

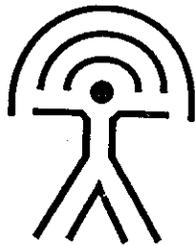
# ENVIRONMENTAL HEALTH IN HOSPITAL

*A Practical Guide for Hospital Staff*

## Part I: POLLUTION PREVENTION

L.M. Marshall M.D. F.A.A.E.M. F.R.S.M.  
J.G. MacLennan B.A. M.D. F.A.C.A. F.A.A.E.M.

Canadian Society for Environmental Medicine



## **The Canadian Society for Environmental Medicine**

is an incorporated (1985) non-profit foundation dedicated to advancing human health and well-being through:

1. study of the close relationships between people and their environments and important health effects that may result from these interactions;
2. promotion of environmental stewardship to prevent pollution-related illnesses, in collaboration with other similarly motivated organizations;
3. improvement in access to a comprehensive range of medical and social services for individuals adversely affected by environmental exposures;
4. education of the public and health care professionals about environment-related illnesses; and
5. stimulation of, and involvement in, environmental health research.

### **Environmental Health in Hospital**

#### ***A Practical Guide for Hospital Staff***

#### **Part I: Pollution Prevention**

#### **(Part II: Environment-sensitive Care)**

This guide is based on current knowledge and parts of it may be changed as new research findings emerge with regard to the effects of environment on health and effective prevention and remediation strategies. Suggestions are offered which may assist refinement of hospital policies that promote and protect patient and staff health, and optimize care for individual patients with environment-sensitive illnesses. It is acknowledged that the available evidence upon which these suggestions are based varies in quantity, type, and quality.

Some suggestions in this guide may not be suitable for some hospitals.

This publication was developed as a collaborative process over several years, and thus in total may not necessarily represent the views of individual contributors.

The Canadian Society for Environmental Medicine assumes no liability for any damage, injury or expense that may be incurred as a result of this publication.

c 2001 Revised Edition

The Canadian Society for Environmental Medicine

P.O. Box 62058, Convent Glen Postal Outlet

Orleans, Ontario, K1C 7H8

Parts of this publication may be re-printed for intra-hospital and educational use provided that appropriate acknowledgement is given to the Canadian Society for Environmental Medicine. No other use, in whole or in part, is permitted without written permission from the Canadian Society for Environmental Medicine.

## **Environmental Health in Hospital**

### **Acknowledgements**

In the 1960's, Dr. J.G. Maclennan, founding member of the Ontario Allergy Society (1958), the American Academy of Environmental Medicine (1965), the Allergy and Environmental Health Association of Canada (1969), and the Canadian Society for Environmental Medicine (1985) originated hospital admission information sheets to assist his allergic and chemically sensitive patients and his medical colleagues.

These information sheets were well-received and formed the basis for the first edition of *Environmental Health in Hospital*, compiled by Dr. L. M. Marshall in 1993 with the input of Dr. Maclennan and other CSEM colleagues. This Guide has been annually updated and expanded as a result of ongoing literature review and feedback from experienced physicians, nurses, other health care providers, and consumers.

The Canadian Society for Environmental Medicine wishes to express appreciation to all who gave ideas to develop this guide, who reviewed it and suggested improvements, and who informally tested it in various sized hospitals during their own or their loved ones' admissions.

Contributions from the following are particularly acknowledged:

Canadian Society for Environmental Medicine Members Drs. Jennifer Armstrong, Jeffrey Balon, Patricia Beresford, Philip Bright, the late Bruce Elliott, Elizabeth Gold, Jozef Krop, Ross Mickelson, John Molot, Marian Zazula.

Allergy and Environmental Health Association Members Elizabeth Hare, Leslirae Rotor, Katherine Auslander, Susan Beck, Chris Brown, Jacqueline Cyr, Kathy Dickinson, Estelle Drolet, Margaret Kelly, Ed Lowans, Shirley Magee, John and Kitty Nelms.

American Academy of Environmental Medicine Members Drs. Gerald Ross and Francis J. Waickman.

Environmental Hypersensitivity Association of Ontario Members Wanda Wilson, Virginia Anderson R.N., Eleanor Johnston, and the late Darlene Koski.

Pollution Probe Environmental Health Programs Director Ian Morton.

Environmental Illness Society of Canada President Judith Spence R.N.

Environmental Health Center, Dallas, Director Dr. William Rea.

Environmental Health Clinic, Women's College Campus, Sunnybrook and Women's College Health Sciences Centre (SWCHSC), Toronto, Drs. Alison Bested, Riina Bray, Frank Foley, Program Coordinator Valerie Lawler, Education Coordinator Nancy Bradshaw.

Women's College Campus, SWCHSC, Toronto, Peri-operative Educator Cathy Isman.

Nova Scotia Environmental Health Centre, Halifax, Director Dr. Roy Fox.

Nova Scotia Environmental Health Centre Steering Committee Member Linda Hilchie.

**Environmental Health in Hospital** *Canadian Society for Environmental Medicine*  
**A Practical Guide for Hospital Staff Part I: Pollution Prevention**

**Table of Contents**

<b>Using this guide</b>	<b>1</b>
<b>Introduction</b>	<b>1-2</b>
<b>Key Suggestions Summary</b>	<b>3-4</b>
<b>Administrative Services</b>	<b>5-7</b>
Suggestions Summary	7
<b>Public Relations</b>	<b>8</b>
Suggestions Summary	9
<b>Engineering and Maintenance</b>	<b>10-11</b>
Suggestions Summary	12
<b>Housekeeping and Waste Management</b>	<b>13-14</b>
Suggestions Summary	14
<b>Laundry</b>	<b>15</b>
Suggestions Summary	15
<b>Purchasing and Central Supply</b>	<b>16-17</b>
Suggestions Summary	17
<b>References</b>	<b>18-20</b>

**Environmental Health in Hospital** *Canadian Society for Environmental Medicine*  
**A Practical Guide for Hospital Staff Part I: Pollution Prevention**

**Using this guide:**

There are two sections, Part I centred around providing a supportive environment for optimum patient care, and Part II focused on enhancing staff environmental awareness to assist in the provision of optimum care, particularly for those with environment-sensitive illnesses.

An overall summary of suggestions for each part is provided near the beginning of Parts I and II. A summary of suggestions pertaining to each department may be found at the end of the chapter for that department, and may be photocopied and posted on department bulletin boards. The complete guides may be kept in each department for ready reference and/or can be obtained from the designated Environmental Health in Hospital Coordinator(s)(see Administrative Services).

