is proximate to the medical model; it uses approaches that are similar to those in current use.

f) The theoretical explanation for its success has promise.

g) There is no evidence of serious harm to patients and there is no evidence of the risk of such harm.

Factors that support exclusion from public funding:

a) A number of studies suggest that it is not effective, i.e., that it is not an effective diagnostic procedure or that there are a large number of false positives and false negatives.

b) There is no substantial anecdotal evidence of relief through the use of the procedure.

c) There is clear evidence of harm to patients or there are extensive secondary effects.

d) There is growing anecdotal testimony that the approach is useless.

e) There is no explanatory model for its effectiveness or the theories espoused have no promise.

f) The procedure is quite remote from accepted medical paradigms.

g) It is not susceptible to a methodologically sound study.

h) It is susceptible to financial exploitation or is too costly in relation to other options.

i) There are alternative, established methods of achieving the same result.

j) The therapy, if supported, cannot be controlled adequately while sound research is undertaken.

We emphasize that, even if consideration of these factors should lead to a positive decision, public funding is justified only while sound research is being undertaken to establish the efficacy of the procedure.

With respect to these three tests, the factors supportive of public funding are generally met. There are few other examples in medicine where so many symptoms are accepted as positives and it is difficult to understand how a slightly lower dose is quickly able to eliminate the symptoms (and this is seen as part of the validation of the testing). There is also some indication of individuals being harmed by the testing,

though we heard of no major problems. If there is any serious harm, it might be found in any cases where major lifestyle changes are made when this is, in fact, unnecessary.

The answer is less clear in relation to the factors that indicate exclusion from funding. There are at least as many studies leading to the conclusion that the tests are ineffective as there are those leading to the opposite conclusion. We have some anecdotal evidence to suggest that the testing was not useful. The possibility of financial exploitation, if full financial support is provided, must be acknowledged, though we do not suggest that we have evidence that this is associated with the present practice here in Ontario.

Given the fact that the decision that has to be made is not based on scientific data, it may be beyond the Committee's ability to do more than simply identify those factors it sees as relevant in making such funding decisions. We have not found this issue an easy one and not all the members of the Committee reached the same conclusion; accordingly, we do not make a specific recommendation on this issue. However, we are agreed that any recommendation to provide funding before the research is done might imply more

than was intended and might create a situation that could not be reversed, regardless of the results of that research. There is much evidence to suggest that available funds would be better spent on establishing a unit within which extensive and methodologically sound research could be undertaken quickly; it could also provide basic supports to those patients who most need assistance, until the validity of one or more of the tests and treatments is established.

> **Recommendation 10:** We recommend that the following procedures not be considered at this time as worthy of financial support as insured health services:
>
> a) Blood tests for Candida.
>
> b) Vega II Machines.
>
> c) Cytotoxic tests.
>
> d) Hair analysis.

We are unable to find any peer-reviewed studies supporting blood tests to diagnose Candida as a cause of environmental hypersensitivity. Therefore, we recommend that these tests not be publicly funded when used for the diagnosis of environmental hypersensitivity disorders.

Vega II machines have not been demonstrated to be effective and the Committee has not been given any clear model that explains the machine's testing capability.

The absence of sound studies demonstrating the effectiveness of cytotoxic tests and the difficulties associated with interpretation that make uniform results between examiners hard to achieve, and the widespread rejection of the test by both proponents and opponents of clinical ecology lead the Committee to the view that this test should not be supported.

With respect to hair analysis, it is the Committee's opinion that this rarely used procedure does not meet either the scientific criteria or the less rigorous criteria we have established for public support of methods of diagnosing environmental hypersensitivity.

2. Treatments

In chapter 6, we reviewed the literature that evaluates the various treatments used by those dealing with environmentally hypersensitive patients. This leads us to the following conclusions:

A - Avoidance and Diets

> **Recommendation 11:** We find that the following treatments have been demonstrated to have validity and should receive initial or continued public financial support:
>
> 1. avoidance;
> 2. the prescription of nutritionally safe diets.

