

ENVIRONMENTAL HEALTH FOUNDATION of CANADA

RR #3, Auburn, Ontario, N0M 1E0 tel: (519)482-3416 fax: (519)482-7820

MINUTES of the Teleconference January 30, 2000

1.0 Roll Call

Meeting commenced at 11:10 CST. In attendance were:

Klaus Seeger Tim Roark
Charlie Young Peter Rogers
Dean Sargeant Duncan Ellison
Keith Smith Scott McLean

Regrets:

Ron de Burger John O'Laney
John Blatherwick Robert Bradbury

1.1 Additions to the Agenda

The "Safe Drinking Water Foundation" was added to the agenda as item 3.4.3 and approved.

1.2 Errors and Omissions EHFC Minutes November 28, 1999

There were no errors or omissions.

1.3 Approval of EHFC Minutes of November 28, 1999

Moved by Charlie Young and seconded by Tim Roark that:

"The minutes of the EHFC from November 28, 1999 be accepted."

CARRIED

2.0 BUSINESS ARISING FROM THE EHFC MEETING OF NOVEMBER 28, 1999

2.1. Financial Report (Charlie Young)

Reporting for the period November 28, 1999 to December 31, 1999, Treasurer Charlie Young provided the following EHFC financial report:

Tanzania Fund:

Receipts = nil Disbursements = nil

Aboriginal Project:

Receipts = nil Disbursements = nil

Sewage Video:

Receipts = \$245.00 Disbursements = nil

Temperature Symbols:

Receipts = nil Disbursements = \$28.40

Groundwater Video:

Receipts = nil Disbursements = nil

Web Page:

Receipts = nil Disbursements = nil

Administration of EHFC:

Receipts = nil Disbursements = \$35.48

Total Receipts = \$245.00 Total Disbursements = \$63.88

Term Deposit = \$24,455.13

Savings/CHQ = \$ 1,196.86

Total (current) Balance = **\$25,651.99**

There is one outstanding cheque for \$715.00 to CIPHI for the Tanzanian project.

Moved by Charlie Young and seconded by Scott McLean that:

“The financial report from November 28 - December 31, 1999 be accepted.”

CARRIED

2.2 Financial Policies and Procedures (Tim Roark)

Effective January 1, 2000, Tim Roark became the Treasurer of the EHFC. His first act was to get the signing authority papers for the bank shipped off to the executive as the CIBC requires new signing cards for institutional organizations such as ours. After much discussion, it was agreed that the number of signatures required for amounts exceeding \$4,000 would be three of the four executive who have signing authority. For amounts less than \$4,000 there would only be the requirement to have two signatures, as it is at present.

Due to our geography it was thought that the “3 of 4” rule might be a hindrance, however it was agreed that when three signatures are required, the invoice could be faxed around to those who

have signing authority, which would then form part of the financial record.

2.3 HACCP- Program Evaluation Model

There is a one year community trial to deliver the HACCP program by the South-west Regional Health Authority (Ontario) has approached the Ontario Minister of Health for funding of this project. Klaus will send a copy of the letter used for funding to Tim for his use in B.C.

2.4.1 Temperature Symbols (Klaus)

Klaus indicated that information on the temperature symbols will be sent out to all health units as per the minutes of the last meeting. The following prices are being offered:

500 magnets= \$0.73 / ea
1000 magnets= \$0.45 / ea
5000 magnets= \$0.41 / ea

For an additional \$100.00, an agency can have its name included on the magnets it orders, regardless of the number.

The application for the french trademark is still in process; nothing new to report yet. We can trademark the “Temp Safe” education program, if we wish, for an additional \$150.00

2.4.2 Fight Bac (Klaus)

Pat Scarlett of the Beef Information Centre, is promoting the “Chill Out” campaign. It is an opportunity for the EHFC to participate, albeit at a cost of \$2,500.00 Pat is looking into the prospect of a lower cost for our organization which, it is hoped, would be more of an incentive for us to join. We would then have our name associated with their promotional material.

The question of whether we should be participating in this campaign was generally favourable, but not at any cost. Also to consider is the fact that our logo is not yet ready. Klaus will indicate to Pat Scarlett that we are not able to commit to this project at this time.

2.5 Sewage Video (Tim)

The last of the mailouts in B.C. to libraries, governmental organizations, schools and local agencies was completed in early January. In total, 50,000 brochures and 500 videos were distributed.

Duncan suggested marketing the video to Conservation officers in Ontario as they would be an ideal target group. Duncan will send mailing address information to Tim for followup.

2.6 Groundwater Video (Tim & Charlie)

The video had been received by all members of the EHFC and it was agreed by all that the content was excellent. However, both Peter Rogers and Keith Smith stated that the video is not culturally appropriate for First Nation communities. Tim suggested that the video can be redone, for a fee. Peter and Keith will discuss this possibility with Medical Services, Health Canada.

2.7 Accredited School Research Project

There was no report.

2.8 EHFC Logo

The winner of the contest, Patrick Fan, will now draft some variations of his logo in both English and French. He will have them ready for the AGM in April.

3.0 NEW BUSINESS

3.1 Canadian Institute of Environmental and Occupational Health (CIEOH) (Peter)

The Canadian Institutes of Health, which replaces the old Medical Science Council, is forming an association of like-minded groups for the purpose of sharing scientific research, ideas and results. The EHFC was asked to participate and we have done so, by agreeing in principle to the idea of forming such an organization. Attached is the signature sheet indicating our agreement in principle.

3.2 Fundraising Committee Report

No report was tabled at this time.

3.3 Trustee Nominating Committee Report

No report was tabled at this time.

3.4 Other New Business

3.4.1 Vancouver Conference

So far, Scott McLean, Dean Sargeant, Tim Roark and Klaus Seeger are planning on attending the AGM in Vancouver in April. The EHFC AGM will be determined by the timing of the other NEC meetings.

3.4.2 EHFC Regulations

We will look at the requirements for quorums and propose changes as necessary in time for the AGM in April.

3.4.3 Safe Drinking Water Foundation

This is an organization from Saskatchewan run by an individual named Hans Peterson. According to Duncan, it is not a Canada-wide foundation and it is being run in the narrowest sense, to provide some tax relief to its board members. Accordingly, it sounds more glorious than it is. Klaus will send out more information on this organization to EHFC members.

3.4.4 Drinking Water Material Safety Act (Duncan)

This act has effectively died in parliament. Many groups, including CWWA, lobbied very hard for its passage.

One result of this act not passing is the influx of point-of-use water treatment devices on the market. They are not NSF certified as a unit, although they are manufactured with NSF certified

components. There are two NSF standards that apply: STD 61 & 62, which deal with components and STD 40 & 42 which apply to devices as a whole. The POU devices have not been scrutinized against STD 40 & 42.

Scott will bring this issue up at the next NEC for the purpose of informing our Institute members.

3.4.5 Payment of Accounts

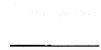
All costs associated with this meeting, such as telephone charges, are to be submitted to the treasurer, Tim Roark.

4.0 Date and Time of Next Meeting

The next meeting will be a combined teleconference / face-to-face on Sunday April 9, 2000 at 19:00 Ontario time (16:00 B.C. time). Those in attendance at this year's conference in Vancouver will meet there, the remainder will attend by telephone. Klaus will determine the exact time and location of the meeting as well as arrange for the appropriate telephone hookups.

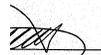
Meeting adjourned at 14: 30 EST.

We the undersigned agree in principle with the concept of forming an institute with the main theme of environmental and occupational health research, which would include injury prevention and control, as one of the institutes in CIHR.