**PART I: POLLUTION PREVENTION**

**Introduction:**

Over the last two decades, many countries, including Canada, have noted an increase in childhood asthma (Weiss et al, 1993) that may be related to ground level ozone and fine particles (Bates, 1995; Burnett et al, 1994). Significant associations have been found between respiratory (Burnett et al, 1994) and cardiac (Burnett et al, 1995) admissions to Ontario hospitals and ozone-sulphate air pollution levels, with even very low levels of pollutants increasing admissions (Burnett et al, 1994; Ontario Medical Association, 1998). Association has also been noted between ozone levels and asthma emergency department visits in St. John, New Brunswick (Stieb et al, 1996).

Not only is outdoor air pollution a concern, but also indoor air contamination, because, on average, Canadians spend 90% of the time indoors (Canada Mortgage and Housing Corporation, 1993; Pollution Probe, Canadian Institute of Child Health, 1998). The introduction of energy conservation measures in the 1970's such as 'tightening' buildings and decreasing ventilation rates, in combination with the post-World War II increased indoor use of offgasing synthetic chemical products, have heightened contemporary concern (Kendall, 1994). Canadians are daily exposed to varying quantities of multiple substances in indoor air which are known to impact on human health- for example dust mites, moulds, metals, tobacco smoke, pesticides, and volatile organic compounds such as perfumed products, paints, solvents, and dry cleaning fluid.

It is unknown what percentage of the Canadian population develops symptoms in response to low level exposures to such contaminants as prevalence studies have not yet been mounted in Canada. A National Academy of Sciences workshop suggested that 15 % of U. S. citizens have "increased allergic sensitivity" to these chemicals, "placing them at increased risk of disease (National Research Council, 1987). Statewide telephone surveys of randomly selected adults revealed 6% of adults in California and 2% in New Mexico had been diagnosed with Multiple Chemical Sensitivity or Environmental Illness, and 16% in both states reported they were

**Environmental Health in Hospital** *Canadian Society for Environmental Medicine*  
***A Practical Guide for Hospital Staff Part I: Pollution Prevention***

"unusually sensitive" to environmental chemicals (Kreutzer et al, 1999). One third of randomly selected adults in different states indicated they were "especially sensitive" to everyday chemicals (Meggs et al, 1996).

Since the introduction, in the 1980's, of universal precautions against the transmission of infectious diseases through contact with bodily fluids, there has been a marked increase in the use of latex gloves, and apparently some breaches of quality management in glove manufacturing processes. Possibly as a result of this combination of circumstances, there have been increased reports of latex-linked symptoms, some life-threatening (Doctor, 1998; Isman and Ryzynski, 1997; Hunt et al, 1996).

As evidence accumulates for adverse health effects of various environmental exposures, hospitals are being compelled, on moral, legal, and cost containment grounds, to anticipate and deal with the needs of patients and staff with environment-sensitive illnesses. Strategies designed to protect the most vulnerable, especially with respect to indoor air quality, afford the additional advantage of providing cleaner air for all patients and staff, including those with unrecognized allergies and other sensitivities.

Savings from a hospital pollution prevention program result from decreased lengths of stay, increased staff productivity and less absenteeism, protection of facilities and equipment, and reduced waste management costs (Woods, 1989).

Some hospitals may already have some aspects of an environmental program in place, and it is hoped the ideas in this guide will be useful to augment previous efforts.

**Environmental Health in Hospital** *Canadian Society for Environmental Medicine*  
**A Practical Guide for Hospital Staff Part I: Pollution Prevention**

**Key Suggestions Summary:**

**Administrative Services:**

- Designate Environmental Health in Hospital Coordinator(s), supported by a Committee composed of a designated staff member from each relevant department. Their mandate is to develop, coordinate, maintain, and evaluate the Environmental Health in Hospital Program, including Pollution Prevention and Environment-sensitive Care components. The Pollution Prevention portion includes latex-safe, scent- and smoke-free environment, integrated pest management, as well as environmentally-aware purchasing and materials management.
- Ask employees involved in direct patient contact or who may touch patient linens or supplies, to wear unscented toiletries and cosmetics.
- Train designated admissions staff to facilitate admission arrangements for patients with environment-sensitive illnesses, in conjunction with admitting physicians.
- Designate a private 'clean room' on medical, psychiatric, and surgical wards, and in emergency, outpatients, and day surgery, equipped with Sensitivity and Latex Allergy Kits.
- Use integrated pest management instead of toxic pesticides and herbicides.
- Purchase the products which are likely to have the least immediate and long-term adverse health and environmental impacts (e.g. stop purchasing mercury-containing equipment wherever possible and substitute existing equipment as quickly as possible)
- Incorporate reduction, reuse, and recycling principles into waste management practices.

**Public Relations:**

- Collaborate with the Environmental Health in Hospital Coordinator(s) to develop in-house communications materials such as policies and employee information/reminders, and assist department heads with setting up program orientation sessions.
- Develop external communication tools such as logos, fact sheets, newsletters, and telephone scripts.

**Engineering and Maintenance:**

- Minimize patient exposure to outdoor contaminants by careful location of 'clean rooms' away from sources of known air pollutants.
- Use alternative pest management strategies to eliminate/minimize exposure to toxic pesticides.
- Utilize safe renovation practices including application of less sensitizing, irritant, and toxic materials, containment of volatiles, careful waste disposal, and provision of protective equipment for employees.
- Maintain cleanliness and operating efficiency of mechanical ventilation and cooling systems.
- Repair any roof or plumbing leaks within 48 hours, removing wet materials that could act as substrates for moulds.
- Maintain any room air filtration devices (HEPA and charcoal), and shower head filters (particulate and charcoal).

**Environmental Health in Hospital** *Canadian Society for Environmental Medicine*  
**A Practical Guide for Hospital Staff Part I: Pollution Prevention**

**Housekeeping and Waste Management:**

- Ask employees to wear unscented toiletries and cosmetics.
- Identify and use cleaning products which are least likely to diminish indoor air quality, or have long-term adverse environmental impact, and yet are effective. Generally, the safest are unscented, biodegradable, non-aerosol products which, according to WHMIS sheets, do not require personal protective equipment to dilute or apply.
- After cleaning, apply disinfectant (hydrogen peroxide appears least noxious) only in areas needed and in the most dilute form that is effective. Use of quaternary ammonium and chlorinated compounds may be minimized by adding boric acid aqueous.
- Use designated cloths and mops for 'clean rooms'.
- Clean portable humidifiers and dehumidifiers every 48 hours to prevent mould growth.
- Identify and use products with low packaging. Segregate waste to maximize recycling.