As indicated above, the time involved in taking detailed histories, prescribing avoidance approaches, and monitoring compliance should, in our view, be recognized in the fee schedule. Our recommendation here is affected by recognition of the economic and other factors that make it difficult for all physicians to enlarge the focus of patient care to include prevention and health promotion.

In so recommending, we do not wish to demonstrate unwarranted confidence in the ability of physicians to diagnose and deal with environmental hypersensitivity through the taking of histories, avoidance and the monitoring of symptomatology. As well, we have already expressed our concern about the prescription of difficult, expensive or major lifestyle changes early

in the treatment process on the basis of histories supplemented by tests that have not yet been scientifically validated.

The use of elimination diets is an example of avoidance as a treatment technique. As noted in chapter 7, the more elaborate rotation diet is less justifiable unless absolutely necessary. We are satisfied that physician time spent on the development of diets and the monitoring of patient progress while on them, should be supported. With children in particular, such diets must be nutritionally sound. No presumption of a benefit to the child can obscure the importance of nutrition to the developing child and we are aware of the British report's warning that "inadequate diets abound -- either self-selected or prescribed by those without expert nutritional knowledge -- and they can be harmful". This was confirmed by Dr. Zlotkin (1985) in his discussions with Committee member Dr. Woodward.

Unless it has been previously used and found nutritionally sound, no restrictive diet should be prescribed until it has been reviewed by a qualified dietician. In cases involving adults, the patient must be made aware of any nutritional and other risks associated with the diet. It is important for him or her to be aware that a restrictive diet that reduces

symptoms (for example, one involving the consumption of large quantities of fish) may also involve over-exposure to toxic elements such as mercury.

B - Vitamin and Mineral Supplements; Uncontaminated Food and Water; Nystatin

These procedures have not, as yet, been demonstrated to be scientifically effective in the treatment of environmental hypersensitivity.

We are aware that there are certain risks associated with megavitamin therapy and with long-term ingestion of vitamin and mineral supplements, particularly by children. There is research to suggest that multivitamin overuse can lead to overdoses (Issenman et al 1985). In addition, the definition of organic food is uncertain and many of the foodstuffs sold as organic may fall short of acceptable standards. The difficulties and openendedness involved in treating these as insured health services are obvious.

Nonetheless, we believe that application of the factors we consider relevant to decisions made in the absence of demonstrated effectiveness does support these measures in certain circumstances.

Recommendation 12: The Committee recommends that vitamin and mineral supplements and uncontaminated food and water not be included as insured health services. We do, however, recommend that they be included in health care plans that provide coverage for drugs and other treatments when they have been prescribed by a physician, subject to defined financial limits. Moreover, those who receive social assistance should be eligible for payment through the associated drug or food supplement plans.

The difficulty in making a recommendation regarding nystatin is in the as yet-unproven hypothesis that excess Candida causes environmental hypersensitivity. However, the Committee recommends that nystatin should be financially supported because it is effective as a treatment for Candida infections and is associated with only minimal side effects. However, little is known about the possible effects of long-term use, which suggests caution in employing the drug.

Recommendation 13: The Committee recommends that nystatin should be financially supported when prescribed for proven Candida infections. Long-term use of nystatin should not be supported until it has been demonstrated to be effective and safe.

C - Sublingual Neutralization and Intradermal Neutralization Injections

As already indicated, we have found these treatments to be unproven. The only issue is whether, in our opinion, these are worthy of financial support before research into their effectiveness is complete. In our opinion they are less supportable than are the tests discussed earlier. This finding is based primarily on the absence of an explanatory model that accords with present medical theories. In addition, these procedures, in our opinion, are more susceptible to financial exploitation than are those discussed earlier. We are further concerned, as already noted, about those risks associated with long-term use of extracts without preservatives.

Recommendation 14: We do not recommend that the use of sublingual neutralization

and intradermal neutralization be approved at this time as insured health services.