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Senior Epidemiologist
Bureau of Reproductive and Child Health
Laboratory Centre For Disease Control
Health Canada

Francine Archambault
Environmental Health Information and Education Program
Environmental Health Directorate
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Sheryl Bartlett, Ph.D.
Chair
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Dr. Ugis Bickis
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Michel Camus, Ph.D.
épidémiologue / epidemiologist
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Dr. Wayne Corneil
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Occupational Health & Safety Agency
Health Canada

Dr. Gaétan Carrier
Professeur titulaire
Chaire en analyse des risques toxicologiques pour
l'humain
Faculté de médecine
Département de Médecine du travail et d'Hygiène
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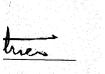
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Health Protection Branch
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Duncan Ellison
CWWA (Canadian Water and Wastewater
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John Eyles, Ph.D.
Director, McMaster Institute of Environment and Health
Professor, School of Geography and Geology
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N

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Faculty of Medicine
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Klaus Seeger
Chair
Environmental Health Foundation of Canada

Jack Siemiatycki Ph.D.
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President, Can. Soc. for Epidemiol. & Biostats.
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Institute for Environmental Studies
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Dr. John Smith
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Pest Management Regulatory Agency
Health Canada

Dr Peter Toft
Acting Director
Health and Environment Division
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Lynne Warda, MD FRCPC
Medical Director, IMPACT - The injury
prevention centre of Children's Hospital
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Dr. Don Wigle
Senior Medical Advisor
Environmental Health Directorate
Health Canada

Proposal for a
Canadian Institute of Environmental
and Occupational Health
(CIEOH)

January 14, 2000

Submitted by an:
Open Consortium of Academia, Research Centres,
Governmental Agencies and
Non-Governmental Organizations

Coordinated by:
Environmental Health Program
Health Canada

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Executive Summary

The environment in which we live and work impacts on our health in many ways, from the air we breathe, to the water we drink, the food we eat, the soil we till, the chemicals we handle, the noise we are exposed to, etc. Research helps to identify, assess and form the basis of strategies for managing these health risks. It is proposed that these impacts, including injury prevention, be investigated in a comprehensive and cohesive manner in an Institute for Environmental and Occupational Health to be called the Canadian Institute of Environmental and Occupational Health (CIEOH). The Governance of the CIEOH will follow the processes and procedures as finalized by the CIHR Governing Council.

Universities, health and research centres, teaching hospitals, federal and provincial governments, and voluntary and private sectors are already working together to address issues in our living and working environment. However, this is not always accomplished in a unified and coordinated fashion. The creation of CIEOH will help to foster and develop this field further by supporting and linking researchers in new and unique ways.

The Canadian Institutes of Health Research offer the chance to respond to the unprecedented flood of research knowledge and provides opportunities to improve the health of Canadians. Increased collaboration and focused research efforts will be needed to counter threats to health which are emerging or re-emerging. The establishment of a Canadian Institute of Environmental and Occupational Health can help address some of these health threats.

The process of identifying, analysing and managing health risks, be it from environmental sources or occupational settings, has certain commonalities. Using a common starting point, such as the Health Canada Decision-Making Framework, will give health researchers a consistent approach in using health research to identify, assess, and manage both natural and man-made environmental health risks, and to improve the health of Canadians. Furthermore, creation of CIEOH would allow researchers to access and integrate multidisciplinary knowledge by forging new linkages between biomedical and biomechanical research, applied clinical research, applied engineering and ergonomic research, psychological and behavioural research, research on health care systems and services and research on society, culture and the health of populations, in the area of environmental health research. The formation of CIEOH would allow researchers to integrate environmental and occupational health research, and build upon a multidisciplinary body of knowledge to the benefit of both disciplines, and ultimately to the benefit of Canadians.

Preamble

This document outlines a recommendation to the Governing Council of the Canadian Institutes of Health Research (CIHR) to establish a Canadian Institute of Environmental and Occupational Health (CIEOH).

The intention for submitting this proposal is not to compete with other similar initiatives but rather to strengthen the rationale for creating an institute within CIHR which embodies the main concepts put forward in this proposal. The support for an institute such as CIEOH is broad based. For example, Eyles et al (1999) in a complementary proposal submitted to the Interim Governing Council (IGC), recommends the establishment of a Canadian Institute of Environmental Health Research with significant social sciences and humanities involvement and leadership. The Toxicology Society of Canada has called for an Institute of Environmental Health Research while the Canadian Society for Epidemiology and Biostatistics was supporting an Institute of Population Health, Public Health, and Environmental Sciences. The Canadian Labour Congress has recommended that one of the Institutes for Health Research be an Institute for Environmental and Occupational Health. The University of Toronto has proposed an institute entitled Therapeutics and Environmental Health. In addition, two networking forums were held in Ottawa in July 1999 and January 2000, bringing together researchers from across Canada to discuss the potential of an Institute of Population Health. In the second forum, the group proposed a slate of institutes which included environmental, occupational health and injury prevention that was to be submitted to the CIHR Interim Governing Council (IGC). In a separate contribution, a letter was sent to the IGC in support for a Canadian Institute for Environmental and Occupational Health Research signed by over 130 researchers representing more than 35 organizations spanning all regions of the country and a broad range of disciplines as well as type of institution (Kennedy et al, 1999).

This proposal is submitted from an open consortium of academia, research centers, government agencies, and non-governmental organizations which was coordinated by the Environmental Health Program, Health Canada. Two conference calls were held resulting in a number of participants agreeing to sign this document in support of the concept of a Canadian Institute for Environmental and Occupational Health. Because of the short time in which the proposal was developed, full consensus on the contents was not achieved.

There are other federal initiatives supporting the concept of environmental health as a theme for an institute in CIHR. Environment Canada and Human Resources Canada are jointly supporting an institute with the theme of environmental influences on health. Health Canada is submitting a slate of institutes to the IGC which includes an institute with the theme of health and environments. Both of these initiatives include occupational health and injury prevention as important components.

Scope

In determining the scope of the proposed institute, environmental health is defined as those aspects of human health, including quality of life, that are determined by the interaction of physical, chemical, biological, social and psycho-social factors of the natural and built environment. It also refers to the theory and practice of identifying, assessing, correcting, controlling and preventing those factors in the environment that can potentially affect adversely the health of present and future generations. Occupational health focuses on the work place environment.

The focus of the activities within the Institute will be on determining evidence for causation to environmental agents. This is particularly challenging in light of the ethical limitations in prospectively assigning inventions to human beings, thus requiring inventive research methodologies and the necessity of extrapolating from often weakly established associations.

The concern of the institute is human health as affected by environmental and occupational exposures to chemical, physical, radiological, and biological agents, as well as psycho-social factors. The scope is wide - including air quality, water and sanitation, food safety, chemical safety, technological risks, ergonomics, psycho-social and behavioural factors, climate and global ecological changes and health, noise and quality of life, occupational health, product safety, injury prevention, radiation safety, environmental health surveillance, environmental health impact assessment, and health risks associated with the ways work is organized.

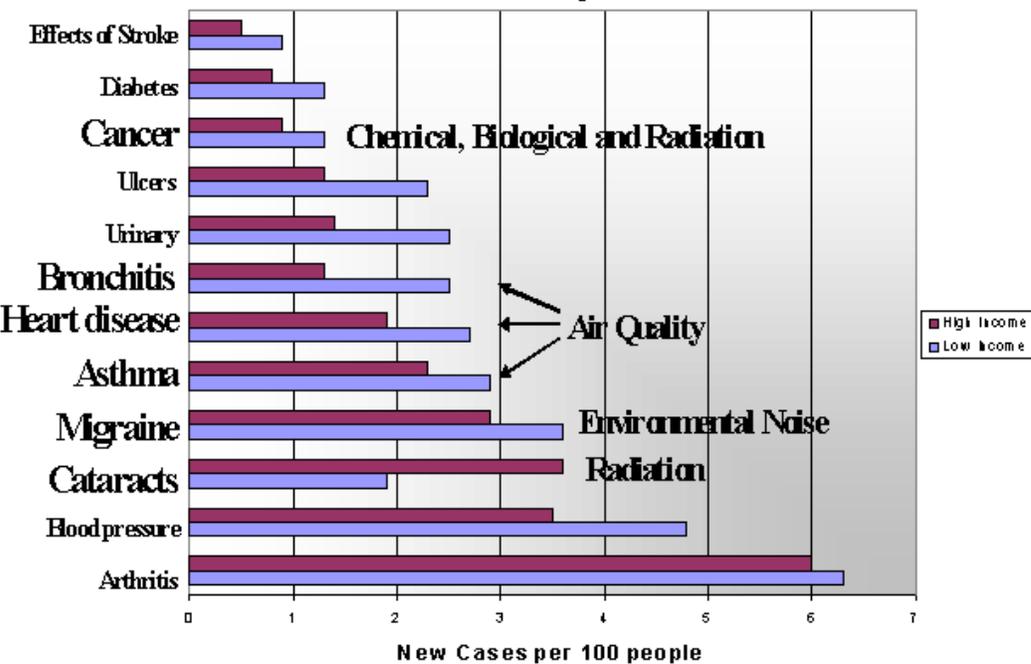
Background

The need for comprehensive research programs in environmental and occupational health is first and foremost driven by increasing scientific evidence that exposure to environmental hazards is causing a growing number of illnesses, injuries and premature deaths among Canadians.