**Laundry:**

- Ask employees not to wear scented products which could be transferred to linens.
- After regulation hospital laundering, rinse linens for patients with environment-sensitive illnesses three times in plain water, and store separately, possibly in designated 'clean rooms'.

**Purchasing and Central Supply:**

- Purchase the least toxic cleaning, laundry, maintenance, paper, and patient care products with maximum recycling and minimum incineration potential.
- Ask employees not to wear scented products that could be transferred to hospital supplies.
- Have glass-bottled IV fluids available, as well as oxygen, ceramic masks, and hard tubing. Also make available latex-free breathing circuits, gloves, IV set-ups, and bandages.
- Compile Sensitivity Kits and Latex Allergy Kits which staff may order for patients with environment-sensitive illnesses, and which may remain with these patients throughout their hospital stays.

**Environmental Health in Hospital** *Canadian Society for Environmental Medicine*  
**A Practical Guide for Hospital Staff Part I: Pollution Prevention**

## **Administrative Services**

**Program Development-** Some hospitals may already have some aspects of Pollution Prevention and Environment-sensitive Care programs in place. Others will have found it daunting to develop coordinated programs throughout their facilities. Contributors have indicated it is helpful to designate a staff member, usually the In-service Education, Occupational Health, or Infection Control Coordinator, to be responsible for development, coordination, maintenance, and evaluation of the Environmental Health in Hospital Program in collaboration with an 'Environmental Health in Hospital Committee'. Alternatively, one staff member may be made responsible for the Pollution Prevention portion of the program, and another for the Environment-sensitive Care portion. These two staff would then collaborate to coordinate the entire Environmental Health in Hospital Program.

The Pollution Prevention portion of the program includes the following policies: smoke and scent-free environment (IWK Children's Hospital, 1995), latex-safe facility (Isman and Ryzynski, 1997; Hunt et al, 1996), integrated pest management (Rubin, 1989; World Wildlife Fund, 1998; Martin, Ontario College of Family Physicians, 1998), and environmentally aware materials management (Center for Health, Environment and Justice, 1998).

Development would include review of references by the designated Environmental Health in Hospital Coordinator(s), and seeking input from hospital staff on policy formation, in-service education and implementation issues. While staff input is being sought, the Coordinator may be able to identify an employee in each relevant department who seems particularly interested in the program. If the Department Head agrees, the Coordinator can recommend to Administration that this employee be designated as the department representative on the Environmental Health in Hospital Committee, sometimes dubbed 'the green team'. Once the Committee is assembled, the Coordinator will have a resource for ongoing advice as policy statements and communication materials are prepared (Isman and Ryzynski, 1997; IWK Children's Hospital, 1995).

Coordination would involve networking with employees assigned day-to-day management responsibility in departments such as: Administration, Public Relations, Engineering and Maintenance, Housekeeping and Waste Management, Purchasing and Central Supply, Laundry, Food Services, Laboratory, Radiology, Physio and Occupational Therapy, Nursing, Medicine, Surgery, Emergency, Anaesthesia and Respiratory Care.

Maintenance would include educating new employees about the program, periodically updating staff, encouraging the gift shop to refrain from selling scented products and latex balloons, and meeting on request with inpatients who have environment-sensitive illnesses.

Evaluation could include patient and staff satisfaction surveys, as well as tracking of program costs versus length of stay reductions, improvements in employee attendance and productivity measures, facilities and equipment maintenance costs, and waste management costs.

**Environmental Health in Hospital** *Canadian Society for Environmental Medicine*  
**A Practical Guide for Hospital Staff Part I: Pollution Prevention**

**Admission Planning-** Train designated admissions staff to be responsible, in conjunction with the admitting physician, for facilitating admission arrangements for patients with environment-sensitive illnesses. Duties would include answering telephone enquiries, mailing out information about hospital policies for dealing with sensitivities, and arranging preadmission or day of admission meetings to make appropriate preparations. Such meetings allow the patient, accompanied by a relative or friend, to outline special needs to the pertinent hospital personnel who will be responsible for his/her care (e.g. nursing supervisor(s), head housekeeper, dietitian). Such support from staff can do much to relieve apprehensions, and the patient and family can play an important role in supplying necessary food or equipment.

**'Clean Room'-** A private room is a medical necessity if it is not possible to protect the patient's space from noxious cleaning/maintenance products, latex-containing supplies, or roommates' toiletries, visitors and flowers. Being a medical necessity, a private room should not be charged to the patient.

Ideally, certain rooms, for example infection control rooms, can be designated and maintained as 'clean rooms' on medical, psychiatric, and surgical wards. It is important to locate 'clean rooms' away from high traffic areas, building exhaust vents, parking lots, truck delivery areas, incinerators, laundry rooms, laboratories, and areas recently or regularly sprayed with pesticides. New buildings or recently renovated rooms usually have heightened levels of volatile organic compounds (VOCs) from offgassing building materials or paints, and should be avoided for sensitive patients. Synthetic materials in new furnishings also offgas VOCs whereas metal or non-preserved hardwood does not.

**Emergency, Outpatients, Day Surgery Arrangements-** Designate and prepare a 'clean room' in each of these departments (see Engineering and Maintenance, Housekeeping and Waste Management sections). Maintain a Sensitivity Kit and a Latex Allergy Kit in each of these rooms (see Purchasing and Central Supply section). The attending physician/surgeon and/or the intake nurse is responsible for identifying those with environment-sensitive illnesses or a past history of adverse exposure reactions, and notifying the department about the need for the 'clean room'.

**Pest Management -** Since pesticides and herbicides are toxic compounds (Colborn et al, 1993), alternative pest management strategies, which avoid the use of such agents altogether, are preferable (Rubin, 1989; World Wildlife Fund, 1998; Martin, Ontario College of Family Physicians, 1998), for example, aeration of lawns and use of diatomaceous earth. In the occasional circumstance when pesticides or herbicides are deemed necessary, maintenance should notify the Environmental Health in Hospital Coordinator(s) about the planned date of application. The coordinator(s) can then notify the relevant departments so that arrangements can be made to relocate vulnerable patients and staff for a few days to allow for dissipation or biotransformation of these toxins.