D - Other Treatments

1. Ketoconazole: Given the possibility of serious side effects associated with long-term use of ketoconazole, its use for Candida should not be supported until more is known about Candida as a cause of environmental hypersensitivity.

2. Transfer factor: The capacity of transfer factor to endow non-immune recipients with cutaneous delayed-type hypersensitivity has been well documented. The practical therapeutic application is dependent on clearly defining the recipient's immunologic deficit. In accordance with this, transfer factor has been used to treat a wide range of disorders, including immunodeficiency diseases, neoplasms and chronic infections. In view of the many opinions concerning the immune status of the person who is diagnosed as environmentally hypersensitive and the lack of evidence to demonstrate the effectiveness of transfer factor in the treatment of environmental hypersensitivity, the Committee cannot, at this time, advocate transfer factor as a treatment for this condition.

3. Intravenous injections of large quantities of

vitamin C (e.g., 10 to 15 grams in a 30-minute period): In our view, the scientific evidence supporting this is weak and it is potentially harmful.

> **Recommendation 15:** We do not recommend that the use of ketoconazole, transfer factor and vitamin C injections be supported at this time as insured health services.

IV - Controls on Tests and Treatments

If OHIP funding is provided for the most widely used procedures (sublingual, intradermal and end-point titration tests and neutralization treatment), whether the decision is made before or after they have been shown to be scientifically effective, we believe controls should be placed on them, as follows:

> **Recommendation 16:** All materials, extracts in particular, should come from third-party sources, provided that such extracts are available, free of preservatives if required. Physicians should not be permitted to develop their own extracts and should not receive any financial benefit from the cost to patients of extracts. An allowance should be paid, if necessary for a

physician's involvement in individual sampling. We recognize that, to be consistent, similar requirements should apply to extracts used by allergists.

Recommendation 17: Both the cost per test and the maximum number of tests per year should be established.

Wherever applicable, all materials should meet standard pharmacological criteria to ensure sterility, absence of toxic effects, appropriate chemical content and biological effectiveness.

V - Information

We have expressed our concern that patients and others have had great difficulty obtaining current, balanced and understandable information, on the issues addressed in this report. In light of this, we have a number of recommendation to make.

a) Patients: We see the environmental unit as having an important role to play in this area. The protocol that seeks proposals for establishment of the unit should make this clear. Although the exact means of achieving this should be determined by those who are part of the new unit, the Committee suggests that

consideration be given to the following:

Recommendation 18: That the environmental unit undertake production of easily understood pamphlets on the more controversial issues related to environmental hypersensitivity; that it consider issuing a version of the Committee's report that is easily understood by members of the public; that it ensure adequate involvement in conferences, meetings, etc. sponsored by various advocacy and information bodies recently established in Ontario; that it offer assistance in ensuring that documents prepared by school boards, public health units, etc. are accurate and balanced.

Recommendation 19: In view of the special role that can be played by the public health system, by medical officers of health and, in particular by public health nurses, we recommend that special efforts be made to educate and prepare public health nurses to function as a source of current information on

> environmental illness in general and on environmental hypersensitivity in particular. These nurses are often the first and most accessible source of information for the patient who is confused by conflicting reports elsewhere. Moreover, this role is consistent with the accent on prevention established in the new Health Protection and Promotion Act.

We considered whether financial and other support should be given to certain of the patient organizations that have been formed in recent years and that deal directly with patients and with others who are personally involved in environmental hypersensitivity. We recognize that there are limits to the informational role that a centrally based unit can play; at a minimum, the unit should keep in close contact with such organizations. More extensive support might be appropriate, particularly of those organizations that are committed to the preparation and dissemination of materials that reflect current knowledge in the field.

b) Physicians: The need to ensure that there is adequate dissemination of information extends as well to the medical profession. This is an essential part

of efforts that will produce dialogue rather than debate in this field. Here, again, the environmental unit, as recommended, can play a major role; if it is formed, that fact will, itself, stimulate interest in the field.