Scientific evidence is increasing our knowledge of the profound influence these hazards have on our health and safety. For example: air pollution accounts for at least 5,000 premature deaths annually; at least 10% of cancers are attributable to environmental and occupational hazards; asthma is responsible for 25% of all school absences; diabetes is a growing issue for Aboriginal populations; 15% of Canadians may be affected by environmental sensitivities; immune depression and neurological disorders are all linked to environmental hazards. There is also growing evidence of linkages between environmental contaminants in both the natural environment and in the workplace and human reproductive disorders and more subtle neurological and behavioral impairments. Household chemicals account for 50,000 poisonings each year, and a further 1,600 deaths, while 250,000 preventable injuries each year are attributed to unsafe consumer products and/or their unsafe use. Each year more than 67,000 seniors are hospitalized and 3,000 die as a result of injuries from avoidable hazards in their environment. Aboriginal populations, due to living conditions and heavy reliance on country foods, are particularly vulnerable to environmental hazards.

Even though our health appears to be improving based on indicators that Canadians are living longer, fewer infants are dying during the first year of life, premature deaths due to heart disease

Two-year incidence of selected chronic disease in
Canadians aged 12 and older



Note: Diseases on the vertical axis in large, bold print are affected by environmental factors.

Source: National Population Health Survey Overview, 1996-97. Statistics Canada. ISBN 0-660-60555-4

and injuries have declined, and declining death rates for many diseases, in many areas, there are significant challenges to ensuring a healthy existence. As seen from the figure illustrating the two-year incidence of selected chronic disease in Canadians aged 12 and older, environmental factors such as chemicals, biological factors, radiation, air quality and environmental noise, strongly impact 6 out of 12 (shown in large bold text) of the most widespread chronic diseases in Canada. These effects are substantial— affecting 1.1 million Canadians, and costing Canadian society \$40 billion *per year*. The burden associated with non-chronic diseases is even greater.

Workplace hazards result in tremendous human and economic costs. Three Canadian workers die from an occupational accident or illness every working day, and more than 3,000 are injured. Every minute worked costs the Canadian economy \$82,000 in compensation payments to workers for accidents and injuries. The number of work days lost due to occupational injury is equivalent to the number of hours worked in 71,000 jobs in one year. Compensation payments and reimbursements of various costs directly related to occupational injuries totaled nearly \$5 billion. When indirect costs are included, workers' compensation board payments cost the Canadian economy nearly \$10 billion a year.¹

Injuries, both unintentional and intentional, are an important public health problem in Canada². In

¹North American Occupational Safety and Health Week 1999; Statistical Analysis, Occupational Injuries and Fatalities, Canada, published by the Research and Analysis Unit, Operations Directorate, Labour Branch, Human Resources Development Canada, 1999/05/10.

²Federal, Provincial and Territorial Advisory Committee on Population Health - Public Health Working Group. "National Injury Prevention and Control Strategy".

1997, 12,791 Canadians died as a result of both intentional and unintentional injuries³, and another 258,418 were hospitalized⁴. It has been estimated that, for every Canadian who dies from injury, a further 320 are seen in hospital emergency rooms, while an unknown number have their injury treated elsewhere or do not seek treatment. Many non-fatal injuries result in impairment and disability such as blindness, spinal cord injuries, and intellectual deficit due to brain injury. Unintentional injuries including motor vehicle crashes, falls, burns and poisonings account for 65% of deaths and 85% of hospitalizations for injury. Injury is arguably the most underrated public health problem in Canada, given that so many of these deaths and injuries are predictable and preventable.

Injured Canadians spend close to 2.2 million days in hospital each year⁵. In addition to the impact of human suffering and death caused by injuries, the financial cost to society is large. The economic burden of unintentional and intentional injury is estimated to be greater than \$14 billion per year, or 11 percent of the total direct and indirect cost of illness, ranking third after cardiovascular(\$20 B) and musculoskeletal (\$18 B) disease among health problems in terms of total costs to Canadians⁶.

Unintentional injuries cost Canadians more than \$8.7 B per year, approximately \$4.2 B of which is spent on health care, and \$4.5 B representing loss of productivity associated with disability and premature death. This amount does not include the costs of injuries from violence and suicide, nor does it attempt to assign a financial value associated with the pain and the out-of-pocket care giving costs associated with caring for injured Canadians⁷.

Certain populations are particularly vulnerable. Injuries and cancer are the two leading causes of death among children. With their relatively immature immune and metabolic systems children are more prone to health problems derived from environmental factors, and are at greater risk from accumulated lifetime exposure to certain hazards such as UV radiation. There are also concerns about risks to early childhood physical and neurological development from several environmental hazards.

³Canadian injury mortality data are the results of calculations by the Laboratory Centre for Disease Control using Statistics Canada data.

⁴Canadian injury hospitalization data are the results of calculations by the Laboratory Centre for Disease Control using data from the Canadian Institute of Child Health.

⁵Canadian Institute for Health Information, National Trauma Registry Report 1995/96 Fact Sheets, 1998.

⁶Moore R, Mao Y, Zhang J, Clarke K. Economic burden of illness in Canada, 1993. Health Canada 1997

⁷Angus DE, Cloutier E, Albert T, et al. The economic burden of unintentional injury in Canada. SMARTRISK 1998.

Why a Canadian Institute of Environmental and Occupational Health?

Promoting and protecting health, at either a personal or societal level, is complex. It generally involves identifying specific hazards, estimating the level of risk associated with these hazards, developing and analysing potential options for managing the risks, selecting and implementing a specific risk management strategy and monitoring and evaluating the impact of this strategy. These steps may be taken formally or informally, and to varying degrees, depending on the situation and participants involved.

There are many areas of research involved in the promotion and protection of health, and the coordination of research within these areas is a challenge. We are proposing that one of these areas be addressed through the creation of the Canadian Institute of Environmental and Occupational Health. Such an institute would be highly connected to any number of other candidate institutions, whether they be oriented towards diseases or traumas, special subpopulations, health products or services, or stages of the life cycle. In Appendix A, the relationship between CIEOH and other potential institutes is discussed.

The question of “Why environmental and occupational health?” arises. This area is a broad topic onto itself which can ensure that Canadians enjoy a safe living and work environment. A recent national opinion poll by Environics (ccu-cuc.ca/en/polls/indexpolls.html) indicates that the environment is bumping out the economy as the biggest concern for Canadians as the new millennium approaches. According to a Pollara poll(ccu-cuc.ca/en/polls/indexpolls.html), Canadians are interested in seeing funding restored to existing government programs, especially health care, environment and rebuilding old-age pensions. A press release from the Environmental Monitor cites that an international study which measures public perceptions on the environment/health link that “indicates that a majority of people in all but one of 18 countries studied believe that environmental problems now affect their health. In most countries with comparative data, these health concerns are significantly deeper than was the case five years ago. The results would seem to contradict the belief among many policy-makers that the environment is fading as a concern for their citizens.”

Research plays a significant role in the identifying, assessing and managing of health risks due to environmental and occupational exposures, and helps form the basis for decisions made throughout the process. In particular, research informs and forms the basis of decisions made in identifying issues, estimating the level of risk associated with the issue, selecting a strategy, and monitoring/evaluating the strategy. An example of a decision-making framework, one used by Health Canada, is described in Appendix B. An example of how research played a critical role in establishing air quality policy is discussed below.