**Environmental Health in Hospital** *Canadian Society for Environmental Medicine*  
**A Practical Guide for Hospital Staff Part I: Pollution Prevention**

**Materials Management-** It is important to examine the products purchased for the hospital, and waste management practices with respect to immediate and long-term impact on human health (Center for Health, Environment and Justice, 1998; Working Group, Toronto Board of Education, 1997). For example, alternatives to many mercury, polyvinyl chloride, and perfume-containing products are available and may be requested from suppliers, often at no appreciable cost increase, sometimes even with cost savings. Waste management strategies can incorporate or improve reduction, reuse, and recycling principles (Center for Health, Environment and Justice, 1998).

**Suggestions Summary, Administrative Services:**

- Designate Environmental Health in Hospital Coordinator(s), supported by a Committee composed of a designated staff member from each relevant department. Their mandate is to develop, coordinate, maintain, and evaluate the Environmental Health in Hospital Program, including Pollution Prevention and Environment-sensitive Care components. The Pollution Prevention portion includes latex-safe, scent- and smoke-free environment, integrated pest management, and environmentally-aware materials management.
- Ask employees involved in direct patient contact, or who may touch patient linens or supplies, to wear unscented toiletries and cosmetics.
- Train designated admissions staff to facilitate admission arrangements for patients with environment-sensitive illnesses, in conjunction with admitting physicians.
- Designate a private 'clean room' on medical, psychiatric, and surgical wards, and in emergency, outpatients, and day surgery, equipped with Sensitivity and Latex Allergy Kits.
- Use integrated pest management instead of toxic pesticides and herbicides.
- Purchase the products which are likely to have the least immediate and long-term adverse health and environmental impacts.
- Incorporate reduction, reuse, and recycling principles into waste management practices.

**Environmental Health in Hospital** *Canadian Society for Environmental Medicine*  
**A Practical Guide for Hospital Staff Part I: Pollution Prevention**

## **Public Relations**

**Background-**Because of their known toxic effects (Colborn et al, 1993; World Wildlife Fund, 1998; Martin, Ontario College of Family Physicians, 1998), several communities in North America have banned the use of pesticides for cosmetic purposes. Concern about adverse health effects of fragrances (Cooke, 1994; Kumar et al, 1995; Anderson and Anderson, 1998; Millqvist et al, 1999) has led some hospitals such as IWK Children's (Halifax) to develop guidelines and promotional material to implement a scent-free policy (IWK Children's Hospital, 1995). Popular press reports have indicated that some government departments, some schools, some churches, and the State of California have instituted fragrance-free zones. Many hospitals, including Women's College Hospital (Toronto) have instituted a latex allergy policy and protocol as part of their Patient Care Manual (Isman and Ryzynski, 1997), which includes a hospital-wide ban of latex rubber balloons. Most hospitals have already banned smoking.

**In House Communications-** In collaboration with the Environmental Health in Hospital Coordinator(s), develop employee information/reminders (fact sheet, newsletter, posters, buttons, telephone script) regarding the 'scent-free', 'smoke-free', and 'latex-safe' environment, as well as policies on integrated pest management and environmentally-aware materials management.

Assist department heads to explain the need for these policies in program orientation sessions for all current staff.

Train staff how and when to courteously and sensitively approach visitors whose fragrance is having a negative effect on those around them.

Arrange for information and training support for maintenance staff regarding pest management and for housekeeping re environmentally aware materials management.

Facilitate orientation of all new employees on an ongoing basis.

**External Communications-** Develop scent-free, smoke-free, and latex-safe environment logos, brochures, posters, fact sheets, promotional displays, external advertisements, notices in the hospital's external publications (annual report and newsletters), notices in other external newsletters and local newspapers, notice to physicians, and notice to all patients in pre-admission packages.

Facilitate training of staff to use a prepared telephone script alerting prospective patients and visitors to the hospital's scent-free, smoke-free, and latex-safe policies.

**Environmental Health in Hospital** *Canadian Society for Environmental Medicine*  
***A Practical Guide for Hospital Staff Part I: Pollution Prevention***

**Recommendations Summary, Public Relations:**

- Collaborate with the Environmental Health in Hospital Coordinator(s) to develop in-house communications materials such as policies and employee information/reminders, and assist department heads with setting up program orientation sessions.
- Develop external communication tools such as logos, fact sheets, newsletters, and telephone scripts.

**Environmental Health in Hospital** *Canadian Society for Environmental Medicine*  
**A Practical Guide for Hospital Staff Part I: Pollution Prevention**

## **Engineering and Maintenance**

**Overview-** Attention to building design, materials, and maintenance to minimize pollutants may not only be protective of occupants' health, but also may result in cost savings and enhanced systems and staff productivity (Woods, 1989).

**'Clean Room' location-** It is important to ensure that 'clean rooms' are located away from high traffic areas, exhaust vents, parking lots, truck delivery areas, incinerators, laundry rooms, laboratories, copiers, and areas which have recently been sprayed with pesticides.

**Renovations-** New buildings or recently renovated rooms usually have heightened levels of particles from construction dust and volatile organic compounds (VOC's) from off-gasing building materials or paints. Since these can be health hazards for vulnerable patients, it is important to collaborate with the designated Environmental Health in Hospital Coordinator and designated employee representative in Administration when building/renovating must take place. Then, necessary adjustments may be made to accommodate the needs of persons with allergies and other sensitivities. Before undertaking renovations which may release particulates, biologicals, heavy metals or VOC's into the air, consult an environmental engineer and/or Canada Mortgage and Housing Corporation regarding safe renovation practices including use of less sensitizing, irritant, and toxic materials (Canada Mortgage and Housing Corporation, 1994, 1998), dispersal/disposal of dusts, fumes, and wastes, and protective equipment for employees.

**Paint-** When a designated 'clean room' needs painting, use a nontoxic solvent-free paint (Woods, 1989), and thoroughly ventilate the room before occupancy. Low odour latex paint (e.g. Glidden Lifemaster 2000) contains polymerized hydrocarbons derived from petrochemicals, and does not contain latex rubber proteins. Wallpaper is generally best avoided because the paper or the glue can off-gas volatile organic compounds, and, if it becomes wet, it may act as a substrate for growth of moulds and fungi (Federal-Provincial Committee on Environmental and Occupational Health, 1995).