The Committee recognizes and supports recent efforts to increase the amount of information about nutrition offered to medical students in a number of Ontario medical schools and suggests that education in this field be established as a part of the accepted curricula in all medical schools.

> **Recommendation 20:** We recommend that programs of continuing education be developed to provide practitioners with the scientific information, which is increasing, that both supports and questions recent, highly publicized theories and beliefs in the field of environmental hypersensitivity. As an example of why this is needed, we note that there is a general lack of understanding of the possibility that indoor air can be a contributary factor in illness.

We agree with the statement of the British Joint

Committee that examined food intolerance and food aversion and found "a need for diagnostic methods to be carried out and interpreted by strict criteria, especially because placebo responses are common. Potential diagnostic pitfalls should be given more publicity among the medical and dietetic professions and the inadequacy of untested methods should be emphasized".

VI- Patient Supports

The Committee has recognized the serious difficulties many patients face when they seek financial and other social support services and we recommend the following measures in order to alleviate these difficulties:

> **Recommendation 21:** All basic social assistance programs, particularly those administered under the Family Benefits Act, should be reviewed to ensure that they recognize how disabled some of these patients are. They should not be deprived of minimal levels of support because of disagreement within the medical profession regarding the causes of their conditions.

While we have already acknowledged the difficulty of

making decisions regarding public funding of particular tests and treatments, there is no doubt in our minds that those who administer social assistance programs should be receptive to individual patients judged to be disabled, while the precise cause of their disability is being established. The same is true of those trying to determine whether working conditions are contributing to a patient's problems. Furthermore, patients might be helped considerably by being given access to existing homemaker and home care programs, provided that those involved are welltrained with respect to the particular needs of these patients.

> **Recommendation 22:** Because administrators of social assistance programs have wide discretion, the environmental unit should provide expert assistance to appeal bodies such as the Social Assistance Review Board, and to those groups, such as the Community and Social Services Medical Advisory Board, that provide appeal bodies with expert advice.

> **Recommendation 23:** In view of the important role of the individual physician to whom a person seeking social assistance, Worker's Compensation, etc.

is referred, those physicians must have current information about environmental hypersensitivity and must be willing to assess the patient's condition irrespective of any diagnosis attached to it. Here, too, the environmental unit should be involved in selecting such physicians and, in particular cases, should be available to bodies seeking expert advice.

Recommendation 24: Private insurers need to be encouraged to take the same approach in situations where there is a clear disability but some debate as to causation. This is true for those programs that provide payments as replacement for lost income as well as for those that provide assistance for the costs of drugs, extracts and other interventions.

We agree with the statement, made by Wilkins and Hoey, (1985) that "Evidence is accumulating that shows that expanding the role of nurses in varied health care settings is a feasible, effective and economical means

by which to improve compliance with recommendations in preventive health care and health promotion." Here, as in the matter of better dissemination of information, we see a special role for public health nurses attached to public health units. Those nurses well-trained for the task could tell patients about the environmental unit, about social assistance programs and other support services. They could also provide some advice to patients on avoidance techniques; could assist patients to understand the various dietary procedures; could serve as emotional supports, particularly for those persons who are isolated, either physically or psychologically.

Many people recommended that patients be reimbursed for the costs of making a wide range of physical and environmental lifestyle changes on their own or on the advice of their physicians. This included the costs of special diets, housing changes (e.g., a new furnace, change of insulation, new rugs, moving, etc.)

The Committee is of the opinion that, at this time, such measures should not be considered health care costs. That kind of open-ended approach to insured health care service, and such a precedent, coming, as it would, before sound research establishes the circumstances under which they are effective, militate

against accepting these as costs payable by the Ontario Health Insurance Plan. Rather, we have considered these from the standpoint of those unable to afford them.

> **Recommendation 25:** At least a portion of the costs associated with special diets and prescribed vitamin and mineral supplements should be claimable through existing food supplement programs and drug plans. Controls would have to be placed on what would otherwise be an extremely openended level of support. However, we are satisfied that these measures, when prescribed by a physician after careful investigation and diagnosis, should not be denied those who are simply unable to afford them.

