

# The Ecosystem, the Natural Environment, and Health and Nursing: A Summary of the Issues

## What's the issue?

The natural environment has a significant impact on our quality of life, our health, and the sustainability of our planet. Increasing population, urbanization and industrialization around the world place enormous stress on the ecosystem, which affects the quality of the air we breathe, the water we drink and the food we eat, and the availability of the resources we consume to maintain our lifestyles. New chemicals and industrial processes are being rapidly developed, and sometimes produce unforeseen risks to human health and to the ecosystem.

In Canada, cities continue to expand into farmland. There has been a significant increase in the number of smog alerts in urban areas. A thinning ozone layer has led to an increase in the occurrence of melanomas. The contamination of the public water supply in places like Walkerton, Ontario and North Battleford, Saskatchewan highlight the issue of environment-related health issues.

Poor environmental quality contributes to between 25 and 33 per cent of global environmental diseases (European Public Health Association, n.d.). These include pollution-related diseases, occupational diseases, food-borne diseases and water-borne diseases. As our knowledge progresses about the etiology of disease, evidence of environmental contributions to disease also grows, particularly the environmental link to a number of chronic diseases.

## Why is this issue important?

### *How this issue relates to ecosystem health*

The ecosystem includes the interrelated physical and biological systems that connect and sustain all forms of life on the planet. Changes in the ecosystem and the natural environment are often due to either environmental contamination or degradation. Environmental contaminants are man-made or natural substances that are present in such amounts that they have the potential to adversely affect human or ecosystem health. Routes of contamination may be chemical, physical or biological. Environmental degradation happens when the ecosystem's intrinsic capacity for self-renewal is damaged, for example through global warming or excessive soil erosion.

Environmental contamination and degradation create a series of interrelated ecological crises that threaten people's health and well-being. These include: exploitation of non-renewable resources; climate change; pollution of soils, ground and surface water, oceans and atmosphere (including destruction of the ozone layer); and overpopulation. These crises are producing the following effects:

- natural catastrophes, such as droughts, floods, hurricanes and rising sea levels
- environmental degradation, such as soil erosion and desertification, deforestation and habitat destruction, and air and water pollution,
- human catastrophes, such as starvation, disease and environmental refugees.

### *How this issue relates to human health*

Human health is affected most directly by three types of environmental exposure: air, water and soil (mainly through food).

#### **Air quality:**

- The air may contain thousands of chemical and biological substances emitted into the atmosphere by natural sources (e.g., forest fires) or human activities (e.g., vehicle exhaust). In addition, these chemicals may react in the atmosphere to produce other pollutants. Substances that foul the air are called pollutants. They include ground-level ozone (O<sub>3</sub>), particulate matter (PM), sulphur dioxide (SO<sub>2</sub>), carbon monoxide (CO), nitrogen oxide (NO<sub>x</sub>), volatile organic compounds (VOCs), hydrogen sulphide (H<sub>2</sub>S), sulphates and nitrates. Additional air pollutants of concern include toxic metals (lead, mercury, manganese, arsenic and nickel), benzene, formaldehyde, polychlorinated biphenyls (PCB), dioxins and other persistent organic compounds.
- In and around major urban centres, transportation is the biggest source of many air pollutants that affect human health. Much of the focus on the health effects of the pollutants in smog is on ground-level ozone and fine particulates. Research has found that there is no threshold level below which it is safe to breathe such substances. Estimates of the health impacts of smog vary, but Toronto Public Health has recently calculated that 1,700 Toronto residents per year die prematurely and 6,000 Torontonians are hospitalized, largely because of air pollution from transportation sources (Toronto Public Health, 2004).
- Airborne contaminants, including environmental tobacco smoke and moulds, can cause or exacerbate a number of respiratory conditions, such as asthma. Asthma rates have risen sharply; asthma now affects roughly three million Canadians, and between 7 and 10 per cent of Canadian children (Canadian Lung Association, 2003).

#### **Water quality:**

A growing numbers of activities can contaminate our drinking water, including improperly disposed of chemicals, animal and human wastes, wastes injected underground, and naturally occurring substances. Likewise, drinking water that is not properly treated or disinfected, or that travels through an improperly maintained distribution system, may also pose a health risk.

There are five main types of water contamination: physical, inorganic, organic, microbiological and radioactive.

- Physical contamination is turbidity or cloudiness as a result of suspended particulate matter such as clay, silt or microorganisms. This can be a source of nutrients for bacteria and can make it difficult to purify water.