Role of Research in Making Decisions Concerning Ambient Air Pollution

One of the worst episodes of air pollution in modern history occurred in London, England, in December 1952, when a temperature inversion trapped pollutants near the ground and kept them

from dissipating for days. Four thousand people died of chronic bronchitis and other respiratory illnesses aggravated by an acidic smog—a dangerous combination of coal smoke, airborne acids and water vapour. Extreme air pollution events such as those experienced in London in the 1950s and 60s clearly demonstrated the potential of ambient (outdoor) air pollution to exacerbate cardio-respiratory disease, resulting in pre-mature mortality and admission to hospital. Subsequently, considerable efforts have been made to reduce pollution from the combustion of fossil fuels. Several countries, including Canada and the United States, established new stringent guidelines and standards for air pollutants such as sulphur dioxide, nitrogen dioxide, carbon monoxide, ozone, and particulate matter.

Research has played an essential role in the development of National Ambient Air Quality Objectives in Canada. For example, the major impetus for a review of particulate matter AQOs in Canada came from the administration over the last few years of a large number of well run epidemiological studies linking ambient particulate matter levels with adverse health outcomes. The studies included both short-term (time-series) and long-term (cohort) analyses demonstrating associations between particulate matter and the full range of adverse cardiorespiratory outcomes including mortality and hospitalization, increased illness, reduced activity days, decreased lung function, and other health outcomes. The health services sector was vital to obtaining health outcome information.

There are still many open questions in establishing cause and effect between ambient air quality exposure and adverse health outcomes. For instance, several important confounders could play a role in the interpretation of previously conducted epidemiological studies. Additionally, the mode of action is not clear and potential causal mechanisms are only now being elucidated. Nonetheless, the coherence and consistency of the body of evidence cannot be dismissed.

Occupational health is a major component of this proposal which is inextricably linked to environmental health. There are strong linkages between occupational exposures to chemicals, dust, fumes, gases, radiation, electric and magnetic fields and biological agents (and their potential health effects) and exposures potentially found in the wider environment. Indeed, occupational investigations and safety standards and procedures continue to inform environmental health practice. For example, levels of exposure to hazardous agents typically occur at much higher levels than that experienced in the ambient (outdoor) environment, leading to higher risk levels to workers. In addition, due to the higher exposure levels, dose-response relationships (i.e. a relationship in which increasing exposure to a hazard increases the negative health effect) based on human data could be detected and estimated much more readily at exposure levels found in workplaces than at much lower ambient exposure levels.

Similar disciplines and methods are used in occupational and environmental health hazard investigation: toxicology, epidemiology, social survey, occupational/environmental hygiene, risk and health impact assessment, and qualitative methods. Further, there has been much interest in recent years in mechanical and ergonomic impacts in the workplace as well as considerations of stress and psycho-social and behavioural outcomes. Much of the evidence on *decision latitude* and *locus of control* is derived from workplace health studies. This is not surprising since there is recognition in all social research arenas that interactions between individuals (in peer or

asymmetrical power relations) affect health. The box below shows an example of how epidemiology was used to study impact of occupational exposures in the pulp and paper industry on the risk of cancer.

Occupational Exposures and Cancer Risks in the Pulp and Paper Industry

Pulp and paper is a major industry in Canada and a primary one in British Columbia. Wood may be converted to pulp by a number of processes, the most common being chemical. In chemical pulping, lignin is solubilized under two conditions: alkaline, also called kraft or sulfate process, and acidic or sulfite process, the former being the most common. During chemical pulping, exposures to known or potential carcinogens occur, including arsenic, chlorophenols, dioxins and furans. Band et al (1997) investigated the causes of death in a cohort of 30,157 workers in 14 pulp and paper mills in BC. Of these, 20373 (68 %) worked in the Kraft process only, 5249 (17%) worked in the sulfite process only, and 4535 (15%) in both processes. Cancer mortality significantly associated with work duration and time from first employment of 15 years or more were: a) for the entire cohort: cancer of the pleura, cancer of the kidney and of the brain; b) for workers in kraft mills only: cancer of the kidney; c) for workers in sulfite mills only: Hodgkin's disease; d) for workers ever employed in both kraft and sulphite mills: cancer of the esophagus. In a follow-up study, the cancer incidence pattern of this cohort was investigated. Cancer incidence significantly associated with work duration and time from first employment were: a) for the entire cohort: cancer of the pleura and of the prostate; malignant melanoma; b) for workers in kraft mills only: malignant melanoma; c) for workers in sulphite mills only: cancer of the pleura, prostate and rectum; d) for workers ever employed in both kraft and sulphite mills: cancer of the stomach and of the prostate. Further research is underway to investigate the association between specific compounds and the cancer sites found to be significantly increased in the mortality and cancer incidence studies.

Another significant component of environmental and occupational health, is injury prevention. While every injury is important at the individual level, injury types are a public health priority when they are either frequent, severe, or both. The vulnerability of individuals and sub-populations at risk is also important. The greater the inability of people to recognize, understand and manage hazards, the greater the need for public protection. In order to address these issues, it is important to understand the mechanisms that lead to injury upon which appropriate prevention strategies are developed. Research is needed about the hazard itself, the mediating factors present, the interaction between the individual and the product/environment, and the outcomes/injury.

Although injury ranked third among health problems in total economic burden, injury-related research ranked last and accounted for only 1.2% of total research funding⁸. In order to reduce mortality and morbidity associated with injury, research is needed. One of the types of research most urgently needed is well designed and well evaluated studies to identify effective interventions

⁸Moore R, Mao Y, Zhang J, Clarke K. Economic burden of illness in Canada, 1993. Health Canada 1997

that prevent injuries or reduce their severity. But a wide range of other research types must not be overlooked. These include research on behavioural aspects of risk taking, simulation modelling and testing in design and manufacture of products and structures, research on rehabilitation and prevention of secondary effects of disabling injuries, and more.

Emerging health issues, new discoveries and new technologies will also play a major role in the CIEOH. There are many changes sweeping our society which have had an impact on public health and the challenge of promoting and protecting health. In partnership with the research community, individuals, families, communities, commercial enterprises and all levels of government, we need to deal with the following types of changes in the natural and built environments: ***New health risks are emerging.*** For example, the question of whether endocrine disrupting substances (EDS), or hormone mimickers, are causing adverse impacts on human health remains greatly controversial even though this issue has been the focus of a great deal of scientific inquiry for over a decade. ***Old health risks are re-emerging.*** Old health risks are re-emerging, sometimes in more virulent forms than originally. We have to contend with drug-resistant strains of tuberculosis, scarlet fever, raccoon rabies, etc., emphasizing that the "magic bullets" of contemporary medicine are not as reliable as we thought, and re-emphasizing the need for primary prevention along the lines of classic "hygiene" (the science dealing with the preservation of health)." ***New discoveries are changing our lives.*** For example, there is an exponential increase in the number and amount of genetically engineered biological products manufactured and introduced into the marketplace each year with very little known about the public health impacts of the environmental exposures to these products. ***New technologies are changing the way we work.*** Technological improvements have changed the kind of expertise we need to assess and manage health risks. Instant communication capabilities result in new ways of collecting, analyzing and sharing information, and managing risks. This new surveillance capacity needs to be matched with analytic capacity to provide information for evidence-based decision-making. ***Science is becoming increasingly important.*** Science provides a critical underpinning of much of environmental policy helping inform policy makers about which issues are most important, about emerging issues and contributing to solutions: "...science is the essential, if often overlooked, foundation of an environmental protection strategy."⁹ The role of science in addressing uncertainty in an emerging issue is discussed below.

Uncertainty in the Science of Endocrine Disruptors (Hormone Mimickers)

Our "endocrine" or hormonal system is a complicated network of biochemical pathways that controls a wide range of bodily functions, including reproduction, growth and energy metabolism. Over the last decade, studies involving laboratory animals and wildlife have shown that some naturally occurring chemicals and synthetic pollutants can cause a variety of adverse effects by disrupting the endocrine system. Such endocrine disruptors can mimic or interfere with such hormones as thyroid hormone, estrogen and testosterone.