We do not recommend that structural changes, moving costs, environmental changes be funded before research is completed that demonstrates whether and when such measures are effective. However, we do feel that some persons are in serious difficulty if they are financially unable to make simple environmental changes (for example, the move from a boarding home where one is vulnerable to secondhand smoke).

Recommendation 26: In cases of genuine financial need, (i.e., people receiving social assistance) rent supplements or discretionary payments should be available for those seeking to make modest environmental changes.

While research is underway and at least until the results of the early investigations are known, the most seriously ill patients could undergo diagnostic testing and treatment at the unit without leaving the province. In addition, because the full cost of such procedures would be borne by research grants, patients would be relieved of some of the financial burden of their treatment while the decision to provide coverage under the provincial health care system is pending.

In the event that the unit is not developed, we do not see how, medically, ethically or politically, future patients in such ill health could be denied the right to financial support for treatment in environmental control units in the United States.

VII- New Programs

We have considered a number of proposals that programs be established for patients diagnosed as environmentally hypersensitive. To some degree, we

have responded to this by recommending that the environmental unit be established that would treat a number of patients on an inpatient and outpatient basis as part of their program of research for a limited period. We recognize that this comes at a time when the emphasis in health care is being placed, quite properly, on measures designed to help people to be cared for in their own homes.

We have recommended that existing homemaker and home care programs develop a capacity to assist those patients who are unable to leave their home environment. More extensive coverage of costs being experienced by patients at home should await the results of the proposed research.

There are some current attempts to establish "half-way" houses for patients unable to remain at home but who do not require hospital-based care or who have left hospital after being inpatients for purposes of investigation and initial treatment. While we feel that government funding or establishment of such programs is premature, we see the environmental unit as playing a role in this matter.

Recommendation 27: We recommend that the environmental unit collaborate with and

assist those involved in the development of special housing programs. Consideration should be given to establishing a nearby apartment, modified for patients who are participants in the environmental unit's research program and are able to reside outside of the unit. The unit might also assist some hospitals in making changes to one or two rooms so that patients diagnosed as environmentally hypersensitive would feel less concerned about being hospitalized when they become seriously ill and require emergency admission.

VIII - Inter-Disciplinary Dialogue

We have emphasized the need to develop approaches that minimize destructive debate and encourage constructive dialogue on the part of all those involved in this field. An interdisciplinary environmental unit, simply because it is interdisciplinary, is an essential step in producing that dialogue. In attempting to find other ways of speeding this process of useful discussion, we make the following recommendations:

Recommendation 28: That, in the near future, an interdisciplinary conference be held to discuss this report and its recommendations and that conferences of this type should be held regularly as part of the environmental unit's vital educational role.

Recommendation 29: That the Ontario Medical Association consider establishing an environmental health subsection to bring together practitioners interested in this field.

"Medical education gives the career of many innovations an early and influential boost and creates a formidable impediment to the removal of those that eventually prove worthless or dangerous. All professionals are reluctant to alter practices that they have been taught. Innovations gain added legitimacy once they find their way into the medical curriculum and receive endorsement from influential educators and distinguished medical institutions". (McKinlay, 1981) That being so, it is important to introduce teaching programs that make students aware of the growing importance of the environment in the diagnosis of illness and, at the same time, ensure that

the present, uncertain "state of the art" is accurately described.

> **Recommendation 30:** The Committee recommends that the environmental unit develop recommendations for curriculum review committees regarding possible curriculum changes in medical schools to ensure that issues relating to environmental illness are part of medical education.

Environmental hypersensitivity involves some key human issues: the fragility of the global environment, the fragility of the personal environment of some particularly vulnerable human beings and, in the possible interplay of psyche and soma, the delicacy of each person's inner environment. It highlights both the possibilities of science and its limitations. The Committee trusts that the Ministry will find the discussion and recommendations contained in this report to be of use as it deals with this complex matter.

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