- Microbiological contamination comes mainly from untreated human and animal waste. The greatest health risks come mainly from certain types of bacteria, campylobacter, E. coli, salmonella, giardia, cryptosporidium and viruses. Exposure to these may lead to a variety of gastrointestinal illnesses, some potentially life-threatening.
- Inorganic contamination includes metals (which may be naturally present or byproducts of mining or other industrial processes), arsenic, lead, fluoride and nitrates (naturally occurring and also as a main component in fertilizers, therefore often end up in water via runoff from farmers fields, landfills and septic systems. Exposure to some of these substances has been linked to cancer (arsenic), neurological impairment (lead), methemoglobinemia (nitrates), and other diseases.
- Organic contaminants include pesticides and VOCs from certain household products and industrial processes such as dry cleaning (e.g., trichloroethylene). Many of these have been identified as carcinogens. They are particularly persistent in nature because they concentrate in the food chain.
- Radioactive contaminants include decayed uranium and other radionuclides from natural and human sources. These have been linked to genetic defects and cancers.

Drinking water is a minor source of most pollutants – we get 80 to 95 per cent of our daily intake of persistent organic pollutants from food – but it is the principal source of exposure to some microorganisms. In 1988 and 1989, 17 outbreaks of water-related disease in Canada were recorded, affecting 550 individuals. This is very likely an underestimate (Pollution Probe, 2002).

### Soil contamination and food:

The main environmental contaminants in food consist of agricultural by-products (e.g., fertilizers, pesticides or herbicides), and chemical additives (e.g., dyes or preservatives). Commercially available fruit and vegetables are subject to regulations and are monitored by the Canadian Food Inspection Agency for contamination. Studies have shown that in more than 85 per cent of retail produce, no pesticide residues are detectable using current analytic methods. Less than 3 per cent of all vegetables and fruit contain pesticide residue above Canada's maximum limits (Canadian Cancer Society, 2005).

However, there is some controversy over the measurement of pesticide residues and the interpretation of what constitutes "safe" levels of exposure. Shafer and Kegley (2002) found that about 20 per cent of the food in a typical diet is contaminated with trace amounts of pesticides, even though most of them have been banned for decades. A typical diet features between 60-70 "hits" daily of toxic chemicals such as DDT, dieldrin and dioxin. These persistent organic pollutants, which have been linked to cancer and other diseases, are of concern because they build up in fatty tissues and persist in the environment for many years.

Environmental contaminants do not affect everyone equally. **Children** are disproportionately affected by their exposure because:

- Relative to their weight, children breathe, eat and drink more than adults.
- Children have more hand-to-mouth activity, and are closer to their environment (playing in mud and dirt, rolling in grass, splashing in puddles, etc.) than adults.

- Children absorb more chemicals through their skin and intestines than adults.
- Children pass through critical developmental stages when exposure to certain contaminants can have a major effect.

In addition to children, **people living in poverty** are at greater risk for environmental health problems because:

- their *burden* of physical, chemical and biological exposure is greater (for example, living close to factories or expressways, and in older buildings that may have lead paint or asbestos insulation).
- they have less access to resources that help mitigate the negative effects of this exposure (for example, nutritious food and high quality medical care).

Environmental contaminants cause or aggravate a wide range of illnesses, including cancer. An estimated 134,100 new cases of cancer and 65,300 deaths from cancer occur in Canada every year. Up to five per cent of cancers (approx. 6,400 per year) can be directly linked to the environment. Some experts estimate that future research could directly link up to 10 per cent of cancers to environmental contaminants (Canadian Cancer Society, 2005).

### *How this issue relates to the functioning of the health system*

The natural environment and the health system are interrelated in two ways. First, illnesses caused by or aggravated by environmental contamination are a major cost to the health system. Second, the health sector has a significant effect on the natural environment; learning to operate in a “greener” way could reduce this impact.

### **Environmental illness**

Environmental contaminants are linked to many largely preventable illnesses. Thus, interventions to reduce exposure to these contaminants have the potential to produce significant health care savings:

- Unless interventions are made now, the estimated direct cost of cancer care in Canada is expected to rise from \$1.2-billion in 2001-2002 to \$2-billion in 2020. Five to ten per cent of these cancers are directly linked to environmental factors (Canadian Cancer Society, 2005).
- In Ontario alone, the cost of air pollution to the health care system and to the provincial economy exceeds \$1-billion and could reach as high as \$10-billion annually (Ontario Medical Association, 2000).
- The annual health-care costs of water-related disease outbreaks in Canada are estimated to exceed \$300-million (Pollution Probe, 1999).

### *“Green” health care*

The health care sector represents 10 per cent of the Canadian economy. It is a significant user of energy and a contributor to global climate change; a significant producer of solid, liquid and gaseous wastes, including such potent pollutants as dioxins (from the incineration of PVCs) and mercury; and a significant user of plastics, paper, lumber and other resources. As a result of these activities, the health sector contributes considerably to impairing ecosystem health.