⁹ It's About Our Health! CEPA Revised. Report of the House of Commons Standing Committee on Environment and Sustainable Development, 1995, page 13.

The question of whether Endocrine Disrupting Substances (EDS) are causing adverse impacts on human health remains greatly controversial even though this issue has been the focus of a great deal of scientific inquiry for over a decade. It is presently impossible to confirm or deny this hypothesis as consistently collected data on population-based measures of the incidence and severity of health conditions that would indicate EDS impacts are not currently available. The evidence most commonly cited as supporting this hypothesis, in addition to widespread adverse developmental and reproductive anomalies in wildlife populations which are contaminated with EDS, is the increasing incidence of cancers of the reproductive tissues (breast, prostate gland, testes) seen in human populations in industrialized countries. Increased incidence of other endocrine-related adverse health effects (e.g. reduced fertility, sperm counts, libido, increased incidence of genital abnormalities and thyroid diseases) and impaired immune, thyroid and cognitive functions have also been suggested. To date, there is no convincing evidence that these effects, other than the rates of the cancers listed above, are occurring throughout the population, nor is there convincing evidence that exposure to low levels of EDS leads to these conditions.

This issue has received a lot of attention in the media and with the general public and will continue until additional evidence is collected to reduce the scientific uncertainties. Research is required to ensure that sound evidence is being used as a basis for making decisions about endocrine disruptors.

Our ever expanding knowledge of genetics is playing and will play an even larger role in the assessment and management of environmental and occupational health issues. Our ability to conduct knowledgeable assessments of human hazards and risks from substances and agents in the environment has been limited to only a frail understanding of “normal” adult human responses. Relatively little is known or considered, in risk assessment of human sensitivities or susceptibilities caused by age, diseases, ethnicity, and/or inherited genetic conditions. The rapidly unfolding knowledge of the human genome sequence, and the functioning of genes, is only now beginning to provide unprecedented insight into the mechanism of genetically-based conditions and the relationship between genetic variation (i.e. polymorphism) and environmental response. Such information will facilitate dramatic advances in our ability to measure human response to environmental conditions, to develop drug treatments and gene therapies for such conditions, and to develop animal and in vitro models for their study. New knowledge of the structural and functional genomics of non-human species will also have a pervasive impact in the field of toxicology of environmental substances, and biotechnology products derived from microbes and other species designed for use in the environment. New animal biomarkers and assays will emerge which will permit the quantification of chemical exposures and their effects in laboratory and wildlife species, resulting in unparalleled insight into mechanisms of action thereby enhancing our ability to understand and their assess risks. New knowledge of the structure and function of microbial genomes will facilitate not only the development of, for example, microbial models for the in situ remediation of environmental hazards, and new biologically-based pest control agents, but it will also lead to precise methods for the surveillance of such organisms leading to effective determination of risk to humans and the environment. Such knowledge will also lead to a new understanding of how microbes interact in vivo with environmental substances and their metabolites to cause adverse effects.

The social sciences and humanities have a major role to play in the integration and organization of existing social science principles and knowledge so they can be more effectively used and unnecessary replication of research efforts is minimized. They can broaden the scope of environmental and occupational health research by bringing novel, innovative approaches to research that incorporate social, cultural, economic and political components into areas where little systematic work has been conducted. They are especially useful for addressing *who* is exposed to environmental factors that threaten health, and *why*, e.g., by establishing the demographics of populations at risk; the identification of vulnerable groups (e.g., children, the elderly) or those more likely to be at risk (e.g., the poor, Aboriginals, women) within that population; and the role of socio-economic status and individual/community coping responses on the environment and health relationship. Because Canadians are so concerned about the potential impact of environment on health, the social sciences' conceptual and analytical frameworks and methodologies for evaluating social dynamics and social interventions (policies and communication strategies) will be especially valuable for evaluating responses to environmental health issues. The position paper written for SSHRC and CHSRF by Eyles et al. (1999) explores in depth the role of the social sciences and humanities in a Canadian Institute of Environmental Health Research (McMaster Institute of Environmental Health, 1999).

Prospective Social Sciences and Humanities Research in Environmental Health

Eyles et al (1999) provide a number of examples illustrating the important role of the social sciences and humanities in environmental health research. Psycho-social impact assessment can be used to evaluate psycho-social effects and behaviour related to measured or perceived climate change and atmospheric hazards and to documenting beliefs and social factors leading to acceptance or resistance behaviour regarding health advisories. Research on health communications could include the analysis of media coverage of environmental issues and evaluation of issue attention cycles as well as determination of health information recall biases to measure elements or contextual factors most likely to influence recall when making risk related decisions. Resource use research can help evaluate resource consumption determinants in rural and urban settings and among certain groups at risk and to assessment the willingness to pay or act in terms of comfort, economic effort, personal investment to ensure food quality and sustainable consumption practices. Psychometric studies are useful in assessing determinants of risk perception and socioeconomic studies can help uncover perceptions of environment and health held by different groups. These are just a few of the areas that would be addressed in an Environmental and Occupational Health Institute.

Much has been said about research in the subject areas of environmental and occupational health. To do this well, research on tools and methodologies is also required to improve the ability to measure exposure and health effects, design epidemiological studies, and analyze data. Thus, measurement techniques, epidemiological and biostatistical methodologies need to be developed. Capacities built through supporting this research will be transferable to future research initiatives.

In order to improve the quality of human health risk assessment related to an exposure to environmental and workplace contaminants, in toxicological as well as epidemiological studies, it is

of utmost importance to: (1) Improve exposure assessment by developing good biomarkers of exposure and intervention protocols allowing to estimate exposure with a high quality and precision. (2) Increase the specificity of effects estimates, by developing good biomarkers of effect specific to the environmental or workplace contaminant under study as well as markers of susceptibility to the toxic compound of interest. (3) Improve the current understanding of the kinetics of toxic substances and their active metabolites in humans and develop toxicokinetic models enabling to estimate, with a good predictive value, the body burden or the concentration of these substances in target organs at any time point and for any exposure scenario. Such models should allow to reconstruct body burden or concentration in target organs as a function of time on the basis of a single measurement of urinary, blood or hair biomarkers at a specific time point, or on the amount accumulated over a certain period of time (for example a 24-h urine sample). (4) Establish the best determinants of health risk associated with an exposure to environmental or workplace contaminants, e.g. the concentration of the parent compound or a metabolite in target organs, the concentration of specific protein or DNA adducts, peak exposure, length of exposure for a given body burden, or the presence of a genetic marker increasing the susceptibility of exposed individuals. (5) Improve the current knowledge of the mechanisms of action by which toxic agents produce their physiological and pathological effects, and the dose-response relationship in humans. (6) Develop strategies enabling verification of validity under actual environmental or workplace exposure situations in human populations, of proposed models using high to low doses or animals to humans extrapolation methods to estimate chronic risks, such as cancer. (7) Study the interactions between several potentially toxic substances found at the same time in the human body. Establish the influence of these interactions on the toxicokinetics of these substances, and on the relationship between exposure dose and toxic response in target organs.

Methodological tools include economic, statistical and epidemiological evaluation. An example of developing an biostatistical and epidemiological tools for assessing the link between occupational exposure to radiation and health outcomes follows.

Tool Development for Occupational Radiation Risk Assessment

The National Dose Registry of Canada (NDR) is a centralized registry of records of occupational exposure to ionizing radiation maintained by the Radiation Protection Bureau of Health Canada. The NDR is the largest occupational radiation exposure database in the world. It currently includes records for over 500,000 individuals from 24,000 organizations dating back to 1951. The NDR contains work histories described in terms of an 80 category job classification codes and a 14 category organizational classification codes. It also contains historical summary records of exposures to X-rays, gamma rays, neutrons, beta particles, internal tritium, and radon daughters. The first analysis of cancer mortality in this cohort was confined to whole-body penetrating doses from external radiation (X-ray, gamma, beta, and neutrons) and whole-body internal exposure from tritium.