**Flooring-** Off-gasing of volatile organic compounds will be minimized if the floor of the sensitive patient's room is smooth, hard, more than six months old, and not freshly waxed (Canada Mortgage and Housing Corporation, 1993). Awareness may need to be raised that shiny floors do not equate with clean floors.

**Ventilation/cooling System-** Ventilation ductwork should be inspected regularly (Quinlan et al, 1989) and cleaned to remove dust and other debris. Chemicals should not be added after duct cleaning to prevent mould growth or stickiness of the ducts because they will be distributed through the hospital via the ventilation system. Mechanical systems should be checked to ensure continuous delivery of an adequate supply of fresh air ( United States Environmental Protection Agency, 1990; Stenberg et al, 1994), especially to 'clean rooms'. Separate ventilation/exhaust systems are important for the laboratory and operating room. Copy machines should be vented to

**Environmental Health in Hospital** *Canadian Society for Environmental Medicine*  
**A Guide for Hospital Staff Part I: Pollution Prevention**

the outdoors, as they pose known risk for sick building syndrome (Stenberg et al, 1994). Cooling systems should be well maintained to prevent contamination and aerosolization of organisms (Stenberg et al, 1994; Dennis, 1990; American Lung Association et al, 6607J).

**Roof-** Investigate any reports of leaks immediately, and repair swiftly, removing any wetted cellulose materials such as ceiling tiles or insulation, as these form substrates for the rapid (within 48 hours) propagation of moulds and fungi (Federal-Provincial Committee on Environmental and Occupational Health, 1995).

**Windows** - Given the imperfections of ventilation/cooling systems, and the possibilities for inadvertent exposures, windows should preferably open to allow extra intake of fresh air and escape of accumulated volatiles. If windows are sealed, or must be kept closed because of pollens or air pollution, it is important that an air purification system be available in the 'clean room'. Such a device should contain a HEPA (High Efficiency Particulate Arresting) filter (United States Environmental Protection Agency, 1990), and a charcoal adsorbant (empirically, coconut or peat charcoal seem to be best tolerated by patients with environment-sensitive illnesses). Replacement of filters is necessary in relation to the manufacturer's directions and hours of use.

**Plumbing-** Investigate any reports of leaks promptly, and repair them within 48 hours, removing any wet material that could act as a mould substrate (Federal-Provincial Committee on Environmental and Occupational Health, June, 1995). Wipe the area around the leak with Borax in water.

Water filtration devices (see Food Services section, Part II, Environment-sensitive Care) must be maintained on a regular basis according to the manufacturer's recommendations.

**Shower** - A particulate and charcoal filter installed on the shower head prevents exposure to both biological and chemical aerosols produced during showering. Chemical water contaminants such as chlorine or organochlorine compounds cannot only be inhaled, but also can be absorbed through the skin. Filter replacement needs to be scheduled according to the manufacturer's directions and in relation to hours of use.

**Pesticides/herbicides-** Since pesticides and herbicides are toxic compounds (Colborn et al, 1993; Martin, Ontario College of Family Physicians, 1998), alternative pest management strategies, which avoid the use of such agents altogether, are preferable (Rubin, 1989; World Wildlife Fund, 1998; Martin, Ontario College of Family Physicians, 1998), for example aeration of the lawn, and use of diatomaceous earth. In the occasional circumstance when pesticides or herbicides are deemed necessary, maintenance should notify the Environmental Health in Hospital Coordinator about the planned date of application. The Coordinator can then notify the relevant departments, so that vulnerable patients and staff can be re-located for a few days to allow for dissipation or bio-transformation of these toxins.

**Environmental Health in Hospital** *Canadian Society for Environmental Medicine*  
*A Practical Guide for Hospital Staff Part I: Pollution Prevention*

**Suggestions Summary, Engineering and Maintenance:**

- Minimize patient exposure to outdoor contaminants by careful location of 'clean rooms' away from sources of known air pollutants.
- Use alternative pest management strategies to eliminate exposure to toxic pesticides.
- Utilize safe renovation practices including application of less sensitizing, irritant, and toxic materials, containment of volatiles, careful waste disposal, and provision of protective equipment for employees.
- Maintain cleanliness and operating efficiency of mechanical ventilation and cooling systems.
- Repair any roof or plumbing leaks within 48 hours, removing wet materials that could act as substrates for moulds.
- Maintain any room air filtration devices (HEPA and charcoal), and shower head filters (particulate and charcoal).

## **Housekeeping and Waste Management**

**No Scents Personnel Policy-** Fragrances add unnecessarily to the load of airborne chemicals indoors, and can provoke serious health problems in some people (Cooke, 1994, Millqvist, 1999). Therefore, at work, housekeeping staff are asked not to wear any perfume, cologne, or aftershave, or scented hairspray, deodorant, lotion or cream. Fabric softener on clothes can also be troublesome, and vinegar and washing soda in the final rinse water is a useful alternative.

**Cleaning Products-** Since there are so many cleaning products containing widely varying ingredients in differing concentrations and combinations, assessment of which products offer the least risk of adverse health effects is a very inexact science. In response to health concerns related to cleaning products in schools, a Working Group, with the support of the Toronto Board of Education, has developed a useful tool for evaluating products based on human health, environmental impact, and indoor air quality (Working Group, Toronto Board of Education, 1997). This tool asks a series of questions about each cleaning product and scores the answers as red (unacceptable), yellow (caution) or green (acceptable). Total scores for several properties important to human health allow identification of the products least likely to have adverse health effects. The head of the Housekeeping Department, along with the designated department Environmental Health in Hospital employee may then use this product assessment matrix to select the safest products and then use the Performance Effectiveness Form to compare these lower risk products with those in current use. In general, unscented, biodegradable, non-aerosol products, which do not require personal protective equipment for dilution and application, are the safest.

Unscented soap is needed for the washroom hand soap dispensers throughout the hospital.

Health Canada has developed guidelines for cleaning and disinfection, which emphasize the necessity for "removal of all foreign material, e.g. dust, soil, organic material such as blood, secretions, excretions and microorganisms...accomplished by water, detergents and mechanical action, and must precede disinfection" (Health Canada, 1998). Laundering of cleaning cloths after use, without putting them back into the cleaning solution, helps ensure removal of organic substrates which can harbour pathogens.