Health professionals need to be conscious of the “environmental footprint” their organizations make, and to learn how they can minimize the negative ecological effects of their work. The movement towards “green” health care seeks to make the health care sector more environmentally responsible. Its core areas of focus include:

- energy conservation
- pollution prevention
- resource conservation
- solid waste reduction
- good indoor air quality
- environmentally responsible design and management.

### **Why is this issue important to nurses?**

Since the days of Florence Nightingale, nurses have noted the link between physical environments and the health of their patients. Nightingale wrote about the need for pure air and clean water to promote health and healing. She was a strong advocate for nurses intervening to improve environmental conditions. In addition to integrating this information into their clinical practice, nurses became strong advocates for healthy environments.

Today, the relationship between the environment and health is much more complex, especially as new industrial processes and chemicals enter the environment every day. More than ever, nurses will be called upon to use their knowledge and skills for the prevention, treatment and management of environmental health issues. This is a role that nurses can play with individual patients and their families, in workplaces and in other locations, such as schools and neighbourhoods.

Nursing education and practice need to evolve in critical areas to deal adequately with the increase in environmental health issues:

- Nurses in all settings should be well-prepared to identify and assess potential environmental health issues related to workplaces, neighbourhoods, houses and schools.
- Given that environmental health is a rapidly evolving field, nurses should know where to go to find current and credible scientific information.
- Nurses are considered to be trusted sources of information regarding environmental health risks. As such, they are often in a position to translate information from other experts in fields such as toxicology and epidemiology, making it comprehensible to their patients.
- Nurses are often in a position to identify environmental health issues because they may recognize patterns of symptoms in people who live or work in the same areas. Nurses should be prepared to investigate and act when they see such patterns.

## What has CNA done to address this issue?

- CNA is a member of the Expert Advisory Board on Children's Health for the Commission for Environmental Cooperation.
- CNA is a member of the Environmental Health Coalition.
- CNA is a member of the Canadian Coalition for Green Health Care.
- CNA developed a position statement on the environment as a determinant of health.
- CNA drafted a joint policy statement with the Canadian Medical Association on environmentally responsible activity in the health sector.
- CNA has resolutions on:
  - o chemicals, pesticides and radioactive materials
  - o disposable items in health facilities.

## What can nurses do about this issue?

### *Primary prevention*

- Counsel women of childbearing age about reducing their exposure to environmental hazards.
- Support the development of exposure standards for toxins and other contaminants.
- Advocate for safe air and water.
- Teach avoidance of ultraviolet exposure and use of sunscreen.
- Support programs for waste reduction and recycling, as well as energy conservation in your community and your workplace.

### *Secondary prevention*

- Assess homes, schools, worksites and communities for environmental hazards.
- Screen children under five years for blood lead levels.

### *Tertiary prevention*

- Support cleanup of toxic waste sites and removal of other hazards.
- Refer homeowners to approved programs that eliminate contaminants such as lead and asbestos.

## Where can you go for further information?

- Asthma Society of Canada ([www.asthma.ca](http://www.asthma.ca))
- Canadian Association of Physicians for the Environment ([www.cape.ca](http://www.cape.ca))
- Canadian Cancer Society ([www.cancer.ca](http://www.cancer.ca))
- Canadian Centre for Occupational Health and Safety ([www.ccohs.ca](http://www.ccohs.ca))
- Canadian Health Network websites for Environmental Health, Workplace Health ([www.canadian-health-network.ca](http://www.canadian-health-network.ca))
- Canada Health Portal ([www.chp-pcs.gc.ca](http://www.chp-pcs.gc.ca))
- Canadian Institute of Child Health ([www.cich.ca](http://www.cich.ca))
- Canadian Lung Association ([www.lung.ca](http://www.lung.ca))
- Canadian Occupational Health Nurses Association (<http://www.cohna-aciist.ca>)
- Canadian Partnership for Children's Health and the Environment ([www.healthyenvironmentforkids.ca](http://www.healthyenvironmentforkids.ca))
- Canadian Public Health Association ([www.cpha.ca](http://www.cpha.ca))
- Citizens for a Safe Learning Environment ([www.chebucto.ns.ca/Education/CASLE/asthma.html](http://www.chebucto.ns.ca/Education/CASLE/asthma.html))
- European Public Health Alliance Environmental Network ([www.env-health.org](http://www.env-health.org))
- Healthy Spaces ([www.cfc-efc.ca/healthy-spaces](http://www.cfc-efc.ca/healthy-spaces))
- International Council of Nurses ([www.icn.ch](http://www.icn.ch))
- Nightingale Institute for Health and the Environment ([www.nihe.org](http://www.nihe.org))
- Pollution Probe ([www.pollutionprobe.org](http://www.pollutionprobe.org))
- Sierra Club of Canada ([www.sierraclub.ca](http://www.sierraclub.ca))
- World Health Organization ([www.who.org](http://www.who.org))

## Further Reading

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