The successful application of record linkage methods to combine information on occupation

radiation exposure with information on cancer incidence and mortality has confirmed the utility of the National Dose Registry of Canada as a basis for cancer risk assessment.¹⁰ The NDR data can form the basis for a comprehensive evaluation of the cancer risks associated with exposure to ionizing radiation, using recently developed risk projection models and methods.

The assessment of the potential cancer risks associated with occupational and environmental exposure to ionizing radiation requires the development of an appropriate risk projection model relating exposure to cancer risk. The evaluation of health risks due to low dose, low-dose rate exposures to ionizing radiation is an important issue in population health risk assessment. In order to develop cost-effective exposure mitigation strategies, estimates of population health risk must be based on the best available scientific methods. To strengthen the basis for low dose risk assessment, a comprehensive program of research on the development, application, and validation of both empirical and biologically-based risk models is needed. Both existing and new data derived from the National Dose Registry of Canada should be used in the development of risk projection models for ionizing radiation.

While ad hoc networks are already established in the area of environmental and occupational health, these networks are not integrated in a comprehensive fashion. We propose that CIHR recognize the vital importance of healthy living and work environments as a primary determinant of the health of Canadians by establishing an institute of health based on this theme. This helps reinforce one of the CIHR objectives in Bill C-13: “promoting, assisting and undertaking research that meets the highest international scientific standards of excellence and ethics and that pertains to all aspects of health, ...and environmental influences on health.”¹¹

The scope of CIEOH is broad so the four areas identified by the CIHR Interim Governing Council, i.e. basic biomedical research, applied clinical research, research on health care systems and services, and society, culture and the health of populations will each provide important perspectives to the research being conducted under its mandate. Eyles et al (1999) describe how an environmental theme encompasses all four themes.

- *Basic biomedical* research aims at understanding biological, physiological, anatomical, biochemical, genetic and behavioural phenomena which operate at individual, organ, cell, and molecular levels. For environmental health research, the identification of toxic and infectious elements in the environment and their effect on body function and health are key. Toxicology and genetics have significant roles to play as does epidemiology to identify the determinants and distributions of the exposures and outcomes of interest in particular populations. This leads to effective creation of diagnostic, preventative, protective and promotional tools and measures for use in population health interventions.

¹⁰ Ashmore JP, Krewski D, Zielinski JM, Jiang H, Semewnciw R, and Band P. First Analysis of Mortality and Occupational Radiation Exposure based on the National Dose Registry of Canada American Journal of Epidemiology 148, 564-574, 1998.

¹¹ Bill C-13, First Reading, “An Act to establish the Canadian Institutes of Health Research, to repeal the Medical Research Council Act and to make consequential amendments to other Acts”

- *Applied clinical* research is concerned with the application of knowledge for the effective clinical interventions. For environmental health, it's important, too, to identify and assess public health interventions for determining the effectiveness, efficiency and efficacy of a different program, practice or policy. Evaluation and outcomes research combine with the basic biomedical to assess evidence and the procedures derived therefrom. "Evidence-based practice" links the applied clinical to the policy domain. This leads to efficient use of available tools and measures to remedy, prevent, cure or care the burden of disease from environmental origin.
- *Society, culture and population health* research focuses on making discoveries in understanding the determinants of health in populations and how social systems affect health. A CIEOH would also be firmly located in this research sector, establishing the relationships between environmental quality, exposure and different health outcomes in studies to identify the environmental burden of illness, environmental effects in relation to those of other determinants, and environment as an enhancer of quality of life. Epidemiological and quantitative social research are important tools as are qualitative methods and ways of addressing issues of justice and fairness in the ecological and socio-geographical distributions of environmental exposures. This leads to effective policy formulation and implementation.
- *Health services and systems* research relates to those systems and policies which affect health, including the delivery of services and activities in non-health sectors. Environmental health research will focus on understanding and explaining the formulation and implementation of systems, structures and policies. By their nature, such phenomena are multi-sectoral and will require that attention be given to health, environment, natural resources, law, economic development, recreation and tourism, finance and so on. Policy science, surveillance and database development are major tools in this sector. Health services can also be used to obtain better exposure and health outcome data. This leads to effective systems design and efficient services delivery.

The box below provides an example which shows how an environmental health issue needs to be addressed in an integrated fashion, where researchers, doctors, patients and communities need to work together to address the issue of environmental health sensitivities.

Research on Environmental Health Sensitivities in the Four Theme Areas

An example of how the four themes need to be brought together in a coordinated fashion can be illustrated through environmental sensitivities: Some people are unusually sensitive to chemicals and other substances in our environment, a condition known as *environmental sensitivity* or multiple chemical sensitivities. Such people are sensitive to low levels of natural or manufactured irritants present in a variety of sources, such as food, water or air. Although many different hypotheses have been put forward to explain the cause(s) of environmental sensitivity, these theories have not been adequately supported through well-controlled scientific studies. Similarly, many of the new diagnostic tests and treatments employed have not been supported by controlled clinical studies and thus have not been endorsed by the medical community at large.

Given the existing uncertainty concerning diagnosis, causation and treatment of environmental sensitivity, and particularly the importance of environmental versus psychological factors, it has been generally recommended that clinicians should perform the necessary clinical assessment (including standard patient history, physical examination, psychiatric/psychological assessment and laboratory tests) on patients to rule out any medical or psychiatric/psychological conditions that require specific treatments. As with allergies, identifying and avoiding substances that trigger reactions among people with environmental sensitivity are very important. Mechanical air filtering may be the solution for some people. Controlling other triggers, such as sudden changes in temperature and humidity, can also be helpful. Many environmentally sensitive people seem to benefit from clean air and water and food grown without chemicals. As allergies, allergy-like reactions and sensitivities may result from exposure to high levels of various chemicals, reducing exposure as much as possible could significantly reduce the risk of adverse reactions.

The key to creating this institute will be to develop strong communication and consultation practices among a solid representation of the many stakeholders of environmental health research, including Canadian universities, health and research centres, government laboratories, teaching hospitals, federal and provincial governments, unions, communities, population groups, and non-government organizations voluntary and private sectors. Additionally, it is essential that there is a strong link to other proposed institutes where cross-cutting issues exist. The box below provides an example which shows how injuries cross-cut other proposed institutes and provide a common concern on which to build linkages and foster multidisciplinary, partnership research programs.

Injury as a Cross-Cutting Issue

Injury is an issue that is not limited to environmental and occupational health. Canadians of all ages are at risk of injury. The youngest and the oldest in our society are at particularly high risk. Some sub-populations which are at higher risk include aboriginals, the poor, and those living in rural and remote regions of the country.

Injury prevention and control is not solely a health issue, but is interdisciplinary in nature and requires research expertise from structural engineers, safety engineers, industrial designers, ergonomists, industrial hygienists, toxicologists, social and behavioural scientists, educators, epidemiologists, emergency response and critical care professionals, physicians, surgeons, medical specialists, and rehabilitation experts. The responsibility for injury prevention is shared by individuals, families, communities, health care, the private sector, and all levels of government.

The very broad nature of this issue is a challenge, but it also offers extensive opportunities for interdisciplinary collaboration and partnership ventures involving other research institutes and funding agencies in the health field and in the transportation, agriculture and other sectors. Within the examples of research institutes listed in Appendix A, collaborative opportunities would be possible with Institutes for Disease and Trauma (musculoskeletal and trauma), Health Inequalities and Exclusions (injury risks and treatment in disadvantaged populations), Health Delivery (critical care and rehabilitation), Health of Communities (injuries among aboriginal and rural people), Health Products, Services and Technologies (design of safety equipment and assistive devices for

those with impairments and disabilities). Life Cycle (injuries among children and seniors), Mental Health (suicide), and Physiology (risk behaviour and neuroscience).

The Governance of the CIEOH will follow the processes and procedures as finalized by the CIHR Governing Council.