Staff need to be trained to use the least amount of the product to do the job (also a useful cost-saving measure), to mix products safely to the most dilute solution that is effective, and to use protective equipment as necessary.

All cleaning products need to be labelled according to the Workplace Hazardous Materials Information System (WHMIS) and stored tightly capped (Working Group, Toronto Board of Education, 1997). Manufacturers must supply Material Safety Data Sheets (MSDS).

**Disinfectants-** After cleaning, only unscented, well-tolerated disinfectant, such as hydrogen peroxide (Health Canada, 1998), should be used to wash walls and furniture of 'clean rooms' and

**Environmental Health in Hospital** *Canadian Society for Environmental Medicine*  
**A Practical Guide for Hospital Staff Part I: Pollution Prevention**

the operating room prior to admission of a sensitive patient. More concentrated hydrogen peroxide solution with longer contact time may be necessary in areas, such as Intensive Care or Operating Room, where a higher degree of confidence about eradication of organisms is needed (Health Canada, 1998). Boric acid aqueous solution, which is non-odorous, is active against enterobacteria (Adarchenko et al, 1990), and pseudomonas aeruginosa (Adarchenko et al, 1989). In combination with quaternary ammonium compounds, it is active against fungi (Szymanski and Wazny, 1995) and, with chlorine, against poliovirus (Berg et al, 1989). The use of boric acid allows reduction in the required amounts of quaternary ammonium and chlorine which are more volatile, and are often less tolerated. 3% boric acid (Borax) in water (Borrelly et al, 1991) is also useful to ensure there is no fungal contamination of the 'clean room' bathroom, prior to a sensitive patient's admission. Thereafter use only baking soda and water or tolerated cleaning products cleared or supplied by the patient.

Detach bathroom deodorizers and scrub deodorant residues off tile and mortar. Baking soda absorbs odours.

**Cleaning Tips-** Clean the sensitive patient's room first each am. Damp-dust using a clean cloth supplied by the hospital laundry service (rinsed three times in plain water after regulation hospital laundering). Damp-mop using a designated mop moistened only with water. Clean portable humidifiers/dehumidifiers every 48 hours to prevent mould growth. Avoid wax stripping/re-application in that room or neighbouring areas to reduce VOC emissions and maintenance costs.

**Waste Management-** Housekeeping staff are in a unique position to help identify waste which may be prevented by decreasing packaging. They also can point out the waste segregation practices which maximize re-cycling, and minimize the need for incineration, which releases toxins into the atmosphere (Center for Health, Environment and Justice, 1998). The designated representative can contribute the department's ideas to the Environmental Health in Hospital Committee.

**Suggestions Summary, Housekeeping and Waste Management:**

- Ask employees to wear unscented toiletries and cosmetics.
- Identify and use cleaning products which are least likely to diminish indoor air quality, or have long-term adverse environmental impact, and yet are effective. Generally, the safest are unscented, biodegradable, non-aerosol products which, according to WHMIS sheets, do not require personal protective equipment to dilute or apply.
- After cleaning, apply disinfectant (hydrogen peroxide appears least noxious) only in areas needed and in the most dilute form that is effective. Use of quaternary ammonium and chlorinated compounds may be minimized by adding boric acid aqueous.
- Use designated cloths and mops for 'clean rooms'.
- Identify and use products with low packaging. Segregate waste to maximize recycling.

**Environmental Health in Hospital** *Canadian Society for Environmental Medicine*  
**A Practical Guide for Hospital Staff Part I: Pollution Prevention**

## **Laundry**

**No Scents Personnel Policy-** Fragrances add unnecessarily to the load of airborne chemicals indoors, and can provoke serious health problems in some people (Cooke, 1994, Kumar et al, 1995; Millqvist et al, 1999). Therefore, at work, laundry staff are requested not to wear any perfume, cologne, or aftershave, or scented hairspray, deodorant, lotion or cream. Furthermore, this is necessary to avoid transfer of any of these products to the clean linen.

**Washing-** For 'clean rooms', rinse cotton bedclothes, drapes and cleaning cloths three times in plain water after regulation hospital laundering to reduce clinging organic compounds which can later offgas and contribute to the airborne chemical contaminant burden. Vulnerable individuals with environment-sensitive illnesses can develop serious rashes, headaches, neurocognitive dysfunction, breathing difficulties, or other problems from exposure to detergents, bleach, or fabric softener.

**Storage-** A supply of appropriately washed linens should be stored in a designated cupboard away from other linens. These linens can possibly be kept in the designated 'clean rooms'.

**Alternative Arrangements-** If these measures are insufficient to meet a particular sensitive patient's needs, or are impractical in certain circumstances, it may be necessary to ask the patient to supply his/her own laundered bedding from home. Patients may have found particular unscented products they can tolerate (e.g. Nature Clean or Ivory laundry soaps).

**Suggestions Summary, Laundry:**

- Ask employees not to wear scented products which could be transferred to linens.
- After regulation hospital laundering, rinse linens three times in plain water, and store separately, possibly in designated 'clean rooms'.

**Environmental Health in Hospital** *Canadian Society for Environmental Medicine*  
**A Practical Guide for Hospital Staff Part I: Pollution Prevention**

## **Purchasing and Central Supply**

**Materials Management-** The designated Environmental Health in Hospital committee member for Purchasing and Central Supply can learn from end users of materials throughout the hospital which materials could be changed to less toxic products, what could be re-used, and how better segregation could be achieved to maximize re-cycling and minimize the need for incineration.

**Paper Products-** Purchase chlorine-free paper products printed with vegetable ink, whenever possible. Two- or three-part copy papers off-gas sufficient volatile organic compounds (VOC's) that they are generally poorly tolerated by sensitive patients (Rea, 1997).

**Cleaning Products and Disinfectants-** See Housekeeping Section.  
In general, unscented, biodegradable, non-aerosol products, which do not require personal protective equipment for dilution and application, are the safest.

Unscented soap is needed for the washroom hand soap dispensers throughout the hospital.

**Gloves-** Stock vinyl gloves for non-sterile procedures, and high quality non-latex gloves for sterile procedures in latex-sensitive patients. Ask manufacturers of latex gloves for written assurance that their product is non-powdered (Hunt et al, 1996) and has undergone a leaching process (Doctor, 1998).