Partners and Collaborators

Partners and collaborators in the CIEOH could bring together all fields of environmental and occupational health research, to build an expanded research infrastructure. The modernized, collaborative research venture involving researchers working in different fields and in different parts of the country will be built on a sound basis of pro-actively identifying, assessing, and managing health risks. The research framework would build on the research base in our universities, health and research centres, teaching hospitals, federal and provincial governments, unions, voluntary and private sectors by supporting and linking researchers in new ways. The focus will be on knowledge creation and integration, an enhanced knowledge base for the health system, the creation of more highly-skilled jobs in a key sector of the economy, the development of a “safety culture” and a wholesome environment, and above all -- healthier Canadians.

Interested Parties in Canada

Interested players in Canada include: Canadian universities, health and research centres, hospitals, federal and provincial governments and agencies, communities, population groups, non-government organizations, unions, the voluntary sector, the private sector, worker’s compensation boards, and the Canadian Labour Congress. Appendix C provides a list of specific organizations which can contribute to CIEOH.

International Linkages

It is important to share information and coordinate research internationally. Canada has numerous established partnerships with international government agencies. Types of agreements include International Agreements (e.g. Mexico-USA-Canada), Memoranda of Understanding: (e.g. between Canada and Russia, Canada and Germany), Mutual Recognition Agreements: (e.g. between Canada and the European Community).

The CIEOH will foster and promote the linkages with the international research community, as well as develop others. There are a number of institutions and organizations which are particularly focused on, or maintain a significant and visible program in environmental and occupational health research. The CIEOH will pursue collaborations and partnerships with these organizations as well. Examples of related international programs are many. The objective of the World Health Organization (WHO) is the attainment by all peoples of the highest possible level of health. The International Agency for Research on Cancer (IARC) is the part of the World Health Organization with the mission to coordinate and conduct research on the causes of human cancer, the mechanisms of cancer-causing agents, and to develop scientific strategies for cancer control. The Agency is

involved in both epidemiological and laboratory research, and disseminates scientific information through publications, meetings, courses, and fellowships.

The Pan American Health Organization (PAHO) is an international public health agency with more than 90 years of experience in working to improve health and living standards of the countries of the Americas. The Organization's basic task is to collaborate with Ministries of Health, social security agencies, other government institutions, non-governmental organizations, universities, community groups, and many others to strengthen national and local health systems and to improve the health of the peoples of the Americas. PAHO serves as the World Health Organization's Regional Office for the Americas and is also recognized as an Inter-American Specialized Organization by the Organization of American States.

A number of organizations in the United States conduct research on environmental and occupational health issues. The mission of the U.S. National Institutes of Health (NIH) is to uncover new knowledge that will lead to better health for everyone. This is done by conducting research in its own laboratories; supporting the research of non-Federal scientists in universities, medical schools, hospitals, and research institutions throughout the country and abroad; helping in the training of research investigators; and fostering communication of biomedical information. The U.S. National Institute of Environmental Health Sciences (NIEHS) is one of 25 Institutes and Centers of the National Institutes of Health (NIH), which is a component of the Department of Health and Human Services (DHHS). Its mission is to reduce the burden of human illness and dysfunction from environmental causes by understanding each of these elements and how they interrelate, achieved through multidisciplinary biomedical research programs, prevention and intervention efforts, and communication strategies that encompass training, education, technology transfer, and community outreach. The U.S. National Institute for Occupational Safety and Health (NIOSH) was established by the Occupational Safety and Health Act of 1970. NIOSH is part of the Centers for Disease Control and Prevention (CDC) and is the only federal Institute responsible for conducting research and making recommendations for the prevention of work-related illnesses and injuries. The Institute's responsibilities include: investigating potentially hazardous working conditions as requested by employers or employees; evaluating hazards in the workplace, ranging from chemicals to machinery; creating and disseminating methods for preventing disease, injury, and disability; conducting research and providing scientifically valid recommendations for protecting workers; and providing education and training to individuals preparing for or actively working in the field of occupational safety and health.

The U.S. Centers for Disease Control and Prevention (CDC) conducts research to promote health and quality of life by preventing and controlling disease, injury, and disability. The U.S. Environmental Protection Agency (EPA) carries out research to protect human health and to safeguard the natural environment (air, water, and land) upon which life depends.

Next Steps

The Canadian Institutes of Health Research offer the chance to respond to the unprecedented flood of research knowledge and provides opportunities to improve the health of Canadians. With increased collaboration and effort, enhanced research efforts can help counter the new threats to

health which are emerging or re-emerging.

Coordinated, collaborative and focused health research efforts are required to effectively manage the vast array of environmental and occupational health risks. It is proposed that a Canadian Institute of Environmental and Occupational Health be established to bring together the research base in our universities, health and research centres, teaching hospitals, federal and provincial governments, voluntary and private sectors by supporting and linking researchers in new ways. Using a common starting point, such as the Health Canada Decision-Making Framework, will give health researchers a consistent approach in using health research to identify, assess, and manage both natural and man-made environmental and occupational health risks, and to improve the health of Canadians.

The formation of such an Institute would allow researchers to forge new linkages between biomedical research, applied clinical research, research on health care systems and services and research on society, culture and the health of populations, in the area of environmental and occupational health research.

The Canadian Institutes of Health Research has the opportunity to direct and focus the efforts of many scientists currently working in relative isolation on matters pertaining to environmental and occupational health and safety. This will undoubtedly result in improved identification, analysis, and management of risks associated with environmental and occupational health hazards, thus ultimately benefitting all Canadians.

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U.S. National Institutes of Health (NIH) Web Site at www.nih.gov

World Health Organization (WHO) Web Site at www.who.int

APPENDIX A - Relationship between CIEOH and other categories of Institutes

There are many approaches to splitting up health research activities. For example, health research activities can be split into non-overlapping disease or trauma groupings, such as cancer, cardiovascular disease, injury. Other ways of dividing activities could be by stage in the life cycle such as child health and aging or by special focus groups, such as aboriginals and women. A slate of Institutes would be much richer if it they contained diverse ways of focusing their research. In addition, there are themes which are quite unique and do not necessarily span all activities. Rather than naming individual Institutes, we will show how an Environmental and Occupational Health Theme fits in with categories of other themes. Examples of theme categories are suggested along broad lines:

- **Diseases and traumas.** Includes AIDS and related disorders; arthritis, musculoskeletal and skin diseases; respiratory diseases; cancer; diabetes; infectious diseases; injuries.
- **Special focus groups.** Groups of people who have special manifestations of diseases, afflictions and social circumstances for whom research is needed to develop unique approaches to resolve or mitigate their special problems. Includes aboriginal health, rural health, communities, immigrants, women, men.
- **Life cycle issues.** Includes prenatal and postnatal health, child health, developmental health, and aging.
- **Environmental and occupational exposures.** Research will focus on the impact of environmental and occupational exposures on health. Includes climate change, endocrine disruptors, environmental pollution, food contamination, indoor and outdoor air quality, workplace chemicals and processes, injury prevention and control, effects from the built environment.
- **Health Products, Services and Technologies.** Includes drug research, discovery and development; health technology, health services, clinical evaluation and technology assessment; optimal pharmacotherapy and drug delivery.

The interconnectedness amongst these themes is clear. For example, diseases and traumas can affect special focus groups; special focus groups go through the life cycle; people in the various life cycle stages are affected by environmental and occupational exposures; health products, services and technologies could result in environmental and occupational exposures. The value of having separate institutes is to focus on the specific issue, pulling together and coordinating talents and expertise in the Canadian research community that are focused on that issue. Yet, the linkages amongst institutes necessarily lead to collaborations and cooperation among institutes.

Some of these theme categories are exceedingly large and the names of some of the categories do not necessarily conjure public appeal. Thus, some categories may be split into more than one institute with more acceptable titles.