**Intravenous Set-ups-** Phthalates can leach from plastic IV bags and tubing (Rea, 1997; Kevy and Jacobson, 1982; Nassbarger et al, 1987), and since chemically sensitive patients have been observed to suffer adverse effects from exposure to phthalates (Rea, 1997; Kevy and Jacobson, 1982), it is helpful to maintain a supply of all the commonly used IV fluids in glass bottles (available from Abbott) which may be ordered as required for individual patients. Empty sterile glass bottles are required to collect autologous blood three weeks prior to elective surgery in patients with environment-sensitive illnesses.

For latex-sensitive patients, glass syringes and three-way stopcocks are needed for IV injection ports rather than drawing up medications in disposable plastic syringes with latex rubber plungers, or injecting through latex rubber ports.

**Anaesthetic and Respiratory Supplies-** Some patients develop irritative or sensitivity reactions to plastics in masks and tubing, or to latex rubber in connector tubes or bellows. Stock ceramic masks, and hard (low off-gasing) tubing which may be obtained from oxygen supply firms (e.g. Burrows Medical Oxygen Ltd., Tel. (416) 752-5075 or Medox, Tel. (613) 722-5902). Also stock non-latex connectors and bellows, which may be ordered from central supply to meet particular patients' needs and stocked in Emergency and the Operating Room.

**Environmental Health in Hospital** *Canadian Society for Environmental Medicine*  
**A Practical Guide for Hospital Staff Part I: Pollution Prevention**

**Bandages-** Verify with suppliers in writing which of their tapes and bandages do not contain latex, and stock some for latex-sensitive patients (Isman and Ryzynski, 1997) (e.g. 3M bandages are apparently latex-free).

**No Scents Personnel Policy-** Central Supply staff are requested not to wear perfumed products to work to prevent transfer to hospital supplies.

**Latex Allergy Kits-** These kits are compiled, stocked and replenished in Central Supply, with the assistance of Pharmacy, and can be ordered by hospital staff for latex-sensitive patients as required (Isman and Ryzynski, 1997). The kit may contain non-latex-containing blood pressure cuff, breathing circuit, vinyl gloves, tape, tourniquet, and enema tube, silicone urinary catheter, glass syringes, a list of latex-free hospital products, a warning sign, Benadryl 50 mg tablet, Epi-Pen; salbutamol (Ventolin) inhaler with aerochamber; and a disposable particle mask (3M) to protect the patient if it is necessary to travel through areas where latex products are used.

**Sensitivity Kits-** These kits are also compiled, stocked, and replenished in Central Supply with the assistance of Pharmacy, and may be ordered by staff for patients with environment-sensitive illnesses. They may contain the following: a charcoal-filled disposable face mask (3M) which can protect the patient from airborne particles and volatile organic compounds inadvertently encountered in the hospital; a portable oxygen supply with a ceramic mask and hard tubing; alkaline powder (Katsunama et al, 1992) (Sodium bicarbonate 2:1 Potassium bicarbonate, available from Smith's Pharmacy, (416) 488-2600) 2 doses (each dose could be 1 teaspoon of powder or 5 capsules, or 1 tablet of Alka Seltzer Gold [available in the United States]); approximately 12 oz. spring water in a glass bottle; Benadryl 50 mg tablet; Epi-pen; Ventolin inhaler with aerochamber; warning sign, and information sheets about medication principles and treatment of reactions ( see Medical/Surgical and Emergency section).

**Suggestions Summary, Purchasing and Central Supply:**

- Utilize the least toxic cleaning, laundry, maintenance, paper, and patient care products with maximum recycling and minimum incineration potential.
- Ask employees not to wear scented products that could be transferred to hospital supplies
- Have glass-bottled IV fluids available, as well as oxygen, ceramic masks, and hard tubing. Also make available latex-free breathing circuits, gloves, IV set-ups, and bandages
- Compile Sensitivity Kits and Latex Allergy Kits which staff may order for patients with environment-sensitive illnesses, and which may remain with these patients throughout their hospital stays.

**Environmental Health in Hospital** *Canadian Society for Environmental Medicine*  
**A Practical Guide for Hospital Staff Part I: Pollution Prevention**

**REFERENCES**

Adarchenko AA, Krasil'nikov AP, Sobeschuk OP. Antiseptic sensitivity of clinical strains of *Pseudomonas aeruginosa*, *Antibiotiki i Khimioterapiia*. 34 (12): 902-907, (Dec., 1989).

Adarchenko AA, Krasil'nikov AP, Sobeshuk OP. An evaluation of the sensitivity to antiseptic preparations of clinical strains of microorganisms in the family *Enterobacteriaceae*. *Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii*. (1):23-28, (Jan., 1990).

American Lung Association, American Medical Association, U.S. Consumer Product Safety Commission, U.S. Environmental Protection Agency. *Indoor air pollution: an introduction for health Professionals*, United States Environmental Protection Agency (6607J), Washington, DC 20460.

Anderson RC, Anderson JH. Acute toxic effects of fragrance products, *Archives of Environmental Health*, Vol. 53, No. 2, 138-146, (March/April 1998).

Berg G, Sanjaghsaz H, Wangwongwatana S. Potentiation of the poliocidal effectiveness of free chlorine by buffer, *J. of Virological Methods*, 23 (2): 179-186. (Feb., 1989).

Borrelly J, Blech MF, Grosdidier G, Martin-Thomas C, Hartemann P. Contribution of a 3% solution of boric acid in the treatment of deep wounds with loss of substance. *Annales de Chirurgie Plastique et Esthetique*, 36 (1): 65-69, (1991).

Burnett R et al. Effects of low ambient levels of ozone and sulphates on the frequency of respiratory admissions to Ontario hospitals. *Environmental Research*, 65:172-194, (1994).

Burnett R et al. Associations between ambient particulate sulphate and admissions to Ontario hospitals for cardiac and respiratory diseases. *Amer J Epidemiology*. 142 (1): 15-22, (1995).

Canada Mortgage and Housing Corporation, *The clean air guide: how to identify and correct indoor air problems in your home*, Revised Edition, ii, (1993). CMHC (613) 748-2367.

Canada Mortgage and Housing Corporation. *Renovation: avoiding renovation hazards*, Public Affairs Centre, Canada Mortgage and Housing Corporation (613) 748-2367, (1994).

Canada Mortgage and Housing Corporation. *Building materials for the environmentally sensitive*. CMHC (613) 748-2367, (1998).

Center for Health, Environment and Justice, *Health care without harm*, P.O. Box 6806, Falls Church VA 22040, (1998).