An Institute of Environmental and Occupational Health is linked to the examples of themes provided above as follows:

- Environmental and occupational exposures result in and have the potential to result in all major disease and trauma types. Research on diseases and traumas is essential and complementary to understanding the true impact of environmental and occupational exposures on health. For example, environmental exposure to smog results in higher hospital admissions for respiratory ailments. Higher occupational exposure to radiation or certain chemicals may result in cancer.
- Special focus groups are have unique issues associated with environmental and occupational exposures. For example, aboriginal peoples are exposed to excessive levels of persistent chemicals found in traditional foods.
- People in various stages of the Life cycle also have unique issues associated with environmental and occupational exposures. For example, workers in buildings with poor air quality can have headaches, nausea, fatigue, drowsiness, and eye, nose and throat irritation which is often referred to as “sick building syndrome”.
- Health products, services and technologies could result in environmental and occupational exposures. For example, although drugs can provide therapeutic intervention, they can also cause toxicity or adverse health effects.

APPENDIX B - Identifying, Assessing, and Managing Health Risks

Environmental factors strongly impact 6 out of 12 most widespread chronic diseases in Canada, affecting 1.1 million Canadians, and cost Canadian society \$40 billion *per* year. The burden associated with non-chronic diseases is even greater. Identifying, assessing and managing these health risks is a tremendous challenge.

Protection of health, at either a personal or societal level, is complex. It generally involves identifying specific hazards, estimating the level of risk associated with these hazards, developing and analysing potential options for managing the risks, selecting and implementing a specific risk management strategy and monitoring and evaluating the impact of this strategy. These steps may be taken formally or informally, and to varying degrees, depending on the situation and participants involved. Informed health research is at the core of all aspects of effective risk management.

Health protection agencies often use a formal method for assessing and managing health risks. Decision-making frameworks have been developed for this purpose by several organizations in Canada and internationally. Although frameworks tend to be based on similar principles, they may differ in scope, terminology, presentation of the steps involved, level of detail and the role of such factors as risk communication and the involvement of stakeholders (i.e. parties who are concerned about or affected by the issue) in the overall process.

An example of a decision-making framework is one from Health Canada which has the following underlying principles:

- Maintaining and improving health is the primary objective;
- Involve interested and affected parties;
- Communicate in an effective way;
- Use a broad perspective;
- Use the best available information;
- Use a collaborative and integrated approach;
- Allocate resources appropriately;
- Implement efficient and effective strategies;
- Tailor the process to the issue and its context;
- Clearly identify assumptions and uncertainties;
- Clearly define roles, responsibilities, and accountabilities; and
- Strive to make the process transparent

The proposed decision-making framework is depicted in Figure 1 and consists of a series of interconnected and inter-related steps, which may be grouped into three phases: issue identification (identify the issue and put it into context); risk assessment (assess risks and benefits); and risk management (identify and analyze options; select a strategy; implement the strategy; and monitor and evaluate the results). The framework reflects the involvement of interested and affected parties throughout the process, including partners, the public, and other stakeholders.

APPENDIX C - Potential Partners and Collaborators

Participants in Development of this proposal

The responsibility for protecting our health is shared by individuals, families, communities, commercial enterprises, and all levels of government. The following is a partial list of organizations which are involved in promoting safe living and working environments, many of which are actively involved in related research. Some have worked on the development of this proposal.

Canadian Universities

Canadian Network of Toxicology Centres, Guelph University

Centre de recherche en biologie de la reproduction, l'Université Laval

Centre pour l'étude des interactions biologiques entre la santé et l'environnement, Université du Québec à Montréal

Centre for Environmental Health, University of Victoria

Centre for Indigenous People's Nutrition and Environment, Macdonald campus of McGill University

Environmental Health Sciences Program, Department of Public Health Sciences, University of Alberta

Environmental Hypersensitivity Research Unit, University of Toronto

Gage Occupational and Environmental Health Unit, University of Toronto

Groupe de recherche en santé communautaire: la santé et l'environnement, Unité de recherche en santé et environnement, l'Université Laval et Centre Hospitalier Universitaire de Québec, Centre de santé publique de Québec

Institute for Environmental Studies, University of Toronto

Institute of Population Health, University of Ottawa

Institute of Risk Research, University of Waterloo

Institut national de la recherche scientifique, l'Université de Québec

International Network on Water, Environment and Health, United Nations University, Headquartered at McMaster University

McMaster Institute of Environment and Health, McMaster University

National Network on Environments and Women's Health, York Centre for Health Studies, York University

Network for Environmental Risk Assessment and Management, University of Waterloo

Population Health Research Unit, Department of Community Health and Epidemiology, Dalhousie

Royal Military College of Canada

Many individuals from a broad spectrum of departments in many Canadian universities including Queens University, Simon Fraser University, Trent University and University of British Columbia.

Health and Research Centres

Alberta Centre for Injury Control and Research

Alberta Council for Research on Air and Health

B.C. Cancer Research Agency

B.C. Injury Research and Prevention Unit
B.C. Lung Association
B.C. Research Institute for Children's and Women's Health
Canadian Institute of Child Health, Children's Environmental Health Program
CINBIOSE Research Centre (WHO-PAHO Collaborating Centre in Occupational and Environmental Health)
Institut Armand Frappier
Institut de recherche en santé et en sécurité du travail du Québec
Institute for Work and Health, Toronto
Manitoba Cancer Agency
National Cancer Institute of Canada
National Research Council
Network Centres for Excellence, in the area of Environmental Health
Nova Scotia Child Safety and Injury Prevention Program
Ottawa Life Sciences Centre
Plan-it Safe: Child and Youth Injury Prevention Centre
Radiation Biology and Health Physics Branch, Chalk River Laboratories, Atomic Energy of Canada, Ltd.
Réseau de recherche en santé environnementale, Le Fonds de la recherche en santé du Québec
The Population Health Program, The Canadian Institute for Advanced Research
Traffic Injury Research foundation of Canada
WHO Collaborating Centre for Injury Prevention and Safety Promotion (Quebec)
Winnipeg Health Sciences Centre

Hospitals

Children's Hospitals
Halifax Health Centre
Hôpital du Sacré-Coeur, Montréal
Occupational Health Clinic, Toronto
Ottawa Hospital
St. Michael's Hospital
Teaching Hospitals
Toronto Western Hospital

Federal and Provincial Governments and Agencies

Alberta Health
British Columbia Health
Canadian Centre For Occupational Health and Safety
Department of Indian and Northern Affairs
Environment Canada
Environment Ontario
Environmental Health Program, Health Canada
Health Promotion and Programs Branch, Health Canada
Human Resources Development Canada
Industry Canada

Laboratory Centre for Disease Control, Health Canada
Manitoba Department of Labour
Medical Services Branch, Health Canada
Natural Resources Canada
Nova Scotia Cancer Registry and Cancer Care Nova Scotia
Nova Scotia Environmental Health Centre
Occupational Health and Safety Agency, Health Canada
Ontario Ministry of Environment
Ontario Ministry of Labour
Pest Management and Regulatory Agency, Health Canada
Saskatchewan Health
Workplace Safety and Insurance Board
Workers' Compensation Boards

Trade Unions

Canadian Labour Congress

Population Groups

Native Canadians
Rural Populations
Sydney (Tar Ponds issue)
Port Hope

Others

Atomic Energy Control Ltd.
Canadian Chemical Producers Association
Canadian Federation of Agriculture
Canadian Institute of Child Health
Canadian Institute of Public Health Inspectors
Canadian Pediatric Society
Canadian Petroleum Products Institute
Canadian Pulp and Paper Association
Canadian Registration Board of Occupational Hygienists (www.crboh.ca)
Canadian Standards Association
Canadian Teachers Federation
Canadian Water and Waste Water Association
Canadian Wildlife Federation
Centre for Coastal Health
Federated Women's Institutes of Canada
First Nations Environmental Health
Friends of the Earth
Heart Safe Ottawa
Mining Association of Canada
Poison Control Centres

Pollution Probe
Rick Hansen Institute
Safe Communities Foundation
Sierra Club
SMARTRISK
Sustainable Development Institute
Telecom
Workplace Health and Safety Agency

International Organizations

Canadian Society for International Health
Intergovernmental Forum on Chemical Safety
International Joint Commission
National Center for Environmental Health
Pan-American Health Organization
U.S. Centers for Disease Control and Prevention
U.S. National Institute for Occupational Safety and Health
U.S. National Institute of Environmental Health Sciences
U.S. Universities