Colborn T, vom Saal FS, Soto AM. Developmental effects of endocrine-disrupting chemicals in wildlife and humans. *Environmental Health Perspectives*, 101(5), 378-384, (October, 1993).  
Cooke MA. *Fragrance: its biology and pathology*, *J of Royal College of Physicians of London*, Vol. 28, No. 2, 133, (March/April 1994).

Dennis P.J.L. Reducing the risk of legionnaire's disease, *Ann Occup Hyg* 34: 189-193 (1990).

**Environmental Health in Hospital *Canadian Society for Environmental Medicine***  
***A Practical Guide for Hospital Staff Part I: Pollution Prevention***

Doctor J. Protecting patients from latex allergy, *The Canadian Journal of Diagnosis*, 123-129, (March, 1998).

Federal-Provincial Committee on Environmental and Occupational Health. Fungal contamination in public buildings: a guide to recognition and management, Environmental Health Directorate, Health Canada, Tunney's Pasture, Ottawa, ON, K1A 0L2, (June, 1995).

Health Canada. Infection control guidelines for handwashing, disinfection and sterilization in health care, *Canada Communicable Disease Report Supplement*, (November, 1998).

Hunt LW, Boone-Orke JL, Fransway AF, Fremstad CE, Jones RT, Swanson MC, McEvoy MT, Miller LK, Majerus ET, Luker PA, Schleppman DL, Webb MJ, Yunginger JW. A medical-center-wide, multidisciplinary approach to the problem of natural rubber latex allergy, *JOEM*, 38(8), 765-770, (August, 1996).

Isman C, Ryzynski A. Latex Allergy. *Women's College Hospital Patient Care Manual*, WCH, Toronto, (September, 1997).

IWK Children's Hospital, Halifax N.S. Fragrance free...that's for me! Guidelines and promotional material for scent-free environment policy, (1995).

Katsunuma T, Iikura Y, Akasawa A, Iwasaki A, Hashimoto K, Akimoto K. Wheat-dependent exercise-induced anaphylaxis: inhibition by sodium bicarbonate, *Annals of allergy*, 68:184-188, (February, 1992).

Kendall P.R.W. Indoor air quality: issues and concerns, City of Toronto, Department of Public Health, Environmental Protection Office, 1-1, (September, 1994).

Keyv SV, Jacobson MS. Hepatic effects of phthalate ester plasticizer leached from polyvinyl chloride blood bags following transfusion, *Environmental Health Perspectives* 45:57-64, (1982).

Kreutzer R, Neutra RR, Lashuay N. Prevalence of people reporting sensitivities to chemicals in a population-based survey, *American J of Epidemiology*, Vol. 150, No. 1, 1-12, (July 1, 1999).

Kumar P, Caradonna-Graham VM, Gupta S, Cai X, Rao PN, Thompson J. Inhalation challenge effects of perfume scent strips in patients with asthma, *Annals of Allergy, Asthma, & Immunology*, Vol. 75, 429-433, (November, 1995).

Martin K. Pesticides and human health, *Newsletter for Family Physicians*, Environmental Health Committee, Ontario College of Family Physicians (1998).

Meggs WJ, Elsheik T, Metzger WJ, Albernaz M, Bloch RM. Nasal pathology and ultrastructure in patients with chronic airway inflammation (RADS and RUDS) following an irritant exposure, *Clinical Toxicology*, 34(4), 383-396, (1996).

Millqvist E, Bengtsson U, Lowhagen O. Provocations with perfume in the eyes induce airway symptoms in patients with sensory hyperreactivity, *Allergy* 54 (1999), 495-499.

**Environmental Health in Hospital** *Canadian Society for Environmental Medicine*  
**A Practical Guide for Hospital Staff Part I: Pollution Prevention**

Nassbarger L, Arbin A, Ostelius J. Exposure of patients to phthalates from polyvinyl chloride tubes and bags during dialysis, *Nephron*, 45:286-290, (1987).

National Research Council. Board of Environmental Studies and Toxicology. Workshop on health risks from exposure to common indoor household products in allergic or chemically diseased persons, (July 1, 1987).

Ontario Medical Association. Position paper on health effects of ground-level ozone, acid aerosols and particulate matter. Ontario Medical Association, (May 1998).

Pollution Probe, Canadian Institute of Child Health. The air children breathe: the effects on their health, conference proceedings, viii-ix, (January 19-20, 1998).

Quinlan P, Macher JM, Alevantis LE, Cone JE. Protocol for the comprehensive evaluation of building-associated illness. *Occupational Medicine: State of the Art Reviews*. 4(4), 771-797, (October-December 1989).

Rea WJ. Chemical sensitivity, Volume 4, CRC Press, Boca Raton, Chapter 41. Surgery in the chemically sensitive: 2803-2850, (1997).

Rubin C. How to get your lawn and garden off drugs, Friends of the Earth, 701-251 Laurier Ave. W., Ottawa, Ontario, K1P 5J6. (1989).

Stenberg B, Eriksson N, Hoog J, Sundell J, Wall S. The sick building syndrome (SBS) in office workers. A case-referent study of personal, psychosocial and building-related risk indicators. *International Journal of Epidemiology*. 23(6), 1190-1196, (1994).

Stieb DM, Burnett RT, Beveridge RC, Brook JR. Association between ozone and asthma emergency department visits in Saint John, New Brunswick, Canada, *Environ Health Perspect*; 104: 1354-1360, (1996).

Szymanski J, Wazny J. Disinfection of wood in mushroom growing cellars with Mycetox, *Roczniki Panstwowe Zakladu Higieny*. 46 (2): 193-197, (1995).

United States Environmental Protection Agency. Ventilation and air quality in offices. Fact sheet. EPA, Air and Radiation (6607J). 402-F-94-003, (July 1990).

Weiss KB, Gergen PJ, Wagener DK. Breathing better or wheezing worse? The changing epidemiology of asthma morbidity and mortality, [Rev] *Annu Rev Public Health*, 14: 491-513, (1993).

Woods JE. Cost avoidance and productivity in owning and operating buildings, *Occupational Medicine: State of the Art Reviews*, 4(4) 753-770, (October-December 1989).

Working Group with Support of Toronto Board of Education. Product Assessment Matrix., (September 1997).

World Wildlife Fund Canada. Reducing your risk from pesticides. WWF, Toronto, 29 (1998).

